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Effect of Home Exercise Protocol on Exercise Tolerance and Quality of Life in Post CABG Subjects

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ABSTRACT

Coronary artery bypass grafting (CABG) rehabilitation protocols were developed to restore patient's daily activities emphasizing physical and functional fitness. Home exercise protocol includes aerobic and resistance exercise framed to perform with graded complexity and much motivation.

Objectives: 1) To determine the effect of home exercise protocol on exercise tolerance and quality of life in post CABG subjects and 2) To determine the effect of conventional physiotherapy on exercise tolerance and quality of life in post CABG subjects.

Method: Ethical Clearance was obtained from institutional ethical committee. A total 70 post CABG subjects were selected and divided into two groups. Group A (n=35) received conventional physiotherapy which includes walking, shoulder and thoracic mobility exercises, breathing exercises along with medications for 1 hour/day and 5 days/week and Group B (n=35) received home exercise protocol which includes aerobic exercises and resisted exercises along with conventional physiotherapy. The preassessment of exercise tolerance is measured by 6 Six Minute Walk test (6MWT) and quality of life with SF36 questionnaire and postinterventional assessment was taken for the same after 3 months.

Result: Intergroup statistical analysis for 6MWT revealed significant in postintervention for Group B ($p < 0.0001$). QOL was extremely significant for group B ($p < 0.0001$). Group B treated with home exercise protocol have statistically significant improvement over group A in 6 minute walk test and quality of life.

Conclusion: Hence home exercise protocol is effective in improving exercise tolerance and showed increased quality of life in post CABG subjects.

Keywords: Home exercise protocol, CABG, 6 MWT, walking, quality of life.

Introduction

The presences of angina and reduction in vascularity of myocardium with signs of ischemia are taken as the

indication for coronary artery bypass grafting. Coronary artery disease in India has led to an increase in number of coronary artery bypass grafting. Coronary arteries supply blood flow to the heart muscle. Plaque damages the coronary arteries and blood platelets can stick to these damaged areas, causing blockage of blood flow. This can lead to ischemia or myocardial infarction^[1]. Coronary artery bypass grafting is the main treatment for coronary artery disease when medicines or percutaneous procedures are not sufficient to relieve symptoms^[2].

CABG is a surgical procedure in which one or more blocked coronary arteries are bypassed by a blood vessel graft to restore normal blood flow to the heart. These

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grafts are usually taken from patient's own arteries and veins which are located in the leg, arm or chest. At the first the Great saphenous vein was used to be first preference. Now, internal mammary artery and right gastroepiploic artery are most commonly used for grafts^[3]. The aim of the operation is to relieve the symptoms of angina and in certain group of patients to prolong life. In CABG cases, operation is performed using cardiopulmonary bypass. In vertical approach median sternotomy is probably the most commonly used anterior incision^[4].

Though median sternotomy is considered as incision with least complications, the immediate post-operative period records morbidity due to splinting as this restricts the thoracic expansion and thereby affecting the ventilation resulting in redundant ventilator status. In 2006, CABG accounts for more than 60% & every year 25000 coronary bypass operations are being carried out in India^[5]. Currently, the number of CABG is declining from a peak of 519,000 operations in 2000 to an estimated 300,000 cases in 2012^[6]. Post operative physiotherapy includes change of positions, incentive spirometer, breathing exercises, early mobilization, coughing techniques during hospital stays helps in improving pulmonary functions resulting in early discharge^[7,8]. But further sedentary life in the home will reduce the exercise tolerance and quality of life. In this respect, these patients have performed not only aerobic exercises but also resistance exercises which are recommended for increase in functional capacity.

The benefits of resistance exercises associated to aerobic exercise include an overall decrease of recurrent cardiac events, increased survival and improved quality of life^[2].

Resistance training increases peripheral blood flow whereas combined aerobic and resistance training will improve endothelial function^[9]. Resistance training can increase muscle strength and endurance as well as positively influence cardiovascular risk factors, metabolism, cardiovascular function, psychological well-being and hence quality of life^[10]. Research studies reported that walking training has a positive impact on ventilation/perfusion rate during physical activity. According to the American College of Sports Medicine, any activity that work many groups of muscles is repeatedly maintained and performed rhythmically is known as aerobic or cardiovascular exercise^[11]. Aerobic exercise can be

effective in increasing endurance of cardio respiratory system by improving stroke volume at rest, lowering resting heart rate, lowering blood pressure^[12].

The six-minute walk test is a valid, responsive and interpretable self-placed test that quantifies functional exercise capacity in terms of the distance walked in six minutes^[13]. Traditional evaluation of CABG outcomes has focused on objective measures such as mortality, morbidity and clinical function. Patient performed a symptom limited 6 Minute walk test in a 30m corridor. They were instructed not to consume stimulating food substances and not to perform strenuous activities before test. The following variables were obtained at post test: HR, BP, oxygen saturation, dyspnea, pain and rate of perceived exertion^[14].

SF36 questionnaire consists of 36 questions, all with 8 components. The questions are of two, three, five and six choices. Questions for the physical function are 10, physical role limitation 4, body pain 2, general health 6, vital force 4, social function 2, psychological role limitation 3 and mental health 5^[15].

Participation in cardiac rehabilitation is known to improve health related quality of life; these programs are often located at hospitals which make it difficult for some patients to participate after discharge. Hence, home exercise protocol is designed to focus the exercise component of the cardiac rehabilitation^[16].

Materials and Methodology

Study design: experimental study, sample size-70 subjects, study place- KIMS hospital, Karad, duration-3 months, sampling method-simple random sampling (lottery method), treatment duration: 1 hour per day

Inclusion Criteria: 1) Age group between 45-70 years 2) Subjects with BMI of 18.5 to 24.9, 3) Both sex 4) Stable vital signs 5) Pre and post-operative complications 6) Subjects willing to participate in the study on voluntary basis

Exclusion Criteria: 1) Subjects who are in intensive care unit for more than 48 hours 2) Surgical wound infection 3) Smokers for more than 10 years 4) Asthma, COPD and any other lung pathology 5) Joint pathology which affects balance and coordination 6) Neurological condition that affect the respiratory muscles 7) ICU acquired delirium.

Outcome Measures:

1. Exercise Tolerance:

1. Six minute walk test
2. Quality of life – SF 36 questionnaire. Materials used - Pen, Paper, Data collection sheet, Plinth, Pulse oxymeter

Ethical clearance was obtained from the institutional Ethical Committee, KIMSUDU, Karad. 80 subjects underwent CABG were assessed for eligibility for the study. 80 post CABG individuals were enrolled. Out of which 3 were not meeting inclusion and exclusion criteria, 2 were not willing to participate in the study and 1 individual dropped out due to some other reason. 75 individuals were included in the study. They were randomized into two groups by simple random sampling (lottery method). 75 covers with information regarding their treatment were prepared and the patients themselves selected the cover. 38 and 37 individuals were included

in group A and group B. They were explained about the study based on the exercise type in their cover and informed consent was taken prior to study. Pre-test for six minute walk test and quality of life questionnaire were taken before the study started and post-test was done after every 1 month and the values of 90th day was analyzed and the intermittent results were discarded.

Group A received conventional physiotherapy which includes walking, shoulder and thoracic mobility exercises, breathing exercises along with medications for 1 hour [17]. Group B received home exercise protocol which includes aerobic exercises along with resisted exercises along with conventional physiotherapy.

During the study in group A 2 individuals dropped out due to pain and 1 due to migration .1 individual due to irregular follow up and 1 because of some other personal reason in group B. Totally 35 individuals were taken for analysis in each group in the study.

Treatment protocol was as follows:

Group A (Control Group)	Group B (Interventional Group)
Conventional physiotherapy - 1 hour Walking - 45 minutes Shoulder and thoracic mobility exercises - 15 minutes Breathing exercises - Medications intake	Home exercise protocol-1 hour Aerobic exercises-45 minutes – Warm up exercises-10 minutes – Brisk walking-30 minutes – Cool down exercises-5 minutes Shoulder and thoracic mobility exercises-15 minutes. Resisted exercises-progression with bottles Breathing exercises Medications intake

Table No. 1: Treatment Protocol

1. Gender Distribution

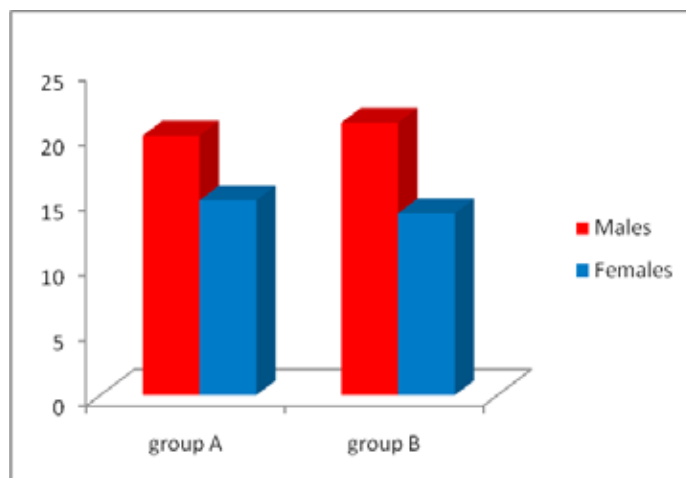


Fig. No. 1: Gender Distribution

Interpretation: This graph shows that out of 70 subjects, Group A had 20 males and 15 females, Group B had 21 males and 14 females. It also reports that more number of males undergo CABG with coronary artery disease.

2. Age Distribution

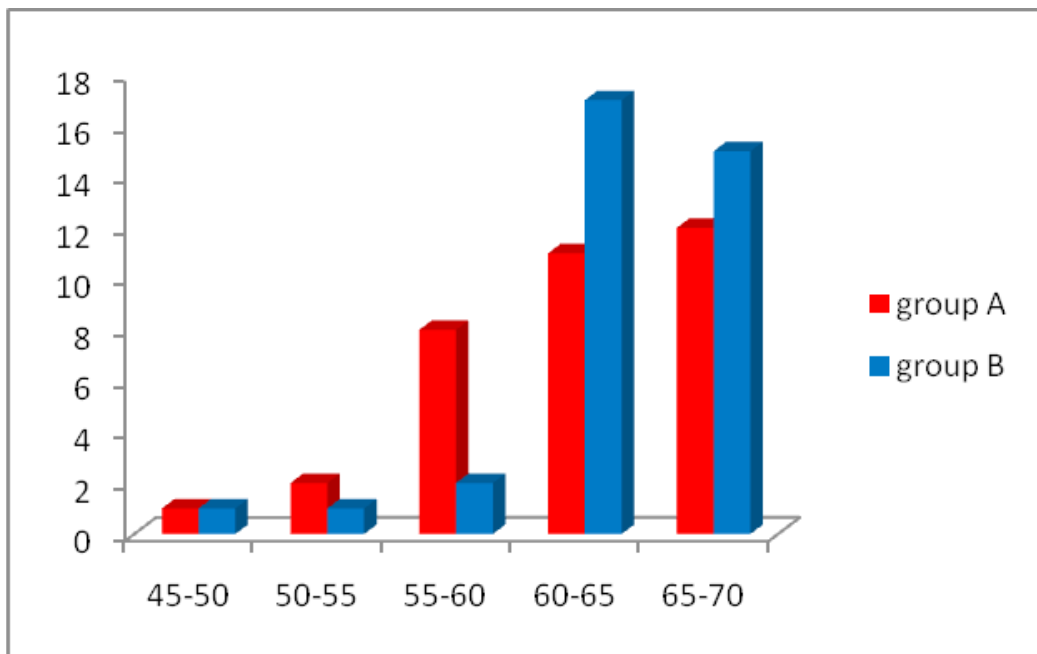
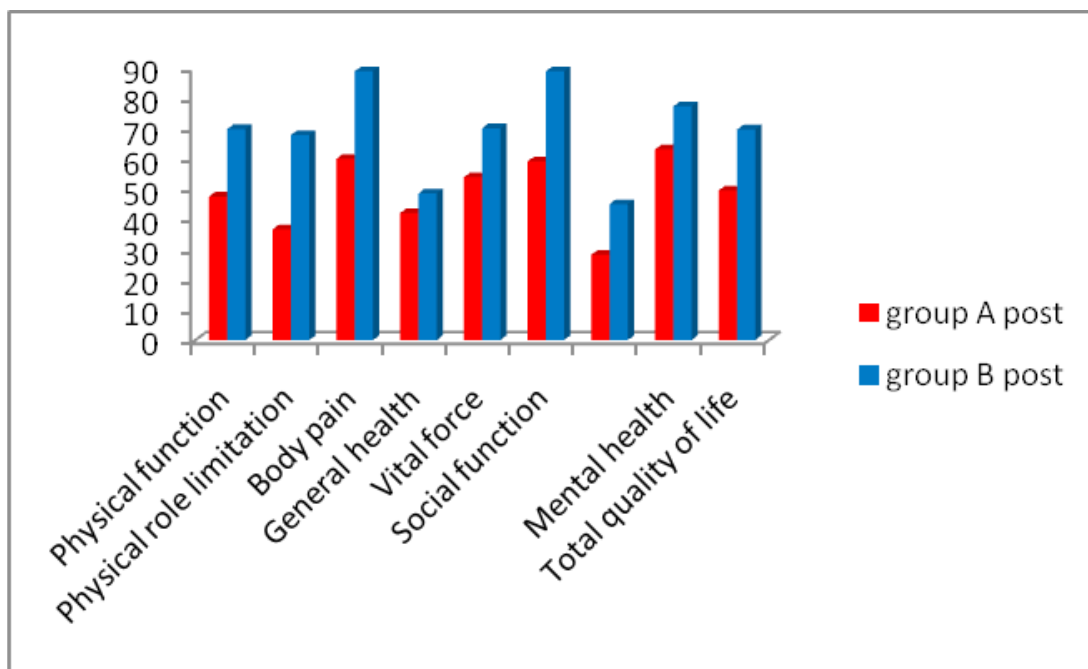


Fig. No. 2: Age distribution

Interpretation: This graph shows that, the age distribution in this study included is more in the age group of 60-75 yrs.

3. Comparison between Groups:



Graph No.: 3 Comparison between groups-SF36

Interpretation: This graph shows the post mean values of both group A and B of SF36 questionnaire.

4. Comparison within Groups:

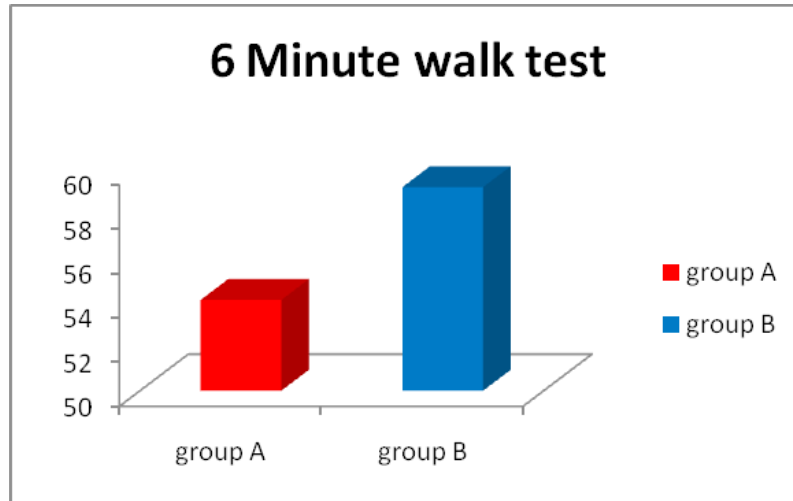


Fig No: 4: Comparison between groups-6MWT

Interpretation: This graph shows the post mean values of group A and B of 6 MWT.

Charts: 6 minute walk test

Table No. 2: Six minute walk test

Groups	Time of Hospital discharge	After 3 months	P value
Interventional	59.2±11.1	50.6±9.9	0.016
Control	54.1±22.7	52.5±15.5	0.42

SF-36

Table No. 03: SF-36 Questionnaire

Component of quality of life	Time of Discharge				3 Months After Discharge		
	Groups	Mean	SD	P	Mean	SD	P
Physical function	Intervention	47.14	20.7	0.95	69.85	17.48	0.0001
	Control	47.22	18.0		47.52	16.07	
Physical role limitation	Intervention	26.87	29.04	0.59	67.85	26.49	0.0001
	Control	27.94	17.36		36.71	14.46	
Body pain	Intervention	53.24	23.53	0.95	88.92	16.72	0.0001
	Control	54	23.74		60	19.38	
General health	Intervention	60.81	17.57	0.9	48.56	9.00	0.003
	Control	60	15.5		42.09	9.35	
Vital force	Intervention	53.21	19.97	1.0	70.14	15.95	0.0001
	Control	53.71	18.95		53.90	15.25	
Social function	Intervention	52.50	27.41	0.97	88.92	15.30	0.0001
	Control	52.85	27.13		59.14	22.14	
Psychological role limitation	Intervention	26.63	31.1	0.52	45	20.82	0.0001
	Control	33.42	31.25		28.27	19.33	
Mental health	Intervention	63.20	22.07	0.83	77.37	15.88	0.0003
	Control	62.20	22.58		63.13	19.06	
Total quality of life	Intervention	49.51	15.39	0.76	69.7	9.95	0.0001
	Control	48.43	15.06		49.53	12.12	

Result

Intergroup statistical analysis for 6MWT revealed significant in post intervention for Group B ($p < 0.0001$). QOL was extremely significant for group B ($p < 0.0001$). Group B treated with home exercise protocol have statistically significant improvement over group A in 6 minute walk test and quality of life.

Discussion

In comparison between groups control group for 6 minute walk test the (p value = 0.0404) which is not significant and interventional group the ($p < 0.0001$) which is statistically significant. Oliveira et al suggested that decrease in FVC and FEV1 occurs after CABG as the lung volumes and capacities reduce due to pain and low air entry and increased respiratory effort resulting in hypoxemia and reduced diffusion resulting in reduced exercise tolerance . but walking program and graded exercise program combined and practiced for 3 months in a systemic way increases the exercise tolerance in both the groups but statistically significant in group B.

In SF 36 in physical function the results in group B is similar to that of brown et al p value of group B is (0.0001) which is statistically significant. In physical limitation the results in group B is not similar to that of brown et al but conclusive with p value of group B is (0.0001) which is statistically significant. In body pain the results are same as that of Iranian study in which group B is similar to that of brown et al p value of group B is (0.0001) which is statistically significant. In general health the early results were not in favour of the present study where p value of group B is (0.03) which is statistically significant. Invital force berobiker's results supports the results in group B with p (0.0001) which is statistically significant. In Social function the results support the Iranian studies as p value of group B is ($p = 0.0001$) which is statistically significant. In psychological role limitation, chakraboety et al results supports the improvement of group B which is ($p = 0.0001$) statistically significant . In mental health Dehdari T, et al results support the improvement in group B is ($p = 0.0003$) which is statistically significant.

In total quality of life the results show an increase in total quality of life in group B with ($p < 0.0001$) values which is statistically significant. Patients undergoing cardiac surgery may present clinical and functional disorders, highlighting pulmonarydys function, which leads to decreased lung volumes and lung compliance,

impaired respiratory function and increased respiratory effort. Decrease in lung volumes and capacities contribute to alterations in gas exchange, resulting in hypoxemia and decreased diffusion. In cardiac rehabilitation the common aerobic exercise used is walking as it involves larger muscle groups which are indispensable for maintaining the general, cardiac and social wellness which needs no equipment, centers and financial aspects^[18].

Recently, Goncalves et al. reported that patients showed good tolerance during the practice of resistance exercise in a progressive manner and it was considered safe due to lack of complications of cardiovascular events. These authors related as benefits of resistance exercise in cardiac patients are health improvement, control of risk factors, improve pulmonary hygiene, lung volumes and capacities and functional capacity increase. We found decreased in predicted distance walked in 6 MWT between preoperative period and hospital discharge as expected. However patients who performed resistance exercise maintained their functional capacity when compared to control group.

Conclusion

On the basis of the results of our study, it was concluded that home exercise protocol was significantly effective in improving exercise tolerance and quality of life more than conventional physiotherapy.

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Conflict of Interests: The authors declare that there is no conflict of interest concerning the content of the present study.

Source of Funding: Self-funded.

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Physical Activity Promotion in the Physical Therapy Setting: Perspectives from Practitioners and Students in Maharashtra

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Abstract

Background and need of study: Physical activity promotion and practice may vary in health care providers.

Method: 600 participants (300 Physiotherapy final year students and interns +300 practicing therapists) filled the Standardized Physical activity promotion and practice questionnaire.

Results: PT students and Practitioners strongly agreed that, they should promote physical activity and act as a role model for their patients to lead a healthy life style (54 and 65,60 and 71 percentages respectively). Percentage of students practicing physical activity and promoting it was higher than therapists (57 and 38, 37-some times, 45-rarely)

Conclusion- Although students and therapists strongly agree for practice and promotion of physical activity they, lack in promotion of it due to various reasons. Students were found to be promoting and practicing physical activity more than the practitioners.

Keywords: Physical activity promotion, practice, physical therapy.

Introduction

Simple physical activities like walking, stair climbing, swimming done on a regular basis help to improve quality of life and physical wellbeing.^{1,2} Explorative studies done worldwide encourage use of a collaborative approach of exercises, counseling and physical activity promotion to restore fitness and promote an active lifestyle by therapists.²⁻⁸ In a state like Maharashtra where, health care delivery system is taxed, physically active lifestyle can reduce the burden on system significantly. Physiotherapists, who are in touch with patients for long time, should promote its application as much as they can. In Maharashtra state,

patients either go to an independent therapist or take physical therapy from centers/institutes where they are being treated by physical therapy students under guidance of their teachers.

Factors like age, set up, personality, years of experience, type of patients seen may influence attitudes, beliefs, practice of physical activity promotion. Various studies have been done in different countries to study the percentage of physical activity promotion by physical therapy fraternity along with factors that may influence this practice.⁹⁻¹³ No such data is available for physical therapy fraternity of Maharashtra. This study was planned to assess the level of promotion of physical activity by physical therapy fraternity and to understand factors that influence the practice and promotion trend and reasons for them.

Understanding the beliefs, trends of practice and promotion may help the policy makers to take appropriate steps to enhance promotion of physical activity in these groups thus, enhancing quality of life, reducing monetary and care giver burden on society.

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Research Question: What is the level of practice, knowledge, opinion, role perception, barriers, feasibility and counseling practice of physical therapy students and practitioners in Maharashtra regarding the promotion of non treatment physical activity for better health?

Objective: To collect information regarding opinion, practice and feasible ways to promote physical activity by PT students and Therapists

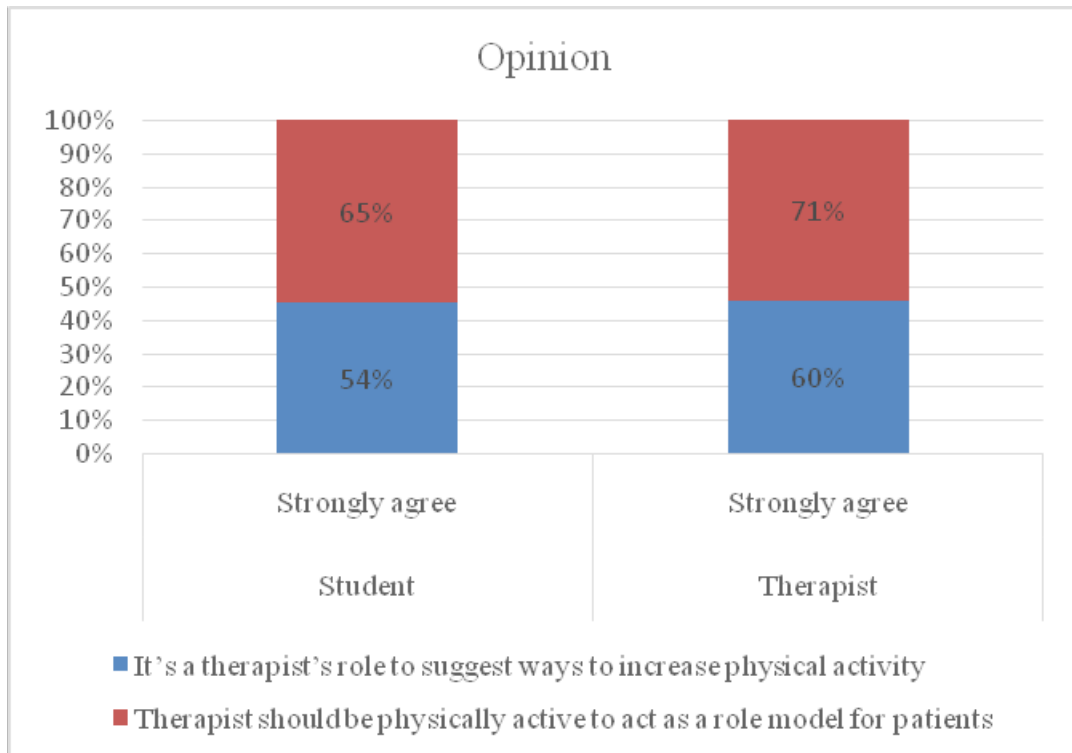
Methodology

- Study type-Survey
- Study Duration- Nov 2015-Feb 2017
- Sample size-300 students+300 therapists
- Sampling technique-purposive
- Inclusion-3rd/4th year BPTTh/MPT students, interns, practicing therapist
- Exclusion- students, therapists outside Maharashtra

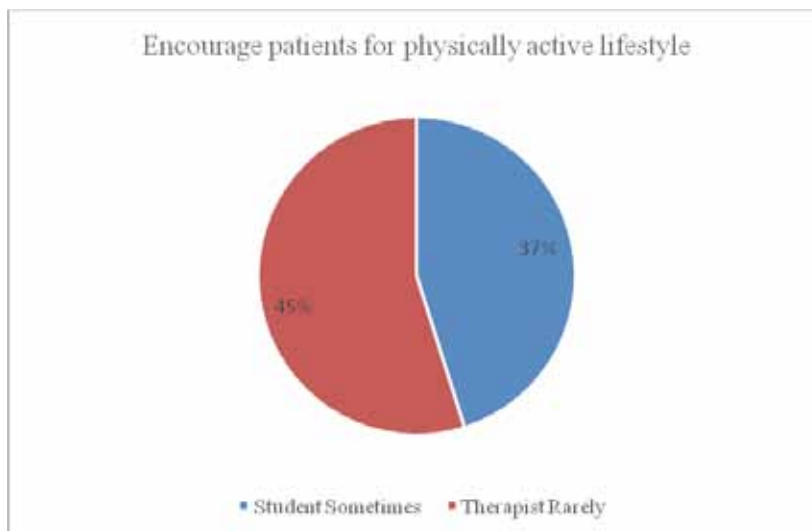
- Material-Questionnaire (Adapted from Debra Shirley, van der Ploed’s research on Physical activity promotion in the physical therapy setting: perspectives from practitioners and students) (permission for use was obtained) ⁹
- Method (steps)-
- Institutional ethics clearance was taken
- Data was obtained thru mails, in person and by post
- Data analysis was done using descriptive statistics

Results

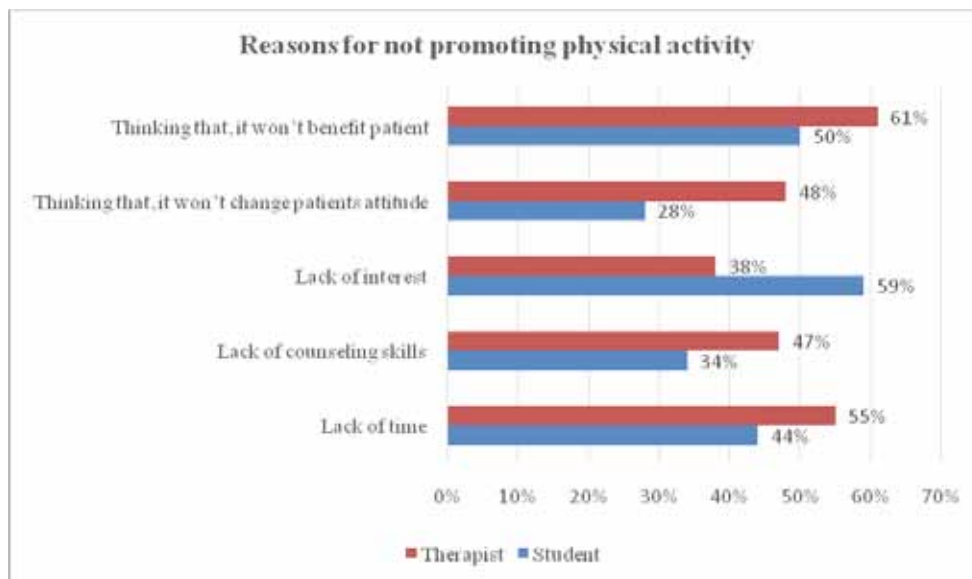
Demographic data	Students	Therapists
M:F(%)	20:80	30:70
Yrs of experience/studying year	2-5:69	II BPTTh:75
	6-9:119	III BPTTh:65
	10-13:76	IV BPTTh:79
	14 onwards:36	Interns:81
Rural setting: urban setting	45:55	36:64



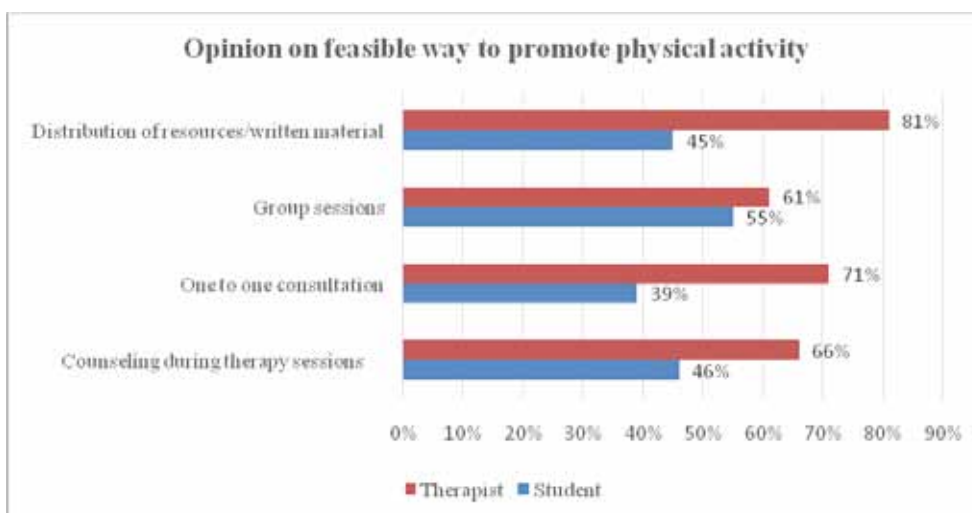
Graph 1: Opinion on Physical activity



Graph 2: Encourage patients for physical active lifestyle



Graph 3: Reasons for not promoting physical activity



Graph 4: Opinion on feasible way to promote physical activity

Discussion

Maharashtra is one of the important states in India with a population of about 120 million. Several physical therapists are practicing this state. Physical therapy is mainly provided by private practitioners in this state. Teaching institutes also help to cater needs of a big chunk of population for their physical therapy needs. This study aimed at establishing preliminary data for current practices of physical activity promotion of these care givers. It also tried to put light on barriers and feasible ways thought by them to overcome those barriers.

54% of students and 60% of participants agreed about promotion of physical activity being a part of the therapist's role. Data collected in previous studies on Physicians, therapists and other care givers also gives the same inference.^{9,10}

Participants of this study also feel that, therapist should act as a role model for their patient hence; the therapist himself should be physically active before advising physically active life style to their patients. Although positive effects of physical activity are well known by those involved in health care profession, only 57% of students and only 38% of the therapists gave positive answer to being physically active. It shows significantly lower number of practicing therapists being involved in physically active lifestyle. In our knowledge this is the first study to assimilate such information about physical therapists in Maharashtra. Other studies done thru out India have shown that, physical activity in physiotherapists and other health care profession students has been less.¹⁴⁻¹⁶ This highlights the need to assimilate detailed information about physical activity, barriers and facilitators for the same, in therapists and students from Maharashtra and India so that appropriate measures can be taken to enhance physically active lifestyle in them. Physical activity promotion is integrated in practice of physical therapists of other countries eg. UK this proportion is 77%, in USA 54% in Nigeria 78% and in Australia it is 54%.^{9,11,12,13,17} Even in Sweden it was found that, therapists provided maximum physical activity prescription than any other health care professional.¹³

37% student participants in current study sometimes encouraged their patients for physically active lifestyle whereas only 47% of the practitioners rarely did the same. This shows severely lacking encouragement for Physical activity by both groups. It also arises a question as to why this percentage is so less.

Lack of time was listed as the first reason (44% students sometime 55% very often by therapists). Practice for therapists in Maharashtra is always over crowded. Therapists work at 2/3 places part time hence have time constrains. At some centers one therapist has to see 10-12 patients in 3 hrs. Thus, patient to therapist ratio is always high, leading to inadequate time and resources for the therapists'. This may be the reason why many therapists were unable to promote Physical activity to their patients. Similar reason was given by respondents of study done by Aweto HA et al. and Sørensen JB.^{17,18}

Students on the other hand have adequate time but they though they lacked skills and knowledge to do so (34% most of the times). Pinto et al also had found this as a main reason for physician to be unable to promote physical activity in their patients. Shirley D et also found this as a reason for inability to promote physical activity by students.^{9,19}

For countries like Canada, USA, UK, clear guidelines are available which the health care practitioners refer for comparison and counseling of physical activity promotion.²⁰⁻²³ Lack of such guidelines for this population may be additional reason for lack of counseling skills and knowledge in students. Lack of interest was also identified as one of the reasons for reduced promotion of physical activity in previous studies. This study 59% students reported that, it was hardly the reason where as 38% therapists reported this to be the reason very often for not counseling or promoting physical activity. They also felt that, counseling or encouragement won't change patients attitude. This might have led to their lack of interest and hence lack of finding suitable time for promotion of physical activity. Therapists from the other countries also have listed similar reasons in past.^{9,24-28}

In the opinion about what can be done to overcome these barriers 46% students thought that, counseling during therapy would be feasible option as opposed to 66% of the therapists who thought that it is highly non feasible option for them due to lack of time. One to one counseling sessions was reported as somewhat feasible by 39% of students an highly feasible if separate time has been allotted or if patients come specifically with that purpose, by 71% of the therapists. Therapists in other countries also have agreed on integration of physical activity promotion during therapy as the most feasible option to overcome barriers for activity promotion.^{9,24-28}

Distribution of written resource materials was also

thought to be somewhat feasible by 45% students and not feasible at all by 81% of therapists. According to therapists, many patients lack awareness and hence attitude to follow up when they are made to be responsible for their health. Many therapists also expressed lack of resource material in simple and regional language that can be understood by patients. Although, there is dearth of material in physical therapy to support effectiveness of such practices, conclusion of studies done on general physician and other health care practitioners can be applied in current scenario. It shows that, written prescription for physical activity has been found to be effective as compared to the oral instructions to encourage people for physically active lifestyle in previous studies.²⁹

Many other researchers have also suggested that methodological physical activity counseling along with written prescription was more effective than oral PA for enhanced weekly physical activity in their study participants.³⁰⁻³² An RCT done on general practitioners about written exercise advice also lead to similar conclusions.³³ This highlights the need for devising such material available for Maharashtrian population.

Thus, it can be concluded that, students and therapists strongly agree for practice and promotion of physical activity. They lack to do so due to various reasons. The need for improving therapist patient ratio and simple, regional language material about physical activity promotion seems to be the need of the hour.

This study had few limitations, eg non probability sampling of the study warrants to interpret the data cautiously. The data was collected from students and practitioners willing to participate in study hence there are chances that they may have a positive attitude towards physical activity and promotion thus creating a self-selection bias. Most of the participants were tapped in a regional conference in western part of Maharashtra hence the data might be representing more of western Maharashtra. However due to practical and logistical reasons it would have been difficult to obtain region wise random sample.

Clinical Implication: Focus on physical activity promotion, its counseling and importance should be enhanced in curriculum. Therapists and students should be given appropriate information and meaningful insight in order to inculcate a habit of physical activity promotion in their routine treatment. Appropriate measures can be

taken by policy makers to Reduce strain on the therapists by incorporating different ways of increasing therapist-patient time, availability of suitable written material for patients and promotion of group sessions will help for quality PA promotion.

Source of Funding: Self

Conflict of Interest: Nil

Ethical Clearance: Ethics clearance from college ethics committee was taken and permission to conduct study was obtained from Physiotherapy colleges and practicing Physiotherapists.

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Assessment of Risk of Fall in Depressed Elderly Individuals

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Abstract

Background: Aged as the word is used in society may or may not correlate with the general condition of the individual but more often refers to the individual's loss of capacity to maintain independence. Falling is a ubiquitous event experienced by all throughout life. Most falls in children and young adults are of minor consequences and readily forgotten and have no impact on subsequent function.

Objective: To assess risk of fall in depressed elderly individuals.

Study design: Observational study design

Method: 60 subjects were included in the study according to the inclusion and exclusion criteria. Subjects having depression were included in the study. Risk of fall was assessed in depressed elderly individuals.

Results: The result shows that there is moderate to high risk of fall in depressed elderly individuals..

Conclusion: The study concluded that there is moderate to high risk of fall in depressed elderly individuals which is statistically significant.

Keywords: *Elderly individuals, Depression, Balance.*

Introduction

The term aging refers to a number of developmental changes occurring in the older age group. These changes decrease the person's ability to function, maintain survival and have a high quality of life.⁽⁸⁾

For maintaining a position, remaining stable after changing the position and moving freely balance is required. And the ability to balance can be compromised by following- medications, disease and the process of aging.⁽¹¹⁾

Aged as the word is used in society may or may not correlate with the general condition of the individual but more often refers to the individual's loss of capacity to maintain independence.

Depression is the most common psychological problem in elderly . The causes of depression are – loss of health, stress of physical illness, physical disability, pain and lifestyle changes, can result in psychological response of depression. The characteristics of depressed older person are as follows- feelings of sadness,

hopelessness and loss of interest and pleasure in previously pleasurable activity. The other characteristics are as follows- difficulty concentrating, memory complaints, slowed thinking, indecisiveness and perceived lack of competence and control.

The depressed person has difficulties with interpersonal interactions, including withdrawal from family and friends. Depression includes somatic symptoms such as problems with appetite, sleep and psychomotor functions. Numerous authors have speculated about the causes of depression and various models have emerged- cognitive model, the learned-helplessness model, the interpersonal model, the neurobiological model and the social resources model.⁽⁸⁾

Everybody falls, regardless of age. Falling is a ubiquitous event experienced by all throughout life. Most falls in children and young adults are of minor consequences and readily forgotten and have no impact on subsequent function.⁽⁸⁾

Falls in elderly are a major cause of morbidity and mortality – the consequences often extend far

beyond minor injury to significant loss of functional independence and even death.⁽⁸⁾

Too much fear may compromise physical and mental well-being, although some level of fear of falling is reasonable and can promote effective fall prevention coping skills.

Diagnostic process designed to identify medical, psychosocial, functional capabilities and problems are a part of multi-dimensional geriatric assessment.

Depression which is one of the main factors for falls in old individuals can be assessed by using Geriatric Depression Scale. The GDS has 30 questions which must be answered in ‘yes’ or ‘no’. Each question is scored as 0 or 1. The more the score more the individual is depressed.

The Berg Balance Scale is a widely used tool to assess an individual’s static and dynamic balance which contains 14 balance related tasks. A total score of 56, higher the score less the risk of fall.⁽¹⁰⁾

Materials and Method

A. Study Design:

- **Type of study:** Observational study.
- **Duration of study:** 1 year.
- **Place of study:** Metropolitan city.

B. Sample Design:

- **Sample size:** 60.
- **Sample population:** 65-75 years of individuals.
- **Sampling:** Convenience Sampling.

C. Materials Used:

1. Consent form.
2. Geriatric Depression Scale.
3. Berg Balance Scale.

Selection Criteria:

D. Inclusion Criteria:

1. Subjects who are willing to participate.
2. Age group of 65- 75 years (young old).
3. Elderly individuals able to walk without support.

E. Exclusion Criteria:

1. Cardiovascular disorder.

2. Respiratory disorder.
3. Neurological disorder.
4. H/O fracture of lower limb.
5. Neuropathy of lower limb.
6. Any deformity of lower limb.
7. Visual impairments.
8. Hearing impairments.
9. Psychiatric patients.

Procedure: Screening of the subjects is done according to the Inclusion and Exclusion criteria.

Then a written consent form was taken from the subjects in the language best understood by them.

Assessment of Depression was done using Geriatric Depression Scale.

Elderly having depression were selected for the study.

The selected individuals were then assessed for the risk of fall using Berg Balance Scale.

Then risk of fall was noted in depressed geriatric individuals.

The data was collected and then statistically analysed.

Statistical Analysis: 60 Subjects were taken according to the inclusion and exclusion criteria, assessment of depression was done using Geriatric Depression Scale. Elderly having depression were selected for the study. The selected individuals were then assessed the risk of fall using the Berg Balance Scale. Risk of fall was noted in depressed elderly individuals, Data was analysed using the student T test.

Table 1: Shows the risk of fall and depression

	Mean	SD	P-value	Significance
BBS score	27.57	6.54	<0.001	Significant
GDS score	20.97	3.93		

Result

This study was conducted on assessment of risk of fall in depressed elderly individuals using geriatric depression scale and berg balance scale .Our study has shown that there is moderate to high risk of fall in depressed elderly individuals.

The mean of geriatric depression scale and berg balance scale is -6.60.

$$t = 6.7063$$

$$df = 118$$

Therefore the standard error of difference = 0.984.

The 2 tailed p-value is less than 0.0001. By conventional criteria, this difference is considered to be extremely statistically significant.

Discussion

The term aging refers to a number of developmental changes occurring in the older age group. These changes decrease the persons ability to function, maintain survival and have a quality of life. Depression is the most common psychological problem in elderly.

.Depression which is one of the main factors for falls in old individuals can be assessed using Geriatric Depression Scale. Berg Balance Scale is used to assess individuals static and dynamic balance.

This study was conducted on assessment of risk of fall in depressed elderly individuals using geriatric depression scale and berg balance scale .Our study has shown that there is moderate to high risk of fall in depressed elderly individuals.

The mean of geriatric depression scale and berg balance scale is -6.60.

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Therefore the standard error of difference = 0.984.

The 2 tailed p-value is less than 0.0001. By conventional criteria, this difference is considered to be extremely statistically significant.

A Biderman et al, depression leads to reduced functioning and reduced quality of life which leads to reduced confidence and is associated with falls among elderly. Due to reduced functioning and loss of confidence there are frequent episodes of fall.

Jacqueline Close et al, falls in elderly are a major cause of morbidity and mortality and the consequences often extend far beyond minor injury with significant loss of independent and even death.

Conclusion

The study was to assess risk of fall in depressed elderly individuals.

The study included 60 subjects. Depression was assessed using the geriatric depression scale. In depressed elderly individuals risk of fall was assed using berg balance scale.

Hence the present study suggests that there is moderate to high risk of fall in depressed elderly individuals.

Ethical Clearance: Ethical Clearance was taken from the subjects

Conflict of Interest: Nil

Source of Funding: Self

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Effect of Fireworks Pollution on Human Health During Diwali Festival: A Study of Ahmedabad, India

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Abstract

Context: India has a long tradition of celebrating diwali festival by burning firecrackers. The fireworks release a large amount of air pollutants which have a detrimental effect on human health. Very few studies have done to examine the detrimental effect of fireworks pollution on human health and no scientific study has done in Ahmedabad.

Aims: The aim of the study is to examine the effect of fireworks pollution on human health.

Method: Four residential areas were included in Ahmedabad city. Total 252 people were participated in the study. The structured questionnaire was used to inquire about symptoms like breathlessness, cough, wheeze, runny nose, eye irritation, allergy, itchy skin.

Statistical Analysis Used: Microsoft excel 2010 software was used for analysis.

Results: We found that 48% of subjects complained of cough, 38% of subjects complained runny nose and eye irritation, 27% subjects complained breathlessness, 5% subjects complained allergy and itchy skin and 2% subjects complained wheeze.

Conclusion: The study concludes that there is harmful effect of fireworks pollution on human health and the symptoms of cough, runny nose and eye irritation were most common.

Keywords: Fireworks pollution, Human health, Diwali.

Introduction

Diwali festival is celebrated with great joy and enthusiasm in many cities of India including Ahmedabad. It is one of the biggest festivals of India celebrated with decorating home, glowing diyas and burning firecrackers. It is known that firecrackers burning during the festival have a negative impact of air quality index and human health.

Air quality index is affected in many parts of the country in the recent year. In 2014, the World Health Organisation compiled average annual PM 2.5 (particulate matter) numbers for over 1600 cities across the world, including 124 from India. Delhi had the worst air quality in the world by that estimate, Ahmedabad was included in 12 other Indian cities were among the world's worst 20 polluted cities.¹ Of the 13 cities in the

country whose air quality index is measured daily by the central pollution control board, including Ahmedabad, face a severe problem of suspended particulate pollution. The problem is the increasing prevalence of particulate matter of 2.5 microns or less in the city air.² According to the meteorological department, Ahmedabad recorded high levels of sulphur dioxide in the air at 503 micro grams per cubic metre.³

According to new findings of the Global burden of disease report, Outdoor air pollution has become the fifth largest killer in India after high blood pressure, indoor air pollution, tobacco smoking and poor nutrition. Air pollution is the fifth leading cause of death in India, with 620,000 premature deaths in 2010.⁴

During diwali festival, because of fireworks, air quality index is deteriorating. All fireworks contain

carbon and sulphur, which are necessary for burning. In addition, different substances are added (arsenic, manganese, sodium oxalate, aluminium and iron dust powder, potassium perchlorate, strontium nitrate and barium nitrate) to give colour. The burning of fireworks releases a large amount of air pollutants, particularly SO₂ (sulphur dioxide), CO₂ (carbon dioxide), CO (carbon monoxide) and PM along with several metal salts.⁵

Though there are many evidence and data which proved that Ahmedabad was the polluted city and worsening air quality index during diwali festival, no scientific study has been done to examine harmful negative impact of fireworks pollution on human health in Ahmedabad. So, the purpose of the study is to examine the effect of fireworks pollution on human health during diwali festival in Ahmedabad.

Materials and Method

Ethical clearance for the present study was taken from institutional ethics committee. This cross sectional observational study was done in four residential areas of Ahmedabad city namely Chandkheda, Ghatlodiya, L D engineering college and Naroda. Residential areas were selected so as to avoid bias in the study due to the effect of vehicular and industrial pollution. Total 252 subjects participated in the study out of which 141 were male and 111 were female. Age group of subjects was 15-60 years. The subjects having chronic respiratory symptoms,

known respiratory or cardiac disease and active smokers were excluded from the study. The questionnaire was used to inquire about symptoms like breathlessness, cough, wheeze, runny nose, eye irritation, allergy, itchy skin 3 days before diwali, 3 days during diwali.

Results

Table 1 shows total number of subjects complaining particular symptoms. Breathlessness was present in 11 subjects before diwali and 81 subjects after diwali. Cough was present in 2 subjects before diwali and 123 subjects after diwali. Wheeze was present in 7 subjects before diwali and 13 subjects after diwali. Runny nose was present in 13 subjects before diwali and 110 subjects after diwali. Eye irritation was present in 19 subjects before diwali and 116 subjects after diwali. Allergy was present in 1 subject before diwali and 14 subjects after diwali. Nobody complained itchy skin before diwali and 13 subjects complained itchy skin after diwali. Total 70 subjects complained breathlessness, 121 subjects complained cough, 6 subjects complained wheeze, 97 subjects complained runny nose 97 subjects complained eye irritation, 13 subjects complained allergy, 13 subjects complained itchy, which was not present before. Graph 1 shows total number of subjects complaining particular symptoms. It shows cough was most common symptom followed by eye irritation, runny nose, breathlessness, allergy, itchy skin and wheeze.

Table 1: Difference between prevalence of symptoms before and after diwali

Symptoms	Before Diwali (Number of subjects)	During Diwali (Number of subjects)	Difference	Percentage
Breathlessness	11	81	70	27
Cough	2	123	121	48
Wheeze	7	13	6	2
Runny nose	13	110	97	38
Eye irritation	19	116	97	38
Allergy	1	14	13	5
Itchy skin	0	13	13	5

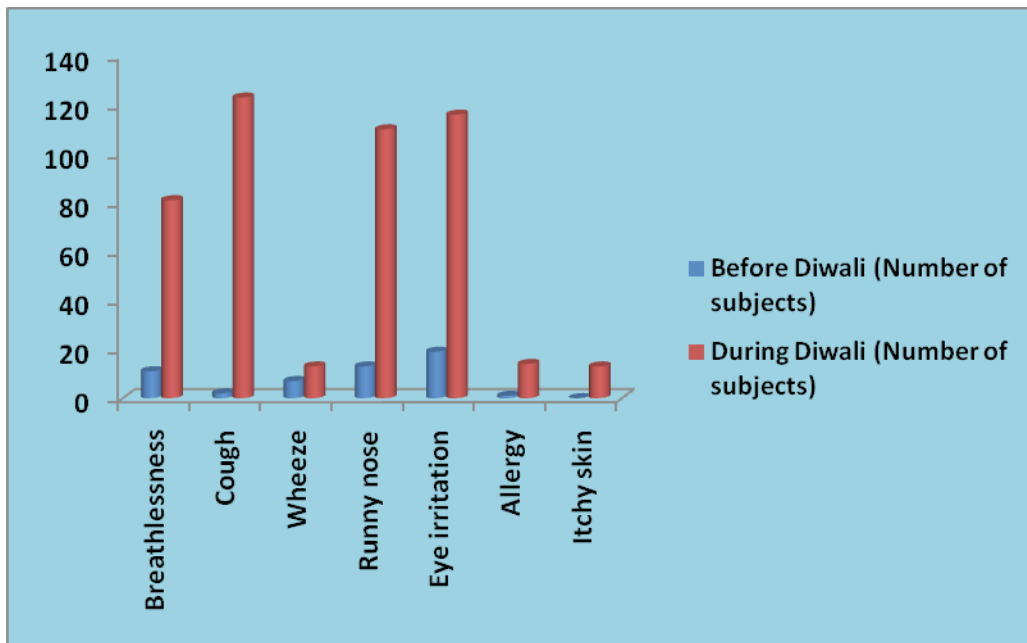


Image 1: Graph showing difference of symptoms before and after diwali

Discussion

The aim of the present study was to know the effect of fireworks pollution on human health, The result of the study shows that 48% of subjects complained cough, 38% of subjects complained runny nose and eye irritation, 27% of subjects complained breathlessness, 5% of subjects complained allergy and itchy skin and 2% of subjects complained wheeze which was not present before diwali.

There are many studies which proved that pollutions in ambient air are increase during fireworks. Chichilin found that Outdoor ambient PM levels increase significantly during fireworks and fire crackers burning. Fireworks PM remains suspended in the air for up to 1 month after festival displays, causing high PM concentrations for a long period.⁶ Jayantnirmalkar et al found that during diwali festival PM10 concentration was about 2.6 and 1.9 times higher than pre-diwali and post-diwali period, respectively in eastern central India. PM2.5 and PM1 concentrations during diwali festival were more than 2 times higher than pre-diwali and post-diwali.⁷ Venkata Swamy Yerramsetti et al found that because of fireworks burning, there is twofold to threefold increase level of ozone, nitrogen oxides and black carbon concentrations during diwali festival in Hyderabad.⁸

There are some studies which showed health effects of fireworks. Raghu et al found that the numbers of hospital admissions post-diwali were significantly more compared to pre-Diwali from both rural and urban locations in south India. The mean duration of hospital stay was significantly less pre-Diwali compared to post-Diwali. Post diwali, significantly increased number of patients required ventilator support.⁹ A case of acute eosinophilic pneumonia was presented in hospital after inhaling smoke from fireworks for 3 consecutive nights.¹⁰ Shantanusharma et al found that the prevalence of post diwali morbidity was increased in Delhi.¹¹

Smith et al found that fireworks air pollution in Honolulu can alter pulmonary function in susceptible people. They also speculated that the 26% decrease in maximal midexpiratory flow rate in susceptible people and 4.7% decrease in maximal midexpiratory flow rate in normal subjects.¹² Gouder C et al did extensive medline search and found that strong evidence of the impact of fireworks on respiratory health is lacking in susceptible as well as healthy individuals with no formal studies on COPD (chronic obstructive pulmonary disease) or asthma. They suggest susceptible individuals, mainly patients suffering from respiratory conditions, should avoid heavy exposure so as to avoid the possibility of exacerbations of their illness. Increasing awareness amongst the high-risk groups should decrease morbidity

and the number of unscheduled health care visits and hospitalizations.¹³

Firework composition and pollutants: The firework is a mixture of substances designed to produce an effect by heat, light, sound, gas and smoke. The five basic ingredients in fireworks are fuel, an oxidiser, colourants, binder and chloride donor. The mixture of sulphur, charcoal and potassium nitrate used as fuel. An oxidisers in fireworks are perchlorates, chlorates and nitrates. The metals like aluminium, barium, carbon, calcium salts, chloride compounds, copper, iron, lithium, magnesium, sodium compounds, sulphur, antimony, titanium and zinc are added in fireworks to produce different colours during burning.¹⁴

The burning of fireworks releases large amount of sulphur dioxide, nitrogen oxide, carbon monoxide, several metals and particulate matter into the air. SO₂ is a highly irritating, colourless soluble gas. SO₂ is a major air pollutant and has significant impacts upon human health. Inhaling SO₂ is associated with increase respiratory symptoms and disease and difficulty in breathing. Short-term exposures to the NO₂ gas may cause airway responsiveness and lung function injury. Long-term exposures may reduce immunity and lead to respiratory infections.¹⁵ CO is an odorless, colourless and tasteless but dangerous gas. Breathing low levels of CO can cause headache, nausea, dizziness, weakness, confusion, disorientation. PM can be both a primary and a secondary air pollutant. Particles having an aerodynamic diameter of <10 µm are called PM10 and those <2.5 µm are called PM2.5. Particles <1 µm in diameter are called ultrafine particles (UFP) or nanoparticles. Particles in these size ranges can easily enter into the distal portions of the lung and the systemic circulation.¹⁶

Potential mechanism of health effects: The potential mechanisms linking air pollution involve direct effects of pollutants on the cardiovascular system, blood and lung receptors and indirect effects mediated through pulmonary oxidative stress and inflammatory responses. Direct effects may occur via agents that readily cross the pulmonary epithelium into the circulation, such as gases and possibly UFP along with soluble constituents of PM2.5.¹⁷⁻¹⁸ Less acute and chronic indirect effects may occur via pulmonary oxidative stress/inflammation induced by inhaled pollutants. The harmful effects of ambient air pollutants are caused by the formation of reactive oxygen species, which in turn induce oxidative stress in the lungs inciting a powerful cellular and

mediator inflammatory response that spills into the systemic circulation and causes harmful effects in other body organs.¹⁹

There are some limitations of the study. The composition of firecrackers was not analysed. The air quality index of the study areas was not measured due to unavailability of the measuring instrument. Apart from inquiry about respiratory symptoms, other investigations like pulmonary function test and chest x-ray was not performed. The effect of firecrackers composition on fireworks manufacture was also not known. Future study by measuring the air quality index and performing spirometry can be done to know the acute effect of fireworks pollution exposure on pulmonary health.

Conclusion

The study shows that exposed person develops symptoms like breathlessness, cough, running nose, eye irritation, allergy and itchy skin that due to acute exposure of fireworks pollutants. The quality of firecrackers should be checked before they are sold in the market and use of harmful chemicals and metals for firecrackers manufacture should be banned. Implementation of strict air quality index standard during diwali festival should be formed by government and must be followed. Awareness must be created in public regarding potential harmful effect of air pollutions.

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Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: Nil

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ACL Injury Prediction in Footballers Using Landing Error Scoring System (LESS)

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Abstract

Background: The use of clinical field assessment tools is popular in sports rehabilitation settings. The purpose of these tools is not only prediction of injury but also to assist in development of injury prevention programs. Landing Error Scoring System (LESS) is a clinical tool that evaluates biomechanical performance during a jump-landing task with particular focus on aspects related to an increased risk for ACL injury.

Objective: Of this study was to find the most common faulty biomechanics in football players.

Method: This is an evaluation-based study which predicts the risk of ACL injuries in 30 football players based on their jump landing mechanics. This evaluation was carried out with the help of software Kinovea that helps in analysis of joint kinematics. The data captured with the help of off-the-shelf cameras in frontal and sagittal planes and analysed. The frequency of common errors was identified.

Result: It was found out that 20% of the players had poor landing mechanics having maximum errors, 20% had moderate errors, while 13% had good score and 47% had excellent landing mechanics. The most common error was knee valgus at initial contact, stance width wider and knee valgus displacement.

Conclusion: LESS is beneficial in identification of faulty biomechanics. LESS when used along with Kinovea helps analyse common jump landing errors. Knee valgus along with internal rotation of tibia was found to be the common error which predisposes footballers to ACL injury.

Keywords: *Jump-landing, LESS, ACL injury, prevention program, Kinovea.*

Introduction

Injury to the anterior cruciate ligament (ACL) is one of the frequently encountered injuries occurring in sports today. These injuries not only take a significant financial and emotional toll on the athletes due to surgical and rehabilitation expenses, but it also decreases their sporting career due to early onset of knee osteoarthritis¹. According to studies done in India, Soccer was found to be the most common sport associated with knee injuries accounting for 30.6% of the injuries followed by kabaddi (20.9%). Also, competitive injuries were found to be significantly more than practice/training injuries. According to many studies, the most common injuries noted were ACL tears followed by meniscus injuries and the most common combination of injuries were an ACL

tear with medial meniscus tear. These statistics support an important area of research that aims to develop screening mechanisms to identify those individuals who may be at greater risk of injury. A variety of ACL injury prevention programs have been developed in the recent past which focused primarily on plyometric activities, balance and proprioception, as well as core, knee and hip muscle strengthening exercises. The basis for these programs comes from lower extremity pathomechanics related to the sport that are known to put them at risk for ACL injury. Specifically, poor jump landing mechanics have been linked to multiple lower extremity injuries. For effective injury prevention, presence of predisposing risk factors for injury should be established for effective prevention. Most risk factors for ACL injury such as gender, hormonal changes, notch

width and static postural alignment are non-modifiable through preventive efforts. Abnormal lower extremity biomechanics, however, is modifiable and specific preventive treatment can be given for correction. Specifically, 3- dimensional knee loading, including knee-extension moment, proximal anterior tibial shear force, knee valgus-varus moment and knee internal-external-rotation moment, often is implicated in ACL injury and imposes the greatest strain on the ACL.

The use of clinical assessment tools is popular in sports medicine settings. The purpose of these tools is not only prediction of injury but also to develop injury prevention programs. Landing Error Scoring System (LESS) is a clinical tool that evaluates biomechanical performance during a jump-landing task with particular focus on aspects related to an increased risk for ACL injury. LESS is a reliable and valid tool which requires videographic analysis of each joint of the lower limb at initial contact of the landing after the jump. The LESS has been proven to be reliable at identifying athletes with high-risk biomechanics by using a 17-criterion list that assesses the subject's biomechanics with the use of sophisticated videography (Padua et al. 2009). A higher LESS score indicates a higher number of errors during jump landing and hence poorer neuromuscular technique during landing. Clinically, the use of the LESS has great potential; however, validation studies have only been conducted in the laboratory environment. This restricts its usage widely among clinicians as it may not be feasible in terms of cost.

Keeping the above background as the basis for our study, there is a need to promote screening of faulty biomechanics for prevention of ACL injuries using a clinician friendly method. In our study, the motion analysis was performed mainly using computational tools instead of traditional sensors and special hardware. Our study was conducted using KINOVEA software which is a sophisticated and reliable software. This software helps in measuring joint angles by easily pausing and rewinding the videos; thereby making the process convenient, easily applicable and cost-effective⁶.

Material/Methodology and plan of Study: Thirty professional male footballers were selected as subjects for the study based on the following inclusion criteria of minimum 1-5 years of experience in the age group of 19-35 years. Female football players, players with

any injury and players with inadequate experience were excluded from the study as the study focussed on healthy professional young male football players with experience. The football players were asked to perform 3 trials of a standardized jump landing task during each test session on a ground. The test requires the participant to stand on a 30-cm-high box placed at a distance of half the body height away from a landing area, which was marked by a line on the ground. Participants were instructed to jump forward so that both limbs leave the box simultaneously, to land just past the line and to jump from maximal height immediately after landing. They were instructed to practice until they were comfortable with the task and then perform it. During task instruction, emphasis was placed on subjects jumping as high as they could once they landed from the box. Subjects were not provided with any feedback or coaching on their landing technique unless they were performing the task incorrectly. Reflective markers were placed on the subjects' skin over the lateral aspect of the thigh and antero-medial aspect of the proximal tibia and foot (on the shoes). Each test jump was recorded from both frontal and lateral views using off the shelf cameras. The videos were replayed at a later date and the LESS scored during replay using pause and rewind controls. To simplify the scoring process, the rater focussed on a designated "test leg," typically defined as the dominant leg. The LESS scoring sheet was used in conjunction with KINOVEA software which is a reliable tool for measuring joint kinematics^{8,11}.



a. Knee valgus displacement



b. Stance width: wide



c. Knee valgus at initial contact

Results

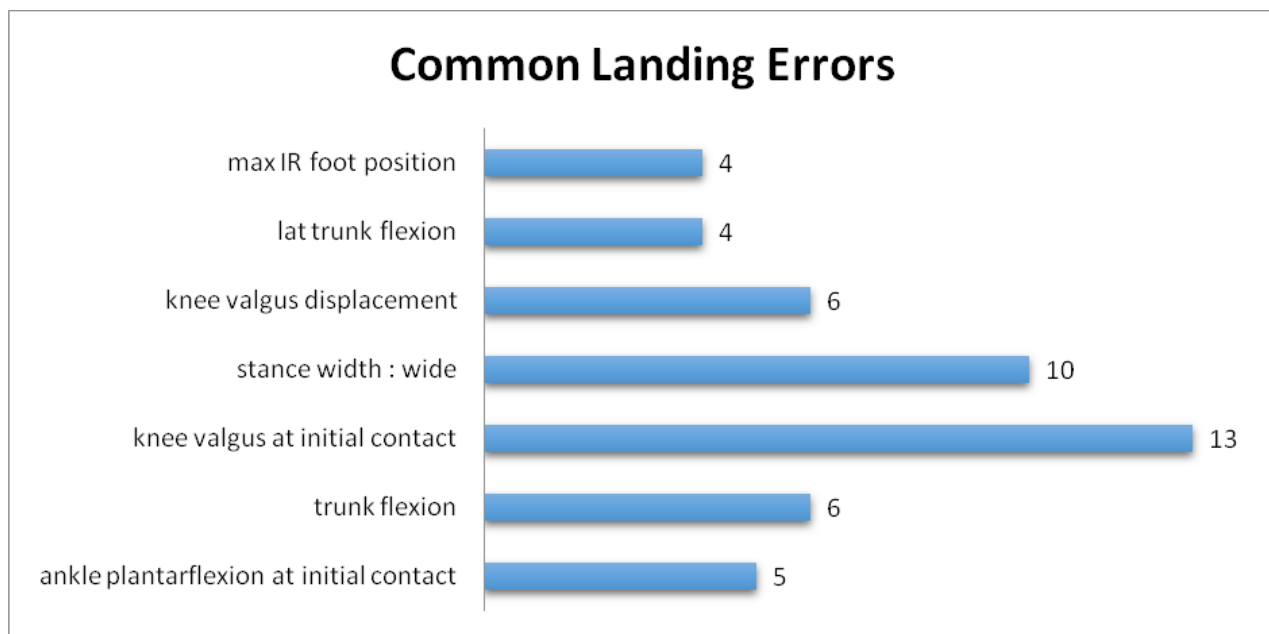
It was found out from the study that LESS helped in assessing the faulty biomechanics in the athletes. The most common faulty biomechanics were knee valgus angle at initial contact and stance width wide. Total scores indicate that 20% had poor landing mechanism with maximum errors, 13% had moderate errors, while 20% had good landing mechanics and 47% had excellent biomechanics while landing.

Descriptive Statistic:

N = 30	Mean	Standard Deviation
Age	24.07	3.9
Years of experience	4.5	2.14



Inference: It can be inferred that 47% of the players are at the least risk for an injury, 20% are at moderate risk and 20% of the people are at a high risk of injury.



Inference: Knee valgus at initial contact, wide stance width at landing, knee valgus displacement and increase trunk flexion were the common landing errors.

Discussion

It has been widely accepted that the mechanism of ACL injuries is multiplanar in nature. Many studies have demonstrated that isolated sagittal plane loading did not increase the risk of ACL injury. Addition of knee valgus moment combined with either decreased knee or decreased hip flexion, or decreased hip internal rotation velocity results in greater ACL injury risk. As the biomechanical risk factors for ACL injury are multiplanar in nature, clinical assessment tools too should reflect this fact. Landing error scoring system (LESS) is one such tool that assesses the otherwise 2-dimensional jump landing in a 3-dimensional procedure. To assist in this regard and as a replacement of laboratory settings, Kinovea proves to be a substantial tool.

Subjects with poor (high) LESS scores demonstrated different lower extremity kinematics across multiple biomechanical factors and in multiple planes of motion. In our study, based on the total scores 20% footballers demonstrated maximum faulty mechanics which amounts to greater risk of ACL injury. Although 47% footballers demonstrated excellent landing mechanics, 20% showed a moderate faulty mechanics. The total scores of all the 17 components in all the 30 participants were analysed and it was found that 14 players had a score < 4 excellent biomechanics, 4 players had a score >4 to ≤5 good biomechanics, 6 players had a score >5 to ≤6 moderate biomechanics and finally 6 players had poor biomechanics with a score of >6.

Many authors have established reliability of LESS and inference has been drawn on its ability to detect faulty biomechanics⁸. It was found in certain studies that the LESS successfully distinguished between groups on a range of jump-landing biomechanics that have previously been shown to be related to ACL loading and injury mechanisms. There were significant differences in sagittal, frontal and transverse plane biomechanics and in vertical ground-reaction force, between subjects with poor (LESS score >6) and excellent (LESS scores ≤4) jump landing technique¹¹. Our study concluded that LESS can be used for effective screening of footballers and counteract ACL injury with early prevention programs. The range of total LESS scores for our participants fell between 0 and 9 rather than the full possible 0-to-17 range and may have reduced our capacity to detect an association with injury risk. It could be attributed to a small sample size. It is possible that LESS score varies more widely in groups that are

undergoing rapid neuromuscular development, such as younger athletes, or the military population upon which the LESS was developed. In our study, it was found out that the mean age of the football players was 24.07 with a Standard deviation of 3.903. this could be one of the limitations of this study.

Another significant finding of our study was the recurrent faulty biomechanical patterns. Knee valgus angle at initial contact (13) i.e. knees not over mid foot, stance width wider at landing (10), i.e. stance width wider than shoulder, knee valgus displacement (6), i.e. medial knee movement at maximum flexion and increase trunk flexion (6) were the common errors observed. These findings of our study are in accordance with other studies; however, increase in knee flexion at initial contact were the commonest findings in other studies⁷. Isolated increase in knee valgus displacement and at initial contact are reported to place less load on the ACL but when combined with tibial internal or external rotation magnifies the loading greatly. Tibial internal rotation was observed with wider stance width at landing. Tibial internal rotation and knee valgus motion have been identified as common mechanisms, especially for noncontact injuries, which occur when strain is applied to the ACL in multiple anatomic planes. Increase in trunk flexion leads to changes at hip angles and asymmetric landing thereby predisposing one limb to ACL injury.

The main highlight of our study was that it was conducted using the Kinovea software. It is a free software application for the analysis, comparison and evaluation of joint movements in sports and rehabilitation settings. The main advantage of Kinovea is easy to use and the analysis can be done without using physical sensors. It has been found out to be a competent tool to aid easy clinical application of LESS⁶.

Conclusion

It was concluded that LESS is an effective tool to identify faulty biomechanics. Kinovea was also found to be an efficient tool to measure LESS. The most common faulty biomechanics was knee valgus angle at initial contact, stance width wider and knee valgus displacement. This information can help physiotherapists/coaches for injury prevention, correction of faulty biomechanics and application of correct techniques.

Conflict of Interest: There is no conflict of interest

Source of Funding: Self

Ethical Clearance: The study was undertaken after due clearance from the institutional ethics committee. Informed consents were taken from the subjects before data collection.

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Comparative Study between Efficacy of Circuit Training and Interval Training in Improving Exercise Capacity among Chronic Kidney Disease Patients

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Abstract

Introduction: Exercise has several benefits in general population in reducing risk of cardiovascular mortality. Aerobic, resistance and combined exercise are several forms of exercises suggested in CKD to improve quality of life. Circuit training and interval training are two important forms of high intensity aerobic resistance training. There is a limited data that compares these two forms of exercise and their benefits in CKD. Hence this study was designed to find and compare the effectiveness of circuit training and interval training in improving exercise capacity amongst CKD.

Materials and Method: This was an intervention study. Patients aged between 36-71 years with CKD stage 2-5, who were hemodynamically stable, who could perform activities and not having associated co morbid conditions were included. Those with chronic heart failure and co morbid conditions were excluded. 82 patients were recruited, with 41 in each of circuit training and interval training group. The intervention (circuit based and interval based) lasted for 8 weeks in total, with exercise sessions lasting for 50-55 minutes at a frequency of 3 sessions per week. The progression of intensity, frequency and duration was monitored and controlled by Borg's perceived exertion scale applied for resistance exercise. 6 minutes walk test prior and after exercise at baseline and after 8 weeks was recorded along with vitals.

Results and Discussion: 120 patients were screened from February 2016 through January 2017 for eligibility to participate in this study, patients assessed for eligibility to participate, 38 individuals were excluded because they did not meet inclusion criteria or declined to participate in the study after the initial screening according to inclusion criteria selected the sample 41 patient each has selected for each group rest of them excluded from the study. Conducted study for total duration of 1 year, each patient had trained for 8 weeks. 2 weeks supervised and 6 weeks home based. All were performed well during training period.

Conclusion: Baseline characteristics were similar and both circuit and interval exercise intervention showed improvement in 6 minutes walk test.

Keywords: *Chronic kidney disease, Exercise capacity, Circuit training, Interval training.*

Introduction

Age adjusted CKD (Chronic kidney disease)

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prevalence in India is reported to be 229/million population and > 1,00,000 patients enter renal replacement annually.⁽¹⁾ Exercise has several benefits in general population in reducing risk of cardiovascular mortality, control of diabetes and hypertension, which are also amongst the common causes of CKD and hence deemed beneficial. Aerobic, resistance and combined exercise are several forms of exercises suggested in CKD to improve quality of life. Several studies have suggested

that exercise in CKD improves physical functioning, help in better management of hypertension.⁽²⁾ Circuit training and interval training are two important forms of high intensity aerobic resistance training. While circuit training improves muscle endurance, interval training achieves better cardiovascular performance. There is a limited data that compares these two forms of exercise and their benefits in CKD. Hence this study was designed to find and compare the effectiveness of circuit training and interval training in improving exercise capacity amongst CKD.

Materials and Method: This was an intervention study conducted in Yenepoya Medical College, Mangalore after obtaining informed consent from the patients. Patients aged between 36-71 years with CKD stage 2-5, who were hemodynamically stable, who could perform activities and not having associated co morbid conditions were included. Those with chronic heart failure, pregnancy, uncontrolled diabetes mellitus and hypertension, cardiac arrhythmia, osteoporosis, orthopaedic diseases, who required support for ambulation, with psychiatric illness, who started exercise recently, known cases of neuro muscular disease and had taken antibiotics for a course of infection within last month were all excluded from the study. Diagnosis of CKD, assessment of inclusion and exclusion criteria was done by nephrologists, after the recommendation from whom the patients were recruited. The data were collected from pre assessed health files of hospital records. 82 patients were recruited, with 41 in each of circuit training and interval training group. Sample size was calculated for a significance level of 0.05 and power of 0.8.

The intervention lasted for 8 weeks in total, with exercise sessions lasting for 50-55 minutes at a frequency of 3 sessions per week. The progression of intensity, frequency and duration was monitored and controlled by Borg's perceived exertion scale applied for resistance exercise.⁽³⁾ The Borg RPE scale is a numerical scale that ranges from 6 to 20, where 6 means no exertion at all and 20 means maximal exertion. (6 – No exertion at all; 7 – Extremely light; 8,9 – Very light; 10,11 – Light; 12,13 – Somewhat hard; 14,15 – Hard; 16,17 – Very hard; 18,19 – Extremely hard). Interval training consisted of 10 minute warm up including stretching of general group of muscles hamstring, quadriceps, pectoralis major, biceps, triceps and calf muscles. Warm up was followed by 30-35 minutes of aerobic and resistance training that included static cycling only. Finally 10 minutes of cool

down period was offered. Circuit training was done using moderate intensity exercise without rest periods. Similar 10 minutes warm up with stretch exercise was done followed by 30-35 minutes of aerobic and resistance training. Aerobic training included 3 minutes each of static cycling, stepping activities and walking in order respectively. Resistance training included 3 minutes each of bicep curls using light hand weights, chest press using light hand weight and 5 minutes of rest after one session in that order and repeated. Finally 10 minutes of cool down period was offered. Exercise capacity of each group was measured by using 6 minutes walk test (6 MWT) before and after the exercise intervention of 8 weeks in each group. This was achieved with 2 weeks of supervised training following which they were sent home, but were asked to perform same activities at home with same intensity for the rest of 6 weeks. The instructions were given through phone.

Vitals including respiratory rate (RR), Pulse rate (PR) by radial pulse palpation, Blood pressure (BP) using sphygmomanometer by auscultatory and palpation method, SPO2 using pulse oximetry were recorded before and after 6 MWT. The body mass index was calculated for each participant by dividing their body weight in kilograms (kgs) by the square of the height (h²) in meters. All participants were weighed on the equilibrated portable balance scale which would be at zero prior to each weighing to ensure accuracy. The weights were taken without shoes and with light clothes only. They were asked to maintain erect posture; the reading was noted and documented in kilograms. The height was measured without shoes using a stadiometer which was fixed to the wall. The participants were positioned in such a way that their backs were touching against the wall. They were instructed to maintain the erect posture with the head in neutral position, arms at side and heels together. The meter was pulled down to the vertex of their head. The reading was recorded in meters. 6 MWT included patients walking for 6 minutes on a hard flat surface with self pacing and rest along a marked pathway with pulse oximeter attached to monitor. After 6 MWT distance covered was measured in meters by the laps he covered. Maximum heart rate according to age was calculated by subtracting age from 220.

Statistical analysis was done by using SPSS IBM version 22. Descriptive statistics were reported as mean (SD) for continuous variables and frequency (%) for categorical variables. A 2 sample independent t-test/¹ Mann Whitney u test was used to compare efficiency

of circuit training and interval training exercises based on normality. A paired t test/Wilcoxon signed rank test was used to compare pre and post intervention for both circuit training and interval training. A 'p value' of < 0.05 was considered statistically significant.

Results: 120 patients were screened from February 2016 through January 2017 for eligibility to participate in this study, patients assessed for eligibility to participate,

38 individuals were excluded because they did not meet inclusion criteria or declined to participate in the study after the initial screening according to inclusion criteria selected the sample 41 patient each has selected for each group rest of them excluded from the study. Conducted study for total duration of 1 year, each patient had trained for 8 weeks. 2 weeks supervised and 6 weeks home based. All were performed well during training period.

Table No. 1: Difference in effect of circuit and interval training on exercise capacity as measured by SBP, DBP, PR and RR before and after 6 MWT

Variable	Circuit training		Interval training		Baseline	After 8 wk
	Baseline Pre 6MWT vs. Post 6MWT	After 8 wk Pre 6MWT vs. Post 6MWT	Baseline Pre 6MWT vs. Post 6MWT	After 8 wk Pre 6MWT vs. Post 6MWT	Circuit-Interval Mean diff±SEM (95% CI) P value	Circuit-Interval Mean diff±SEM (95% CI)
SBP	129.51±4.98	129.51±4.98	130.98±8.31	129.51±4.98	-1.46±1.5 (-4.4 – 1.46) P=0.336	-1.46±1.5 (-4.4 – 1.46) P=0.336
	149.51±5.89	149.51±5.89	148.54±9.37	148.78±8.72	0.98±1.73 (-2.46– 4.42) P=0.574	0.73±1.6 (-2.5-4) P=0.732
DBP	88.05±4.01	88.05±4.01	88.78±7.81	88.78±7.81	-0.732±1.37 (-3.4-1.99) P=0.595	-0.732±1.37 (-3.4-1.99) P=0.595
	98.78±3.31	98.78±3.31	99.02±7	99.02±7	-0.24±1.2 (-2.6-2.16) P = 0.84	-0.24±1.2 (-2.6-2.16) P = 0.84
PR	79.49±1.99	79.49±1.99	74.63±2.52	74.54±2.45	4.86±0.58 (0.5-3.8) P=<0.001*	-3.22±0.36 (-3.9- -2.5) P<0.001*
	86.56±1.83	86.29±1.9	79.83±4.1	79.61±4.22	6.7±0.7 (5.3-8.13) P <0.001*	6.68±0.72 (5.24-8.12) P<0.001*
RR of pre 6MWT	18.98±1.99	18.98±1.99	22.2±1.21	22.2±1.21	-3.22±0.36 (-3.9 - -2.5) P <0.001*	-3.22±0.36 (-3.9 - -2.5) P <0.001*
	24.59±1.07	24.51±1.03	25.59±1.09	25.54±1.14	-1±0.24 (-1.5- - 0.5) P <0.001*	-1±0.24 (-1.5- - 0.5) P <0.001*
6 MWT in meter	284.61±9.16	304.56±9.53	293.17±13.07	312.34±18.02	-8.56±2.49 (-13.5- -3.5) P=0.001*	-7.78±3.18 (-14.1- -1.4) P=0.17
Glucose in mg/dl	159.15±18.16	NA	153.59±18.04	NA	153.59±18.04 P=0.168	NA
GFR in ml/min	21.05±5.05	NA	21.32±6.04	NA	-0.27±1.2 (-2.7 – 2.2) P=0.829	NA

Legend to Table No. 2: Both interval training and circuit training improved the exercise performance after 8 weeks. There was no difference between circuit and interval training. 6 MWT steps improved after 8 weeks in both circuit and interval training.

Discussion

We demonstrated that this combined model of supervised and home based exercise training was efficacious, with improvements in exercise capacity. Exercise training for 2 months had significant increases in 6 minute walk distance. Prior studies have demonstrated that improving fitness in high-risk individuals, significant improvement in GFR in participants who followed an endurance training program.⁽⁴⁾ Other exercise and physical activity studies have shown no discernible change in GFRs between the exercise and control groups; however, the relatively short duration of exercise interventions, as well as small sample sizes, combined with inherent large variability in CKD progression and the total volume of exercise of the various exercise interventions may not have been sufficient to produce significant effects over short periods in our study.⁽⁵⁾

This study focused on participants with progressive CKD stages 2 to 5, rather than those with more stable kidney function. Late stage of CKD is associated independently with increased risk of CVD (cardiovascular disease). Also considering the small sample size of the study, small exercise dose and variability in responses collected all contributing to less changes in GFR. However, we should emphasize that the aim was to encourage, support and educate patients to alter their lifestyles to be more physically active and meet current minimum physical activity.

Some Studies have identified low self-reported physical activity and fitness as prognostically important for CVD and all-cause mortality in patients with CKD stages 2 to 4. Despite taking great care in the administration of the assessment of self-reported physical activity, the results must be interpreted with care. Physical inactivity is the fourth leading cause of global mortality and contributes to the prevalence of many chronic conditions. Low exercise capacity independently predicts cardiovascular morbidity and mortality in the general population and patients with end-stage kidney disease.⁽⁶⁾

Since no adverse events in the form of cardiovascular morbidity and mortality were noted in this study, which therefore should encourage nephrologists to ensure that exercise is recommended routinely to all patients with CKD. This finding was similar to other studies.⁽⁷⁾ But our study was not adequately powered to assess the impact of exercise training on cardiac risk factors or kidney function. The findings from this study suggest

that exercise training is effective and safe in patients with CKD. Patients who previously were inactive and deconditioned were able to safely initiate an exercise program and the patients maintained activity levels over an 8 week period. In early stage of kidney disease if given an exercise intervention, can show more improvement in 6 minutes walk test, GFR (Glomerular filtration rate), BMI, exercise capacity, blood pressure, SPO₂, Respiratory rate and Pulse rate, than these late stage kidney disease patients.

Similar study indicate that aerobic capacity is improved by all regular exercise training programs regardless of exercise type, intensity, or length of intervention in CKD stages 2-5 groups and showed improved health-related quality of life following regular, high-intensity mixed cardiovascular and resistance training.⁽⁸⁾ Physicians should educate their adult patients with CKD about scientific evidence showing that regular exercise of longer than 30 minutes per session 3 times weekly will improve aerobic capacity, blood pressure, muscular strength and health-related quality of life. These benefits occur in adults with CKD stages 2-5, those receiving dialysis and adults with a kidney transplant.

Limitations of this study: The study did not include a control group to compare the findings with physically active and inactive non CKD individuals. A longer follow-up was not possible as the study duration was 1 year, exercise training was 8 weeks. The data was collected from one particular hospital based on convenience. Thus, the results of the study cannot be generalized to the whole population. End stage of kidney disease may not show much improvement in exercise capacity.

Future scope of study is the study can be carried out with large sample size with more duration and effects on parameters of kidney function in exercise intervention can be studied in CKD patients. Same study can be done in early stage kidney disease for more effective and preventive results.

Conclusion

Both circuit and interval exercise training had improvement in exercise capacity of patients with CKD.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: From ethics Department:

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Need for Cross-Cultural Adaptation of Self-Reported Health Measures: Review Study

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Abstract

Background: Most of the self-reported health measures are designed in English speaking countries and according to western culture. Need arises for the tools of measurement in non-English speaking population and different cultural background. The purpose of the study is to highlight the need for either development of new measure or cross-cultural adaptation of existing measures according to differences in daily activities and considering the language.

Relevance: Guidelines will help physiotherapists in deciding whether to develop a new measure or to adapt the existing one.

Method: Literature was reviewed and studies were found out from search engines and databases like Google scholar, PubMed, Cochrane review from the year 1990 to 2019. Studies recommending need for translation and cross-cultural adaptation of self-reported health measures were identified. PRISMA and STROBE checklist were used for analyzing and reporting articles.

Analysis: Studies were qualitatively analyzed. Method implied in translation and adaption process were critically reviewed. Scenarios in which language and cultural difference exist were ruled out. Guidelines and criteria for cross-cultural adaptation were found out.

Results: The current study shows that cross-cultural adaptation saves resources. It is also less extensive and offers standard measure for assessment. However, extensive guidelines must be followed and adapted tool must undergo validation process.

Conclusion: Cross-cultural adaptation of self-reported health measure is advisable as compared to the development of new measure.

Keywords: *Cross-cultural adaptation, Self-reported health measure, Guidelines.*

Introduction

Self-reported health measures or Questionnaires are tools designed to quantify the qualitative properties of the population.^[1] Designing a questionnaire requires extensive work in regard of measuring population characteristics, adding and eliminating item based on population response.^{[2],[3]} Most of the self-reported health measures are designed in English speaking countries and according to the western culture.^{[2],[4],[5]} There is a wide variation in the culture and language across different countries. During testing, it comes to researcher's knowledge that some items of questionnaire does not apply to all population leading to the exclusion

of the subjects and causes linguistic and cultural barriers.^{[2],[6]} Hence, need arises for the tools of measurement in non-English speaking population and different cultural background.

Purpose: The purpose of the study is to highlight the need for either development of new measure or cross-cultural adaptation of existing measures according to difference in culture and considering the language barrier.

Objective: This study will help physiotherapists in deciding whether to develop a new measure or to adapt the existing one and scenarios in which adaptation is required.

Methodology

Literature was reviewed and studies were found out from search engines and databases like Google scholar, PubMed, Cochrane review from the year 1990 to 2019. Total 9405 records found based on the search term; extensive search was done and found 200 records, of those 66 records were excluded due of duplicates. 134 records were screened and full text access of 45 articles was available. 19 articles relevant to the study, recommending need for translation and cross-cultural adaptation of self-reported health measures were reviewed. PRISMA and STROBE checklist were used for analyzing and reporting articles.^[7]

- Keywords used for the search were
 - Development of self-reported health measures/ tool
 - Need for cross-cultural adaptation AND/OR translation

- Cross-cultural adaptation of health measure
- Guidelines for cross-cultural adaptation of health measure

Results

The current study shows that cross-cultural adaptation has many advantages. Patients can correlate to the adapted version better as it is in their own language and according to their lifestyle. It saves resources and is less extensive and less time consuming. It offers standard measure for assessment and allows for comparison across national/cultural groups. Also, it allows inclusion of immigrants and hence reduces selection bias. It is budget friendly compared to development of new measure.^{[2],[4],[5],[6]}

Scenarios in Which Cross-Cultural Adaptaion is Required: Guillemin [1993], suggested following scenarios in which cross-cultural adaptation is considered more important.^{[2],[8]}

Table 1: Showing the scenarios in which translation and adaptation is required

Sr.No.	Culture of target population	Language of measure	Country of utilization	Translation required	Adaptation required
1	Same	Similar	Same	---	---
2	Other	Similar	Same	---	√
3	Other	Similar	Other	---	√
4	Other	Other	Same	√	√
5	Other	Other	Other	√	√

Discussion

Reviewing the literature shows need for the translation and cross-cultural adaptation of existing self-reported health measures. Adaptation is aimed towards measuring a similar phenomenon in different culture and producing equivalent instrument adapted to another culture. (International Test Commission,

2010)^{[9],[10]}. However, several problems are encountered in adapting a tool. Extensive guidelines are available for translation and cross-cultural adaption, strict adherence to the guidelines is required.^[5] Also, reliability and validity measurement of the adapted tool is must, as few properties of the tool might have changed according to the changes in the items of tool.^{[4],[11],[16]}

Table 2: Adaptation Versus Developing a Measure

	Adaptation of Existing Measure		Developing a New Measure
PROS	<ul style="list-style-type: none"> • Cost effective • Less extensive • More feasible • Offers standard measure for use in International studies • Allows for comparison across national/cultural groups Allows inclusion of Immigrants and reduces selection bias	PROS	<ul style="list-style-type: none"> • Adds to the new tool for measurement • New tool can be exclusively developed according to the need of community and directly into language

	Adaptation of Existing Measure		Developing a New Measure
CONS	<ul style="list-style-type: none"> • Permission from the developers of original version • Steps should be followed rigorously Adapted tool should undergo validation process and reliability measurement	CONS	<ul style="list-style-type: none"> • Requires extensive work and immense men power • Time consuming • Needs adding and eliminating items based on population response • Budget required is more
CAUTIONS	No matter how much effort is made to adapt a scale, it will always be the “Adapted version”, credit will always be of the original scale		

Conclusion

Cross-cultural adaptation of self-reported health measure is advisable as compared to the development of new measure. Multinational studies/studies involving different cultural forums would be possible with the adaptation and also allow for inclusion of immigrants. However, extensive guidelines must be followed and adapted tool must undergo reliability testing and validation process.

Conflict of Interest: None

Source of Funding: Self

Ethical Approval: Ethical approval for this study was taken from Institutional Ethical Committee.

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Effect of Graded Spinal Exercises in Postnatal Women

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Abstract

Background: Postpartum or postnatal period begins immediately after the birth of a child as the mother's body, including hormone levels and uterus size, returns to non pregnant state. This leads to various postural changes during pregnancy. Changes occur to counter the balance with compensatory changes in spinal column. Most common modification occur in pelvis, lumbar and thoracic curvature during pregnancy. Previous studies have found that postural changes occur after delivery like various spinal changes and correction have been done but not according to the graded exercise therapy . So graded spinal exercises are used in this study for these spinal correction.

Objective: To determine the effect of graded spinal exercises program in postnatal women. To correct the posture of the postnatal women.

Materials and Method: Total 40 subjects were selected aged between 25 to 35 years according inclusion and exclusion criteria. Prior consent was taken. Pre assessment was taken for postural examination. After that subjects were asked to perform the set of exercises as noted in the protocol. This set of exercises were practiced for 45 min/day, 5days/week and for 3 weeks. The results gained after completing the one month protocol was noted by post assessment for postural examination . The change in individual's was noted and thus conclusion was made.

Conclusion: The study concluded that there was significant improvement noted for postural correction with graded spinal exercises in postnatal women.

Keywords: Posture, spinal changes, graded spinal exercises, postnatal women, postural changes, postural assessment.

Introduction

Postpartum or postnatal period begins immediately after the birth of a child as the mother's body, including hormone levels and uterus size, returns to non pregnant state.¹ Both fetus and mother have physiologic

characterizes via simultaneous enlargement during pregnancy.²

Mother's center of mass changes with weight distribution pattern as fetal enlargement occurs. This leads to various postural changes during pregnancy. Changes occur to counter the balance with compensatory changes in spinal column. Most common modification occur in pelvis, lumbar and thoracic curvature during pregnancy.²

Postural alterations most frequently mentioned in the literature are increased lumbar curvature, pelvic antversion, increased thoracic curvature increased cervical curvature, protraction of the shoulder girdle, hyper extended knees and extension of the ankles.³

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The development of back pain has been related to spinal changes, especially an increase in lumbar curvature, which alters the distribution of loads, causing increased tensions in lumbar structures.³

Findings range from an increased lumbar curvature and pelvic ante version to slight postural adjustments attributed to individual adaptations of each woman or a tendency towards lumbar kyphosis and posterior inclination of the sacrum.³

Postural changes seen during pregnancy: Posture means disposition of the body at any one moment and is composite of the positions of the different joints of the body at that time. When minimum stress is applied to each joint is called correct position. And faulty posture is called when there is increase in the stress to the joints. When the posture is used for the purpose with maximum efficiency and minimum efforts is called as good posture. When the posture is insufficient and fails to complete the purpose is called as poor posture.⁴

Good posture vs bad posture: Common spinal deformities are lordosis, kyphosis, scoliosis. Lordosis is an anterior curvature of the spine. Kyphosis is a posterior curvature of the spine. Scoliosis is a lateral curvature of the spine.⁴

Assessment of posture is done in three views anterior, posterior and lateral view in standing, sitting and supine lying. From head to toe everything is observed.⁵

Anterior view, Posterior view & Lateral view

General posture management guidelines:

Awareness and control of spinal posture: Therapist and patient interaction, helping patient to correct alignment and mirror used by the patient which may act as biofeedback.

Posture, movement and functional relationship: if patient is having faulty posture and pain ask the patient to wait and correct the posture and feel the pain now. Patient having faulty posture and extremity function then ask patient to perform functional activity.

Joint, muscle and connective tissue mobility impairment: stretching and mobilization can be suggested.

Impaired muscle performance: Endurance training are necessary.

Body mechanics: Strengthening exercises can be performed.

Ergonomics: regular exercises to be done with sustained or repetitive basis at work, at home.

Stress management and relaxation.

Healthy exercise habits: Stabilization exercises, aerobic conditioning and functional activities.

Stabilizing exercises differ from general exercises by being more body-specific and requiring more attention and precision from the patient. Importantly, psychosocial factors related to the development of pain and disability, e.g., self-efficacy and fear of movement, may also affect the persistency and recurrence of pain. The stabilizing exercises, by being individually dose and graded into functional and loaded positions, might affect self-efficacy beliefs and possible fear of movement.⁶

Stabilization exercises start with recumbent position and progress to sitting, standing on large gym ball, standing with the back supported against wall and finally standing without support. It can be progressed to unstable surfaces.⁶

Previous studies have found that postural changes occur after delivery like various spinal changes and correction have been done but not according to the graded exercise therapy. So graded spinal exercises are used in this study for these spinal correction.

Need for Study: Postural changes take place during pregnancy and have impact on women's life after delivery. So it is important to study these postural changes and correct these postures. Previous studies have found that postural changes occur after delivery like various spinal changes and correction have been done but not according to the graded exercise therapy. So graded spinal exercises are used in this study for these spinal correction.

Materials and Methodology

Methodology:

Study type: Experimental

Study design: Pre and post test

Sampling method: Simple random sampling

Sample size: 40

Study duration: 6 months

Place of study: Krishna hospital, Karad

Inclusion Criteria:

Postnatal women with normal vaginal delivery

Primigravida women

Age group- 25 to 35 years

Exclusion Criteria:

Fracture of lower limb

Psychological problem

Visual defect

Outcome Measure:

Postural assessment

Materials:

Inch tape

Data collection sheet

Pen

Procedure:

Subjects were selected as per the inclusion and exclusion criteria.

Written consent was taken from the subjects.

After selection of the subject the postural examination was done before the treatment.

Subject were asked to perform the set of exercises as noted in the protocol

Each Session:

1. Warm up for 10 min:

- free exercises: Squats, lunges, side bending, hip rotation, hip flexion and extension.

2. First week protocol:

Breathing Exercises: Pursed lip breathing: ask the subject to sit back straight or lie down, relax shoulders as much as possible. Now inhale deeply through nose and exhale slowly through mouth like blowing a candle.

Diaphragmatic breathing: lie down on back on flat surface or in bed with knees and head supported. Place one hand on upper chest and other just below rib cage. Feel the diaphragm as performing breathing. Now inhale slowly through nose and exhale through mouth.

Stretching of lower limb with 10 sec hold: Hip extensors: ask the subject to lie flat on back on flat surface or in bed. One leg rest and other leg raised as

high as possible. The therapist is on one leg on the floor and shoulder against the back of the raised leg. Now therapist will raise the leg slowly. Hold this position for 5 sec and relax.

Strengthening:

Basic Crunches: Ask the subject to lie down on back on flat surface or in bed. Place your hand behind the head hold your elbow out to the side. gently pull your abdominals inward. Curl up and forward so that your head, neck and shoulder blades lift of the floor towards your knee. hold this position for 5 sec and relax.

Pelvic tilting: Ask the subject to lie down on back on flat surface or in bed without head supported. Now bend the knee. Now perform by pulling belly button in toward the spine, pushing pelvis up toward the ceiling. Tighten gluteus and hip muscles as you tilt pelvis forward. Hold for 5 sec and repeat.

Pelvic Bridging: Ask the subject to lie down on back or flat surface or bed without head supported. Now bend the knee. Lift your tail bone to the ceiling to stretch your lower back and pull in your stomach. To go into a bridge lift the entire spine except neck. Hold this position for 5 sec and relax.

Cat and camel: Get on to your hands and knees, with your knees spaced hip width apart and your hands directly beneath your shoulder. Tighten your abdominal muscles and arch your spine upward toward the ceiling. Hold this position for 5 sec and relax your back. Allow your stomach to fall towards the floor and stretch your back downwards. Hold this position for 5 sec and relax.

- **Ergonomic Advices:** To maintain correct posture during breastfeeding. Relax after every set of exercise.
- **Home Protocol:** Follow all the exercises given.

Second Week Protocol:

Swiss Ball Exercises:

Spinal Stretching:

Squats: By placing swiss ball between you and wall, a standard squat can be performed.

Third week protocol: Above 2 weeks protocol to be continued with increase in number of repetition and hold time.

This set of exercises were practiced for 45 min/day, 5 days/week and for 3 weeks.

The results gained after completing the one month protocol was noted by postural assessment.

The change in individual's was noted by the pre and post assessment of posture and thus conclusion was made.

Statistical Analysis: Data of all outcome measures was measured as pre treatment & post treatment values. Mean & standard deviation was calculated for each outcome measure.

Within group comparison was done by applying 'Paired t-test' to pre and post treatment values of same group for all outcome measures.

Data Presentation:

Age Distribution In The Study:

Table No. 1: Age distribution

Age	Total
25-30	38
31-35	2

Anterior View:

Table No. 2: Anterior view

ANT View	Pre	Post	MD	t value	p value	Remark
H	2.25±0.95	1.52±0.96	0.72	5.23	<0.0001	ES
M	1.17±0.38	1.07±0.26	0.1	2.0782	0.044	S
SHD	1.05±0.23	1.02±0.16	0.025	1	0.323	NS
RIB	0	0	0	0	0	
SC	0	0	0	0	0	
PELVIS	2±0	1.5±0.5	0.5	6.24	<0.0001	ES
HIP	0	0	0	0	0	
FEMUR	0	0	0	0	0	
KNEE	0	0	0	0	0	
PT	0	0	0	0	0	
TB	0	0	0	0	0	
ANK	0	0	0	0	0	
RF	0	0	0	0	0	
FEET	0	0	0	0	0	
TOES	0	0	0	0	0	
LL	0	0	0	0	0	

Lateral View:

Table No. 3: Lateral view

LAT View	Pre	Post	MD	t value	p value	Remark
H	1.12±0.82	0.3±0.64	0.82	5.97	<0.0001	ES
M	1.17±0.38	1.024±0.15	0.15	2.62	0.012	S
SC	0	0	0	0	0	
THK	0.85±0.36	1.32±0.85	-0.47	4.002	0.0003	ES
LL	1±0	1.62±0.49	-0.62	8.06	<0.0001	ES
PELVIS	1±0	0.52±0.50	0.47	5.94	<0.0001	ES
KNEE	0.52±0.5	0.42±0.5	0.1	2.08	0.044	S
FEET	0	0	0	0	0	

Posterior View:**Table No. 4: Posterior view**

POST View	Pre	Post	MD	t value	p value	Remark
H	0	0	0	0	0	
SHD	0.95±0.22	1±0	-0.05	1.43	0.159	NS
SC	0	0	0	0	0	
SPINE	0	0	0	0	0	
PELVIS	2±0	1.22±0.42	0.77	11.59	<0.0001	ES
HIP	0	0	0	0	0	
KNEE	0.52±0.50	0.3±0.46	0.22	3.36	0.0017	VS
LEG	0	0	0	0	0	
ANKLE	0	0	0	0	0	
CP	0	0	0	0	0	

Discussion

This study “EFFECT OF GRADED SPINAL EXERCISES IN POSTNATAL WOMEN” was conducted to see the effect of graded spinal exercises among postnatal women. Postpartum or postnatal period begins immediately after the birth of a child as the mother’s body, including hormone levels and uterus size, returns to non pregnant state. Both fetus and mother have physiologic characteristics via simultaneous enlargement during pregnancy. Mother’s center of mass changes with weight distribution pattern as fetal enlargement occurs. This leads to various postural changes during pregnancy.

Changes occur to counter the balance with compensatory changes in spinal column. Most common modification occur in pelvis, lumbar and thoracic curvature during pregnancy. Postural alterations most frequently mentioned in the literature are increased lumbar curvature, pelvic antversion, increased thoracic curvature increased cervical curvature, protraction of the shoulder girdle, hyper extended knees and extension of the ankles.

Previous studies “Changes in trunk posture and muscle responses in standing during pregnancy and postpartum” by Gemma Bivia -Roig, Juan Francisco Lison, Daniel Sanchez-Zuriaga concluded that in standing, pregnant women in the third trimester of pregnancy do not show alterations in the position of the lumbar spine and pelvis respective to postpartum and nulliparous women ($p < 0.01$). “Postural Changes during First Pregnancy” by S. Kouhkan, A. Rahimi,

M. Ghasemi Et al showed a significant increase in most variables that became higher as the months of pregnancy increased ($p < 0.05$).

“Postural changes during normal pregnancy” by Amal M. Yousef, Hala M. Hanfy, Fniyz F. Elshamy, Et al concluded that there was a statistically highly significant increase in the thoracic kyphosis angle, lumbar lordosis angle and pelvic inclination angle during normal pregnancy ($p < 0.001$). “Static trunk posture in sitting and standing during pregnancy and early postpartum” by Wendy L. Gilleard, Jack Crosbie, Richard Smith concluded that there was no significant effect of pregnancy on upper body posture during sitting and standing and a flatter spinal curve was found during standing postpartum.

The aim of the study is to find out the effect of graded spinal exercises in postnatal women. The objectives were to determine the effect of graded spinal exercises program in postnatal women and to correct the posture of the postnatal women.

The study was conducted with 40 subjects. Subjects were selected according to the inclusion and exclusion criteria. Inclusion criteria was Postnatal women with normal vaginal delivery, Primigravida women, Age group- 25 to 35 years. Exclusion criteria was Fracture of lower limb, Psychological problem, Visual defect.

Prior consent was taken from them. Pre assessment was taken. The interventions were carried out for 45min/day, 5days/week and for 3 weeks. The outcome

measure was Postural assessment. After 3 weeks post assessment was taken. Thus conclusion was done. This was confirmed using statistical analysis by using 'Paired t- test' for within group comparison.

During the study few discontinued and even did not give the response towards the treatment protocol. Few showed better improvement as proper counselling was done with psychological support was provided. The study was effective among postpartum women as immediately treatment was given in early postpartum phase as normal delivery was done. Primiparous women were included which showed better result.

In anterior view: pre and post training there was significant improvement noted for head ($p < 0.0001$), mandible ($p = 0.044$), shoulder ($p = 0.323$) and pelvis ($p < 0.0001$). In lateral view: pre and post training there was significant improvement noted for head ($p < 0.0001$), mandible ($p = 0.012$), thoracic kyphosis ($p = 0.0003$), lumbar lordosis ($p < 0.0001$), knee ($p = 0.044$) and pelvis ($p < 0.0001$). In posterior view: pre and post training there was significant improvement noted for pelvis ($p < 0.0001$) and knee ($p = 0.001$) and not significant improvement noted for shoulder ($p = 0.159$).

This study was limited to a small geographic area and study duration was short and limited. A future study with large sample size and among LSCS delivered women can be done.

Conclusion

The study concluded that there was significant improvement noted for postural correction with graded spinal exercises in postnatal women.

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Conflict of Interest: There was no conflict of interest carried out during the study.

Source of Funding: Source of Funding is by self.

Ethical Clearance: The institutional ethics committee has given permission to initiate the research project.

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Effect of Muscle Energy Technique on Strength and Range of Motion in Young Swimmers with Sick Scapula Syndrome: A Pre-Post Clinical Trial

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Abstract

Background: There are various overhead injuries which mainly affect the shoulder complex in swimmers and one among them is sick scapula syndrome which results in muscular imbalance in such athletes. The abbreviation SICK stands for Scapular malposition, Inferior medial border prominence, Coracoid pain and malposition, Dyskinesia.

Method: In this study 26 subjects with sick scapula syndrome were taken into the study by evaluating through the lateral scapular slide test (LSST), the subjects affected were given muscle energy technique to increase the strength of the scapular muscles the technique was given for 45-60 seconds thrice in a week for three weeks and all the subjects were immediately assessed using MMT.

Results: The t and p value of Pre and Post ROM scale of Extension was 11.523 and 0.001. The t and p value of Pre and Post ROM scale of Internal rotation was 10.490 and 0.001. The t and p value of Pre and Post ROM scale of external rotation was 12.569 and 0.001 which is statistically significant.

The t and p value of Pre and Post MMT scale of serratus anterior was 1.995 and 0.050. The t and p value of Pre and Post MMT scale of Pectoralis Minor was 5.000 and 0.001. The t and p value of Pre and Post MMT scale of Latissimus dorsi was 2.440 and 0.022. The t and p value of Pre and Post MMT scale of Trapezius was 6.325 and 0.001 which is statistically significant.

Conclusion: The present study results demonstrate that of Muscle energy techniques effective in increasing the range of motion and strength in young swimmers within the age group of 8 to 15 years with sick scapular syndrome.

Keywords: Scapular dyskinesia, Scapular mal-position, Scapular abnormalities.

Introduction

The shoulder complex is comprised of sternoclavicular joint, glenohumeral joint, scapular and scapulothoracic joint. The scapula is a triangular flat bone

that lies on posterolateral aspect of thorax overlying 2nd and 7th ribs stabilizing scapula onto the chest wall by muscle attachments to spinous process and ribs.¹

There are various overhead injuries which mainly affect the shoulder complex in swimmers and one among them is sick scapula syndrome which results in muscular imbalance in such athletes. Overhead injuries are progressive in nature and therefore could be prevented by strengthening of weak muscles, it is of most importance to prevent and increase the strength and maintain the efficient sports performance. The shoulder complex is of utmost importance in the kinetic chain and

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therefore if any component of kinetic chain is affected then performance is also affected.²

Muscle energy technique (MET) has been proven effective in increasing the range of motion (ROM) and posture of the upper extremities, the cervical, the thoracic and the lumbar spine in asymptomatic individuals and symptomatic individuals. Apart from the usual techniques, muscle energy technique (MET) can be possibly given by altering muscle length at the start, effort of the client or therapist, duration of the contraction, pulsed or single contraction, number of repetitions of the contraction, position change with each repetition, client breathing and eyeball movements in direction of the force.⁴

Scapular dyskinesis can also be classified as: Type 1 or inferior angle prominence, which is associated with excessive anterior tilt; Type 2 or medial border prominence, which is associated with excessive scapular internal rotation; and Type 3 or superior border prominence, which is associated with elevated scapula.⁸

During the clinical examination, clinicians observe the asymmetry in shoulder and scapular posture, such as muscle atrophy, bony contour, excessive scapular winging, inferior angle prominence and presence of a scar. 1–6 Postural asymmetries found during the clinical examination may be related to abnormalities.

Alterations in scapular muscle activation are related to scapular dyskinesis. Serratus anterior activation and strength is decreased in patients with impingement and shoulder pain, contributing to the loss of posterior tilt and upward rotation causing dyskinesis. In addition, the upper trapezius/lower trapezius force couple may be altered, with delayed onset of activation in the lower trapezius, which alters scapular upward rotation and posterior tilt.¹³

Altered scapular motion or position both decrease linear measures of the subacromial space, increase impingement symptoms, decrease rotator cuff strength, increase strain on the anterior glenohumeral ligaments and increase the risk of internal impingement radiculopathy. These protocols have been unable to demonstrate the asymmetry in healthy groups or those with abnormalities.

Hypertrophy of anterior shoulder muscles is often experienced by professional swimmers due to excessive shoulder revolutions. Forward head posture

and protracted shoulders are also seen due to tightness of pectoralis minor muscle among professional female swimmers which results in shoulder pain. Therefore, the forward pull on the shoulders and the muscle imbalance lead to increased anterior tilt, internal rotation and downward rotation of the scapula. This, in turn, causes excessive scapular protraction. In many swimmers, it may further give rise to shoulder injuries namely subacromial impingement syndrome, thoracic outlet syndrome, glenohumeral instability.

Muscle energy technique (MET) has been proven effective in increasing the range of motion (ROM) and posture of the upper extremities, the cervical, the thoracic and the lumbar spine in asymptomatic individuals and symptomatic individuals.

Apart from the usual techniques, muscle energy technique (MET) can be possibly given by altering muscle length at the start, effort of the client or therapist, duration of the contraction, pulsed or single contraction, number of repetitions of the contraction, position change with each repetition, client breathing and eyeball movements in direction of the force.

Material and Methodology

Materials Used:

- Consent form
- Data collection sheet
- Pen
- Marker

Apparatus Used:

- Baseline inclinometer (Biotech)
- Goniometer
- Measuring tape
- Marker.

Source of data: Subjects will be recruited from the swimming training center in and around Belagavi, Karnataka, India.

Method of data collection: The present study was conducted on 26 participants, the source of data was taken from the nearby swimming centers in and around Belagavi and the study type was a pre-post clinical trial. Subjects were informed about the aims and procedure of the study and a written consent was provided to

them before the intervention and ethical clearance was obtained from the institutional ethical committee. After the subjects were screened for the inclusion and the exclusion criteria, the subjects were given the intervention of muscle energy technique for three weeks for three consecutive months for a time period of 45-60 seconds for each particular muscle which was to be treated.

The strength and range of motion was assessed pre and post after every intervention and the particular record was maintained and it was found that after every intervention the strength was increased, the strength increment and decrement was assessed thorough manual muscle testing(MMT) and the range of motion increment and decrement was assessed using a goniometer and a baseline inclinometer .

Procedure: To perform the muscle energy technique, the subjects were supine positioned for the intervention with the affected side of the patient out of the couch so that it is not in contact with the couch . The therapist will be at the affected side of the patient, the affected arm will be moved into horizontal abduction where the limitation for the range of motion will be felt, that particular angle will be taken as the affected range there in that particular range stretch-contract technique will be conducted for three seconds in the particular muscles affected and the subject will be asked to take it to the new range, contraction will be performed isometrically. The sequence will be repeated with the arm in horizontally abducted and taken to a new range through stretch contract technique.

Four cycles will be conducted for 45-60 seconds thrice in a week for three consecutive months.

Discussion

According to a study which was done in 2011, evaluated the effects of muscle energy technique in improving Range of motion and he hypothesized that the effects are mainly due to two distinct physiological processes, which are of PIR/RI in which PIR of agonist contraction and RI of antagonist's contraction. They stated that when an isometric contraction is sustained, neurological feedback through the spinal cord to the muscle itself results in PIR. But during IR, the reduction in tone relies on the physiological inhibiting effect on antagonist. this study provides a strong base to our results which show improvement in Shoulder ROM and Increase in muscle strength with p value 0.001.⁵

According to a study done by Gary Fryer MET may influence pain mechanism and promote hypoalgesia. The specific mechanisms are not known, but may involve central and peripheral modulatory mechanisms, such as activation of muscle and joint receptors that involve centrally mediated pathways, like the periaqueductal grey (PAG) in the midbrain, or non-opioid serotonergic and noradrenergic descending inhibitory pathway. Additionally, MET may increase fluid drainage and augment hypoalgesia. He concluded that MET application may reduce pro-inflammatory cytokines and desensitize peripheral nociceptors.⁶

A study was conducted to determine if an MET provides improvements in resting pectoralis minor length (PML), forward scapular position and scapular upward rotation in female collegiate swimmers. total of 40 National Collegiate Athletic women's swimmers from the same swim team volunteered for this study, they were divided into 2 groups. The experimental group received 2 treatment sessions per week for 6 weeks and control group received no intervention during this 6-week period. A total of 4 cycles of MET were continuously applied per treatment session twice per week for 6 weeks. The results indicated that 6 weeks of MET treatments applied to the pectoralis minor of asymptomatic female swimmers provided improvements in PML and forward scapular position compared with a control group with a p value ($p > 0.001$) supporting results of our study which shows similar improvement in Pectoralis strength and overall increase in shoulder range of motion.⁷

A study was done to analyses effect of latissimus dorsi and pectoralis minor stretching and shoulder strengthening with an elastic band in subjects with rounded shoulder posture. the groups performed exercises for 40 mins 3 times a week. The results showed that strengthening showed improvement in the strength of latissimus dorsi and pectoralis minor. In our study also MET showed improvement in the MMT of latissimus dorsi and pectoralis minor which was graded using MMT.

A study was done to check effect of exercise at light loads with manipulative resistance on trapezius and deltoid muscle activities in shoulder joint elevation and it showed that exercise helps in improving the strength of deltoid and trapezius. Our study showed improvement in MMT grading of trapezius muscle after 3 weeks of intervention.

A study was done in which muscle energy technique was given on improving Glenohumeral Internal Rotation Deficit and functional outcomes in overhead athletes. 40 patients who had Glenohumeral internal rotation deficit. Group A (n = 20) had received muscle energy technique. Group B (n = 20) underwent stretching program. Both muscle energy technique and the stretching program were found to be significantly effective in increase Glenohumeral internal range of motion and also reduce the disability and improve functional outcomes. In the experimental group the SPADI was reduced which was statistically significant (p value 0.001) the IROM was improved which was statistically significant (p value 0.005) similarly in our study Internal rotation was increased by giving MET with a p value of 0.001.⁹

A clinical trail was done in which elastic resistance bands were used in strengthening of scapular muscles like infraspinatus, supraspinatus and serratus anterior in subjects with frozen shoulder and found that there was an improvement in muscle strength after 1 week of strengthening .in our study there was improvement in serratus anterior, trapezius, pectoralis minor and latissimus dorsi after 3 weeks of MET .the improvement was may be because of realignment of muscle fibers after muscle contraction and relaxation.

A clinical trail studied the differences between the muscle weakness and shoulder Mobility in painful and pain free shoulder in swimmers. The results suggested that prevention and rehabilitation of shoulders in swimmers. Our study also showed reduction of shoulder extension, internal and external rotation which improved after 3 weeks of intervention of MET.¹¹

Evidence has shown that MET was effective in reducing pain and improve functional activity and the effect was due to stimulation of joint proprioceptors, via the production of joint movement and the stretching of joint capsule, may be capable of reducing pain by inhibiting the smaller diameter nociceptive neuronal

input at the spinal cord leads to alter the perception of pain which leads to decrease in disability . Thus the improvement in ROM and increase in strength of the muscles in our study may be because of the same physiology.¹³

We would recommend MET with other conservative physiotherapy management to patients with SICK scapula and other conditions affecting shoulder complex.

Results

The t and p value of Pre and Post ROM scale of Extension was 11.523 and 0.001. The t and p value of Pre and Post ROM scale of Internal rotation was 10.490 and 0.001. The t and p value of Pre and Post ROM scale of external rotation was 12.569 and 0.001 which is statistically significant.

The t and p value of Pre and Post MMT scale of serratus anterior was 1.995 and 0.050.. The t and p value of Pre and Post MMT scale of Pectoralis Minor was 5.000 and 0.001. The t and p value of Pre and Post MMT scale of Latissimus dorsi was 2.440 and 0.022. The t and p value of Pre and Post MMT scale of Trapezius was 6.325 and 0.001 which is statistically significant.

Descriptive statistical analysis for demographic variables:

Table 1

Particular	Minimum	Maximum	Mean	SD
Age	9.00	15.00	12.42	1.79
Height	130.00	149.00	141.23	4.87
Weight	30.00	50.00	42.23	5.01
BMI	14.27	28.15	21.37	2.49

Table 1 represents the maximum and minimum age, height, weight and BMI of the participants in the study along with the mean and the standard deviation of the same.

Table 2

Variable	Time Frame	Mean	SD	Mean Diff	SD Diff	z-value	p-value
FLEXN	Pre	180	00	NA	NA	NA	NA
	Post W3	180	00				
EXT	Pre	55.65	1.81	4.19	1.85	11.523	0.001*
	Post W3	59.84	0.61				
ABDUCTION	Pre	180	00	NA	NA	NA	NA
	Post W3	180	00				

Variable	Time Frame	Mean	SD	Mean Diff	SD Diff	z-value	p-value
ADDDUCTION	Pre	180	00	NA	NA	NA	NA
	Post W3	180	00				
IR	Pre	66.30	1.34	3.65	1.41	13.189	0.001*
	Post W3	69.96	0.19				
ER	Pre	84.80	2.09	4.92	1.93	12.569	0.001*
	Post W3	89.73	1.04				

Table two represents the comparison of pre and post Shoulder ROM with respect to Mean, SD, t value and p value.

Conclusion

The present study results demonstrate that of Muscle energy technique is effective in increasing the range of motion and strength in young swimmers within 8 to 15 years of age with sick scapula.

Conflict of Intrest: None

Source of Funding: Self

Ethical Clearance: Ethical clearance was obtained from institutional ethical review board of KAHER Institute of physiotherapy.

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Prevalence of Ankle Sprain in Paediatric Football Players

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Abstract

Background: The purpose of this study was to find the prevalence of ankle sprain in paediatric football player.

Method: Ethical clearance was obtained from the institutional ethical committee. School students playing football were selected based on the inclusion and exclusion criteria. After consent from parents, the footballers were asked a set of questions related to ankle sprain. And accordingly study was carried out to find the prevalence of ankle sprain in paediatric footballers.

Results: After analysing the data, it was found that 46% of children had ankle sprain. Among this 46% of population, inversion type of ankle sprain was most common with prevalence of 36% followed by eversion with prevalence of 7%.

Conclusion: After analysis it was concluded that the prevalence of ankle sprain was 46%.

Keywords: Ankle sprain, Paediatric football player.

Introduction

Ankle joint is a synovial joint of hinge variety. This joint is supported by fibrous capsule, deltoid or medial and lateral ligament. Movements occurring at ankle joint are dorsiflexion and plantarflexion.^{1,2} The different terms used in relation to ankle injuries describe the forces the ankle may be subjected to-inversion, eversion, pronation, supination, rotation and vertical compression³.

The main components of lateral ligament complex are anterior talofibular ligament, posterior talofibular ligament, calcaneofibular ligament. The anterior talofibular ligament is relaxed in neutral and it is taut in plantar flexion. It is main restraint against inversion while the foot is plantar flexed and

calcaneofibular ligament is relaxed in neutral and taut in dorsiflexion. Most common ankle injury involves an isolated tear anterior talofibular ligament. The cause of injury is usually inversion of plantar flexed foot⁴.

The weak lateral collateral ligament is stressed when ankle is moved into greater degrees of plantar flexion, medial rotation and inversion. In plantar flexion, the narrower posterior body of the talus is within the mortise. This loose pack position of ankle makes it less stable in plantar flexion, thereby making lateral ankle ligament more prone to injury². Thus, lateral ankle ligament complex structure is most commonly involved in ankle sprain⁵.

Ankle ligament sprain classified into three way grade I or mild ankle sprain, grade II, moderate ankle sprain and grade III severe sprain. Mild swelling in grade I and moderate to severe swelling in a diffuse pattern in grades II and III. Ankle sprain signs and symptoms are pain, pop felt by the patient over the lateral ankle, swelling, tenderness, inability to bear weight on extremity, joint instability. Tenderness is usually induced at the anterior edge of the fibula with anterior

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talofibular ligament in injuries and in calcaneofibular ligament at the tip of fibula. In diagnosis inversion injury is commonly associated with tearing sensation or pop felt over the lateral ankle⁴.

For diagnosis of ankle sprain, patient must give history of ankle twist followed by pain and swelling and also exacerbation of pain on weight bearing. If there is complete ligament tear, patient gives history of tear followed by swelling and tenderness localised to site of injury³.

Rapid increase in the speed and competitive nature of sport has resulted in an increase in sport injuries. The injuries are classified as traumatic (external trauma) and non-traumatic (internal trauma).⁶ Incidence and distribution of sports related injury vary based on sport affiliation, participation level, gender, player position⁷. Young athletes are vulnerable to different injuries to cartilage, apophysis and growth plates than adults due to imbalance between muscle and bone growth⁸. Acute sports related injuries in children and adolescents mostly involve lower extremities⁹.

During childhood there is a period peak linear growth and they are more vulnerable to injury because of strength imbalance and flexibility and even due to changes in biomechanical properties of bone, bone stiffness increases and resistance of impact diminishes, sudden overload may cause bones to bow and buckle. Physiological loading is beneficial for the bones but excessive strain may produce serious injury to joint and surrounding structure. Sports injury can affect both bone and soft tissue and as the skeleton is growing it may lead to injuries which can result in progressive permanent effect. This can lead to growth plate disturbance which may further result in limb length discrepancy altered joint mechanics and may lead to long term disability. Even children produce more heat relative to body mass and they also have a low sweating capacity and they don't tend to drink enough water compared to adult thus heat exhaustion is more likely in children than adults. This may even lead to more injuries⁷. Furthermore their body is pliable which predisposes them for injury. Among all the sports, football game has the highest rate of injury as it is a high velocity contact sport¹⁰. Running, jumping, swerving, kicking step siding and turning are the activities involved during football which leads to injury.^{11,12,13,14,15}

Ankle sprain is most frequent in players among

sports population which occurs due to stretching of fibres of ankle ligament.^{16,17,18} Injuries caused by football have some specific mechanism of injuries. The injured individuals have a hit directed laterally on the medial side of ankle and leg. Whereas an inversion injury is caused by arriving in supinated position. Ankle inversion torques lead to lateral ligament lesion which are caused when the ankle goes through a transition from an unloaded to load condition. Clinical studies suggests that the typical football mechanism is an inversion sprain after a laterally directed hit on the medial side of ankle or lower leg. Biomechanical studies suggest that when forced inversion of ankle occurs, ATFL is the first to rupture¹⁹.

Thus finding prevalence of ankle sprain in paediatric football players will help us know the prevalence rate and further treatment may be designed in other studies and will help in prevention of ankle sprain. A previous study by Walls²⁰ et al stated that ankle sprain accounts up to 67% of all soccer related ankle injuries²⁰. This study was among adolescent and adult population, but there are only few studies on paediatric population. Hence we need to find out the prevalence rate of ankle sprain in paediatrics football players in Karad.

Material and Methodology

An ethical clearance was obtained from institutional ethical committee of KIMSDU Karad prior to initiation of the study. A survey study was conducted in various schools in Karad. Total 100 paediatric football players were taken by the simple random sampling method and as per inclusion, exclusion criteria for study. Inclusion criteria was-Age: 11 to 15 years, Ankle sprain occurred while playing football, Both girls and boys, exclusion criteria was-Children with underlying pathologies of lower limb, Children having recent foot injuries apart from playing. Written informed consent was taken and whole study was explained to them. And the football players were asked a set of questions related to ankle sprain.

Results

1. Gender Distribution in the study

Table No. 1: Gender Distribution

Gender	Total
Male	79
Female	21

2. Age Distribution**Table No. 2: Age distribution**

Age	Total
11-13	31
14-15	69

3. MOI, Type of sprain, no. of episodes, foot wear.

MOI (Mechanism of injury)	MOI	Total
	Contact	35
	NC	11
	Nil	54
Type of Sprain	Type of Sprain	Total
	Inversion	36
	Eversion	7
	Syndesmosis	3
	Nil	54
No. of Episode	No. of Episode	Total
	0	54
	1(One episode)	18
	2(Two episode)	6
	>2(More than episode)	22
Foot Wear	Foot Wear	Total
	Sports Shoes	12
	Shoes with Studs	32
	Other	2
	Nil	54

Table No. 3: MOI, Type of sprain, no. of episodes, foot wear**4. Warm up:****Table No. 4: Warm up**

Warm Up	Total
Yes	37
No	9
Nil	54

5. Prevalence of Ankle Sprain:**Table No. 5: Prevalence of Ankle Sprain**

Ankle Sprain	Total
Yes	46
No	54

6. Prevalence of Ankle sprain according to Age and Gender**Table No. 6: Prevalence of Ankle sprain according to Age and Gender**

Age	Gender	Total	% Of Ankle Sprain
11	M	1	2%
	F	1	2%
12	M	2	4%
	F	1	2%
13	M	10	22%
	F	4	9%
14	M	12	26%
	F	2	4%
15	M	10	22%
	F	3	7%

Discussion

This study, prevalence of ankle sprain in paediatric football players was conducted to find out prevalence of ankle sprain in paediatric football player.

Football is the sports commonly played by paediatric population in Karad. However due to under develop grounds and uneven ground surfaces children tend to have frequent falls and injuries. As per the previous studies it was seen that ankle sprain is the commonest injury seen in football players. Thus it was necessary to find out the prevalence of ankle sprain in paediatric population of Karad. Even this study helped to create awareness among the players in Karad and would further be beneficial for their betterment and also prevent injury.

The aim and objective was to study and determine the prevalence of ankle sprain in paediatric football players.

Inclusion criteria were age: 11 to 15 years, ankle sprain occurred while playing football, both girls and boys. Exclusion criteria was children with underlying pathologies of lower limb, Children having recent foot injuries apart from playing

The study was conducted with 100 subjects in Karad. Subjects were selected according to the inclusion and exclusion criteria and written consent was taken. Both the boys (79) and girls (21) subjects were included for the study. Subjects were explained about the procedure of the study. Then they were asked to fill the assessment form and accordingly results and conclusion was obtained.

The study showed 79% male and 21% female subjects participated. 69% of the population are aged between 11 to 12 years and 31% of the population are aged between 14 to 15 years. 11% of the subjects had ankle sprain due to non-contact injury and 35% had ankle sprain due to contact injury and remaining 54% did not have any injury. 36% had inversion type of ankle sprain, 7% eversion, 3% syndesmosis and remaining 54% did not have any sprain. 22% had more than two episode of ankle sprain, 6% had two episode of ankle sprain, 18% had one episode of ankle sprain and remaining 54% did not have injury. 32% were wearing shoes with studs, 12% were wearing sports shoes and 2% were wearing other foot wear and remaining 54% did not have injury. 37% paediatric football players did warm up prior to practice and remaining 9% did not do any warm up prior to practice and 54% did not have injury.

After analysing the data, it was found that 46% of children had ankle sprain, 54% children did not have ankle sprain. The prevalence of ankle sprain according to age and gender and it indicates that maximum amount of ankle sprain population (26%) is of the age group 14 years

The future scope of this study is that it will be helpful to find out the training status as well as physical components such as gait parameters, dynamic balance and weight-height ratio of paediatric footballers.

Conclusion

After analysing the data, it was found that 46% of children had ankle sprain. Among this 46% of population, inversion type of ankle sprain was most common with prevalence of 36% followed by eversion with prevalence of 7%.

Conflicts of Interest: The authors declare that there are no conflicts of interest concerning the content of present study.

Source of Funding: Source of Funding is by self

Ethical Clearance: The study was approved by institutional ethics committee of Krishna institute of medical sciences “Deemed to be University”

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Efficacy of Pivotal Response Training in Management of Visual Conceptual Deficits in Adult Autistic Population

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Abstract

Background and Objectives: Recent years have witnessed revolutionized increase in number of Autistic individuals. With world-wide prevalence rate ranging from 7-13 cases per 10,000. In India, the occurrence is approximately 1 in 500 people. Among various impairments seen in Autism, visual conceptual deficit is the one which leads to impaired complex information processing and task shifting activities; leading to difficulties in executive functions. The aim of the present study was to examine visual conceptual deficit in these individuals and subsequently give a therapy which aims at reducing this deficit. **METHOD:** 40 adults with Autism, both male and female satisfying the inclusion criteria was included for the study (age 30-50 years). Their visual conceptual deficit was measured using Comprehensive Trail Making Test. Thereafter, they were subjected to Pivotal Response Training for 8 weeks. After 8 weeks of the therapy the effectiveness of Pivotal Response Training was re-evaluated using Comprehensive Trail Making Test. **RESULTS:** The subjects showed an improvement in multitask performance post pivotal response training and also significant improvement in visual conceptualization i.e. visual tracking and visual set shifting tasks. **Conclusion:** The findings in the present study focus a new light on the efficacy of Pivotal Response Training in improvement of visual conceptual deficit in adults with Autism.

Keywords: Autism, Visual conceptual deficit, Comprehensive Trail Making Test, Pivotal Response Training.

Introduction

Autism is a neurally based psychiatric disorder; affecting multiple domains of cognitive, sensorimotor and socio-behavioral function. Not only are autistic individuals emotionally ill, but otherwise normal, they have one of a group of developmental disorders of brain function, which is collectively called Pervasive Developmental Disorders.

DSM-IV-TR and ICD-10, defines Autism on the basis of behavioral features and age of onset. Autistic

traits persist into adulthood, but with wide range of outcomes.

Impairments in Autism: In Autism, there is a triad of impairments in social skills, communication and imaginative activities,⁰¹ the causes of which can be attributed to biological,⁰² prenatal factors like tuberous sclerosis, intrauterine rubella etc., chromosomal abnormalities, postnatal conditions like untreated phenylketonuria, infantile spasms etc.⁰³ familial linkage⁰⁴ Gene linkages like serotonin-transporter gene.⁰⁵ Other impairments seen in Autism are behavioral expression of social deficits, expression of language deficit, expression of impairment in play, cognitive alterations, sensorimotor impairments and epilepsy.⁰⁶

Visual Conceptual Deficit: Autistic individual show selective impairment in complex information processing across domains. They perform poorly on

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meaningless materials, but they are able to utilize meaning to aid their visual memory.⁰⁷

Various therapeutic approaches are available to improve cognitive disability in Autism like Applied Behaviour Analysis⁰⁸, Discrete Trial Teaching⁰⁹, Structured Teaching (TEACCH)¹⁰ Cognitive Behavioural Modification (CBM)¹¹, Cognitive Learning Strategies¹² and PIVOTAL RESPONSE TRAINING (PRT) etc.

Pivotal Response Training has been proved to be effective in various domains like, improving communicative and socio-emotional functioning,¹³ improving complex task performance and creative activities^{14,15} and self-initiation skills¹⁶ in autistic individuals.

Pivotal Response Training: This behavioral treatment is based on principles of ABA and derived from the work of Koegel, Schreibman, Dunlap, Horner and other researchers.¹⁷ Key pivotal behaviors have been identified for individuals with Autism: motivation and responsivity to multiple cues (Koegel and Koegel).

Considering the enormous benefits exhibited by PRT, as highlighted by various researches; this therapeutic approach has been chosen for improving visual conceptual deficits in adult Autistic population.

Methodology

40 adult autistic subjects were selected from the population through convenient sampling method in this experimental study. The subjects were recruited from special care homes in and around Bangalore. The study was done for 8 weeks for 5 days a week with an hour therapy session on each day.

Inclusion Criteria: Subjects diagnosed with Autism according to DSM-IV-TR criteria²¹, Having mild to moderate grade of Autism as diagnosed by Neuropsychiatrist, Subjects between the age group of 30-50 years, both male and female were included in this study.

Exclusion Criteria: Subjects with refractive epilepsy, primary and secondary optic atrophy, Leber Congenital Amourosis, fetal toxic encephalopathy, infectious fetal encephalopathy, autism spectrum disorder, mentally deranged patients, Charles-Bonnet syndrome, adenolyase succinate deficiency, cystosolic^{5'} nucleotidase deficiency, paroxysmal disorders,

phenylketonuria, mucopolysaccharidosis.

Materials Used: A stop watch, Comprehensive Trail Making Test sheets, Pencils, Gardening tools, alphabets and numbers board, jigsaw puzzles, neuropsychiatrist assessment form according to DSM-IV-TR for Autism was used.

Data Collection Procedure: The study got ethical clearance from the institute. These subjects were screened by neuropsychiatrist and included in the study. A sample of 40 subjects was selected from the population by convenient sampling. Subjects and their guardians gave an informed consent before being included in the study. A brief assessment was done for each subject as per the proforma.

Their visual conceptualization was measured with the help of Comprehensive Trail Making Test. Each step of the test was clearly explained to the subjects before its execution and subsequently time taken by subjects to complete each trail was recorded using stop watch. These readings were collected for all the subjects before giving Pivotal Response Training.

Before giving main test sheets, the subjects were made to undertake Sample Tests: In Sample A²², the subjects were made to join numbers 1 through 5 and ignore six distracter circle array, once the subject successfully completed Sample A, Trail 1 to trail 4 were given.

Similarly, before undertaking Trail 4, subjects were made to solve Sample B. It was comprised of 5 circles with Arabic numerals inside them and 3 rectangles with number words printed therein.

After successful completion of trail 4 subjects were administered Sample C, It was consisted of 9 circles with numbers (1-5) or letters (A-D) printed inside them.

In case, the subjects who were not able to complete sample test, further trails were not undertaken and consequently the test was terminated.

In the present study, time taken to complete the test was recorded. Where an error occurred, the participants were directed to correct it but the clock was continuously recording the time duration. Total time taken to finish the task was considered as the final score. Numbers of error were not recorded. Standardized scores were given in the form of T-score, with a mean of 50 and Standard deviation of 10.

On the basis of comprehensive trail making test scores, patients were subjected to pivotal response training. The training included the following steps²³:

- i. The patients were asked to choose any activity of his/her choice from the given choices i.e. gardening tool, alphabet or number board, jigsaw puzzles etc.
- ii. The chosen activity was then varied with a new task, keeping the patient's interest intact.
- iii. These tasks when mastered, were then, interspersed with another task to maintain sense of competence and to increase the likelihood that the subjects may also attempt this task.
- iv. All these mastered tasks were re-enforced among

the patients by demonstrating appropriate social interactions.

- v. All the steps of the intervention were repeated at the end of each session

Pivotal Response Training was given for 8 weeks for 5 hours per week.²⁴ Each session was consisted of an hour therapy session on each day. At the end of 8 weeks, Comprehensive Trail Making Test was repeated.

Results

The data was put for analysis using SPSS 11.0 software, to compare the pre and post therapy test scores, to find out the significance of the data.

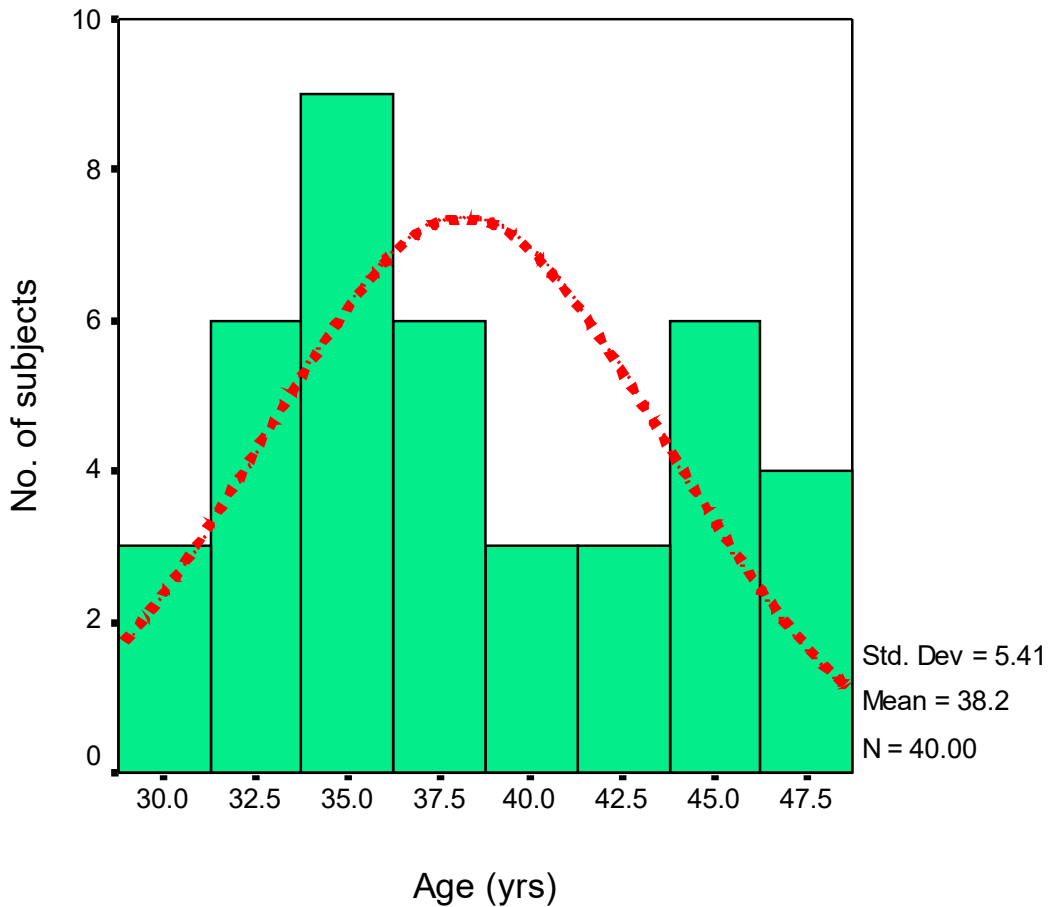


Figure 1: Distribution of age in various age groups

In the present study it is observed that 2 (5.0%) of the subjects are ≤ 30 years, 11 (27.5%) of them are in the age group of 31-35 years, 14 (35.0%) belonged to 36-40

years of age, 9 (22.5%) are in 41-45 years of age group and 4 (10.0%) between 46-50 years. The mean age is 38.2 years with a standard deviation of 5.41 years.

Table 1: Pre and post therapy scores

	Pre therapy		Post therapy		Effect size	t-value	P-value
	Mean	SD	Mean	SD			
Part1	119.35	26.36	100.65	24.89	1.03	23.565	<0.001
Part2	107.78	27.16	89.93	25.66	0.96	21.383	<0.001
Part3	143.93	13.70	123.88	14.94	1.98	22.382	<0.001
Part 4	132.93	22.99	113.05	21.86	1.25	25.572	<0.001
Trail B	191.93	30.27	171.68	29.35	0.96	20.586	<0.001
Total time (seconds)	695.92	120.48	599.19	116.70	1.24	22.697	<0.001

The total time has an overall effect size of 1.24 with Mean±SD of 695.92±75.30 and 599.19±72.17. The overall percentage reduction is observed to be 13.39 which is found to be statistically significant (P<0.001).

Table 2: Comparison of pre and post test score improvement among various age groups

Age (Year)	No. of subjects	Pre-therapy	Post-therapy
		Mean	Mean
≤30	2	51.87	48.52
31-35	11	52.49	51.09
36-40	14	52.01	52.03
41-45	9	48.11	48.74
46-50	4	39.36	40.07
Total	40	48.77	48.09

Variables in this table show more improvement in visual conceptual deficit in younger age groups (30-35 years) as compared to older age groups (35-50 years).

Table 3: Comparison of Trail B mean scores pre and post therapy.

Total Time (Seconds)	Pre-therapy	Post-therapy
	Mean	Mean
≤500	-	125.50
501-550	130.00	149.63
551-600	165.00	173.19
601-650	173.44	177.60
651-700	184.50	179.00
701-750	227.00	200.00
751-800	189.50	223.00
>801	225.60	-
Total (Average)	161.88	153.49

Discussion

In the present study, an attempt was made to examine the influence of Pivotal Response Training over visual

conceptual deficit in adult autistic population. The results have shown that there is a significant reduction in visual conceptual deficit Post-pivotal Response Training.

Determining visual conceptual deficit involves a set of visual set shifting and visual tracking tasks which can be conducted through many tests like Rey- Osterreth Complex Figure Test and Recognition Trial, Wisconsin card Scoring Test-Revised and Expanded etc., but Comprehensive Trail Making Test which is derived from Halstead-Reitan Neuropsychological Test Battery, is a brief test to assess visual scanning, graphomotor speed, cognitive flexibility, temporal sequencing and planning.²⁵

Neurological Basis of Autism: Anatomical abnormalities have been identified in many brain areas in Autism. These include the cerebellum²⁶, the brain stem, frontal lobes²⁷, Parietal lobes, hippocampus²⁸ and the amygdale.

Purkinje cells being abnormally low in the cerebellar cortex is abnormally low, leads to a disinhibition of the cerebellar deep nuclei and consequently over-excitement of the thalamus and cerebral cortex.²⁹

Hyper arousal in response to sensory input and decreased ability to select between competing sensory inputs has been reported. fMRI studies have shown increased activity in sensory areas of the brain causing stimulus driven processing and decreased activity in areas normally associated with higher cognitive processing.²⁹ Both the hemispheres show abnormal activation indiscriminately during shifts of attention into any hemifield. There’s also a deficit in rapid shifting of attention between modalities, between spatial locations and between object features.

MRI morphometry shows volume deficits in cerebellum, brainstem, posterior corpus callosum

and parietal lobe. PET & Single Photon emission CT, showed abnormalities in metabolism or regional blood flow in temporal lobe and cerebellum.

Thus autistic individuals show significantly greater cerebellar motor activation and significantly less cerebellar attention activation.

Causes of Visual Conceptual Deficit in Autism:

Some high-functioning individuals with Autism display repetitive stereotyped behaviors, perseveration and obsessionality.

Autistic individuals have selective impairment in complex information processing across domains. Autistic subjects perform poorly on meaningless materials, while using visual recognition memory task, but they are able to utilize meaning to aid their visual memory⁰⁷.

People with Autism act differently because they think differently:

- They have an enhanced awareness of details.
- They have reduced understanding of meaning & reduced capacity for conceptual reasoning in all areas.
- They can only handle small amounts of new information.
- They may use different cognitive skills to compensate.
- If the information or task is visual, they are able to understand more.

These differences are due to differently wired brain in Autistic individuals. Thus neuro developmental delay in Autism may particularly impact on the Left hemisphere and consequently explain some of the developmental Executive function anomalies found in this disorder.¹⁸

Autistic people use more non-verbal visually oriented processing and rely on visuospatial analysis, thereby resulting in more activation in posterior regions than anterior, associated with visual processing and more activation in right than left hemisphere.

Comprehensive Trail Making Test can effectively measure these deficits through a set of trail making tasks. This test is extremely sensitive to neurological insult, disease, injury or dysfunction¹⁹. It takes 5-12 minutes to administer and less than 5 minutes to score. This test is designed to enhance the frontal lobe components of

the task by introducing inhibition on several trials and impairments in set shifting.

Pivotal Response Training is one of the latest therapeutic approach that can be used for improvement of social, emotional and behavioral outcomes in Autistic people. This therapy is given in natural environment of an individual. This optimizes communicative and socio-emotional functioning¹³. This therapy helps an individual to learn to perform complex and creative activities²⁰. PRT can also improve self-initiating skills.

PRT, thus, aims at improving MIRROR NEURONS, which show significantly less activity in Autism. These neurons are responsible to help in visual cues. These are particular type of brain cells that have the unique property of firing both when an individual performs a goal directed action as well as when he/she observes the same action performed by others.

Limitations of this study: In the present study educational status of the individuals and their knowledge in English language was not evaluated. The Comprehensive Trail Making Test can give variable result in individuals with fluency in English and also with higher Intelligent Quotient. The long term effects of this therapy were not calculated and the study was conducted on a very small population.

Physiotherapy Implications: The current study has opened doors for physiotherapists to explore the role of a therapist in executive function disorders. PRT is a new therapy in field of physiotherapy but if learnt and practiced it can prove to be a real boon in this field. Even Comprehensive Trail Making Test can be used in other neurological disorders like post Stroke, Traumatic head injury etc. on the basis of the result, a physiotherapist apart from the usual therapy can take care of their higher mental functions too effectively.

Ethical Clearance: Taken from Krupanidhi College of Physiotherapy & RGUHS, Blr ethical committee.

Source of Funding: This was a self funded study

Conflict of Interest: Nil

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Play India Youth Games (Khelo India): Scheme for Promotion of Sports in India

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Abstract

Sports is an extremely important component for the overall development of our nation. India in the last few years has made steady progress in the field of sports. Keeping in view the Khelo India programme has been introduced to revive the sports culture in India at the grass root level by building a strong framework for all sports played in our country and establish India as a great sporting nation. This program costing Rs. 1756 crore will be spent on 2018-20 to 2019-20 period. This game program will be used as a tool for personality development, community development, economic development and national development. Ministry of Finance on 28th October, 2015, had advised this Department to suitably restructure the Centrally Sponsored Scheme into a Central Sector Scheme and divided State Governments throughout India by dividing the states into six zones, i.e., Northern, Central, Eastern, North Eastern, Southern and Western zones. This paper explores fully the contents of Kheloindia scheme such as details of scheme, its components, infrastructure, administration, financial implications, monitoring and many more.

Keywords: Sports, centre, state, ministry, youth, development, nation, performance.

Introduction

The importance of games and sports in one's life is invaluable. Playing sports inculcates team spirit, develops strategic and analytical thinking, leadership skills, goal setting and risk taking. A fit healthy individual leads to a equally healthy society and strong man. Sports is an extremely important component for the overall development of our nation. India in the last few years has made steady progress in the field of sports. This tremendous potential needs to be showcased at a global platform. It is a time we inspire young talent, give them top-notch infrastructure and training of the highest level. In we need to inculcate a strong spirit of participation in sports and enables players to demonstrate their true potential. Only then India realize its dreams of becoming sports super power.

Khelo India Youth Games (KIYG), formerly **Khelo India School Games (KISG)**, meaning Play India Youth Games, held annually in January or February, are the national level multidisciplinary grassroots games in India held for two categories, namely under-17 years school students and under-21 college students. Every

year best 1000 kids will be given an annual scholarship of INR 5,00,000 for 8 years to prepare them for the international sporting events.⁽¹⁾⁽²⁾ The Training of Trainers (TOT) Programme will be held in December 2018- January 2019 in the first phase. Here total of 160 trainers will be trained in 4 batches of 40 each in December-January period. This TOT Programme will be carried out semi-annually or quarterly to include all the interested teachers, principals, vice-principals and physical education trainers. Small state of Haryana (102 medals including 38 golds, 26 silvers and 38 bronzes) which is considered a sports powerhouse was the top team in 2018, followed by Maharashtra (111 medals including 36 golds) and Delhi (94 medals including 25 golds).⁽³⁾⁽⁴⁾

Play India or khelo India school games, which are part of khelo India programme, are held from 31st January to 8th February 2018 will be held in many places like Delhi Jawaharlal Nehru stadium, Indira Gandhi stadium complex, Major Dhyanchand National stadium, Karnisingh shooting range and SPM swimming complex. 16 sports modes- archery, athletics,

badminton, basketball, boxing, football, gymnastic, hockey, judo, Kabaddi, Kho-kho, shooting, swimming, volleyball, weight lifting and wrestling etc are included in school games.

On 31 January 2018, Prime Minister, Narendra Modi, declared open the inaugural Khelo India School Games at the opening ceremony based on Guru-shishya tradition held at Indira Gandhi Arena.^{[1][2]} From the 2019 events, Khelo India School Games were renamed to Khelo India Youth Games after Indian Olympic Association came on board earlier in September 2018. The second edition of the event was kicked off

in Shree Shiv Chhatrapati Sports Complex, a sports complex situated in Balewadi, Pune, by Sports Minister, Rajyavardhan Singh Rathore, and, Chief Minister of Maharashtra, Devendra Fadnavis.⁽⁵⁾

Seven million for the synthetic athletics track, these 5 million for synthetic hockey field, 5 crore for synthetic turf football ground, 8 crore for multi-purpose halls, 50 million for swimming pools and construction of stadium and district head quarter. On February 27, 2019, PM Narendra Modi launched the Khelo India App at the Youth Indian Parliament in Vigyan Bhawan, New Delhi to promote sports and fitness.⁽⁶⁾



Figure 1.

Background of Study: The Youth represent the most dynamic and vibrant segment of the population. India is one of the youngest nations in the World, with about 65% of its population being under 35 years of age. The youth in the age group of 15-29 years comprise 27.5% of the population. At present, promotion and development of sports in the country is being carried out through following three schemes:

I. Rajiv Gandhi Khel Abhiyan: To provide infrastructure in rural areas and to encourage

sporting culture in the country through competitions. II. Urban Infrastructure Scheme - To provide quality sports infrastructure in urban areas so as to provide facilities for talent to hone their skills. III. National Sports Talent Search – To identify young talent.

Origin of Scheme: Ministry of Finance on 28th October, 2015, had advised this Department to suitably restructure the Centrally Sponsored Scheme into a Central Sector Scheme. On receipt of this advice from the Ministry of Finance, wide ranging consultations

were held with State Governments throughout India by dividing the states into six zones, i.e., Northern, Central, E astern, North E astern, Southern and Western zones.

After these consultations, consensus emerged that the above three schemes should be merged into one scheme –“Khelo India” - National Programme for Development of Sports, which also draws inspiration in respect of organization of competitions from Khel Mahakumbh which is organized annually by Government of Gujarat. The programme takes care to develop sports infrastructure in both rural and urban areas and provides for not only identification of talent but guiding and nurturing of the talent through assistance to SAI Training Centres and Academies and State Government training centres/academies and setting up of new academies both in public and PPP Mode⁽⁸⁾.

Details of Scheme:

Objective of Scheme: a) Mass participation of youth in annual sports competitions through a structured competition; b) Identification of talent c) Guidance and nurturing of the talent through existing sports academies and new set up either by the central Government or State Government or in PPP mode. d) Creation of Sports Infrastructure at mofussil, tehsil, District, State levels, etc.

Components of Scheme:

Competition: Competition structure should cover the whole of India. The competition will be held at Block/District/State and National level. The games/sports which are popular in a particular area shall be played as part of the competition at Block/District/State level. The competitions will be conducted in respect of five distinct age groups, namely, age above 6 -under 12, above 12 -under 18, above 18- under 36, above 36-under 50 and above 50. The competitions above the age group of 36 are proposed keeping in mind the general health and wellbeing of adult population so that overall economy of the country gets a boost due to reduction of lifestyle and other diseases like obesity, diabetes etc. by adopting the physical activities and participation in these sports competitions.

Talent hunt and scholarship: The talented sports persons from amongst the participants of the competition for the age group of above 6 -under 12 and above 12 -under 18 at, District, State and National level will be identified through the competition. On conclusion of the competitions, the organizing Committee of

the respective level of Competitions will prepare a discipline-wise list of talented candidates separately for boys and girls keeping in view gender sensitivity and representation of Scheduled Castes, Scheduled Tribes, Minorities and weaker sections of society. To identify the talent at grass root level, each sports has a dedicated talent hunt committee, who will identify top 2 sports person for each sports and they will be given an annual scholarship of INR 500,000 for 8 years⁽⁷⁾.

Infrastructure: The existing USIS scheme has been in vogue since the year 2010-11. An Independent Agency was engaged to evaluate the performance of the scheme. The agency made inter-alia the following suggestions for improvement of the scheme:-(i) Development of sports facilities at International level, National level and District level. (ii) Swimming pools may be developed under this scheme.

After taking into account the evaluation report, it is proposed to merge the USIS Scheme on a pilot basis to a full-fledged Central Sector Scheme of Khelo India. The guiding scale (these will be maximum caps) for infrastructure assistance shall be as follows:-

Stadia Complex will be funded subject to availability of adequate funds only and may include the following:- (i): Construction of multi-purpose indoor halls for indoor games (ii): Indoor stadium including Swimming Pool Complex in the Stadium (iii): Outdoor Stadium with spectator galleries and elite facilities (iv): Courts for sports like Tennis, Squash, Basket Ball, Volley Ball etc. (v): Provision of FIFA standard Natural Turf in Football Grounds

Operationalization of the Scheme: The administrative system of the Scheme will be as follows :i. General Council (GC) headed by Union Minister in charge of Sports, ii. National Executive Committee –headed by Secretary (Sports). iii. At State level, the State Level Executive Committee (SLEC) chaired by Chief Secretary of the State iv. District Level Executive Committee (DLEC).

The General Council (GC) of the scheme being chaired by Minister in charge of Youth Affairs & Sports is the highest policy making body for the Mission. The GC will be empowered to decide all policy and other matters of the scheme. Further, GC shall give overall guidance, including policy guidelines and direction to the Mission Directorate as well as to the States/UTs and will also review the performance of the scheme.

The State level Executive Committee (SLEC) will be empowered to approve the State Plan under the Scheme which will then be sent to the National Executive Committee and Annual Action Plans for creation of sports infrastructure; reallocate resources from the State budget within the overall mission guidelines; appoint State level Technical Consultant; give overall guidance and directions on implementation of the scheme; nominate additional members/invitees; and monitor the programme within the State.

The District level Executive Committee (DLEC) will be empowered to recommend Annual Action Plan of the District for creation of sports infrastructure and organizing competitions; and exercise such other powers as may be assigned to it by the SLEC⁵.

Technical Support and Capacity Building Services: An initial corpus fund of Rs. 30 crore will be placed with Ministry of Youth Affairs & Sports for providing technical support and capacity building services (TSCBS) to the scheme at the national level. General Council may decide further allocation to this fund depending upon the requirements.

This fund shall be known as Technical Support and Capacity Building Services (TSCBS) Fund. This fund will be non-lapsable and will be utilized exclusively for the purposes providing technical and other support to the Mission Directorate, including mission campaign activities.

The items of expenditure will include dissemination & awareness, publicity remuneration/contract payment to Mission Directorate personnel, experts, consultants; outsourcing functions like the development and management of IT enabled Management Information Systems, the conduct of orientation programme for Coaches/Trainers website development, web enabled reporting systems; hiring of space and the procurement of office equipment; the hiring of agency services for mission campaign; audio-visual productions and media campaigns; contracting or supporting research studies, study visits, training programmes; promote international cooperation and exchange programmes in the field of sports; monitoring and evaluation; and any other activity approved by the General Council of the scheme.

The Fund shall be maintained in a separate bank account in the State Bank of India or any subsidiary of State Bank of India. Any withdrawal of funds from the accounts of the Fund shall be regulated in a manner to be

determined by the General Council. The General council shall be the final authority to decide on the overall policy of investment of monies of the Fund not required immediately.

The General Council may appoint such staff as it may consider necessary and on such terms and conditions as it may consider appropriate to operate the Fund. The administrative expenses in this regard shall be a legitimate charge on the Fund. Regular accounts shall be kept of all monies and properties and of income and expenditure of the Fund and shall be audited by the Comptroller and Auditor General of India.

Financial Implication: The total estimated cost of the Scheme in the year 2016-17 will be of the order of Rs. 500 crore. Details are as under:

Annual Sports Competitions Sports Competitions (including scholarships): **Rs. 230 crore** (Details of calculation at Annexure 1).

2. Talent Search and Grooming (including support to academies): **Rs. 100 crore** 3. Sports Infrastructure Scheme Infrastructure for urban areas: Rs.60 crores Infrastructure for mofussil/sub-district areas : Rs.76 crores.

Total: Rs. 136 crore 4. Sports and Games for the disabled: Rs. 4 crore 5. Dissemination & awareness, Office expenses, remuneration of staff, development of web portal, training, administrative and misc. expenses etc.: Rs 30 crore:

Total: Rs. 500 crore

Fund Flow: (Rs. in crore) Details

Details	2016-17
Non recurring	136
Recurring	364
Total	500

It is expected that as the scheme picks up, the total expenditure required will be of the order of Rs. 6000 crore per annum. This has been worked out on the basis of budget of Govt. of Gujarat. .

Maintenance: The assets created under this scheme shall be maintained by the grantees/owners of the assets which may be local and civil bodies, district administration, State Government, Sports Authority of India, sports institutions, colleges and universities from

out of their own resources. Alternatively, a nominal fee may be levied on the users of the sports facilities and the funds so generated may be utilized towards maintenance of the sports facilities.

Ministry of Youth Affairs & Sports may issue suitable guidelines regarding levy of user charges so as to maintain uniform up keep of assets all over the country.

Monitoring: The execution of the projects/competitions approved under the scheme will be monitored by a committee comprising of a representative each from Ministry of Youth Affairs & Sports (MYAS), Sports Authority of India (SAI), beneficiary State/UT/

Organization and an engineer from the construction agency/SAI Coach/Eminent sports person. Department of Sports may engage a third party monitoring agency to conduct monitoring of the scheme which will funded from TSCBS fund of the scheme.

Provision for committed liabilities: Expenditure has been incurred under the on-going RGKA and USIS schemes. There are committed liabilities where the balance instalments are required to be released to the grantees for completion of the on- going projects and/ or re-imburement of expenditure which have been committed to be borne by the Centre. The estimated cost of Rs. 500 crore includes the component of committed liability also.

Medal Tally: 2018

Figure 2

Rank	State	Gold	Silver	Bronze	Total
01	Haryana	38	26	38	102
02	Maharashtra	36	32	43	111
03	Delhi	25	29	40	94
04	Karnataka	16	11	17	44
05	Manipur	13	13	08	34
06	Uttar Pradesh	10	24	28	62
07	Punjab	10	05	20	35
08	Kerala	07	11	10	28
09	Tamil Nadu	06	11	11	28
10	West Bengal	05	04	06	15

Medal Tally 2019:

Figure: 3

Rank	State	Gold	Silver	Bronze	Total
01	Maharashtra	64	51	62	177
02	Delhi	47	31	43	121
03	Haryana	37	35	38	110
04	Karnataka	28	26	18	72
05	Tamil Nadu	22	31	18	71
06	Uttar Pradesh	21	23	31	75
07	Punjab	18	14	21	53
08	Kerala	11	12	22	45
09	West Bengal	10	09	08	27
10	Gujarat	10	07	11	28

Conclusion

India in the last few years has made steady progress in the field of sports. Keeping in view the Khelo India programme has been introduced to revive the sports culture in India at the grass root level by building a strong framework for all sports played in our country and establish India as a great sporting nation. This game program will be used as a tool for personality development, community development, economic development and national development. This scheme aims on focusing the preparation of players for international level competitions. This scheme aims on focusing the preparation of players for international level competitions. In five years government gave 5000 scholarships and this will reduce the differences between potential players and medal winners. This paper also explores the contents of schemes such as financial implications, funds used or expenditure, infrastructure needed, administration involved and its components. The main aim of this scheme is focus on grass root sportsmen and to prepare them for international competitions like Olympic games, Commonwealth games, Asian games.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Analysis of Psychometric Properties of Gujarati and Hindi Version of International Physical Activity Questionnaire- Long form in Indian Kidney Transplant Recipients

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Abstract

Background: Systematic data on physical activity level in Indian kidney transplanted patients are limited. Physical activity is considered an essential part of healthy life style for all population including kidney transplant recipients. The International Physical Activity Questionnaires (IPAQ) is internationally accepted self-reported screening tool for assessment of physical activity. However, till date Gujarati and Hindi version of IPAQ is not validated for Indian kidney transplant recipients.

Aim: To validate the Gujarati and Hindi translated version of IPAQ long form in Indian kidney transplant recipients. **Method:** Original English version of IPAQ-long form was translated in Gujarati and Hindi language and evaluated for face, construct, concurrent validity and test retest reliability among Gujarati and Hindi transplant recipients.

Result: 4 questions out of 27 were modified with 80% consensus of panelist to achieve face validity of both version of questionnaire. Total physical activity score of Gujarati ($r=0.83$) and Hindi ($r=0.72$) version were positively correlated with 6MWD in male transplant patients suggesting accepted construct validity. There was high positive correlation noted between all component of English, Gujarati and Hindi version ($r>0.8$, $p<0.05$) having good concurrent validity and acceptable test retest reliability.

Conclusion: The modified Gujarati and Hindi version of IPAQ long form showed acceptable validity and reliability for the assessment of physical activity among kidney transplant recipients.

Keywords: International physical activity questionnaire, Kidney transplantation, Psychometric properties.

Introduction

Kidney transplantation is the best line of treatment for patients suffering from irreversible kidney disease in term of functionality and outcome.¹ Kidney transplant

recipients(KTR) has to take lifelong immunosuppressive therapy which may be associated with secondary development of metabolic syndrome and cardiovascular morbidity.² KDIGO guideline for the care of kidney transplant recipients suggest a healthy life style, with exercise, proper diet and weight reduction.³ The KDOQI guidelines for patients with kidney diseases recommended at least 30 minutes of moderate intensity physical activity five times per week (corresponding to a minimum range from 450 to 750 MET-minutes per week).⁴ Same guideline are endorsed by American college of sports medicine.⁵ Despite a consensus among nephrologists that PA is important for patients, PA advice is not a part of the routine management of KTR.

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Systematic data on physical activity level in Indian renal transplanted patients is scarce.

Accurate assessment of PA is helpful in determining the relationship between inactivity and development of secondary diseases after transplant and derive the rehabilitation protocol. The most common method to evaluate the PA are based on self-reported questionnaires which are easy to use and inexpensive in contrast to objective measure like accelerometers, but it has to be validated for cross cultural adaptation for specific population.⁶

The International Physical Activity Questionnaire (IPAQ) long form⁷ is comprised of total 27 questions involve a 7-day recall for the assessment of the frequency and duration of sitting, walking, moderate-intensity and vigorous-intensity physical activity across the domains of work-related activities, domestic and yard activities, transportation activities and leisure-time activities. Energy expenditure is expressed as Metabolic equivalents of task -minutes/week (MET-minutes/week) by computing the domain specific or intensity specific sub-scores. Sedentary behaviour is also evaluated indirectly by calculating time spend during sitting. Whether or not the study population meet the recommended physical activity guideline is assessed by categorical score in the form of low, moderate and high.⁸

Muras-Szwedziak K et al evaluated of the physical activity and sedentary time in 25 stable Kidney Transplant Recipients using IPAQ to find the effect of the structured Physical Activity Program on bio-markers of kidney disease.⁹ Yanishi Met al evaluated sarcopenia and PA in 58 kidney transplantation recipients found IPAQ useful tool.¹⁰ IPAQ has been validated in hemodialysis patients in China.¹¹ Rathod S. have evaluated validity for Gujarati version of IPAQ in 10 healthy individuals¹² Current study is the part of in-depth study of assessment role of physiotherapy intervention on functional capacity among kidney transplant recipients. Evaluation of psychometric properties of translated version of IPAQ in form of validity and reliability should be done prior to utilize it in larger Indian kidney transplant population.

Ethics approval and consent to participate:

This study was approved by the IKDRC-ITS Ethical committee. Permission for translation of questionnaire was taken from original author. Written informed consent were taken from all participants.

Setting and Design: This is the single center cross

sectional study. Inclusion criteria were Gujarati and Hindi speaking kidney transplant recipients from various states of India having stable graft function (eGFR > 60ml/min/1.72m²) and more than six month of post-transplant duration. Exclusion criteria were hemoglobin level ≤ 9 gm/dL, history of hospital admission within 6-month, post-operative complication, hernia, clinical evidence of cardio respiratory or neuromuscular disorder.

Method

According to guideline provided by the IPAQ committee original English version of IPAQ-long form was translated in Gujarati and Hindi language by dual language experts, synthesized and back translated. Each item was analyzed for its relevancy of content, measurability, specificity and practicability by two nephrologist, one transplant coordinator, one physiotherapist and two transplant recipients in Likert's four-point scale to evaluate face validity. Open questions were also asked regarding opinion on each question. This process was repeated until all reach to 80% consensus for all items.

KTR with mother tongue either Gujarati or Hindi were enrolled. Demographics variables like age, gender, height, weight, waist circumference was noted. Socio-economical classification was done on bases of modified kuppuswamy socioeconomic scale.¹³ Duration on dialysis before transplant (dialysis vintage), duration after kidney transplant, type of transplant, serum creatinine level and hemoglobin level were noted down. As the physical functional capacity is surrogate measure of level of physical activity; the six-minute walk test, body mass index and waist circumference were calculated in all subjects to find out construct validity of IPAQ-G and IPAQ-H. For assessment of concurrent validity; subjects expert in dual language e.g. English as well as Gujarati and English as well as Hindi were given both questionnaires randomly at four-hour distance. Subjects were called after 4 weeks to fill the same Questionnaire for evaluation of test retest reliability.

Analysis: According to data processing and scoring guideline provided by IPAQ committee; moderate PA and vigorous PA time variables below 10 minutes were scored as 0 min. Days of activity per week were multiplied by time to calculate weekly minutes of each intensity. Domain specific score for work, Active transport, Domestic and garden as well as Leisure time; Intensity specific score for walking, Moderate and vigorous intensity were evaluated as per guideline.

Total PA score was calculated in METmin/week and expressed in form of median and inter quartile range. Categorical scoring for low, moderate or high volume was evaluated to compare with current health guideline for physical activity.⁴

Statistical analysis was performed using SPSS version 20. Confidence interval of 95% was kept with a p value <0.05. Descriptive data were computed as mean and standard deviation. As the data was non-parametric; Spearman’s correlation co-efficient was used for evaluation of validity. Test retest was computed using appropriate reliability statistics.

Result

In the original questionnaire the word ‘after your transplantation’ was added in all 5 domain of physical activity. Out of total original 27 questions 23 were accepted without modification. 4 questions were accepted with modification for both version. Most common mode of transportation in India is two-wheeler, car and public transport so in question number 8 and 9 the word scooter, bike or other public transport were used instead of tram. Inquestion number 14 the word snow shoveling was omitted as an activity. In question number 24 instead of double tennis; cricket,badminton,other light sports were replaced.

Table 1: General characteristic of Gujarati and Hindi kidney transplant recipients.

Subjects	Kidney transplant recipients (n= 102)			
	Gujarati		Hindi	
Language spoken				
Gender (n)	Male (47) (Mean±SD)	Female (13) (Mean±SD)	Male (31) (Mean±SD)	Female (11) (Mean±SD)
Age in years	38.9±10.5	34.4±8.2	42.4±11.2	38.2±11.0
Height (cm)	167.5±4.9	165.9±4.1	164.7±5.2	166.4±3.5
Weight (Kg)	68.6±6.8	65.9±4.2	70.2±8.1	69.3±7.8
Socio- economic class (Upper, Middle,Lower)	(1,37,9)	(1,9,4)	(1,28,2)	(1,10,0)
Dialysis Vintage (months)	14.7±9.5	14.1±6.7	12.9±6.5	16.2±6.7
Post-transplant duration (months)	34.4±24.8	20.2±14.5	21.0±9.5	22.4±9.7
Type of transplant (LRKT, DDKT, LURKT)	32, 12,3	10,3,0	27,3,1	10,1,0

LRKT: live related kidney transplant, DDKT: diseased donor kidney transplant, LURKT: live unrelated kidney transplant.

Table 2: Clinical characteristic of Gujarati and Hindi kidney transplant recipients.

Subjects	Kidney transplant recipients (n= 102)			
	Gujarati		Hindi	
Language spoken				
Gender(n)	Male (47) (Mean±SD)	Female (13) (Mean±SD)	Male (31) (Mean±SD)	Female (11) (Mean±SD)
Serum Creatinine (mg/dL)	1.2±0.2	1.07±0.3	1.1±0.4	1.1±0.3
Hb (mg/dL)	11.1±0.6	9.8±1.5	10.8±0.8	9.7±1.9
BMI (Kg/m ²)	24.4±2.3	24.0±1.9	25.9±2.9	25.0±2.6
Waist circumference (inches)	36.6±2.3	36.3±1.4	38.2±2.7	37.6±1.7
RBP mmHg (Systolic/Diastolic)	131±10/80±10	120±10/80±0.5	137.2±12.4/83±11.9	127.5±82.5±4.7
RPR (ppm)	87.3±9.4	77.9±13.04	83.82±13.93	76.7±12.3
6MWD (meters)	418.4±80.5	415.3±90.7	347.2±79.7	380.9±75.4

BMI: Body Mass Index, RBP: Resting blood pressure, RPR: Resting pulse rate, 6MWD: six-minute walk distance.

Out of total 102 KTR; 60(47M; 13F) were Gujarati and 42(31M; 11F) were Hindi speaking. Their general and clinical characteristic are described in Table 1 and Table 2 respectively. As shown in Table 3; there was positive correlation with spearman’s correlation coefficient in the range of 0.6 to 0.8 noted between the total physical activity and 6MWD in both version of IPAQ. There was moderate negative correlation noted with BMI and waist circumference. Average sitting time was positively correlated with waist circumference and negative with 6MWD. 14 Gujarati subjects and 10 Hindi subjects had proficiency in English. There was strong positive correlation (Spearman’s correlation $r=0.9$) except for

moderate physical activity ($r=0.79$) was noted as shown in Table 4. Graph I and Graph II showing the scattered plot diagram of correlation of result of TPA in Gujarati and Hindi version with original English version. 30 Gujarati and 26 Hindi transplant recipients appeared for retest after 4 weeks. There was good recall analyzed in both version. Detail results are shown in table 5. Out of total 102 participants 31% males and 25% female were in obese category of BMI.¹⁴ Abdominal circumference was high in 45% males and in 22% females.¹⁵ Fewer than 50% participants were following the international KDOQI guidelines for kidney patients⁵.

Table 3: Analysis of construct validity

Spearman’s correlation *($p<0.01$)		IPAQ-G		IPAQ-H	
		M(n=47)	F(n=13)	M(n=31)	F(n=11)
TPA	6MWD	0.83*	0.84	0.72*	0.66
	BMI	-0.19	-0.45	-0.60	-0.41
	WC	-0.49	-0.43	-0.21	-0.45
Avg. Sitting	6MWD	-0.68	-0.67	-0.59	-0.65
	BMI	0.18	0.17	0.28	0.05
	WC	0.55	0.59*	0.42	0.48

TPA: Total physical activity, Avg. Sitting: Average sitting hour, 6MWD: six-minute walk distance, BMI: Body Mass Index, WC: Waist circumference.

Table 4: Analysis of Concurrent validity

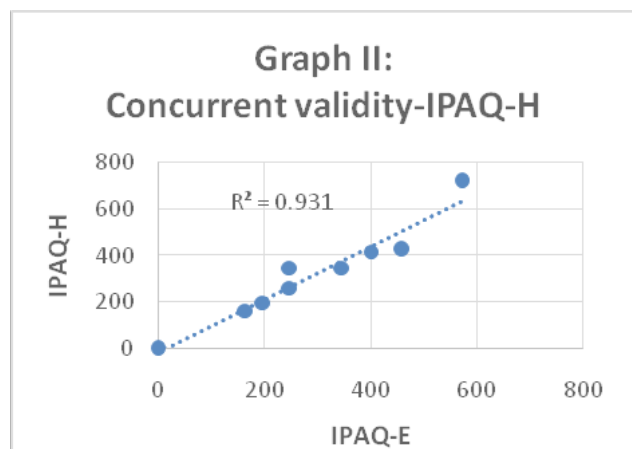
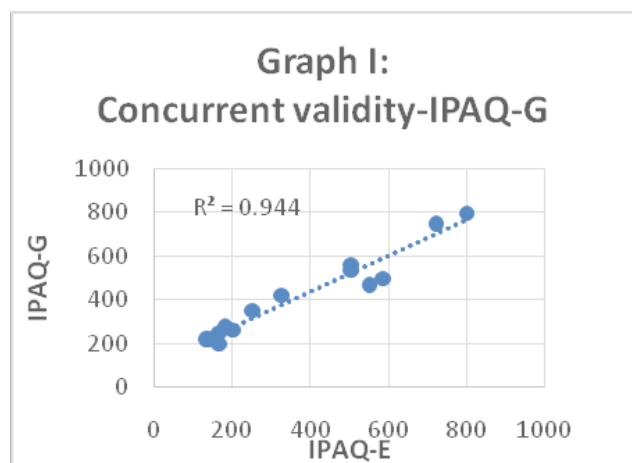
Components of PA	IPAQ-G and IPAQ-E n=14 (10M/4F)	IPAQ-H and IPAQ-E n=10 (7M/3F)
Spearman’s correlation ($p<0.01$)	$r=$	$r=$
Working	0.91	0.95
Active Transport	0.97	1.00
Domestic/Yard	0.99	1.00
Leisure time	0.99	0.97
Walking	0.96	0.98
Moderate Intensity	0.79	0.89
Vigorous Intensity	1.00	1.00
TPA	0.94	0.96
Average sitting	0.90	0.92

TPA: Total physical activity, IPAQ-G: International physical activity questionnaire Gujarati version, IPAQ-E: International physical activity questionnaire English version, IPAQ-H: International physical activity questionnaire Hindi version.

Table 5: Analysis of Test-Retest reliability

Components of PA	IPAQ-G n=30	IPAQ-H n=26
Test-retest reliability (p<0.05)	At Week 0 and Week 4	At Week 0 and Week 4
Working	0.99	0.97
Active Transport	0.97	0.91
Domestic/Yard	0.89	0.83
Leisure time	0.98	0.99
Walking	0.98	0.97
Moderate Intensity	0.71	0.81
Vigorous Intensity	1.00	1.00
TPA	0.89	0.89
Average sitting	0.93	0.85

IPAQ-G: International physical activity questionnaire Gujarati version, IPAQ-H: International physical activity questionnaire Hindi version.



Discussion

This study was performed with the objective to translate and analyses the psychometric properties of Gujarati and Hindi modified version of International physical activity in post kidney transplant recipients. Face validity was achieved with more than 80%

consensus of panel lists by modification in 4 questions out of original 27 questions.

We found the negative correlation of total physical activity with BMI and waist circumference where as positive correlation with 6MWD can be justified by study done by Heather J. MacKinnon et al¹⁶ and Zelle DM¹⁷ suggesting good construct validity. Result of 6MWD are consistent with the similar study done by S. Anwar.¹⁸ Kumar TGS et al found a positive correlation between the physical activity and physical health domains of quality of life in Indian KTR.¹⁹ The result of 6MWD were low as compared with the western KTR population studies but the variability may be demographic, anthropometric and Disease specific attributes.²⁰ Chan. W. Bosch JA et al discussed the obesity related mechanism in kidney transplant.²¹ Sedentary behavior is major confounder after transplant for the development of abdominal obesity. Our results are consistent with the results got by ECH van den Ham et al²²

There was positive correlation noted in Gujarati and Hindi version with original English version having spearman’s correlation coefficient more than 0.9 in almost all components except for moderate intensity activities (r=0.79 for IPAQ-G, r=0.89 for IPAQ-H). There was minimal recall bias found in present study except for moderate activity (r=0.71 for IPAQ-G, r=0.81 for IPAQ-H). This change may be attributed to wide variation in moderate intensity activities carried out at work, home and leisure time and accumulated throughout the day.²³

TPA was low in this study group. Socio-environmental factors, co-morbidities, lack of motivation, fear of graft rejection are the main barriers for PA in solid organ transplantation as discussed by Edwin j. Van Adrichem et al.²⁴ Study done by same author in 2018 in 656 solid organ transplant recipients found similar result as more than 60% of subjects did not fulfilled the PA guideline.²⁵

Conclusion

International physical activity questionnaire in Gujarati and Hindi version can be accepted for Indian kidney transplant recipients. Physical activity and physical function are low in study population. Sedentary behavior is highly prevalent in this population attribute to high risk for abdominal obesity.

Recommendation: The awareness of transplantation

rehabilitation is new in India. Transplant healthcare provider should encourage and educate the transplant recipients for more active lifestyle and barrier to physical inactivity should be short out.

Limitation: Criterion validity was not analyzed.

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Conflict of Interest: None

Source of Funding: Self

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Effect of 4 Weeks Balance Training Program in Healthy Young Adults: A Randomized Clinical Trial Study

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Abstract

Background: The balance is a complex motor task, which requires the interaction of the nervous system, musculoskeletal system and contextual factors. It is important to maintain balance during daily activities like walking, stair climbing, running, jumping and other recreational activities in healthy young individual. Available literature suggests use of many strategies for improving balance. Out of which balance board and BOSU ball trainings are most commonly used strategies which are yet to be discussed for the intensity of training and its effectiveness.

Purpose: To check the significant effectiveness and difference in the two balance training techniques after a 4 weeks Intervention using BOSU Ball and Balance Board for improving balance in healthy young adults.

Procedure: The purpose and the procedure of the research was explained to the subjects and On the basis of inclusion and exclusion criteria, they were requested and those who were willing to participate in the research were selected. The subjects were randomly divided into two groups for BOSU Ball and Balance Board training, the intervention was given for 4 weeks. The pre and post-test measurement was taken using SEBT to check effectiveness of the training devices.

Results: Both groups showed statistical significant improvement ($p = 0.001$) pre and post training within the groups but there was no statistical significant difference between the groups ($p > 0.05$).

Conclusion: 4 weeks Of Continuous Balance Training using BOSU Ball and Balance Board is effective in improving balance.

Keywords: Balance Training, Star Excursion Balance-Test (SEBT), BOSU Ball.

Introduction

Postural control is defined as act of maintaining, achieving or restoring state of balance during any posture

or activity which can be achieved with support and coordinated action of muscle groups. Postural stability is modulated by postural adjustment and is measured by small postural oscillation known as postural sway.¹⁻³

During self-initiated and externally triggered disturbances center of mass of body is maintained by coordination of Sensory-motor strategies in environment. The human posture is maintained by antigravity function, equilibrium of COG within BOS and perception of body segments in relation to external environment. This complex task of controlling body in environment through musculoskeletal system is termed as balance.⁴⁻⁹

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Different sensory systems work together to sense information for relation of body in environment and Information from all these systems are integrated and processed in higher centers of brain. The cerebellum has role in planning, learning and coordination of movement task while basal ganglia have role in planning, controlling and initiation of motor programs.¹⁰⁻¹⁶

For the examination and evaluation of impaired balance, various types of tests are available which are Romberg's test, Single leg balance test, Functional Reach Test, Star Excursion Test, Push and release test, Pull test, Four square step test, Time up and go test, Berg balance scale, etc.^{17,18}

The Star excursion test is low cost and reliable tool for measurement of postural control, which is used to check dynamic balance in healthy adults and athletes. It has eight direction measurement including anterior, anterior-medial, medial, posterior-medial, posterior, posterior-lateral, lateral and anterior-lateral direction. It has high intra-rater (ICC value 0.88 to 0.96) and inter-rater reliability (ICC value 0.83 to 0.93).¹⁹⁻²⁴

The BOSU Ball is a good tool for implementing proprioception, balance and strengthening activities in rehabilitation protocol. It provides training using its both surfaces, the dome and platform. Launder et al. conducted a study on ankle muscle activation by using both sides of BOSU balance trainer on healthy collegiate male subjects which concluded that both sides of BOSU Ball is equally effective in improvement of Balance.²⁵⁻²⁸

The Balance Board has curved surface underneath which allows single plane motion. It helps in improving coordination, proprioceptive awareness, core stability, leg strength, flexibility and agility. A study on effect of wobble board exercise training & static balance performance in healthy male subjects revealed significant increase in balance performance and strength of muscle of lower extremity after 6 week of training on wobble board.²⁹⁻³¹

Another study on role of BOSU Ball, Wobble Board, Airex and Floor found that BOSU ball and Wobble Board are most challenging compared to the Airex and the Floor. A comparative study done on collegiate football players using BOSU Ball and Balance Board which shows significantly increase in balance.³²⁻³³

Hence, purpose of study was to check significant difference in two balance training techniques to find

the effectiveness of BOSU Ball and Balance Board in improving balance.

Aims and Objectives: To determine efficacy and to compare effectiveness of two different Balance training Devices in improving balance among healthy young individuals using SEBT.

Sampling Method: Random Sampling

Sample Size: n = 63 (Kelsey et al.)

Inclusion/Exclusion Criteria: Healthy young asymptomatic men and female between age 17-22 Years were included in study and Subjects with 1) previous balance training 2) trauma requiring medical attention within the past 2 years 3) history of any dizziness, visual, vestibular problems were excluded.

Materials:

- A Measure tape for SEBT measurement
- Stop watch
- Balance Board
- BOSU Ball
- Record sheet
- Restameter
- Weight scale

Outcome Measure:

Pre-Post SEBT Score.

Procedure: The purpose and procedure of research were explained to subjects. On the basis of criterias, signing of consent and based on willingness to participate they were randomly allocated in one among both study groups.

Test Procedure:

Formation & procedure of Star Excursion Balance Test: The layout consisted of four lines, made up on floor with measure tape: two forming vertical and horizontal lines and two positioned perpendicular to each other and at 45 degree with respect to vertical and horizontal lines. The foot is placed at centre point were all measure tape merged.

The trial initiated when the subject began to reach in one of the eight diagonal directions. Subjects were not allowed to touch ground with preceding leg at any time

during reach. The maximal reach distance was furthest point along directional line is marked and noted. The trial was completed after subject returned to starting point by performing in all direction and placing preceding leg in the starting box with the supporting leg. The three trials were performed and average value was taken as final value. Same was performed post intervention to see for change in score.

BOSU Ball Protocol³² (Group 1):

Exercise	Repetitions
Double Limb Stance	1 Min
Anterior/Posterior Tilts	10
Medial/Lateral Tilts	10
Knee Flexion	10
Lunges	10
Single Limb Stance	1 Min

Balance Board Protocol³²(Group 2):

Exercise	Repetitions
Double Limb Stance	1 Min
Anterior/Posterior Tilts	10
Medial/Lateral Tilts	10
Knee Flexion	10
Rotations	10
Single Limb Stance	1 Min

Both groups performed 3 sets of each exercises.

Results

Demographic characteristics of study participants:

Characteristic	Group:1 Mean±SD/N (%)	Group:2 Mean±SD/N (%)
BMI	20.57±4.14	20.55±4.21
Male	6 (18.2%)	3 (10%)
Female	27 (81.8%)	27 (90%)

On paired t test, BOSU ball & Balance board training groups showed change in mean score values on all components of SEBT post 4 weeks. There was strong positive correlation for pre- post score of SEBT. Correlations for all components were found to be highly significant ($p=0.001$).

An independent t- test was applied to analyze the SEBT score among two training groups. The pre and post F value and p- value with $df = 61$ for all components

of SEBT on right and left side. Indicated that there was no statistical significant difference between the groups

Discussion

BOSU is defined as Both Sides Up. BOSU Ball training is been proved to be used for improving lower extremity and core strength. A Study suggested that performing unilateral stance on BOSU can stimulate and improve neuromuscular system in maintaining body balance. Together these can be possible reasons that after 4 weeks of BOSU Ball training in present study there was significant improvement in mean score in all the components of SEBT ($p=0.001$).³³

Dootchaichaiwanichsiri et. al suggested that Balance board training exercises focus on concentric & eccentric muscle contractions, proprioception as well as coordination which may have helped in improving the score on SEBT components post 4 weeks of balance board training with significant results in all the components with $p=0.001$ values.³⁴

In present study, both training groups when compared, results were found to be non-significant ($p>0.005$). The possible reason for that could be duration of training. As suggested by L Melanie et. al. for healthy young adults, a training period of at least 11-12 weeks with overall 36-40 training sessions with each session of 30-45 minutes is more effective to improve balance. Total balance training of 91-120 minutes per week seems to be effective to improve overall balance performances which was not been followed because of time limitation.³⁵

A study on young female athletes using BOSU Ball training found improvement in antero-posterior and medial-lateral direction score on SEBT following 3 sessions of 90 minutes per week training. P Neeraj et al. had studied effects of balance board training in male collegiate athletes. The training was given for eight weeks; five times a week for first four weeks and three times a week for next four weeks. They had significant improvement with balance board training.^{36,37}

In this study continuous training was given for 4 weeks and each session was of 20 minutes of duration which can be the reason for not having significant result ($p>0.005$) among both training groups and superiority of one training program over the other training could not be concluded.

Due to its unique design both sides of the BOSU provides a different type of instability challenge. As in standing on the firm side, while the soft side is on the ground; the BOSU is least stable which can generate maximum changes in body's COG which can be used to train balance in healthy young individuals likewise exercises performed on the other surface of BOSU provides strength training. Considering both effects together we had improvement in BOSU Ball group but when compared we could not get the significant results.³⁸

Balance training using BOSU has certain limitations. 1) Pressure inside BOSU can produce undesirable outcome with usage over time. 2) Subject's body weight can influence its stability. 3) Height of firm side of BOSU from ground has to be maintained same for comparison of all subject's score. These parameters were not considered for every participant. Balance Board used in current study was not a multi-axial balance board so all the exercises given were not been trained in multi-axis. Other component of sensory system which can affect balance was not been focused in the present study which could have influenced our study results.^{39,40}

Force platform is found to provide better insight for balance by measurement of COG displacement.⁴¹ Here, SEBT was used for post training balance measurements. It has been found that modified SEBT is practice based test and improvement of score can be due to repeated practice of test.⁴² Hence, that can be taken as one of the future direction of study for getting the significant results in comparison of both training groups.

Future Recommendation: A cohort study with different age group and with ideal duration of training can be carried out to find out the difference in BOSU Ball and Balance Board training in healthy young adults.

Conclusion

Young healthy individuals of 17- 22 years of age had better improvement on SEBT Score post 4 weeks of continuous training using BOSU Ball and Balance Board.

Ethical Clearance: Taken from institutional advisory board.

Source of Funding: Self

Conflicts of Interest: Nil

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Effect of Aerobic Exercise Training on Energy Expenditure by Physiological Cost Index in Obese Individuals

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Abstract

Aim: To find the effect of aerobic exercise training on energy expenditure by physiological cost index in obese individuals.

Background: Obese individual tend to expend more energy in any particular task as compared to normal weight individuals.

Aerobic exercise has been the subject of investigation to improve energy expenditure.

Methodology: This was an experimental pre/post study. 30 obese individuals between the age group of 18-28 years were included in the study. All the 30 individuals were divided in a group of 5 each. The difference of pre to post PCI week 1 of each subjects was calculated before the exercise programme. The individuals then underwent a group aerobic exercise training, training was imparted for 3 days for 4 consecutive weeks. The training program included warm up, training phase and cool down. The difference of pre to post PCI week 4 was then calculated. The data was statistically analyzed using student paired t test.

Results: Aerobic exercise showed a significant decrease in the physiological cost index after 4 weeks. ($p < 0.0001^*$).

Conclusion: A 4 week aerobic exercise training is effective in improving energy expenditure in obese individuals.

Keywords: PCI, aerobic exercise, obese.

Introduction

Aerobic exercise training is augmentation of the energy utilization of the muscle by means of exercise program.

Training produces a cardiovascular muscular adaptation and is reflected in an individual's endurance.

It increases the efficacy of the cardiovascular system and the active muscles. Performance improves as the same amount of work can be performed after training with less energy expenditure.⁽¹⁾

The energy expenditure is the amount of energy or calories that a person needs to carry out a physical function such as breathing, circulating blood, digesting food, or a physical movement. Total daily energy expenditure is the total number of calories that are burnt each day. To prevent weight gain, energy intake or calorie intake must be balanced with energy expenditure.

Energy expenditure varies with both among individual and within the same person depending on the circumstance, body weight, walking speed, surface texture and gradient.⁽²⁾

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The PCI is an easy to use valid and reliable measure of energy expenditure and it is recommended as a useful tool for physiotherapist in the assessment and evaluation of functional performance. The PCI was founded on the principle that Heart rate (HR) and walking speed are linearly related to VO₂ at the submaximal levels of exercise. The PCI was introduced by MacGregor who recognized a simple, functional, non-invasive method of measuring the physiological cost of walking that could be equally applied in domiciliary and clinical environments.⁽²⁾

He also suggested that PCI is one of the good indicators of energy cost. Therefore, PCI is an effective tool used to measure the energy expenditure during walking.⁽²⁾

PCI is calculated by dividing the difference (HRwalking – HRbaseline) by walking speed. It thereby yields an outcome that is expressed in beats per meter.⁽³⁾

Physiological Cost Index:

PCI (b/min) = [Walking heart rate (b/min) – resting heart rate (b/min)]/Walking Speed

Unit: Beats/minute

Materials and Methodology

A. Study Design:

- Type of study: Cross sectional
- Duration of study – 6 months
- Area – Metropolitan city

B. Sample Design

- Sample size – 30
- Sample population – Adults aged 18- 28 years
- Sampling – convenient

Materials Used:

1. Weight Scale
2. Measuring tape
3. 30 meter hallway
4. 2 Bright coloured cones
5. Stopwatch
6. Chair
7. Pulse oximeter

Inclusion Criteria:

1. Obese adults.
2. Age: 18 to 28 years.
3. Individuals willing to participate.

Exclusion Criteria:

1. Presence of any musculoskeletal, neuromuscular and cardiovascular problems which significantly decrease walking performance.
2. Obese individuals who are engaged in any other form of exercise schedule.
3. Presence of any other co-morbidities affecting the PCI like Smoking, Alcohol consumption etc.

Procedure: 30 subjects who were willing to participate were included in the study and were divided in a group of 6 with 5 individuals in each group.

All participants were screened as per the inclusion and exclusion criteria.

Purpose of the study and procedure was explained to the subjects prior to the study.

A written informed consent was taken from all subjects prior to participation.

The BMI and difference of pre & post PCI week 1 was calculated prior the aerobic exercise training.

After which all the subjects underwent an aerobic training programme, which included a period of warm followed by aerobic exercise and a period of cool down.

Aerobic exercise programme included jumping jacks, butt kicks, alternate side steps, prone leg lift alternate performed on music.

The total duration of the training programme was 45 minutes.

The training was imparted for 3 times a week for 4 consecutive weeks.

After the 4th week, the difference of pre & post PCI was calculated.

The data was collected and statistically analyzed.

Results

There was statistical significant difference in the effect of aerobic exercise training on PCI in obese individuals (p<0.0001).

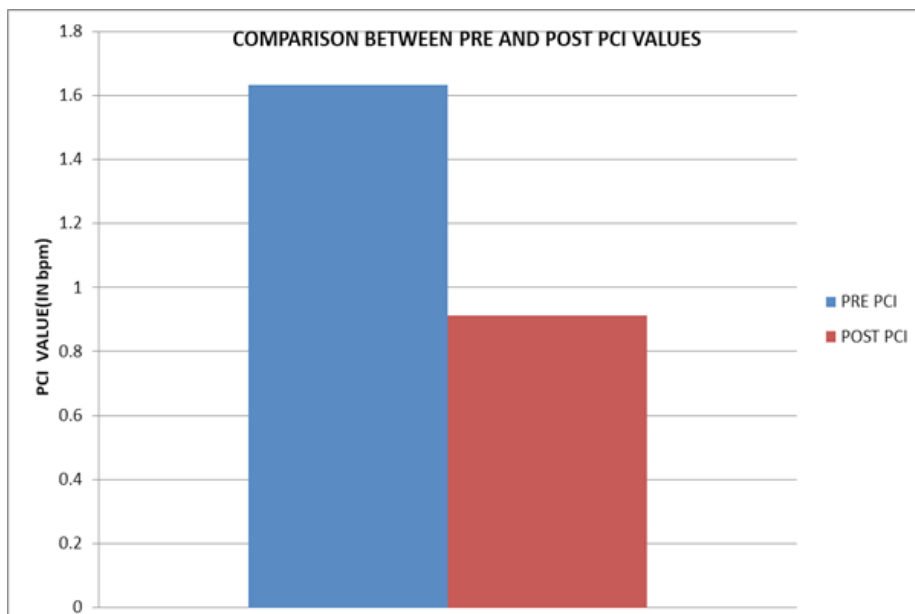
Statistical Analysis:

1. The below table shows descriptive statistics of age group and BMI

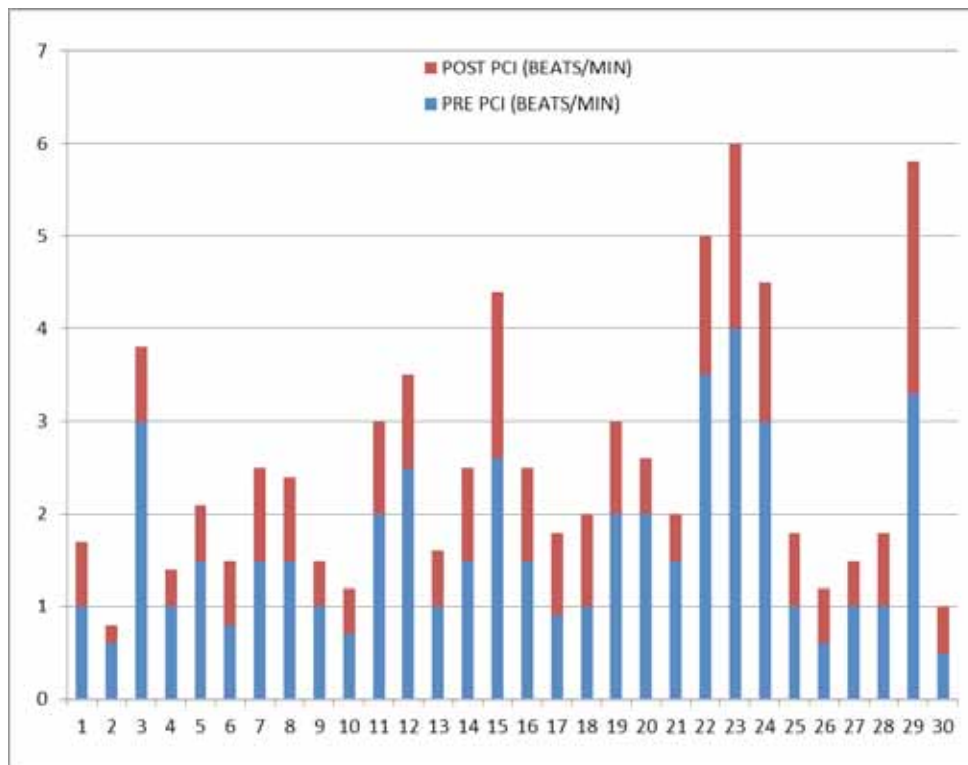
	Age	BMI
Mean	21.6	33.31
SD	1.7	2.22

2. The following table shows the difference in pre & post PCI

Variables	Pre	Post
Mean	1.63	0.91
P Value	<0.0001*	<0.0001*



Graph 1: Comparison of the mean of pre and post PCI values.



Graph 2: Pre & post pci of 30 individuals.

Discussion

The aim of the study was to find the effect of aerobic exercise training on physiological cost index in obese individual.

It is observed that as the BMI increases, the physiological cost index increases, thus concluding more energy expenditure.⁽²⁾

Hence our study is undertaken to improve the physiological cost index of obese individuals by giving aerobic exercise.

In a study conducted by Rudolph L. Leibel et.al in 1995, it was observed that energy expenditure adjusted for metabolic mass increased with a weight gain and decreased with a weight loss. Thereby indicating higher energy expenditure in obese individuals.⁽¹⁷⁾

The results of the study indicate that there is statistical significance in the effect of aerobic exercise training on physiological cost index.

The reason for this change is because the heart rate is regulated by Sympathetic Nervous System (SNS) and the Parasympathetic Nervous System (PNS) which in turn are under control of the brain's higher somatomotor command. Stimulation of the SNS releases catecholamine like epinephrine and nor epinephrines.⁽⁴⁾

However endurance training brings the heart SA node under greater influence of acetylcholine, the parasympathetic hormone that slows the heart rate. This is due to increase in the vagal stimulation. Also there is a decrease in the sympathetic discharge.⁽⁴⁾

Thus the changes in the heart rate can be the probable reason for the changes in physiological cost index post aerobic exercise training.

Conclusion

This study concludes that there is a significant

reduction in the Physiological Cost Index values after 4 weeks of aerobic training in obese individuals. The reduction could be due to difference in reduction in heart rate.

Acknowledgement: We thank principal sir, guide and all the staff of DPO's Nett College of Physiotherapy, Thane, respected parents for support, co-operation and last but not the least almighty for keeping spirits high throughout the study.

Conflict of Interest: Nil.

Source of Funding: Self.

Ethical Clearance: Taken from the ethical committee of Dpo's Nett college of physiotherapy.

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Prevalence of Obesity in Women with Polycystic Ovarian Syndrome: A Retrospective Report

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Abstract

Background: Polycystic Ovarian Syndrome (PCOS) is one of the ten most common gynaecological problems and the leading cause of female infertility. PCOS not only affects the physical health, but also the mental health of women. Prevalence of higher levels of psychological distress in women with PCOS has been well documented. Obesity which also leads to psychological stress and issues too has been documented as a cause of PCOS.

Objective: Despite the increasing incidence of the syndrome, limited research has been done to study the prevalence of obesity among women with PCOS. The aim of this study was thus to find the prevalence of obesity in women who were diagnosed to have PCOS.

Methodology: The data of 73 women who approached the institution for diagnosis and management of PCOS were included in the study. Demographic data like age, height and weight of the women at the time of diagnosis of PCOS were collected and subjected to analysis.

Result: The results showed that 42% women had normal BMI and 14% were underweight. Overweight and obese women constituted 22% each.

Conclusion: The result of the study suggests that obesity and overweight may not necessarily be the cause of PCOS.

Keywords: Polycystic Ovarian Syndrome; BMI; Obesity; Prevalence.

Introduction

Polycystic ovarian syndrome (PCOS), a heterogeneous endocrine disorder is most common in women of the reproductive age group which has psychological, social and economic sequel.¹ It is also known as Stein–Leventhal syndrome.²

It is characterized by the presence of multiple cysts in at least one ovary along with ovulatory dysfunction and excessive androgen secretion.³ The prevalence of PCOS in developed countries like United States is estimated to range between 10.3% - 47.5%.⁴

The overall prevalence of PCOS in developing countries like India is 41%.⁵

Genetic predisposition and lifestyle factors such as high calorie diet, obesity, lack of exercise contribute to the occurrence of PCOS. Early precursors of PCOS are postulated to be gestational factors like foetal programming disturbance in-utero and birth weight.⁶ Overweight and obesity both are abnormal or excessive fat accumulation that present a risk to health. Both were once considered a problem only in countries with

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high income, whereas now it has dramatically risen in countries with low and middle income as well, especially in urban settings.⁷

The Body Mass Index (BMI) is a simple and most commonly used measure to classify overweight and obesity in adults. BMI is defined as the weight in kilograms divided by the square of the height in meters (kg/m²).⁸

Materials and Method

Type of Study: Retrospective study

Methodology: Ethical clearance was obtained from the Institutional Ethical Committee for data collection and analysis. Files of 132 women diagnosed with PCOS from the year 2014 to 2018 between the ages of 18 to 49⁹ years were identified, who visited the institution for diagnosis and management of PCOS.

Demographic data like age, height and weight at the time of diagnosis of PCOS were procured from the file of the patients. BMI was calculated and patients were classified according to the WHO criteria.⁸The data thus obtained was subjected to analysis.

Inclusion Criteria: Data of women between 18 to 49 years of age newly diagnosed with PCOS was included in the study.

Exclusion Criteria: Data of women who were undergoing or had completed treatment for PCOS prior to approaching the institution were excluded from the study.

Result

Data was collected from files of 132 patients diagnosed with PCOS. However, 8 patients did not meet the age criteria and files of 14 patients had either height or weight or both the data missing. 37 women had been following up for the treatment of PCOS elsewhere. Thus the data of only 73 patients was readily available for data analysis.

The mean age of all the women included in the study was 22.9±4.6, least being 18 years and highest being 37 years.

The percentage of married and unmarried women with PCOS was 35.6% and 64.4% respectively.

The mean BMI of the women with PCOS was

25±6.2. Frequency distribution of the women with PCOS according to the classification of BMI showed that 42% women had normal BMI and 14% were underweight. Overweight and obese women constituted 22% each. The mean BMI of underweight, normal, overweight and obese women with PCOS was 21.7±1.8, 16.4±2.0, 27.5±1.6 and 34.1±2.8 respectively.

The percent prevalence of women with underweight and normal BMI when compared with that of overweight and obese together showed a significant difference at a p value of 0.00174.

Table 1: Frequency distribution of women according to BMI

	N	%	Age in Years±SD	BMI±SD
Normal	31	42	21.9±3.8	21.7±1.8
Underweight	10	14	20.8±2.9	16.4±2.0
Overweight	16	22	24.9±5.2	27.5±1.6
Obese	16	22	24.2±5.4	34.1±2.8
Total	73	100	22.9±4.6	25.0±6.2

Discussion

The analysis of the data of 73 women showed that the proportion of unmarried women being diagnosed with PCOS was higher than married women. This result is supported by previous study which also reported an indirect prevalence of approximately 60% women with PCOS being unmarried.⁵

It was noted that majority of the women with PCOS had a normal BMI. Number of women with the normal BMI was twice the number of women with obesity.

The percentage of women when grouped as underweight and normal BMI was higher than the group including overweight and obese together. Previous study suggests that approximately 50% of women diagnosed with PCOS are overweight or obese.^{10, 11}

Conclusion

The results of our study suggest that overweight and obesity may not necessarily be the cause of PCOS as suggested by previous studies.^{12,13} However, generalizing these results for the whole population may be difficult, as the sample size was small and the various other conditions and factors associated with PCOS were not taken into account during the study. Thus further detailed studies including other factors should be undertaken.

Source of Funding: Self

Conflicts of Interest: The authors do not have any conflicts of interest to declare.

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Disability and its Relationship with Caregiver Burden among Stroke Survivors: A Cross-Sectional Study

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Abstract

Background: Stroke is a chronic condition which leads to significant disability. In the developing countries like India such chronic conditions with disability are often kept to be treated in communities, which in turn puts significant stress on their caregivers ultimately leading to increase burden of caregiver. This increase in caregiver burden may further hamper the prognosis and rehabilitation of stroke patients.

Objective: Identifying and comparing the relation between the various level of disability and caregiver burden.

Study Design: Cross sectional study.

Method: 65 persons with stroke and their caregivers meeting the inclusive criteria's were enrolled.

Results: Pearson correlation was achieved between Modified Rankin Scale and Caregiver Burden Scale proving increase in caregiver burden with increase patient disability with 0.348 ($P < 0.01$), negative Pearson correlation between Modified Barthel Index and Caregiver Burden Scale proves decrease in independence level of patient increases caregiver burden with $-0.263(P < 0.05)$.

Conclusion: Caregiver burden of stroke survivor is correlated with disability of stroke patient. So education to caregiver may reduce burden which will may a key to improve rehabilitation.

Keywords: Stroke, stroke survivor, disability, caregiver burden.

Introduction

Stroke is a vascular origin neurological dysfunction affecting the cerebral function leading to focal and at times global damage with rapidly developing signs and symptoms lasting more than 24 hours resulting

in hemiparesis or leading to death due to an abnormal cerebral circulation.¹ Individuals are highly susceptible to disability and handicap subsequently after stroke.² Disability is defined as a complex phenomenon, where the problem is at the level of an individual's body and also a communal phenomenon according to International Classification of Functioning, Disability and Health (ICF). Disability is always an interaction between features of the individual with his/her environment which can be entirely internal or external to the person.³

Nearly 10%-30% of stroke survivor requires institutional care post discharge from hospital while the remnants decide to stay with their family and relatives. Life satisfaction of patients with stroke and their family members continues to get affected due to

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raise in physical, psychosocial, affective and cognitive disabilities of patient with increases in their Survivorship as development in medical science relatively increases their life span. Role and responsibilities of caregivers are extensive towards an individual affected by stroke as it frequently results in some disabilities for long term.^{4,5} Following stroke, more than 60% of survivors will need help of caregivers with at least in one of the activities of daily living (ADL).⁶

Caregivers are individuals who cater the disabled individuals who need assistance in ADL such as donning & doffing clothes, showering, cooking meals, transfers and perambulation with additional errands of administering medication, regularly monitoring pressure sores of bedridden patient.⁷ Availability of caregivers are of two types, primarily the informal caregivers who are unpaid individuals like parents and spouse, family members and friends. The formal caregivers are helpers or paid workers allied with the social service or health care organizations.⁸ Study shows 74% of assistance was required with ADL among 3-month stroke survivors who received informal care from family or friends.⁹ A long term follow up study concluded 47% stroke patient received the assistance of a main caregiver. Patients with moderate or more severe disability were under supervision of caregiver at home.¹⁰

Functioning and quality of life (QOL) both significantly gets diminish in many recovering stroke patients which produces negative effects on caregivers. Emotional well-being, personal relationships, communal events and recreational time are adversely affected in most of the caregivers and it affects their psychological status and life causing in a harmful effect on the stroke survivors.¹¹ Caregivers with greater than $\frac{1}{3}$ rd of them linger to deliver extreme attention to the disabled while enduring from poor well-being themselves with most of them are ill-prepared for their role.¹²

Load on the family members and relatives raises physically and psychologically as majority of disabled individuals prefer to reside at their home with them rather than in rehabilitation centre. This occurrence of chronic disease significantly increases the informal care provided by family members as a result of site of the care shifting to their locality from rehabilitation centre which is evident in family reports.⁷ Caregivers make changes at their workplace, does schedule modifications, change their work-related travel or leave their jobs because of care giving distress. This in turn can lead to financial

burden increasing stress along with burden on caregivers making it demanding to address their necessities.¹³

Rehabilitation process of stroke patients is identified to get hampered because of its devastating and prolonged nature leading caregivers to undergo depression. Hence, it is vital to recognize the burden level of caregiver and its influencing components.¹⁴ Improving functional outcome in stroke rehabilitation, the role of family members gained lot of attention.¹⁵ Caregiver burden and patient functioning plays major role in any rehabilitation program.¹¹

Even though there may exist apparent relationship between disability and caregiver burden, the aim of the study was to specifically measure the effect size of the association of disability and caregiver burden among varying levels in stroke survivors.

Material and Method

This Cross-sectional study was commenced by using purposive sampling technique total of 65 individuals with stroke and their caretakers reaching the inclusive criteria's were enrolled from various rehabilitation centers and communities in Mangalore. All the patients and caregivers were explained about the study and an informed consent was obtained from them on voluntary basis. The sample of stroke patients consisted of 48 males and 17 females between the age group of 22 – 84 years. The caregiver consisted of 15 males and 50 females with age group of 18–82. The inclusive criterion for patients was medically stable patient with first stroke, patients who has an adult family member as a caregiver or professional caregiver and inclusive criterion for caregivers was age above 18 years. Demographic data along with other baseline were collected from patients as well as caregivers affecting caregiver burden.

Procedure: Disability of stroke patient was assessed with two scales namely modified Rankin Scale (mRS) for measuring global disability and modified Barthel Index (mBI) which measures different domains of disability. The mRS score ranged from 0 to 6, where 0 means no symptoms at all to 6 means extreme stage i.e. death.¹⁶ The mBI is a 5 point rating scale, with 10 domains which measures functional independence in personal care and mobility. It has total score of 100 with scores of 0–20 indicating total dependency, 21–60 severe dependency, 61–90 moderate dependency and 91–99 slight dependency.¹⁷

Caregiver Burden Scale (CBS) was used for measuring caregiver’s burden. The CBS measures the subjective impact on caregivers of patients with chronic diseases. It is a 22 item scale and the objective is to analyze the level of stress to which caregivers are subjected to. It is divided into four domains i.e. general strain, isolation, disappointment, emotional involvement and environment. The answers receive scores from 1 to 4 with 1 – not at all, 2 –seldom, 3 – sometimes, 4- often total score was recorded. The higher the score higher the degree of difficulty faced by the caregiver.¹⁸

Result

The data analysis were calculated by using the statistical software SPSS (version 16) for windows. In the stroke group, 36 were right hemiplegic and 29 were left hemiplegic. Pearson correlation between modified Rank in Scale among stroke survivor and Caregiver Burden Scale among caregivers was 0.348 (P<0.01)and between modified Barthel Index among stroke survivors and Caregiver Burden Scale among caregivers was -0.263(P<0.05).

Table 1. Pearson correlation between mRS and CBS

Correlations			
		MRS	CBS
MRS	Pearson Correlation	1	.348**
	Sig. (2-tailed)		.004
	N	65	65
CBS	Pearson Correlation	.348**	1
	Sig. (2-tailed)	.004	
	N	65	65

** . Correlation is significant at the 0.01 level (2-tailed).

Table 2. Pearson correlation between mBI and CBS

		MBI	CBS
MBI	Pearson Correlation	1	-.263*
	Sig. (2-tailed)		.034
	N	65	65
CBS	Pearson Correlation	-.263*	1
	Sig. (2-tailed)	.034	
	N	65	65

*. Correlation is significant at the 0.05 level (2-tailed).

Discussion

Stroke is the second largest cause of worldwide mortality which leaves at least 60% of its survivors with moderate to severe disability limiting their social

functioning.^{19,20} It is highly noticeable that at present people are alive for longer period of time with prolonged and frequently occurring devastating disorders. Greater demands on caregivers and patients can dramatically impact on role of caregiver. Caregivers with high burden level or who have unmet required needs tend to hamper their ability to function efficiently comprising their role as an ongoing support system for the affected individuals which emphasis the health experts to focus on caregivers. High degree of burden on caregiver has left patients with more unmet needs leaving home care support extremely vulnerable. Hence caregiver becomes a serious element of home care.²¹ Therefore the aim of the study was to find out the relationship between the disability and caregiver burden in stroke survivors.

Conclusion

The first objective of the study was to correlate patient disability and caregiver burden, where positive correlation between mRS and CBS concludes that caregiver burden of stroke survivor is correlated with disability of stroke patient which implies that as disability increases caregiver burden also increases but the correlation level was very low. There could be numerous possible reasons for this, mainly the caregiver in this study did not express it as a burden and rather it was the responsibility on their part to take care.

The second objective of the study was to correlate functional status of patient and caregiver burden, where negative correlation between mBI and CBS concludes that functional independence decreases caregiver burden increases. Hence we can conclude that education to caregiver can reduce burden compared to control group.

Funding: There was no funding and conflicts of interest were reported for this study.

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Effects of Anterior Versus Posterior End Range Mobilizations on Shoulder Rotations Range of Motion in Adhesive Capsulitis Stage II

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Abstract

Background: Adhesive capsulitis is characterized by a spontaneous onset of shoulder pain accompanied by progressive limitation of both active and passive glenohumeral joint movements.

Aim and Objectives: This study was done to compare effectiveness of anterior versus posterior end range mobilizations on shoulder rotations range of motion (ROM) in subjects with adhesive capsulitis stage II.

Method: 56 participants with clinical diagnosis of adhesive capsulitis stage II were randomly allocated in two groups A & B. Both groups received therapeutic ultrasound and pre-set of prescribed home exercises in common. While Group 'A' received Anterior and Group 'B' received Posterior end range mobilizations. Shoulder rotations ROM was assessed as Outcome measure using universal goniometer at baseline, at end of 2 weeks post intervention.

Results: Result showed both anterior (% of change was -66.88) and posterior (% of change was -67.80) end range mobilization were equally effective in increasing internal rotation (IR) ROM.

Posterior end range mobilisation (% of change was -187.50) was more effective than anterior end range mobilization (% of change was -101.37) in increasing external rotation(ER) ROM.

Conclusion: We concluded that application of posterior end range mobilization is more effective than anterior end range mobilisation in increasing ERROM.

Keywords: Adhesive capsulitis Stage II, End range Mobilization, Pain, ROM.

Introduction

Glenohumeral joint (GH) commonly referred to as shoulder joint, its large ROM with three degrees of freedom, Mobility of shoulder joint relies upon the

congruent articulating surfaces and surrounding soft tissues.¹

Adhesive capsulitis is an insidious onset of painful stiffness of glenohumeral joint. It is also known as frozen shoulder, scapulohumeralperiarthritis, periarthritis of Dupley, periarthritis of shoulder and check-rein shoulder.²

Adhesive capsulitis has a prevalence of 2-5% in the normal population. In diabetic patients this is increased with a prevalence of 10% in type I and 22% in type II. It is more common between the ages of 40 and 60 years.^{3,4}

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Adhesive capsulitis is mainly classified into: Primary which is characterised by a spontaneous onset of shoulder pain accompanied by progressive limitation of both active and passive glenohumeral joint movements³ and Secondary is associated with a known predisposing condition of the shoulder. eg, humerus fracture, shoulder dislocation, avascular necrosis, osteoarthritis, or stroke etc.⁵

Reeves has described 3 stages of adhesive capsulitis⁶: Stage I is mainly characterized by pain usually lasting 2-9 months, in Stage II (frozen stage) pain gradually subsides but stiffness is marked lasting 4-12 months and in Stage III (thawing phase) pain resolves and improvement in range of motion appears.

Many treatments have been employed in management of shoulder disorders; few have been proven to be effective. Non-steroidal anti-inflammatory drugs, local anaesthetic and corticosteroid injections into glenohumeral joint, calcitonin and antidepressants, distension arthrography, closed manipulation, physical therapy modalities and exercises are showed to be effective in management of shoulder disorders.⁷

Rehabilitation programs consisting of exercise, massage and modalities have been shown to reduce pain and improve shoulder ROM in all planes except external and internal rotation.⁸

Joint mobilization is a form of passive movement used to treat painful and stiff synovial joints. The optimal directions of force and movement application for the Joint mobilization techniques are assumed to induce various beneficial effects.⁹

Kaltenborn's mobilization of extremity joints consists of two passive rectilinear movements traction/separation and translatory gliding, called joint play and depends on concave convex rule. There are 3 grades of Mobilization.^{4,10}

There is evidence, however, that joint mobilization procedures can lessen the associated glenohumeral rotational deficits characteristic of this condition.¹¹ End range mobilization techniques are clearly indicated for stiff and hypomobile joints.⁴ In addition to manual therapy, therapeutic ultrasound can be used as an adjunct treatment in order to help the subjects regain ROM and restore function to the affected shoulder.¹² The rationale for achieving therapeutic goals through deep heating is to alter the viscoelastic properties of the connective

tissues and maximize the effectiveness of the stretch mobilizations to follow. Studies have shown that a significant drop in tensile stress occurs with a rise in the temperature of soft tissues by 3°C to 4°C, which is deemed adequate to alter the viscoelastic properties of connective tissues.¹³

Goniometry is a reliable assessment scale for measuring shoulder range of motion in subjects with adhesive capsulitis.¹⁴

Materials and Method

After obtaining the institutional ethical clearance, the study was carried out in 56 patients with adhesive capsulitis (stage II) of age between 40-60 years of either gender¹ Subsequently after briefing about the study, written consent was obtained and screened.

Group A- subjects received Therapeutic Ultrasound, Anterior (Posterior-Anterior) end range mobilization (AM) and pre set of prescribed home exercises.

Group B- subjects received Therapeutic Ultrasound, Posterior (Anterior-Posterior) end range mobilization (PM) and pre set of prescribed home exercises.

We included the patients of unilateral conditions suffering from Idiopathic or primary adhesive capsulitis stage II. We excluded patients of Malignancy, History of fracture/dislocation, Hypermobility, Inflammation/ infection, Shoulder girdle motor control deficit associated with neurological disorders (eg, stroke, or Parkinson's disease etc.) and Cortico steroid injection preceding 3 months which are contraindicated for end range mobilization.²

The targeted capsule was preheated by the use of thermal ultrasound. Ultrasound was administered to the anterior capsule of those in the AM group and to the posterior capsule of those in the PM group, all ultrasound treatments were applied at 1.5 W/cm² continuously for 10 minutes. Joint mobilization followed the ultrasound treatment as, Kaltenborn grade III mobilizations, which apply force "after the slack of the joint has been taken up," to stretch tissues crossing the joint.¹⁰ The end range position of the mobilization was held for at least 1 minute. No oscillatory motions were performed. Then rest period of half minute was given. Same stretch mobilization was repeated so that a total of 15 minutes of sustained stretch was performed at each treatment session.

Codman’s pendular, Wall bar for flexion and abduction, shoulder protraction and retraction keeping the arm at the side of the body were then taught and made to do in the department and advised to follow the same as home programme exercise. Each subject was treated for 6 sessions. The subjects were asked to schedule therapy sessions 3 times per week.

Anterior end range mobilization group (group A): In the beginning subject was positioned in supine for the AM group.¹⁰ Subject was brought to the side of the couch and maintaining the shoulder in neutral rotation, the affected arm was abducted to the maximum available ROM and therapist stood between the subject’s trunk and arm. In this position, the therapist obtained a lateral humeral distraction in its midrange position then the anterior stretch mobilization was performed to end range. As the subject was able to tolerate a stronger stretching force, he/she was positioned prone (with arm resting position over the edge of the mobilization table and stabilizing acromion with padding) to allow the therapist to utilize the subject’s body weight and gravity to generate the mobilization force in a similar combined fashion of distraction to midrange and anterior glide to end range (**photograph 1**).

Posterior end range mobilization group (group B): Here subject was positioned in supine and

was brought at the side of the couch and maintaining the shoulder in neutral rotation (scapula stabilizing with padding), the affected arm was abducted to the maximum available ROM. Therapist stood between the subject’s trunk and arm. In this position, the therapist obtained a lateral humeral distraction in its midrange position then the posterior stretch mobilization was performed to end range (**photograph 2**). The position chosen for the progression of the posterior mobilization took the humerus into flexion, with the intent to provide a greater stretch to the posterior Capsule And subjects of both the groups will be asked to carry out the pre set of prescribed home exercises at home every day, twice daily like.

1. Codmans exercises.
2. Wall bar exercises.
3. Shoulder protraction and retraction exercise.

Statistical analysis was done by using SPSS version 16 software.

Students unpaired t test was performed to find out significance difference between two groups.

Students paired t was performed to assess significant changes between pre and post treatment with respect to all parameters in Group A and Group B separately.

Results

Table 1: Comparison of Pre and post treatment with respect to internal rotation of range of motion scores in group A and group B by Paired t-test

Group	Treatment	Mean	Std.Dv.	Mean Diff.	SD diff	% of change	Paired t	P-value
A	Pre	28.57	10.35					
	Post	47.68	11.10	-19.11	6.67	-66.88	-15.1489	0.0000*
B	Pre	31.61	9.72					
	Post	53.04	10.03	-21.43	9.41	-67.80	-12.0447	0.0000*

Table 2: Comparison of Pre and post treatment with respect to external rotation of range of motion scores in group A and group B by Paired t-test

Group	Treatment	Mean	Std.Dv.	Mean Diff.	SD diff	% of change	Paired t	P-value
A	Pre	13.04	5.83					
	Post	26.25	8.35	-13.21	6.41	-101.37	-10.9019	0.0000*
B	Pre	15.71	7.03					
	Post	45.18	9.57	-29.46	6.98	-187.50	-22.3239	0.0000*

*p<0.05

Table 1: In group A mean pre and post treatment IR ROM are 28.57(SD=10.35) and 47.68(SD=11.10) respectively. The percentage of change in IR ROM is -66.88.

In group B mean pre and post treatment IR ROM are 31.61(SD=9.72) and 53.04(SD=10.03) respectively. The percentage of change in IR ROM is -67.80.

After data analysis we have found out that in both groups A and B post treatment there is significant increase in IR ROM.

Table 2: In group A mean pre and post treatment ER ROM are 13.04(SD=5.83) and 26.25(SD=8.35) respectively. The percentage of change in ER ROM is -101.37.

In group B mean pre and post treatment ER ROM are 15.71(SD=7.03) and 45.18(SD=9.57) respectively. The percentage of change in ER ROM is -187.50.

After data analysis we have found out that in both groups A and B post treatment there is significant increase in ER ROM.

So here we concluded that: AM and PM, both the techniques are effective in increasing IR ROM in AC stage II.

AM and PM, both the techniques are effective in increasing ER ROM but PM technique is more effective than AM technique in increasing ER ROM in AC stage II.



Photograph 1: Progression of anterior mobilization



Photograph 2: Initial position of posterior mobilization

Discussion

Falconer and associates reviewed the literature to determine the effects of ultrasound on musculoskeletal conditions. In their review, they suggested that ultrasound appears to be effective in relieving pain and increasing range of motion in acute periarticular inflammatory conditions.¹⁵

Sustained stretch at the end range will break the adhesions internally elongating the shortened muscle tendon unit and periarticular connective tissues by moving a restricted joint just past the available ROM. Capsular stretching increases mobility of the soft tissues and subsequently improves ROM by elongating structures that have adaptively shortened and have become hypomobile over time, which in turn reduces pain.⁴

For IR: both the techniques AM and PM are effective in increasing IR ROM. In this study also there is significant improvement of IR ROM in both the groups after the intervention period. So, we can say a combination of US, mobilization and exercises could be responsible for this significant improvement in IR ROM.

Both the techniques increase the ER ROM significantly, means ultrasound, exercise, stretch mobilisation increases ER ROM.

Posterior mobilisation group is more effective in increasing ER ROM because, The changes in the PM group are mainly because of following effects which could have been attributed. The results of this study indicate that posterior glide stretch mobilisations combined with therapeutic ultrasound and upper

extremity exercises were more effective in overcoming ER ROM deficits commonly found in patients with adhesive capsulitis.

Novotny et al¹⁶ studied the glenohumeral joint in vitro using techniques in which only the capsule and articular surface contact controlled the motion of the humerus. They found that at low moments the humeral head initially translates across the glenoid surface in the direction opposite to the motion, due to the joint surface geometry, as consistent with the concave-convex rule. Then, with increasing moment and angle of rotation, the humeral head changes direction as the capsule tightens, “pushing the humeral head back along the glenoid surface.” Thus, it is thought that the tension in the capsular tissues rather than joint surface geometry controls the translatory movements of the humeral head. Asymmetrical capsular tightness has the potential to impact humeral head motion.

Roubalet al¹⁷ suggest that by manipulating the humeral head posteriorly, they might have increased the total allowable excursion of the capsule, thus improving external and internal rotation. The results of this study are not at odds with the concave-convex rule. Our results do, however, support the concept that the capsule plays an important role in dictating the humeral head translation, possibly in the opposite direction to the expected effect of joint geometry if restricted. Thus, the normal shoulder joint requires adequate coordination of all passive and active stabilizers to maintain shoulder stability and pathological changes in any of these can lead to unphysiological translations of the humeral head relative to the glenoid fossa.

Harryman et al¹⁸ found in their cadaver studies that altering the capsule (tightening or cutting) affects the translation of the humeral head on the glenoid during physiologic movement of the humerus. They suggest that a tight rotator cuff interval “may not only limit the ROM, but it may also produce unwanted obligate anterosuperior translation,” thus limiting the posterior translation associated with ER.

Karduna et al¹⁹ found that joint conformity had an influence on translations during active positioning but not during passive positioning. Joint mobilization is a passive movement applied to the joint surfaces, so shoulder mechanics under passive conditions need to be considered. The joint glides that accompany glenohumeral motions support the clinical practice of restoring

translational movement to restore full physiological motion in the shoulder joint, even though care must be taken in attributing joint translations to external mobilizing glides.

In this study, the stretch mobilization procedures were performed for a total of 15 minutes of low-load stretch at available end range of abduction during each treatment session, with the intention to elongate the glenohumeral capsular contracture. Substantial improvements were made in the PM group in just 6 treatment sessions. Here the gain for the improvement in ER ROM in group B may be associated with normalizing the humeral head position in the glenoid fossa.

Conclusion

The study was to compare the effects of anterior versus posterior end range mobilization on rotations range of motion in adhesive capsulitis stage II of shoulder. In Group A- anterior end range Mobilization had 28 subjects with mean age of 51.18(SD=5.64) and Group B-posterior end range mobilization group had 28 subjects with mean age of 50.43(SD=5.39).

We conclude that posterior end range mobilization can be preferred to anterior end range mobilization in regaining rotations ROM for adhesive capsulitis stage II of the shoulder.

Conflicts of Interest: No conflicts of interest

Source of Funding: Self

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Intra Rater and Inter Rater Reliability of Hand Dynamometer and Pinch Gauge in Children with Spastic Cerebral Palsy

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Abstract

Introduction: Hand dynamometer and pinch gauge are common instrument for measurement of hand grip strength and pinch strength. Accurate measurement of hand grip strength and pinch strength in spastic cerebral palsy (CP) is challenging due to spasticity, tightness or contractures of pronator and long finger flexors. Simple availability, less cost & minimum measurement time of these instruments arises the need to check the reliability of hand dynamometer and pinch gauge measurement in children with spastic CP.

Objective: The study aims to find the intra rater and inter rater reliability of hand dynamometer and pinch gauge in children with spastic CP.

Method: After getting approval from IEC, 10 children with spastic CP with mean age 8.9 years (5-16 years), MACS level II, III, IV without any contractures in hand muscles were tested for hand grip strength & pinch strength using hand dynamometer and pinch gauge. Measurements were taken by 3 independent therapists of different clinical experience after 1 minute rest, intra and inter rater reliability of hand dynamometer and pinch gauge was checked by intra class correlation coefficient (ICC).

Result: Intra rater and Inter rater reliability value (ICC) of hand dynamometer, pinch gauge (key grasp) and pinch gauge (tip to tip grasp) for non- affected hand is 0.996 and 0.999, 0.982 and 0.994, 0.986 and 0.995 while of affected hand is 0.993 and 0.998, 0.979 and 0.993, 0.977 and 0.992 respectively.

Conclusion: Hand dynamometer and pinch gauge have excellent intra-rater and inter-rater reliability for measuring hand gripe and pinch gripe strength in CP children above 5 year of age.

Keywords: Hand Function, Grip strength, Cerebral Palsy, Dynamometer, Reliability.

Introduction

Cerebral palsy is most common prevalent from all physical disability in children which is non progressive disorders in fetal development or infant brain¹. The severity and type of motor or sensory impairments of hand depends on time of appearance, location and the degree of cerebral damage.² Voluntary movements are impaired with hand function being most affected in spastic cerebral palsy³.

The upper limbs are always affected with wrist and hand involvement from an early age of development. Asymmetrical hand function shows significant variation in hand sensorimotor impairments which is largely

responsible for the difficulty experienced in daily activities.⁴ Assessment of muscle strength in children with cerebral palsy has become the necessity in clinical practice and research. Hand held dynamometer (HHD) and pinch gauge is one of the most objective and consistent tools to use accurately evaluating muscle grip strength and pinch strength and also very easy to use^{5,6}. Inter rater reliability is the extent of difference produced by different raters and intra rater reliability is the extent of differences produced when used by the same rater over time. The reliability of HHD and Pinch gauge varies from tester to tester according to their skill and experience of measuring gripe and pinch strength with HHD and pinch gauge. There are many studies to

measure of strength for lower extremity using HHD but limited information is thereabout reliability of HHD in children with CP. Hence the need of study is to find intra rater and inter rater reliability of HHD and pinch gauge.

Aims and Objective: The study aims to find the intra rater and inter rater reliability of hand dynamometer and pinch gauge in children with spastic CP.

Methodology

11 subjects with spastic CP were recruited for this study and study was conducted at pediatric rehabilitation department, Ahmedabad. Spastic cerebral palsy children age between 5 to 16 (mean 8.9±2.47) of all clinical types, with spasticity grade 1,1⁺,2 according to Modified Ashworth Scale (MAS), level of manual ability II, III, IV according to Manual Ability Classification System (MACS) and who can understand normal command were included for study. Children with any other neurological condition like Spine bifida, Autism, Down’s syndrome and not willing to participate in the study were excluded. After getting approval from IEC, nature and purpose of study explained to family member of child and informed written consent of family member of child were taken prior to the study. Study performed on 11 children with spastic CP as per inclusion execution criteria.

Hand gripe strength was measured by hydraulic hand dynamometer and pinch strength (key grasp and tip to tip grasp) was measured by mechanical pinch gauge where children were sitting on plinth with back supported & forearm supported on pillow, elbow in 90° flexion, forearm in mid prone position with pillow under the forearm. Gripe strength and pinch strength was taken by 3 independent therapists with variable clinical experience of (16 year, 8 year and PG student) after 1 minute rest for each hand. Grip strength and Pinch strength was measured by therapist 1 for 3 trials and the mean value was considered as the final reading. The procedure was repeated by therapist 2 and therapist 3. 1 minute rest interval was provided to the patient before changing the rater. All 3 values were used to calculate inter rater reliability. After 1 minute rest, again therapist 1 measured all values and the mean value was compared with the first reading of therapist 1 and calculated for intra rater reliability.

Statistical Analysis: Data analysis was done using SPSS for windows version 16. Intra rater and inter rater reliability of hydraulic hand dynamometer and pinch gauge for all subjects was checked by Intraclass

correlation coefficient (ICC). The significance level was set to p< 0.05.

Results

11 children with CP of either gender with age range from 5 to 16 year with mean age (8.9±2.5 years) were tested to measure reliability of hydraulic hand dynamometer and pinch gauge using ICC. Statistical analysis showed Intra rater and Inter rater reliability value (ICC) of hand dynamometer, pinch gauge (key grasp) and pinch gauge (tip to tip grasp) for non affected hand and affected hand were 0.996 and 0.999, 0.982 and 0.994, 0.986 and 0.995, 0.993 and 0.998, 0.979 and 0.993, 0.977 and 0.992 respectively. Table 1: ICC for Intra rater and Inter rater reliability.

Table 1: ICC value for Intra rater and Inter rater reliability

ICC		Intra Rater	Inter Rater	P Value
Hand	Non Affected	0.996	0.999	< 0.000
	Affected	0.982	0.994	< 0.000
Pinch (Key Grasp)	Non Affected	0.986	0.995	< 0.000
	Affected	0.993	0.998	< 0.000
Pinch (Tip To Tip Grasp)	Non Affected	0.979	0.993	< 0.000
	Affected	0.977	0.992	< 0.000

Discussion

The present study was carried out with the aim to assess the intra rater and inter rater reliability of hydraulic hand dynamometer and pinch gauge in children with CP between 5 to 16 years of age. The result of present study indicates that hydraulic hand dynamometer and pinch gauge have excellent intra rater and inter inter-rater reliability for measuring hand gripe and pinch gauge (key grasp) and pinch gauge (tip to tip grasp) for non - affected hand and affected hand.. Hand dynamometer and pinch gauge have excellent statistical outcome. The cost of Hand dynamometer and pinch gauge are less and also easy to use with lightweight. Dekkers KJ in 2012 reported that jammer dynamometer and hand held dynamometer is recommended for measuring upper extremity strength in children with cerebral palsy⁶. Result of present study is in accordance with Emily berry in 2004 who studied intra rater and inter rater reliability of handheld dynamometry in children with cerebral palsy and reported that good to high reliability for isometric force measurements of three lower extremity muscle groups using handheld dynamometry⁷. Previous studies

done by Jodi Crompton et al in 2007 conclude that Hand-held dynamometry has acceptable reliability for testing hip flexors, hip extensors (in supine), knee flexors and extensors and ankle dorsiflexors (with stabilization). Hand-held dynamometry testing was unreliable for measures of the hip extensors (prone), knee extensors at 20° flexion and ankle plantar flexors and dorsiflexors⁸. ICC values for hand-held dynamometry were higher than 0.90 for isokinetic knee studies using hand-held dynamometry were documented by Moshe Ayalon in 2000⁹. Rebecca John in 2016 studied on 30 children with Down syndrome and presented that 60% less grip strength, 33% less palmar pinch strength and 22% less key pinch strength with compared to age and gender match normal children using Jamar dynamometer¹⁰. Jaya Shankar in 2010 studied on reliability of hand held dynamometer for strength testing of knee in health Indian pediatric population and concluded knee flexion and extension exhibited excellent inter-rater reliability with ICC ranging from 0.93 to 0.96 and moderate to good intra-rater reliability with ICC ranging from 0.65 to 0.86¹¹.

Conclusion

Excellent intra rater and inter rater reliability was observed in present study for measuring HHD and pinch gauge in CP children between 5 to 16 years old age which is clinical applicable for measuring hand gripe strength and pinch strength (key grasp and tip to tip grasp).

Future Recommendation: Future studies can be done with more number of subjects, different clinical types of subjects and of other muscle groups.

Ethical Clearance: Taken from S.B.B Collage, V. S Hospital, Committee

Source of Funding: Self

Conflict of Interest: Nil

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A Correlational Study to Analyse Burnout in Working Women and its Impact on Well Being

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Abstract

The purpose of the study was “to find Correlational between burnout in working women and its impact on well being”. Total of 50 subjects were selected for the study and two groups were formed i.e. one of government and other of private, 25 subjects in each group. Burn out Questionnaire and wellbeing questionnaire was given to the subjects data was collected and analyzed and it was found that there is negative correlation between two variables with person coefficient of -0.33 and -0.5 for government and private sector respectively.

Keywords: Burnout; Wellbeing; correlation; working women.

Introduction

Burnout is defined as a syndrome of psychological problems experienced as a result of chronic work stress.¹ Burnout is “a state of physical, emotional or mental exhaustion caused by long term involvement in situations that are emotionally demanding”.⁶

Burnout syndrome was initially associated with health and welfare professions (health professionals, social services workers, criminal justice employees, teachers etc.)⁶ It has been evaluated by different questionnaire like Maslach Burnout Inventory, Copenhagen burnout inventory, Oldenberg burnout inventory, Burnout Questionnaire. Emotional exhaustion is defined as feelings of being emotional overextended and a strong reduction of one’s emotional resources. Depersonalization refers to a negative, compassionless

and detached attitude towards the person that one works with. Lack of personal fulfillment is accessed through a person’s negative self evaluation in relation to his or her job performance.⁵ Burnout Questionnaire was developed by Michelle A. Post. Burnout Questionnaire investigates burnout in three domains: Do you, Are you and Does your Job that focuses on physical, emotional and workplace oriented issues faced by the workers.²⁷

Burnout causes tiredness, dullness, demoralization, dissatisfaction, incapability, aging, insensitivity, decrease in occupational motivation and joy of living which is experienced personally because of the occupational conditions requiring face to face contact and expecting high performance from the employee. Burnout causing aggressiveness, decline in performance, quality and the competence in the work does not just affect the person who is exhausted, but also other people who interact with him/her. Especially the performance of the teachers who are responsible with the education of the people in society is affected negatively. Decline in performance in teaching brings decline in teachers, concerning about students, administrators, parents and his/her job and also causes leaving negative impressions on the people contacted with.⁴

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Teaching is considered as a highly stressful occupation.¹ Emerging issues of concern in the teaching

profession are attrition rates and burnout levels.² supporting this, a number of studies have shown high level of stress and burnout experienced by teachers.¹⁻³

Demographic such as occupational and psychological variables were taken into consideration during the studies on burnout of a wide variety of educators including academicians, high school teachers, primary school teachers and pre-school teachers. Studies have revealed that gender, age, total years spent in employment, total hours spent in a day, willingness to work, being appreciated and supported in job, having deserved degree in job, getting social support, number of the children in classes, quality of the educational institution, marital status and personal qualities of the teacher have effects on burnout level of educators.⁴

Teacher's burnout may dramatically affect well being and their quality of life and hence leads to decline in the teaching efficiency. Feelings of burnout are a critical factor associated with teacher's absenteeism and job turnover.³

The amount of stress and burnout experienced are interrelated with health and psychological problems. The increase in teacher's burnout can have impact on thoroughness of classroom preparation and the involvement in classroom activities decline and student criticism increases. As a result a counter response from student may occur and they are likely to change their perception of the teacher, their feelings towards the teacher and their behavior in the classroom. Teacher burnout may reduce student's intrinsic motivation which may deteriorate learning and engagement in tasks.³

Well being refers to diverse and interconnected dimensions of physical, mental and social well being. It includes choices and activities aimed at achieving physical vitality, mentality alacrity, social satisfaction, a sense of accomplishment and personal fulfillment.²¹⁻²² Teacher well being is a positive emotional state that combines the personal needs and expectations of both learners and their teachers. Well being is measured mainly through WHO Wellbeing Index, which is developed by WHO in collaboration between Centers for Mental Health.

Teacher well being and job satisfaction strongly influence teacher behavior and are positively related to school and classroom environment and students achievement. Few studies have empirically examined the association between burnout well being using WHO

Wellbeing Index scale.¹ Studies have also depicted the negative relation between burnout and well being.¹⁻² some other shows positive relationship between teacher's motivation and well being and learner's performance.²⁻³ Moreover, teacher well being is related to job retention of highly qualified teachers which is especially important for school also. While many researches on teachers well being has tended to focus on negative aspect such as stress or burnout. The rational of the study is teachers in recent era have rapidly changing work environment that drives the knowledge, creation and innovation. This can have an effect on worker's feeling of competence and well being. As technology is emerging, teacher has to develop new knowledge and skills to frequently perform new tasks. All the above factors have influence on teacher's well being and working capability. As technology is emerging and shortage of time to complete deadlines and nuclear families of teachers, all of the above results in high stress and burnout and have an impact on education, so government and private sector will also be affected by these factors. Burnout may be different in different educational sectors and therefore well being will also be affected.

So this study investigates:

- Burnout in government teachers,
- Burnout in private teachers,
- Whether there is a significant relationship between burnout and wellbeing of teacher.

The aim of the study is to analyze burnout in working women's and its impact on well being.

The hypothesis of the study is Government teacher experiences more burnout than Private teachers and burnout has negative impact on well being of school teachers.

Material and Method

- **Research Design:** Correlational Study
- **Sample Design:** Convenience sampling
- **Sample Size:** N-50 (25 government and private each)
- **Sample Source:** Community (New Delhi and NCR).
- **Sampling:** Convenient sampling

Gender: Female

Location: community

- **Method of selection:** The subjects were selected according to the following inclusion and exclusion criteria.

A. Inclusion Criteria:

1. Age group between 25-50 years.
2. School Teachers.
3. Working Hours: More than 5 hours

B. Exclusion Criteria:

1. Mental Disorder
2. Pregnant teachers
3. Teachers who have less than one year of working experience.

- **Outcome Measures:**

A. Burnout Questionnaire:** Burnout questionnaire by Michelle Post is a standardized tool to assess burnout. It consists of 28 response columns/questions which are divided into three further sub-categories. It is scored according to a 5-point scale:

The total scoring ranges from a minimum score of 28 to a maximum score of 140¹³.

B. WHO (Five) WELL- BEING INDEX (1998 version):** The World Health Organisation – Five Well-Being Index (WHO-5) is a short self-reported measure for current mental wellbeing. The measure was first introduced in its present form in 1998 by the WHO. The WHO-5 WBI is suitable for children aged 9 and above.

**** Permission for the use of both the scales has been taken from their respective authors.**

Procedure:

- Convenient sampling was done and the teachers were selected as per the inclusion and exclusion criteria.
- Informed consent was taken by all the subjects.
- Participant’s declaration form was filled by the subjects.
- Identification data was collected through a self-made assessment sheet.
- Both the scales (Burnout Questionnaire and WHO Well Being Index) were given to the 50 subjects (25

government and private teachers each)

- The data was collected and analyzed.

Findings:

Data Analysis: The data was analyzed using SPSS (Statistical Package for Social Sciences), Version 21.

The data was analyzed for all 50 subjects who completed the study. The T-Test was applied to find out the level of burnout and well-being in 25 government teachers and private teachers separately.

Karl Pearson test was performed to check the correlation between:

- Burnout and well-being of government teachers.
- Burnout and well-being of private teachers.

Results

Total 50 subjects were taken for the study. All the subjects were female, which were selected on the basis of inclusion and exclusion criteria, in which 25 were from the government sector and private sector respectively. The subjects were taken from the community, having work experience of more than one year.

Burnout questionnaire was used to assess the level of burnout in teachers of both sectors, whereas well-being was assessed by WHO-5 Well Being Index.

- **Sample Characteristics:** Total of 50 subjects were selected for the study. 25 for government sector and other 25 for private sector. Mean and standard deviation of burnout were calculated as reflected in **Table 1**.

Table 1: Mean and standard deviation of burnout between government and private female teachers’

Group	No. of Sample	Mean	Standard Deviation
Government	25	61.92	13.460
Private	25	59.72	7.458

NS-Not Significant: The result reflected that the mean was 61.92 and 59.72 in government and private teachers respectively. The mean difference between the two groups was found to be 2.20. Standard deviation was also calculated and found to be 13.460 in government and 7.458 in private teachers respectively as illustrated in table 8.1. T-test was applied and t-value and p-value were calculated that was found to be not significant. (Table 1).

- **Correlation between burnout and wellbeing of teacher:** The correlation was found out between burnout and wellbeing. Pearson correlation test was applied to find out the correlation between burnout and well being.

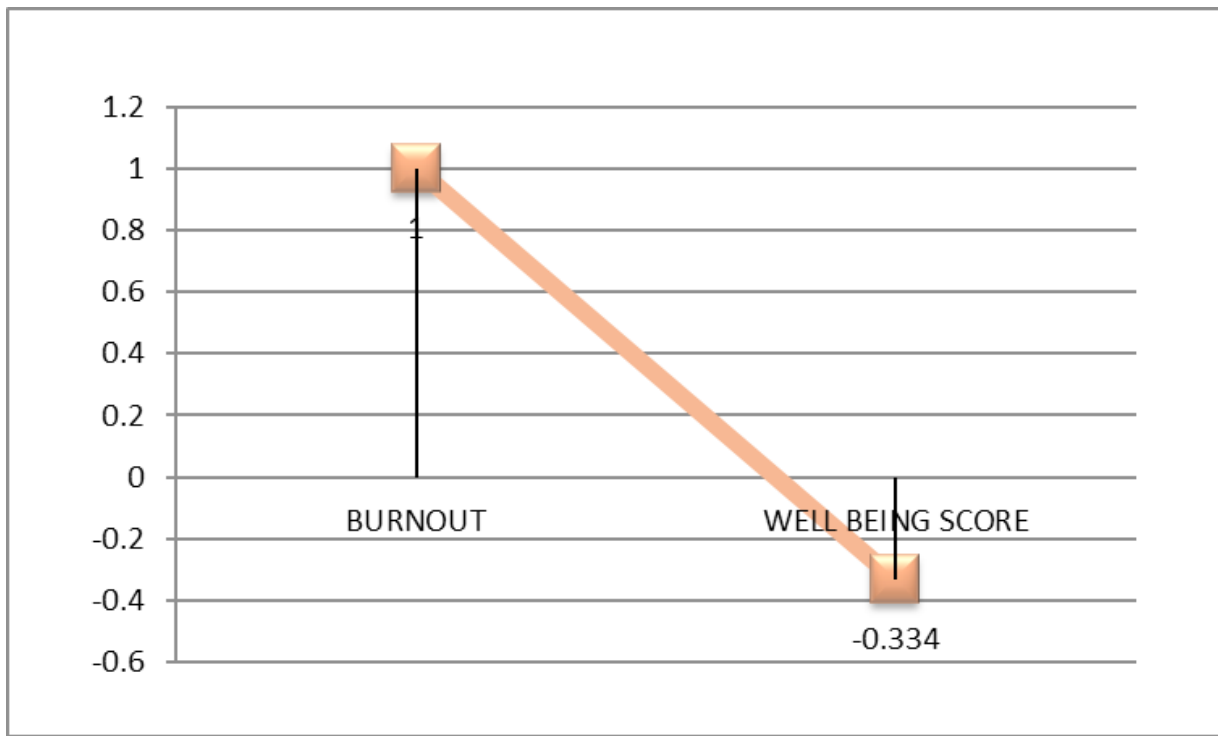
A. In Government Teachers:

Table 2: Correlation of burnout with well being of government teachers:

	Burnout	Well Being Score
Burnout		
Pearson Correlation	1	-0.334NS
p-value		0.103
N	25	25

NS: Not Significant

The negative correlation between the burnout level and well being in government teachers shows that when level of burnout in teacher’s increases their well being decreases. The p-value was calculated (p-value 0.103) which is not significant. (Graph:1)



Graph 1: Correlations between burnout and well being in government teachers

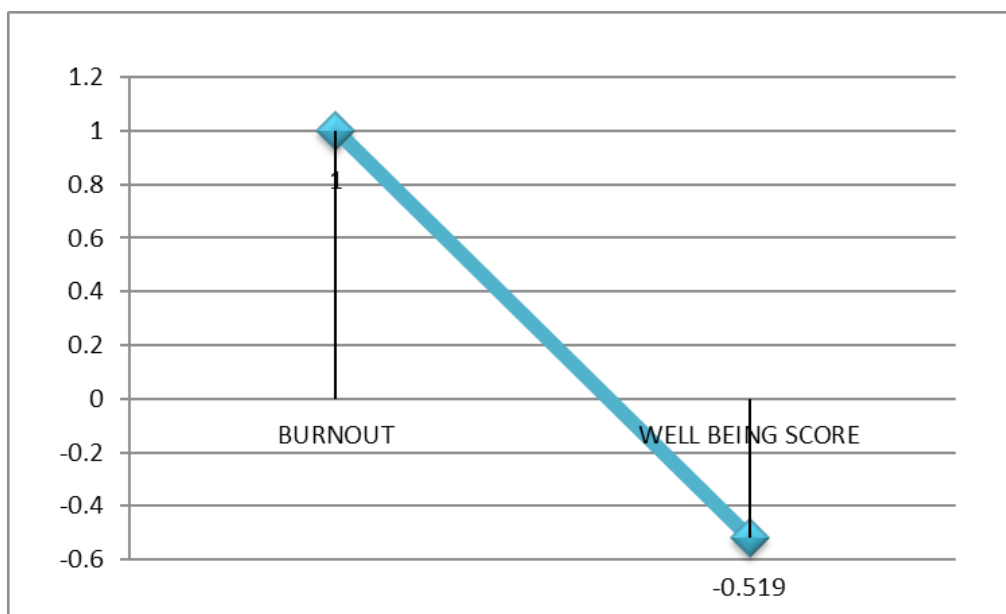
B. In Private Teachers:

Table 3: Correlation of burnout with well being of private teachers:

	Burnout	Well Being Score
Burnout		
Pearson Correlation	1	-0.519**
p-value		0.008
N	25	25

** Correlation is significant at the 0.01 level

A negative was correlation found between burnout and well being in private female teachers and is significant at the level of 0.01. The p-value was calculated that is (p-value 0.008) which is also significant. (Graph:2)



Graph 2: Correlations between burnout and well being in private teachers

Discussion

The purpose of the study was to investigate the level of burnout experienced by government and private female teachers and to analyze whether burnout has impact on well being of school teachers. A total of n-50 subjects were included in this study out of which 25 teachers were from government sector and 25 teachers were from private sector. Subjects were selected according to the exclusion and inclusion criteria and basic information was collected through the self-made assessment sheet. The subjects were asked to fill the Burnout Questionnaire and WHO-5 Well Being Index. Master chart was prepared and the collected data was analyzed.

The analysis of the collected data shows that government teachers had more burnout (61.92) than private female teachers (59.72). There mean difference was found to be 2.20. The well being is less in government teachers (15.72) than private teachers (17.40) and 1.60 was the mean difference obtained. The correlation between burnout and well being was obtained for government teachers was (-0.334) which shows negative correlation whereas in private teachers it was (-0.519) which was significant at the level of p-value >0.01 and shows negative correlation which suggested that when burnout increases well being decreases.

The above result was supported by Jasim-Al-Asadi

et al in 2008 titled “Burnout among primary school teachers in Iraq, concluded that work related factors shows significant association with burnout in government teachers.⁹ Whereas in private teachers Gulen Baran et al in 2010 in his research “Analysis of burnout levels of teacher” concluded that field of work, opportunities, physical condition at school impact the burnout levels of teachers.⁴

The study done by Fulya Cenkseven-Onder on “The Quality of school life and burnout as predictors of subjective well being among teachers showed that there is close relationship between positive events in life and affect and also between stressful events and negative effect. Therefore the teacher’s ability in coping with stressful events at the workplace may lead to have higher level of subjective well being.⁸

Teachers experiences high level of burnout at their workplace due to multiple factors like gender, age, total years spent in employment, motivations of teaching, educational system, willingness to work, being appreciated and supported in job, having deserved degree in job, university of, getting social support, number of the children in classes, quality of the educational institution, marital status and personal qualities of the teacher.⁴

Many comparative studies has been done on job satisfaction, stress and burnout level of government and private university/college teachers that shows that

government teachers experiences more level of stress/ burnout and has less job satisfaction than private teachers. The work was done by Turker Bar, Kadir Ardic 2002 and Salman Khalid et al in 2012.¹¹⁻¹²

Study suggested that the value of correlation between burnout and well being in government teachers was not significant but there was a negative correlation (-0.334) while the value of correlation between burnout and well being in private teachers was significant and there was a negative correlation (-0.519). Negative correlation between burnout and wellbeing measures highlights the impact of burnout on the health and well being of teachers. This suggested that when the level of burnout increases in teachers their well being decreases. Many studies have been done supporting this negative correlation between burnout and well being (Taciano L. Milifont et al 2007, Hitendra Pillay et al 2005).¹⁻²

Conclusion

The correlation of burnout with wellbeing in government teachers is -0.334 and -0.519 in private teachers which is significant. The obtained result supported the experimental hypothesis that is Government teacher experiences more burnout than Private teachers and burnout has negative impact on well being of school teachers.

Being an occupational therapist stress/burnout should be addressed for the treatment in both government and private sectors. Management of burnout includes balance between work and daily activities ie in performance areas through relaxation techniques like Progressive muscle relaxation, Jacobson relaxation technique, deep breathing exercises and visual imaginary technique. Communication skill training (meditation and counseling) has a very good effect on burnout management.

Other occupational therapy intervention techniques include Activity-scheduling, work simplification, incorporating leisure activities and lifestyle modification. As the above techniques helps in reducing burnout that ultimately results in better wellbeing.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: It is a Observational study

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Prevalence of Breathing Disorders and Effect of Lying Positions on Heart Rate and Blood Pressure among Pregnant Women

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Abstract

Introduction: Estrogen induced hyperemia and nasopharyngeal mucosal edema leading to upper airway congestion with hypervolemia of pregnancy increases the risk of Sleep disordered breathing (SDB). Milder degree of SDB can also have adverse impact in pregnant women. The exact prevalence of OSA in pregnancy is not known. Cardiac output increases during pregnancy. Very few studies have been conducted to investigate the response of postural changes on cardiac output. Screening the pregnant women for SDB and monitoring of heart rate and blood pressure can prevent any associated mortality and morbidity. Hence this study was designed to assess the prevalence of breathing disorders and the effect of lying position on heart rate and blood pressure among pregnant women.

Materials and Method: This was a cross sectional study conducted in 90 normal pregnant women selected by purposive sampling. They were included into three groups based on their trimester. Standardised and validated BERLIN questionnaire was given to the subjects based on which diagnosis of SDB was made and counted. The subjects were asked to lie in different positions (supine, left lateral, right lateral and semi fowlers) and relax for five minutes. After which heart rate and blood pressure were measured. ANOVA and Pearson's correlation was used for statistical analysis.

Results: Breathing disorders were highest during third trimester of pregnancy (43.3%) when compared to second and first (26.7%). There was a significant difference in mean Left lateral SBP (1st Trimester: 92.20±10.96; 2nd Trimester: 104.40±17.84; 3rd Trimester: 108.83±11.98) and DBP (1st Trimester: 53.90±10.65; 2nd Trimester: 54.77±15.56; 3rd Trimester: 64.87±11.7) between trimesters. Mean Left lateral SBP ($p < 0.001$) and DBP ($p = 0.002$) were significantly higher in third trimester. There was no significant difference in mean Supine, Right lateral and Semi fowlers SBP and DBP between trimesters. Mean Left lateral SBP and DBP were lower than other SBP and DBP.

Conclusion: The prevalence of SDB increased in third trimester. Left lateral SBP and DBP were lower than others.

Keywords: Sleep disordered breathing, Obstructive sleep apnea, Pregnancy.

Introduction

Breathing disorders are common during pregnancy.

Pregnancy causes hormonal, physiologic, physical and behavioral changes. Estrogen induced hyperemia and nasopharyngeal mucosal edema leading to upper airway congestion with hypervolemia of pregnancy increases the risk of Sleep disordered breathing. These predisposes to development of disordered breathing and worsening of preexistent sleep apnea, snoring being the most common symptom.⁽¹⁾ The other symptoms and signs include witnessed apneas, gasping and choking

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sensations during sleep and hypertension. SDB spectrum consists of apnea at one end and upper airway resistance syndrome and obstructive sleep apnea (OSA) at the other. Polysomnography is the standard test used to diagnose OSA, but it is expensive and questionnaires are used instead. Berlin questionnaire is one such standardized way of diagnosing OSA.⁽²⁾ The exact prevalence of OSA in pregnancy is not known. However the prevalence of OSA in women of reproductive age group is 5% to 6%.⁽³⁾ Risk of myocardial infarction, hypertension and stroke are high in people with snoring.⁽⁴⁾ This indicates that milder degree of SDB can also have adverse impact in pregnant women.

Cardiac output increases during pregnancy. Very few studies have been conducted to investigate the response of postural changes on cardiac output, except few studies that assess hemodynamic effects of standing.⁽⁵⁾ Since pregnant women does not spend most of the time standing, further studies are needed to find the effects of posture on the cardiovascular response including heart rate, systolic and diastolic blood pressure. Hypertension is a common complication during pregnancy. Supine position, by the virtue of aortocaval compression by gravid uterus results in hypotensive response due to the resultant hemodynamic changes.⁽⁶⁾ Screening the pregnant women for SDB and monitoring of heart rate and blood pressure can prevent any associated mortality and morbidity. Hence this study was designed to assess the prevalence of breathing disorders and the effect of lying position on heart rate and blood pressure among pregnant women.

Material and Method

This was a cross sectional study conducted after getting clearance from institutional ethics committee and obtaining informed consent. The study included pregnant women of age 18-40 years with gestational age of 1-40 weeks. 90 pregnant women were included by purposive sampling from the inpatient and outpatient department of obstetrics and gynecology, Yenepoya medical college and Yenepoya specialty hospital, Mangalore. Pregnant women with history of abortions, gestational diabetes, decompensated cardiopulmonary disease, airway cancers and recent surgery of respiratory tract, stroke and treatment for SDB were excluded from the study. They were included into three groups based on their trimester. Standardised and validated BERLIN questionnaire was given to the subjects based on

which diagnosis of SDB was made and counted.⁽⁷⁾ The questionnaire consisted of 3 categories related to the risk of having sleep apnea. Patients were classified into high risk (if there are 2 or more categories where the score is positive) or low risk (if there are only 1 or no categories where the score is positive) based on their responses to the individual items and their overall scores in the symptom categories. Detailed history was also taken to collect demographic details. The subjects were asked to lie in different positions (supine, left lateral, right lateral and semi fowlers) and relax for five minutes. After which heart rate was measured manually by feeling radial pulse and by auscultation and blood pressure was measured by sphygmomanometer by palpatory and auscultatory method.

Continuous data were summarized using mean and standard deviation. Categorical data were summarized using frequency distribution and percentages. ANOVA was used to assess the significance of difference between groups. Pearson correlation test was used to assess the strength of association. $p < 0.05$ was considered significant. All the statistical analysis was performed using SPSS version 21 software.

Reports

Table No 1: Prevalence of breathing disorder in different trimester and overall duration of pregnancy.

		Frequency	Percent	
T1	Breathing Disorder	Positive	8	26.7
		Negative	17	56.7
		Total	30	100.0
T2	Breathing Disorder	Positive	8	26.7
		Negative	22	73.3
		Total	30	100.0
T3	Breathing Disorder	Positive	13	43.3
		Negative	22	73.3
		Total	30	100.0
Overall	Breathing Disorder	Positive	29	32.2
		Negative	61	67.8
		Total	90	100.0

Legend to Table No 1: Breathing disorders were highest during third trimester of pregnancy.

Table No 2: SBP and DBP in various positions during different trimester and overall duration of pregnancy

Trimester (n)	Supine SBP in mm Hg F-0.56; p=0.587	Left Lateral SBP in mm Hg F-11.48; <0.001***	Right Lateral SBP in mm Hg F-0.834; p-0.438	Semi Fowlers SBP in mm Hg F-0.46; p-0.636
	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)
T1 (n-30)	114.20±8.92/ (110.87-117.53)	92.20±10.96/ (88.11-96.29)	111.43±10.567/ (107.49-115.38)	112.73±10.39/ (08.85-116.62)
T2 (n-30)	117.57±12.46/ (112.91-122.22)	104.40±17.84/ (97.74-111.06)	113.27±17.81/ (106.62-119.92)	112.80±13/ (107.95-117.65)
T3 (n-30)	115.67±14.23/ (110.35-120.98)	108.83±11.98/ (104.36-113.31)	108.60±12.94/ (103.77-113.43)	115.33±12.53/ (110.66-120.01)
Total (n-90)	115.81±12.02/ (113.9-118.33)	101.81±15.48/ (98.57-105.05)	111.10±14.07/ (108.15-114.05)	113.62±11.95/ (111.12-116.13)
Trimester (n)	Supine DBP in mm Hg F-2.334; p-0.102	Left Lateral DBP in mm Hg F-6.8; p-0.002*	Right Lateral DBP in mm Hg F-0.819; p-0.444	Semi Fowlers DBP in mm Hg F-0.952; p-0.39
	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)
T1 (n-30)	64.97±10.4/ (61.08-68.85)	53.90±10.65/ (49.92-57.88)	65.00±7.33/ (62.26-67.74)	68.20±13.37/ (63.21-73.19)
T2 (n-30)	70.80±10.78/ (66.77-74.83)	54.77±15.56/ (48.96-60.58)	62.47±15.21/ (56.79-68.15)	67.93±11.32/ (63.71-72.16)
T3 (n-30)	69.90±12.42/ (65.26-74.54)	64.87±11.7/ (60.50-69.23)	66.50±13.1/ (61.61-71.39)	71.70±10.52/ (67.77-75.63)
Total (n-90)	68.56±11.4/ (66.17-70.94)	57.84±13.62/ (54.99-60.70)	64.66±12.31/ (62.08-67.23)	69.28±11.8/ (66.81-71.75)

Legend to Table No 2: There was a significant difference in Left lateral SBP and DBP between trimesters. Left lateral SBP and DBP were significantly higher in third trimester. There was no significant difference in Supine, Right lateral and Semi fowlers SBP and DBP between trimesters. Left lateral SBP and DBP

were lower than other SBP and DBP. ANOVA was used for analyzing the difference in HR between trimesters. BP-Blood pressure; BP-Systolic blood pressure; BP-Diastolic blood pressure. r-correlation coefficient<0.05-significant.

Table No 3: HR in various positions during different trimester and overall duration of pregnancy

Trimester (n)	Supine HR in bpm F-2.2;p-0.117	Left Lateral HR in bpm F-0.243;p-0.789	Right Lateral HR in bpm F-0.637;p-0.531	Semi FowlersHR in bpm F-0.535;p-0.588
	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)	Mean±SD/ (95% CI)
T1 (n-30)	86.67±7.55/ (83.85-89.49)	84.3±7.01/ (79.68-84.92)	86.83±7.83/ (83.91-89.76)	83.03±12.36/ (78.42-87.65)
T2 (n-30)	87.87±13.73/ (82.74-92.99)	84.23±13.42/ (79.22-89.25)	86±14.44/ (80.61-91.39)	86.5±14.72/ (81-92)
T3 (n-30)	82±12.14/ (77.47-86.53)	82.7±12.5/ (78.03-87.34)	83.53±12.07/ (79.02-88.04)	85.77±13.88/ (80.59-90.95)
Total (n-90)	85.51±11.6/ (83.08-87.94)	83.1±11.24/ (80.72-85.43)	85.46±11.72/ (83-87.91)	85.1±13.61/ (82.25-87.95)

Legend to table No 3: There was no significant difference in Supine, Left lateral, Right lateral, Semi fowlers HR between trimesters in pregnancy. ANOVA was used for analyzing the difference in HR between

trimesters.

HR-Heart rate; bpm-beats per minute. r-correlation coefficient<0.05-significant.

Table No. 4: Correlation of lying positions on BP and HR in three trimesters of pregnancy

Variables	T1	T2	T3
	r p value	r p value	r p value
Supine SBP in mm Hg Supine HR in bpm	0.457 0.011*	-0.130 0.494	0.152 0.424
Supine DBP in mm Hg Supine HR in bpm	0.41 0.831	-0.132 0.486	-0.44 0.816
Left lateral SBP in mm Hg Left lateral HR in bpm	0.178 0.346	-0.400 0.028*	-0.184 0.330
Left lateral DBP in mm Hg Left lateral HR in bpm	0.020 0.915	-0.276 0.139	-0.168 0.374
Right lateral SBP in mm Hg Right lateral HR in bpm	0.161 0.394	0.016 0.932	0.141 0.457
Right lateral DBP in mm Hg Right lateral HR in bpm	0.123 0.517	0.308 0.098	0.108 0.569
Semi fowlers SBP in mm Hg Semi fowlers HR in bpm	-0.071 0.710	-0.041 0.829	0.249 0.184
Semi fowlers DBP in mm Hg Semi fowlers HR in bpm	-0.380 0.038*	-0.256 0.173	-0.057 0.764

Legend to Table No 4: There was a significant correlation between supine SBP and HR in first trimester, left lateral SBP and HR in second trimester, semi fowlers BP and HR in first trimester.

Pearson's correlation was used for analysis.

BP-Blood pressure; HR-Heart rate; bpm-beats per minute; BP-Systolic blood pressure; BP-Diastolic blood pressure. r-correlation coefficient <0.05-significant.

Discussion

In the present study the prevalence of breathing disorder in pregnant women was found to be 32% and it was higher during third trimester (43.3%) of pregnancy compared to other trimesters. In a study done in US population incidence of snoring in pregnant women was reported to be 14%, which was significantly higher than 4% when compared with non pregnant women.⁽⁸⁾ Whereas in a similar study done in Sweden amongst 502 pregnant women 23% had snoring compared to 4% incidence reported in the same women before pregnancy. An increased incidence in snoring as indicated by other studies clearly suggests a correlation between SDB and snoring.⁽⁹⁾ In another study including 267 pregnant women pre pregnancy snoring was reported to be 3.7% but it was higher during third trimester (11.8%). This finding was similar to our study. However a contradictory report of lower frequency of apnea and apnea hypopnea in

third trimester of pregnancy when compared with fourth and 6th month post partum. This could be due to lowered progesterone during post partum period. However in our study postpartum subjects were not included.⁽¹⁰⁾

In our study in the first trimester of pregnancy the 13 subjects were found to sleep more on the left side and 11 subjects were found to sleep on the right side and 6 subjects were found to sleep in supine position. Whereas, in second trimester 23 subjects were found to sleep on the left side and 7 subjects were found to sleep on the right side. Moreover, in third trimester 12 subjects were found to sleep on the left side and 18 subjects were found to sleep on the right side. As a result, majority of the subjects preferred to sleep on the left side. We found that most of the pregnant women slept in right lateral position in third trimester and most of them had breathing disorder and high blood pressure. Similar findings were reported in few studies.⁽¹¹⁾ The lower left lateral SBP and DBP throughout all trimester, reported in our study could be due to reduced aortacaval compression in that position. Study done in the past also concluded that positioning a full term parturient in left lateral position is efficient as keeping the pregnant woman in the full left lateral position for preventing aortacaval compression.⁽¹²⁾ In our study it was also found that SBP and DBP were both higher in third trimester when compared with other trimester.

This could be due to higher aortocaval compression by enlarging uterus.

Conclusion

The prevalence of SDB increased in third trimester. Left lateral SBP and DBP were lower than others.

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Immediate Effect of Mobilization vs Myofascial Release on Pain and Range of Motion in Patients with Shoulder Impingement Syndrome: A Pilot Randomized Trial

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Abstract

Background: Shoulder Impingement Syndrome (SIS) is a generic term for injury of structures in the subacromial space, regarded as anatomic abnormalities of the coracoacromial arch or humeral head. SIS is thought to be associated with articular or myofascial dysfunction, various researches have been done on rehabilitation of shoulder impingement by addressing either osseous structure or myofascial structure and found to be effective. But no studies could retrieve to compare these two. Objective: To compare the immediate effects of mobilization vs myofascial release on pain and range of motion in subjects with shoulder impingement syndrome.

Study Design: A pilot randomized trial.

Method: 20 subjects with SIS of both the genders were randomly divided into two groups: group 1 (n=10), which received MFR on active muscle trigger points and group 2 (n=10), received mobilization of AC joint along with Thoracic spine for four sessions. The outcome measures shoulder pain and range of motions measured at the baseline, end of 1st session and 1st week.

Result: The result of this present study showed that participants of both the groups experienced significant improvement in all the outcomes ($p < 0.05$), but the MFR group was superior in reducing pain intensity.

Conclusion: The study concluded that MFR can be used as an initial treatment for pain reduction among SIS individuals.

Keywords: *Shoulder impingement, myofascial release, AC joint mobilization, Thoracic mobilization, shoulder pain.*

Introduction

Shoulder pain is a most common complaint, with the prevalence rate of 20% to 33% among the adult population.^{1,2} Shoulder impingement syndrome (SIS) accounts for the highest prevalence (36%) among all shoulder complaints.³ Which is characterized by

encroachment of the subacromial space by suprahumeral structures.⁴ It comprises of the humeral head inferiorly, the anterior edge and under surface of the anterior third of the acromion, coracoacromial ligament and the acromioclavicular joint superiorly.⁵ According to radio graphs the height of space between acromion and humeral head ranges from 1.0 to 1.5 centimeters.⁵ It is believed that impingement is due to inadequate space for clearance of the rotator cuff tendons as the arm is elevated.⁶ There are two types of shoulder impingement EXTERNAL IMPINGEMENT & INTERNAL IMPINGEMENT.⁷ External impingement is of two types: Primary and Secondary. The primary type is characterized by abnormalities of the coracoacromial arch causing mechanical compression on the rotator cuff.

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The secondary type is due to instability or rotator cuff dysfunction, or due to muscular inflexibility.⁸ Internal impingement is more prevalent among throwers during the late cocking phase of the throwing motion, where the shoulder goes for extreme abduction and external rotation during causing postero-superior shoulder pain.⁹ The common impairments following SIS include pain, loss of quality of life and sleep disturbances, pain exacerbates with arm elevation, deficiencies in rotator cuff strength, limited flexibility of the posterior shoulder structures and other soft tissue restriction, altered scapular length-tension relationship.^{5,10-12}

Various studies have been attempted on rehabilitating shoulder impingement. Among them myofascial release (MFR) on active muscle trigger point (ATrPs), mobilization of AC joint found to be effective in immediate reduction of pain and improvement of range of motion (ROM).^{13,14} MFR is a form of manual therapy, intended to restore myofascial property for decreasing pain and improving function.¹⁵ And yet SIS has the triggering mechanism for physiological alteration in the rotator cuff and other scapular muscles, there by leading to development of trigger points.^{13,16}

Mobilization is applied with a passive oscillatory movement or a sustained stretch at the limit of the joint range. Existing evidences has shown substantial improvement of outcome measures following mobilization of glenohumeral, acromio clavicular & sterno clavicular joints in SIS.^{1,14}

Similarly, literatures also established the influence of thoracic spine posture on shoulder mechanics and found a positive outcome on pain in SIS due to their biomechanical and neurophysiologic connections.^{17,18}

When there is any chronic dysfunction or disorder both the osseous and myofascial structures go for adaptations or alterations but still the conclusion remains unclear that which structure has to be addressed primarily. However, several studies have investigated the individual effect of joint mobilization or ATrP release of the myofascial structures on shoulder impingement. Previous researches has been cited that mobilization of thoracic spine and acromioclavicular joint is an effective tool for achieving end range of motion and reducing pain. Similarly, studies also concluded that myofascial release of shoulder girdle muscles also can be used to improve shoulder function.^{13,14,18} But so far, no studies have been attempted to compare acromioclavicular

joint mobilization used in combination with thoracic spine mobilization to myofascial release of the ATrPs of shoulder girdle muscles on reducing shoulder pain and improving range of motion of patients with shoulder impingement syndrome. Hence the present study aimed to find out the immediate effects of mobilization of acromioclavicular joint combined with thoracic spine versus myofascial release of ATrPs on shoulder pain and range of motion on shoulder impingement syndrome.

Material and Method

This pilot randomized trial was a single blinded study in which there were two groups a mobilization group who received mobilization acromioclavicular joint in conjunction with the thoracic spine mobilization and a myofascial group who received myofascial release on active muscle trigger points. The study was conducted at the outpatient department of Srinivas college of Physiotherapy Karnataka, India, following the approval from institutional ethical committee. The study is registered with Clinical trial registration India bearing the registration No CTRI/2018/08/021415. All the participants were explained about the study and an informed consent was obtained from them on voluntarily basis. 20 participants with shoulder impingement had recruited after meeting with the selection criteria. The inclusion criteria were, age ranging between of 18 to 45 (both male and female), history of shoulder pain since 1 month, positive Neer's impingement test and Hawkins Kennedy test, presence of thoracic hypo mobility from clinical evaluation, provocation of pain above 60 degrees of flexion and abduction and palpable trigger points on (supraspinatus, infraspinatus, pectoralis major, subscapularis) muscles. Participants were excluded if they had a history of Shoulder girdle fracture, dislocation and surgery, diagnosed with frozen shoulder or rotator cuff tear, history of cervicobrachial pain, any neuromuscular pain in upper limb and use of corticosteroids or pain subsiding medication. The demographic details and baseline measurements of pain (VAS), range of motion (mobile clinometer) were collected. Further participants randomly assigned into either Mobilization (n=10) or Myofascial (MFR) (n=10) group by block randomization method. Followed by the participants underwent four sessions of treatment either mobilization of (AC joint and thoracic spine) or MFR on ATrPs. And the outcome measures were assessed at the end of first session and first week.

Procedures:**Group 1:**

AC Joint Mobilization: The participants were in supine lying position and the therapist was above the shoulder region head facing to the patient's feet. The thumbs of the therapist were placed over the superior border of the lateral end of the clavicle adjacent to the AC joint plane. A caudal directed force applied to the clavicle with oscillation.¹⁹

Thoracic Thrust Manipulation: The participants were in high sitting and in prone lying position. The therapist was standing next to the patient in a diagonal stance and also behind the patient during high sitting. Thoracic thrust manipulation demonstrated to manipulate specific thoracic segment mainly mid thoracic. PA glide in prone demonstrated to improve the extension range.²⁰

Group 2:

MFR for Subscapularis: The participant were in supine position, arm abducted and external rotated, the therapist was at side of the patient's affected shoulder & with traction of scapula by one hand and other hand was along the axillary border and towards superior angle with flat palpation.

MFR for Supraspinatus: The participants were in high sitting position with arm adducted, the therapist palpated with pincer grip one finger above the spine of scapula and in the space between scapula and clavicle.²¹

MFR for Infraspinatus: The participant was in high sitting position with arm adducted, the therapist was behind the patient and by using flat palpation two finger below the medial portion of the spine of the scapula and three fingers above the inferior angle of scapula.²¹

MFR for pectoralis major: Subject was asked to abduct the shoulder to 90 degrees and flexes the elbow to 90 degrees, the therapist palpated by pincer palpation on the anterior axillary fold.²¹

Technique: The patient's skin and therapist's knuckle were kept oil free. Using the knuckle, therapist applied a vertical release proximal to the attachment of the muscle belly fascia. Once the end-feel was reached a slow stroke down the length of the target was performed.²² The pressure was maintained until the therapist sensed relief of tension under the palpating finger or the patient experienced a considerable decline in pain. This technique was performed combined with other manual techniques, such as deep stroking.^{13,23} The techniques were continued for 90 seconds (usually 2 to 3 repetition).

Outcomes: ROM (smartphone clinometer): was used to record range of motions. The participant was in standing position. The smartphone was fixed to the upper arm by using a mobile strap. Then the data were recorded while performing the movements (shoulder flexion and abduction).²⁴

VAS scale: A 10 cm line was used to measure pain intensity. The participants were instructed priorly about the scale like they have to mark a point between 0-10 according to their pain intensity, where 0 is no pain and 10 is extreme pain. Following which the intensity was measures by using a measurement scale.⁴

Statistical Analysis: The statistical analyses were conducted using the SPSS software, Version 16. The Kolmogorov-Smirnov test was used to determine the normal distribution. A mixed model analysis was used for the time and group factor. Effect sizes for between-groups variables were calculated using the Cohen d coefficient.

Findings: 20 individuals with shoulder impingent MFR (n=10) and mobilization (n=10) met with the selection criteria and voluntarily participated in the study. The demographic details (age, gender, height, weight) were recoded. The mixed model Anova revealed that participants of both the groups showed significant improvement in pain and range of motions for the time factor ($p < 0.05$). And the MFR group was found superior to mobilization group on reducing pain intensity at 1 week (Table 1).

Table 1: Pre and post values of outcome measures and effect size

Outcomes	Groups	Baseline Mean(SD)	1 st session Mean(SD)	1 week Mean(SD)	Between group difference At 1 week	Effect size (d) between group At 1 week	P value
Shoulder pain	MFR	8.6 (±1.2)	6.9 (±1.8)	4.8 (±1.6)	1.9	0.5	< 0.05
	MOB	7.4 (±1.3)	5.7 (±1.7)	4.5 (±1.5)			
Abduction (DEGREE)	MFR	54 (±25.42)	60 (±24.13)	73 (±23.69)	1.8	0.3	< 0.05
	MOB	44.2 (±20.56)	48 (±19.07)	65 (±17.3)			
Flexion (DEGREE)	MFR	59.5 (±21.5)	72.3 (±26.9)	92 (±28)	4.5	1.04	< 0.05
	MOB	41 (±16.78)	47 (±18.27)	69 (±13.63)			

Discussion

The current study objective was to evaluate and compare the immediate effects of mobilization of acromioclavicular joint combined with thoracic spine versus myofascial release on shoulder pain and range of motion in participants with shoulder impingement. A significant decrease in shoulder pain and ROM was achieved using both approaches following the measurement of pain using VAS, ROM using mobile clinometer. The result of this present study showed that participants of both the groups experienced significant improvement in the outcome measures (p<0.05),but the MFR group showed better reduction of pain than mobilization group at 1 week. The between group changes at 1 week were 1.8, 1.9, 4.5 for the pain, abduction and flexion ROM outcome measures respectively. A high effect size (1.04) was found for flexion ROM. And the effect size was found moderate for pain (0.5). Lozano et al have proven that active trigger points (ATrPs) on the shoulder and scapular muscles are closely related to pain intensity of shoulder impingement and addressing these ATrPs reduces pain sensitivity.¹³ It has been previously reported that subjects with shoulder impingement exhibit both segmental and widespread sensitization mechanisms and those mechanisms are related to the presence of active ATrPs and pain symptoms demonstrated that active ATrPs constitutes a focus of peripheral sensitization as higher levels of algogenic substances.¹³ Hence, it would be expected that treatment of active ATrPs induces segmental antinociceptive effects and improves tissue extensibility. Previous studies by Ajimsha et al. reported that thoracic spine posture and AC joint mobility are closely linked with range of shoulder motions in SIS.²⁵ So it was

postulated that the treatment administered at thoracic spine and AC joint resulted in biomechanical correction, scapular positional dysfunction, AC joint mobility and improved motor control pattern and thus by reducing pain and improving range of motion.^{25,26} Limitations: The study had some limitations first the sample size was small. Second no follow-up which may impair the findings. Third there were no multifactorial exercises and fourth the participants were not categorized based on their unique characteristics which would have been ideal. Further studies are needed for homogeneity with larger sample size and follow-ups.

Conclusion

Present study concluded that MFR on active muscle ATrPs can be used as a first choice of treatment among SIS subjects for reduction of pain and improvement of ROM as the MFR group had shown better reduction in pain sensitivity and improving ROM at one week.

Funding: There was no funding and conflicts of interest were reported for this study.

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Treatment of Plantar Fasciitis: A Review

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Abstract

Plantar fasciitis is a disorder of the connective tissue which supports the arch of the foot. It results in pain in the heel and bottom of the foot that is usually most severe with the first steps of the day or following a period of rest. Pain is also frequently brought on by bending the foot and toes up towards the shin. The pain typically comes on gradually and it affects both feet in about one-third of cases. The researches review the literature pertaining to types of treatment and their efficacy. This article presents an overview on current knowledge on plantar fasciitis and focuses on etiology, diagnosis and treatment strategies, conservative treatment.

Keywords: *Plantar fasciitis, physical therapy.*

Introduction

Plantar fasciitis is the pain caused by degenerative irritation at the insertion of the plantar fascia on the medial process of the calcaneal tuberosity. The pain may be substantial, resulting in the alteration of daily activities. Various terms have been used to describe plantar fasciitis, including jogger's heel, tennis heel, policeman's heel and even gonorrheal heel. Although a misnomer, this condition is sometimes referred to as heel spurs by the general public.

Anatomy: The plantar fascia is comprised of white longitudinally organized fibrous connective tissue which originates on the periosteum of the medial calcaneal tubercle, where it is thinner but it extends into a thicker central portion. The thicker central portion of the plantar fascia then extends into five bands surrounding the flexor tendons as it passes all 5 metatarsal heads. Pain in the plantar fascia can be insertional and/or non-insertional and may involve the larger central band, but may also include the medial and lateral band of the plantar fascia. The plantar fascia is best referred to as fascia because of its relatively variable fiber orientation as opposed to the more linear fiber orientation of **aponeurosis**. The plantar fascia blends with the paratenon of the Achilles tendon, the intrinsic foot musculature and even the skin and subcutaneous tissue.^{[1][2]} The thick viscoelastic multilobular fat pad is responsible for absorbing up to 110% of body weight during walking and 250% during running and deforms most during barefoot walking

vs. shod walking.^[3] During weight-bearing, the tibia loads the the foot "truss" and creates tension through the plantar fascia (windlass mechanism). The tension created in the plantar fascia adds critical stability to a loaded foot with minimal muscle activity. Evidence of the important stabilizing nature of the plantar fascia is evidence when following cases post surgical release which may lead to midfoot arthritis, rupture of the secondary stabilizers of the arch (e.g spring ligament), as well as other pathologies.^{[4][5][6]}

Epidemiology: The average plantar heel pain episode lasts longer than 6 months and it affects up to 10-15% of the population. However, approximately 90% of cases are treated successfully with conservative care.^{[7][8][9]} Although this condition is seen in all ages, it is most commonly experienced during middle age. Females present with plantar heel slightly more commonly than males and occurs more frequently in an athletic population such as running, accounting for up to 8-10% of all running related injuries.^[10] In the US alone, there are estimates that this disorder generates up to 2 million patient visits per year and account for 1% of all visits to orthopedic clinics. Plantar heel pain is the most common foot condition treated in physical therapy clinics and accounts for up to 40% of all patients being seen in podiatric clinics.^[11]

Characteristics/Clinical Presentation:

- Heel pain with first steps in the morning or after long periods of non-weight bearing

- Tenderness to the anterior medial heel
- Limited dorsiflexion and tight achilles tendon
- A limp may be present or may have a preference to toe walking
- Pain is usually worse when barefoot on hard surfaces and with stair climbing
- Many patients may have had a sudden increase in their activity level prior to the onset of symptoms

Differential Diagnosis:

Neurological: Abductor digiti quinti nerve entrapment, lumbar spine disorders, problems with medial calcaneal branch of the posterior tibial nerve, tarsal tunnel syndrome.

Soft tissue: Achilles Tendinopathy, fat pad atrophy, heel contusion, plantar fascia rupture, posterior tibial tendonitis, retrocalcaneal bursitis

Skeletal: Sever's disease, calcaneal stress fracture, infections, inflammatory arthropathies, subtalar arthritis

Miscellaneous: Metabolic disorders, osteomalacia, Paget's disease, sickle cell disease, tumors (rare), vascular insufficiency, Rheumatoid arthritis

Diagnostic Procedure: Plantar fasciitis is a clinical diagnosis. It is based on patient history and physical exam. Patients can have local point tenderness along the medial tuberosity of the os calcis, pain on the first steps or after training. Plantar fascia pain is especially evident upon dorsiflexion of the patients pedal phalanges, which further stretches the plantar fascia. Therefore, any activity that would increase stretch of the plantar fascia, such as walking barefoot without any arch support, climbing stairs, or toe walking can worsen the pain. The clinical examination will take under consideration a patient's medical history, physical activity, foot pain symptoms and more. The doctor may decide to use Imaging studies like radiographs, diagnostic ultrasound and MRI.

Medical Management: When conservative measures fail, surgical plantar fasciotomy with or without heel spur removal may be employed. There is a method, through an open procedure, percutaneously or most common endoscopically, that releases the plantar fascia. This is an effective treatment, without the need for removal of a calcaneal spur, when present. There is a professional consensus, 70-90% of heel pain patients can be managed by non-operative measures.

Surgery for plantar fasciitis should be considered only after all other forms of treatment have failed. With an endoscopic plantar fasciotomy, using the visual analog scale, the average post-operative pain was improved from 9.1 to 1.6. For the second group (ESWT), using the visual analog scale the average post-operative pain was improved from 9 to 2.1. Endoscopic plantar fasciotomy gives better results than extra-corporeal shock wave therapy, but with liability of minor complications^{[12][13]}.

Physical Therapy Management: The most common treatments include stretching of the gastroc/soleus/ plantar fascia, orthotics, ultrasound, iontophoresis, night splints and joint mobilization/manipulation.

Strength Training. Similar to tendinopathy management, high-load strength training appears to be effective in the treatment of plantar fasciitis. High-load strength training may aid in a quicker reduction in pain and improvements in function.^[14]

Stretching consists of the patient crossing the affected leg over the contralateral leg and using the fingers across to the base of the toes to apply pressure into toe extension until a stretch can be felt along the plantar fascia. Achilles tendon stretching can be performed in a standing position with the affected leg placed behind the contralateral leg with the toes pointed forward. The front knee was then bent, keeping the back knee straight and heel on the ground. The back knee could then be in a flexed position for more of a soleus stretch^[15].

Mobilizations and manipulations have also been shown to decrease pain and relieve symptoms in some cases. Posterior talocrural joint mobs and subtalar joint distraction manipulation have been performed with the hypomobile talocrural joint. Patients in 6 different cases demonstrated complete pain relief and full return to activities with an average of 2-6 treatments per case^[16].

A recent study evaluated the effect of ankle, subtalar and midfoot joint mobilizations on pain and function in patients with PF. The researchers hypothesized that mobilization of this joints, in addition to conventional physical therapy, would significantly improve pain and function on patients with PF, as opposed to conventional treatment only. The mobilization in conjunction with conventional therapy did not improve pain and function more than conventional treatment alone in patients with PF. Ankle and midfoot joint mobilization aimed at improving DF rang om motion is not more effective than ultrasound and stretching alone in treatment of PF. The

association between limited DF and PF most probably is based on calf muscle shortening and not on ankle or foot joint mobilization. Therefore, treatment should be focused on soft tissue techniques rather than on foot and ankle joint mobilization.^[17]

Posterior-night splints maintain ankle dorsiflexion and toe extension, allowing for a constant stretch on the plantar fascia. Some evidence reports night splints to be beneficial but in a review by Cole et al he reported that there was limited evidence to support the use of night splints to treat patients with pain lasting longer than six months and patients treated with custom made night splints improved more than prefabricated night splints^[18].

Six treatments of acetic acid **iontophoresis** combined with taping gave greater relief from stiffness symptoms than and equivalent relief from pain symptoms to, treatment with dexamethasone/taping. For the best clinical results at four weeks, taping combined with acetic acid is the preferred treatment option compared with taping combined with dexamethasone or saline iontophoresis^[19].

Foot orthoses produce small short-term benefits in function and may also produce small reductions in pain for people with plantar fasciitis, but they do not have long-term beneficial effects compared with a sham device whether they are custom made or prefabricated.^[20] When used in conjunction with a stretching program, a prefabricated shoe insert is more likely to produce improvement in symptoms as part of the initial treatment of proximal plantar fasciitis than a custom polypropylene orthotic device^[21].

Recent searches were done toward the effects of short-term treatment with **taping** for plantar fasciitis. For an entire week the tape was placed on the gastrocnemius and the plantar fascia. It was concluded that the additional treatment with continuous taping for one week might alleviate the pain of plantar fasciitis better than a traditional physical therapy program only, but it's a short-time effect^{[22][23],[24]}.

Ethical Clearance: the institutional ethics committee has given permission to initiate the research project.

Source of Funding: Self.

Conflict of Interest: Nil

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A Comparative Survey to find out Which Domain is Affected the Most in Health Related Quality of Life in Parents with Cerebral Palsy

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Abstract

Cerebral palsy affects quality of life of parents with cp children whether it is mother or father . In this study it is analysed that which domain of quality of life is affected the most in father and mother. Rand Sf 36 Questionnaire was used for this study and it was analysed that pain and physical functioning is affected the most in fathers where as pain and social functioning is affected the most in mothers in relation to Indian context

Keywords: Cerebral palsy; Health related Quality of life; physical functioning; social functioning.

Introduction

Cerebral palsy is a disorder of movements and posture due to defect or lesion of the immature brain¹. Although impaired motor function is the most characterizing features of the cerebral palsy syndromes, many children also experience sensory, communicative, and intellectual impairments and may have severe limitation in self-care activities such as feeding, dressing, bathing, and mobility⁴. There are about 25 lakh cerebral palsy children in India as per the last statistical information⁵. A cerebral palsy diagnosis brings with it feeling of depression and a sense of unpredictability for the parents. Often parents feel alone in the fight against the disease. The study was conducted on quality of life on group of parents of children with cerebral palsy in which more

than half described their quality of life as good and 40% as “neither good nor bad”⁵. Altindag *et al.* (2007), from his study analysed that increased depression levels were also found in mothers of children with cerebral palsy. It also showed the mothers of children with disabilities suffer from serious psychological distress related to disability level⁶. Smith *et al.* (1993) concluded that depressive symptoms observed in mothers of children with developmental status or parents child interaction behaviour⁶. Sajedi F *et al.* (2009), concluded that having a cerebral palsy child may lead to maternal depression; therefore, to improve rehabilitation of cerebral palsy children support of mother who play a key role in rehabilitation of children with cerebral palsy is needed⁹. Ones *et al* (2005), suggested that quality of life in mothers of children with cerebral palsy was significantly lower & depression level was higher than those of control mothers¹⁰. In usual practice emphasis is given mostly on disability of children & its treatment in differently abled children but the caregivers (usually parents) & all the other members of the family of differently abled child leads a hampered quality of life, less studied has been done through a research based programme. Thus this study would help in setting goals for not only the disabled population but also for parents and will help in improving the quality of life of parents having children with cerebral palsy. Goal focused on performance area

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and component can improve the parents psyche as well as quality of life by improving the rehabilitation of cerebral palsy child.

The major objectives of the study was to see which variable is affected the most in health related Quality of life increasing chronological order.

Materials and Method

The survey was conducted on 60 subjects from Delhi and NCR region (National Capital Region of Delhi). 60 fathers & mothers of children suffering from cerebral palsy were selected by sample of convenience from Society for Advance Study in Rehabilitation Bal Kalyan Bawan, Dayal Bagh.. The subjects were assigned to the study on the basis of (i) Parents of children diagnosed with cerebral palsy(child' age 1.6 to 5years); (ii) Parents: age group 20-40 years; (iii) Parent should be literate; (iv) All type of cerebral palsy. The outcome of the subjects were judged on the basis of RAND-36 health related questionnaire (α score 0.93 to 0.78).

I. Following procedure was adopted during the study:

Consent form will be taken from the parents



Subject will be selected on the basis of inclusion and exclusion criteria

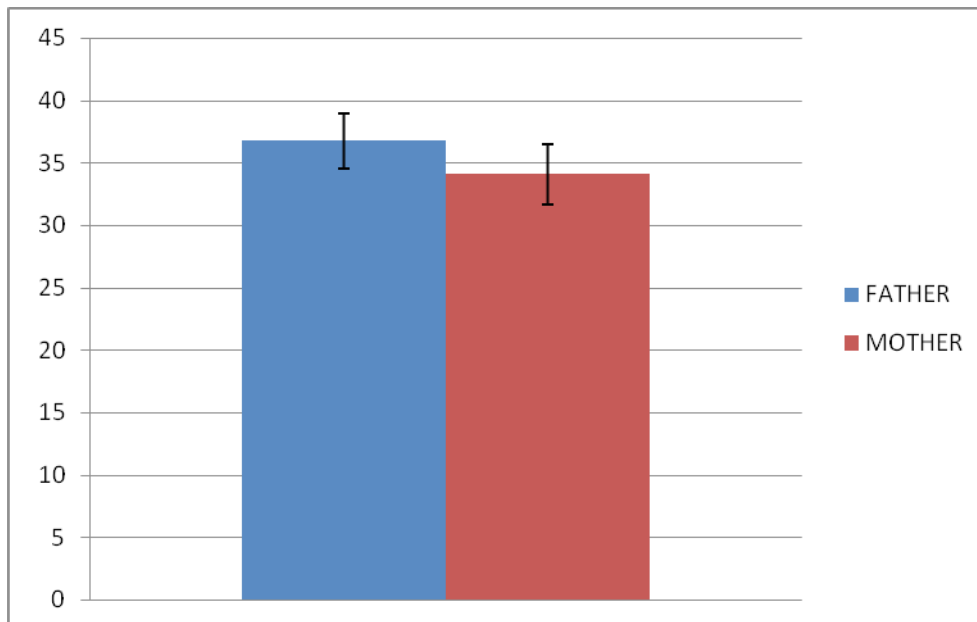


RAND 36 was evaluated by the therapist to find out which variable is affected the most in health related Quality of life



Data analysis was accomplished using, Statistical Package for Social Sciences (SPSS) for windows, (version 20.0 IBM SPSS Inc Chicago, IL) and Microsoft Excel (Professional Edition 2007; Microsoft crop, Redmond, WA) was used for preparation of master chart***.

Findings: A total of 60 parents (Fathers and Mothers) participated for this study. No dropouts were found :during data collection. The mean age and standard deviation of Fathers were 36.07 ± 2.21 and that of Mothers were 34.07 ± 2.41 . (As illustrated in a Graph 1).

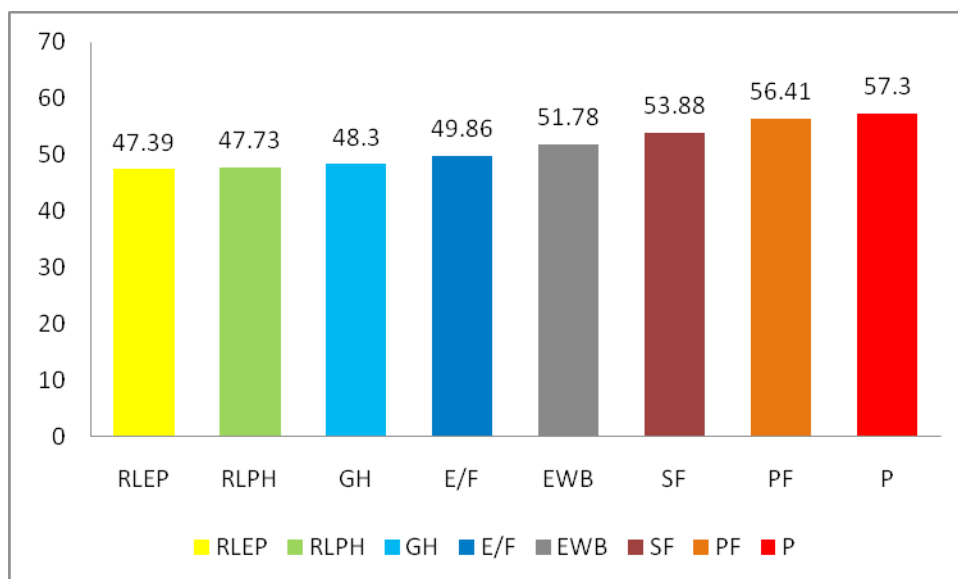


Graph 1: Bar graph representing Mean and Standard deviation of parents

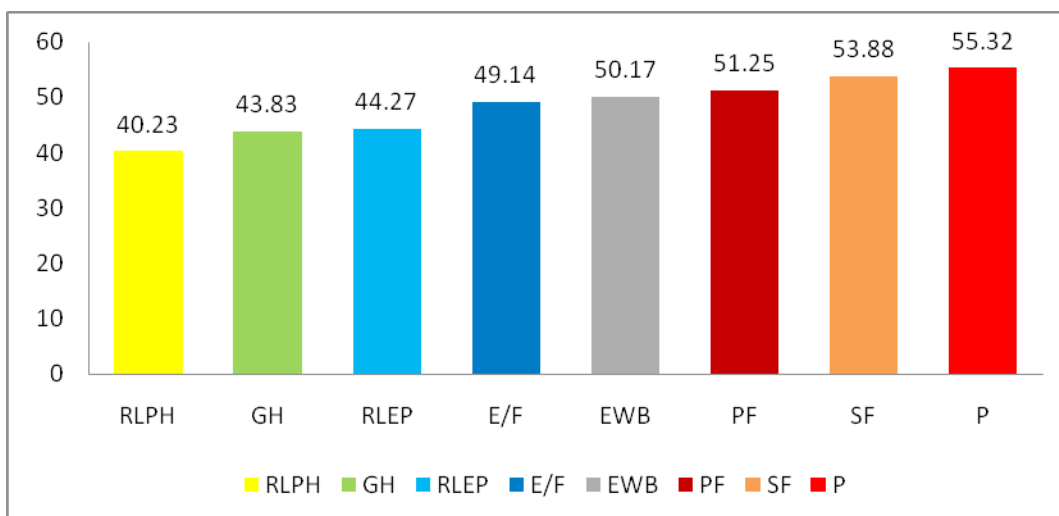
II. Variables affected the most in Health related Quality of life in parents:

On performing descriptive statistical analysis for the sub-domain of Quality of life between Fathers and Mothers, following result were obtained. For Fathers, Role limitation due to Emotional problem (RLEP) was found to have the least mean score in the hierarchical order followed by Role limitation due to physical health (RLPH), then by the mean scores of General health (GH) and Energy/Fatigue (E/F), followed by the mean scores of Emotional well being (EWB) and Social functioning (SF), the mean score of Physical function (PF) and then the Pain (p) was found to have highest mean score in the increasing chronological order as represented

in Graph: 2. Similarly descriptive analysis was also performed for the mean scores of the sub-domain of Quality of life for Mothers of children with cerebral palsy. In Mothers, Role limitation due to Physical health (RLPH) was found to have the least value of mean score in the hierarchical order followed by General health (GH), then by the mean scores of Role limitation due to Emotional problems (RLEP) and by the mean score of Energy/Fatigue (E/F) and Emotional well being (EWB) followed by mean scores of Physical health (PH) and Social functioning (SF) and the Pain (P) being the sub-domain of Quality of life with highest mean score in the increasing chronological order as represented in Graph 3.



Graph 2: Bar graph representing statistical analysis for the sub-domain of Quality of life in Fathers



Graph 3: Bar graph representing statistical analysis for the sub-domain of Quality of life in Mothers

Discussion and Conclusion

The discussion intends to explain the observation made and the results obtained through this study in the light of available scientific evidence. The present study was conducted on parents (mother and father) to find out which domain of health related quality of life is affected the most. About 60 parents (Fathers and Mothers) were taken in the study. For Fathers, Role limitation due to Emotional problem (RLEP) was found to have the least mean score in the hierarchical order followed by Role limitation due to physical health (RLPH), then by the mean scores of General health (GH) and Energy/Fatigue (E/F), followed by the mean scores of Emotional well being (EWB) and Social functioning (SF), the mean score of Physical function (PF) and then the Pain (p) was found to have highest mean score in the increasing chronological order. Similarly descriptive analysis was also performed for the mean scores of the sub-domain of Quality of life for Mothers of children with cerebral palsy. In Mothers, Role limitation due to Physical health (RLPH) was found to have the least value of mean score in the hierarchical order followed by General health (GH), then by the mean scores of Role limitation due to Emotional problems (RLEP) and by the mean score of Energy/Fatigue (E/F) and Emotional well being (EWB) followed by mean scores of Physical health (PH) and Social functioning (SF) and the Pain (P) being the sub-domain of Quality of life with highest mean score in the increasing chronological order.

Study was supported by Mona Khalil, Heba Elweshahy, Hayam Abdelghani et al who did a study on Quality of care provided to children with cerebral palsy in 2018 and found that a quality improvement plan is needed for the provision of care to children with cerebral palsy. Satisfaction was particularly low for waiting time, waiting area and availability of required facilities for their child's care¹¹.

Being Occupational therapist we have to work on above parameters to achieve better QOL in parents so that it give direct or indirect impact on child's health.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Observational study

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Effectiveness of Countermovement Jump and Drop Jump on Leg Muscle Power in Young College Athletes: A Comparative Study

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Abstract

Background and Purpose: Plyometric [PT] refers to performance of stretch-shortening cycle (SSC) movements that involve a high intensity eccentric contraction immediately after a rapid and powerful concentric contraction. PT have consistently been shown to improve the production of muscle force and power and enhancement of performance. Plyometric training includes in various type of jumps like Drop jump (DJ), countermovement jumps (CMJ), squat jump, alternate-leg bounding especially for lower body. Drop jump and countermovement jump are simple, practical and effective plyometric exercises. When done with proper technique and effort, both results in an increase in lower body power. So, it is important to know which exercises produce the greatest power output or what technique have must be used to induce changes in specific sport actions.

Objectives: The purpose of this study was to compare the effectiveness of countermovement jump and drop jump to improve leg muscle power.

Method: 30 subjects volunteered to participate. Written informed consent and institutional ethical clearance was obtained. Anthropometric measurements were obtained and subjects were assigned to one of two groups: Group A: DJ training group (n=15) and Group B: CMJ training group (n=15). They performed either DJ or CMJ training three days a week for 6 weeks. The training program included four sets of 5 repetitions DJ (from the height of a 12-inch box) or CMJ exercise. Standing Long Jump Test (SLJT) was used as outcome measure which was performed a day before and following the 6-week training period.

Results: Both the groups showed improvement in standing long jump test. The mean±SD of pre and post standing jump test of Group A was 68.63±16.64 and 77.80±14.19 respectively and Group B was 65.83±14.61 and 72.43±13.70 respectively. But the mean±SD difference between the group A and group B was 77.80±14.19 and 72.43±13.70 respectively.

Conclusion: The results showed there is significant improvement within Group A and Group B (p<0.01) but there is no significant improvement between both groups (p=0.150). Thus, the study concludes DJ and CMJ plyometric are worthwhile training activities for improving leg muscle power in young athletes.

Keywords: Plyometric, standing long jump, drop jump, countermovement jump.

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Introduction

Exercise is defined as some organized and regular activity that is done to enhance athletic performance which is divided into different categories based on athletic performance necessities. Plyometric exercises are among those various exercises which are used by athletes to improve their performance.^[1] Plyometric

training—jumping, bounding and hopping exercises that use the stretch shortening cycle of the muscle unit—have consistently been shown to improve the production of muscle force and power.^[2] Plyometrics [PT] refers to performance of stretch-shortening cycle (SSC) movements that involve a high intensity eccentric contraction immediately after a rapid and powerful concentric contraction.^[3] This process of the muscle lengthening followed by rapid shortening during the stretch-shortening cycle (SSC) is integral to plyometric exercise. The SSC process significantly enhances the ability of the muscle-tendon unit to produce maximal force in the shortest amount of time. These benefits have prompted the use of plyometric exercise as a bridge between strength and sport-related power and speed.^[4] Power is defined as an ability to do work per unit of time. Since it is the maximal force the muscle generates in the shortest possible time. It is equal to the muscular force or explosive power. This explosive power of the muscle can be improved using various exercise among which plyometrics is one of commonly used exercise and also Plyometric exercises are among those various exercises which are used by athletes to improve their performance.^[5] Numerous authors have described increased jump height, sprint time reduction, improved running economy and improved joint position sense and postural control as a result of LE plyometric training.^[6] Vertical jumping is a fundamental component of many sports and also may be predictive of performance in other sports in which it is not the primary component. The effects of PT on vertical jump performance have been widely researched and has been suggested that PT is more effective in improving vertical jump performance in the SSC jumps as it enhances the ability of subjects to use the elastic and neural benefits of the SSC.^[7,8] Sprinting velocity is important for sports requiring quick bursts of speed or repetitive change of direction. This is valuable for sports like soccer, handball, volleyball and tennis. Plyometric training of the LEs been shown to increase sprinting speed or velocity.^[9] Plyometric drills usually involve stopping, starting and changing directions in an explosive manner. These movements are components that can assist in developing agility. Agility is the ability to maintain or control body position while quickly changing direction during a series of movements. Agility training is thought to be a re-enforcement of motor programming through neuromuscular conditioning and neural adaptation of muscle spindles, Golgi-tendon organs and joint proprioceptors.^[10] Plyometrics has been frequently used for improving human neuromuscular function in

general as well as for improving performance in both explosive and endurance athletic events. Especially for lower body, plyometric training is a method to improve leg muscle power which include various type of jumps like countermovement jumps (CMJ), the drop jump, squat jump, hopping, alternate-leg bounding and stretch-shortening cycle. Several studies have been done on effect of various method of plyometric exercise on muscle power. Drop jump and countermovement jump are both plyometric exercises when done with proper technique and effort, both movements have positive effects on the stretch-shortening cycle and results in an increase in lower body power. So, it is important to know which exercises produce the greatest power output or what technique have must be used to induce changes in specific sport actions. Also, there is little known about quantifying drill intensity and optimal technique for effective plyometric training program. Therefore, the purpose of this study was to compare the effectiveness of countermovement jump and drop jump to improve leg muscle power.

Methodology

Total 30 subjects were recruited from R.V. College of Physiotherapy and R.V Institute of Management, Bengaluru. The investigator personally contacted the above mentioned two R.V institute authorities and obtained permission from the concerned authorities to conduct the study. Subsequently after obtaining the permission the investigator explained the details and purpose of the study to the subjects who were recruited as per the inclusion and exclusion criteria after obtaining informed consent from the subjects.

The inclusion criteria were:

- Athletes between the ages of 18-25 years.
- Subjects who were in any sports training.
- Subjects who were willing to participate and signed the informed consent.

The exclusion criteria were:

- Subjects with musculoskeletal injuries (knee pain, ankle sprain, etc.) were excluded.
- History with lower limb surgery (hip replacement, ACL reconstruction, etc.) and back surgery.
- Subjects who had already participated in similar kind of study.

Demographic data of the subjects were collected and recorded along with standing long jump test. All the tests were performed in the same order with identical equipment, positioning, and technique. The Pre-test was performed one day before the training period and post-test was performed 1 day after the training period. The study was conducted based on Purposive sampling and samples were divided into two groups – Group A and Group B i.e. each group consisting 15 sample each. The training sessions for Group A was drop jump and Group B was countermovement jump. All the subjects were instructed to practice training session for 6 weeks with 3 sessions per week along with 10 min warm-up which included jogging and static stretching before training session and 10 min cool down period which include static stretching. The subjects were monitored either through phone calls or in-personal to remind about their training session weekly once. The training session were as follows:

Group A: Drop Jump^[11,12] Each session began with 10-minutes warm followed by training session of drop jump and 5-minutes cool down. The subjects performed 4 sets of 5 repetitions with 30 seconds rest between the sets. The subjects stood on 12-inch height box and were instructed to step down from the box and land with two feet on the floor. Quickly after landing, they were instructed to jump as high as possible.

Group B: Countermovement Jump^[13,14] Each session began with 10-minutes warm followed by training session of countermovement jump and 5-minutes cool down. The subjects performed 4 sets of 5 repetitions with 30 seconds rest between the sets. The subject stood in upright position and execute a vertical jump after a downward countermovement, ensuring the knee is flexed to 90 degrees at the end of the countermovement. During the jump, the trunk remained as vertical as possible

Out Come Measure: Standing Long Jump Test

(SLJT) A common test for assessing lower body power output is the standing long jump (SLJ) test. The popularity of the SLJ is due to the fact that the SLJ is fairly easy to administer, can be used in various situations and is relatively cost free. Horizontally testing the athlete's SLJ can be done relatively anywhere with some type of measuring tape or yardstick and some chalk. The participant stood behind the starting line and has to push off vigorously and jump as far as possible. The participant has to land with the feet together and to stay upright. Jump distance will be measured from the takeoff line to the point where the back of the heel.^[15,16,19]

Statistical Analysis: Descriptive and inferential statistical analysis has been carried out in this present study. Unpaired t-test has been used to find the significance of the study parameters between two groups. While paired t-test has been used to find the significance of the study within the groups. Statistical software: The Statistical software namely SPSS 16.0 was used for the analysis of the data and Microsoft word and Excel have been used to generate tables.

Results

Table 1: Gender distribution of subjects

Gender	Group A	Group B	Total
Female	8(53%)	6(40%)	14(47%)
Male	7(47%)	9(60%)	16(53%)
Total	15(100%)	15(100%)	30(100%)

Table 2: Demographic characteristics between groups

Variables	Group A	Group B
Age	20.2±0.94	21.53±2.13
Weight (kg)	58.5±8.81	63.2±11.43
Height (cm)	167.47±8.21	166.4±7.29

Table 3: Pre-Post data for outcome variable within Group A

Variable	Pre-test	Post-test	difference	T value	P value
Standing long jump test	68.63±16.64	77.80±14.19	9.1667	6.260	<0.001

Table 4: Pre-Post data for outcome variable within Group B

Variable	Pre-test	Post-test	difference	T value	P value
Standing long jump test	65.83±14.61	72.43±13.70	6.60	7.207	<0.001

Table 5: Difference between the groups post measurement

Variable	Group A	Group B	T value	P value
Standing long jump test	77.80±14.19	72.43±13.70	1.053	.150

Discussion

As mentioned earlier, plyometric exercises involve various muscles in stretch shortening movement cycles. Therefore, with these exercises, the power benefit to the muscles is more than the simple shortening actions. The present study was designed to compare the effectiveness of 6-weeks plyometric drills (DJ Vs CMJ) on leg muscle power among young athletes. The main finding of this study suggested a positive effect of DJ and CMJ on leg muscle power among young athletes with no significance between the two statistically. PT with its effect of stretch shortening cycles in muscle bring about a positive change in muscle power and performance which is compatible with Nurper Ozbar et al who had done a similar study on 18 female soccer players using 8 weeks plyometric training and found a significant increase in leg muscle power.^[9] The plyometric training in the present study was carried on for 6 weeks. The 6- week straining duration was chosen as it would take minimum of this period for the neural and muscular adaptations to occur.^[17] A similar study done by Kelvin Thomas et al on effect of plyometric training on muscle power and agility in young soccer players and Fatemeh Horrins et al on comparison of 3 method of plyometric training on muscle power, both for 6 weeks, twice and thrice a week respectively showed increment in muscles power and agility at the end of the sessions which is in accordance to the present study.^[5] Nurper Ozbar et al on the other side found a similar increase in leg power and sport performance carrying out the training for 8 weeks (1 day per week). So, it can be concluded that extending training period for more than 6 weeks though shorter durations (once weekly) has no additional effect than following the same for 6 weeks which is supposed to be the ideal duration for neural and muscular adaptations. ^[9]In present study, both DJ and CMJ training increased the leg muscle power at the end of 6 week of plyometric training. The mean±SD of pre and post standing jump test of Group A was 68.63±16.64 and 77.80±14.19 respectively and Group B was 65.83±14.61 and 72.43±13.70 respectively. Though statistically, the difference seemed to be not significant between the groups, clinically subjects who were trained with DJ for 6 weeks, thrice weekly showed a better result during standing long jump

test than the one trained with CMJ for the same training period in contrast to the study by Timothy J. Suchomel et al on Comparison of static, countermovement and drop jumps of the upper and lower extremities in U. S junior national team male gymnasts. ^[18]The increase in jumping ability post training could be because of the neural and muscular adaptations. According to previous studies, neuromuscular factors such as increasing degree of muscular co-ordination, increasing inhibition of antagonist muscles and activation and cocontraction of synergists and motor unit functioning have showed to be important factors for increment in leg muscle power and performance following plyometric training.^[9] The result of the present study suggested a significant increase in leg muscle power as the p value within the group was $p < 0.001$. Several previous studies also found a positive effects of plyometric drills like depth jump, hurdle jump, squat jump, drop jump, CMJ, etc.^[2,5,9,17,18] But the effectiveness between the groups was found out to be statistically not significant suggesting both the forms of PT were of similar benefits when done among young athletes to increase leg muscle power.

Conclusion

The present study was intended to find out the effect of drop jump and countermovement jump and compare the effectiveness between them in improving leg muscle power in young college athletes. The results showed there is significant improvement within Group A and Group B ($p < 0.01$) but there is no significant improvement between both groups ($p = 0.150$). It indicates that both the forms of training were equally effective. Thus, the study concludes DJ and CMJ plyometric are worthwhile training activities for improving leg muscle power in young athletes

Limitation: Gender distribution were not equally proportionated, more intense follow-up, Control group was not allocated.

Further Recommendation: The sample size was small so further study is needed to be undertaken in larger sample size, Studies with longer duration and longer follow up for long term benefits are recommended,

Gender specificity can be recommended, Sensitivity and sophisticated outcome measures can be used.

Conflict of Interest: There was no personal or institutional conflict of interest for this study

Source of Funding: Self.

Ethical Clearance: Ethical clearance taken from R.V. College of Physiotherapy, Bengaluru

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Effect of Neuromuscular Electrical Stimulation Verses Electrical Stimulation On Gait Parameters in Subjects Having Plantar Fasciitis

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Abstract

Objective:

1. To investigate the effect of neuromuscular electrical stimulation verses electrical stimulation on gait parameters in subjects having plantar fasciitis
2. To investigate the ratio of the effect in both males and females.
3. To compare the effect of neuromuscular electrical stimulation verses electrical stimulation on gait parameters in subjects having plantar fasciitis

Method: Total 30 subjects were selected according to inclusion and exclusion criteria aged between 40 to 60 years. The outcome measures were foot and ankle ability measures scale, gait parameters - stride length, step length and cadence. The subjects were divided into two groups, group A was treated with Electrical Stimulation and group B with Neuromuscular Electrical Stimulation.

Result: The result was extremely significant within the group on foot and ankle ability measured scale and gait parameters post 4 weeks for Group A. The neuromuscular electrical stimulation on gait parameter in individual having plantar fasciitis there result was extremely significant ($p < 0.0001$) post 4 weeks for Group B. Between the group comparison: Post test there was significant difference between outcome variables in FAAM ($p < 0.001$) and gait parameters. Following are the p values which lead to analysis of improvement in stride length (0.0021), step length (0.0378) and cadence ($p < 0.001$). The result from the statistical analysis of present study support the null hypothesis is rejected which stated that there will be beneficial effect to the subject treated with neuromuscular stimulation than electrical stimulation

Conclusion: Based on the statistical results and interpretation it was concluded that Neuromuscular electrical stimulation showed reduction in pain and improvement in gait parameters in individual having plantar fasciitis. Both the groups showed significant results but, post intervention Neuromuscular electrical stimulation group showed extremely significant effect than the electrical stimulation group

Keywords: Neuromuscular electrical stimulation, electrical stimulation, foot and ankle ability measures scale (FAAM), gait parameters.

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Introduction

Plantar fasciitis is a non inflammatory degenerative syndrome of the plantar fascia resulting from frequent trauma at its origin on calcaneus¹. This condition may not be characterized by inflammation rather than non-inflammatory degenerative changes in the plantar fascia.² The plantar aponeurosis is compound ligamentous

structure that that comprise of neurovascular and muscular components.^{3,4} The plantar fascia originates and twine together with the superficial layer of intrinsic muscles that includes the abductor hallucis, flexor digitorumbrevis and abductor digitiminimi. In the second layer of intrinsic foot muscles, the quadrates plantae also shares its two heads of orogin with the plantar fascia on the inferiou surface of the calcaneus⁴

Plantar fasciitis is the most common cause of heal pain.^{5,6}Prevalence of plantar fasciitis has found to be 10% of the general population over the course of lifetime⁷. The condition is bilateral in one third of cases¹. Incidence reportedly peaks in people between age of 40-60 years⁸. The situation is thought to be multi-factorial in origin with factors such as obesity, decreased ankle joint range of motion, prolonged weight bearing and increase in age are suggested to be frequently involved.^{9,10} In some cases the patients typically report an insidious onset of pain which usually burning, stabbing, dull aching or sharpe in nature and is localized under the plantar surface of the heal.¹¹ It is mainly experienced upon weight bearing after a period of rest. This pain is most noticeable in morning with first few step and is often described as 'first step pain'.¹²Some patients is having severe pain that it results in an antalgic gait.¹

A few of the common interventions used for treatment of plantar fasciitis include calf muscle stretching, plantar fascia-specific stretching and foot orthosis. Therapeutic modalities, including phonophoresis, iontophoresis and electrical stimulation, have also been recommended as treatment interventions for plantar fasciitis. Although phonophoresis and iontophoresis are used to deliver localized anti-inflammatory medications, electrical stimulation has been proposed to enhance circulation of involved tissues to promote healing.^{13,14}

Studies have reported that the neuromuscular electrical stimulation and exercise has been reduced pain and gait pattern of the subject. There is not much evidence documented on neuromuscular electrical stimulation for individual having plantar fasciitis. This research was conducted to examine the effect of neuromuscular

electrical stimulation verses electrical stimulation on gait parameters in individual having plantar fasciitis.

Participants: 30 subjects diagnosed with plantar fasciitis, of age-group 40-60 yrs in Krishna college of physiotherapy had participated in this study. They were divided into two groups each group contain 15 subjects as per convenient sampling method. The pre-outcome measures were taken like foot ankle ability measure scale, gait parameters – stride length, step length, cadence. Pain assessment was done using the visual analogue scale (VAS) at rest and on activity. Specific exercise protocol was given to subjects which included neuromuscular electrical stimulation and electrical stimulation.

Method

Study Design: This study was Comparative study.

- **Subject Criteria:** Total 30 subjects were included, aged between 40 to 60 years, both males and female were diagnosed with plantar fasciitis selected in the study. The explanations about the study procedure were given. The outcome measures were foot and ankle ability measures scale, gait parameters- stride length, step length, cadence. The subjects who were not included in the study were Radiological Evidence Showing, Calcaneal spur, Any acute inflammation of ankle joint, Red flag to Physiotherapy, Prior surgery to distal tibia, fibula, ankle joint or rear foot region, Prior physiotherapy treatment for same complaint.
- **Outcome Measures:**
 - **Physical assessment¹⁶:** Gait parameters were taken to measure the following parameters- stride length, step length and cadence. For measures the length, foot prints were taken.
 - **Foot and ankle ability measures scale² (FAAM):** In this activities of daily living was assisted in 1- 5 numbering 1 has no difficulty and 5 has unable to do. In this 20 activities of daily living had taken to measure the score for the assessment.

Results

Data Analysis—within the group

Group A:

I. Foot and ankle ability measure scale (FAAM):

Table No. 1 Mean of group A foot and ankle ability measure

	Pre	Post	T values	P value
FAAM	58.26±3.515	33.4±1.957	23.470	<0.0001 (ES)

ES : Extremely Significant.

The pre interventional Foot and Ankle Ability Measures was 58.26±3.515 and post interventional was 37.3±3.889. The P value was <0.0001 which is statistically extremely significant (t=23.470) this shows improvement in Foot and Ankle Ability Measures.

Group B:

I. Foot and ankle ability measure scale (FAAM)

Table No. 2 Mean of group B foot and ankle ability measure

	Pre	Post	T values	P value
FAAM	56.4±4.595	28.7±2.374	25.190	<0.0001 (ES)

ES : Extremely Significant.

The pre interventional Foot and Ankle Ability Measures was 56.4±4.595 and post interventional was 28.7±2.374. The P value was <0.0001 which is statistically extremely significant (t=25.190) this shows improvement in Foot and Ankle Ability Measures.

Group A:

Table No. 3 Mean of group A gait parameters

Parameters	Stride length	Step Length	Cadence
Pre	52.8±2.569	27.33±1.633	77.06±2.492
Post	66.6±3.961	33.6±2.324	93.73±2.738
T value	13.410	16.883	20.316
P value	<0.0001 (ES)	<0.0001 (ES)	<0.0001 (ES)

ES: Extremely Significant

Group B:

Table No. 4 Mean of group B gait parameters

Parameters	Stride length	Step Length	Cadence
Pre	51.13±2.825	26.26±1.876	78.86±2.669
Post	71.66±4.220	35.4±2.197	99.13±2.200
T value	28.938	28.391	33.484
P value	<0.0001 (ES)	<0.0001 (ES)	<0.0001 (ES)

ES: Extremely Significant

• Data analysis between the group:

Foot and ankle ability measure scale (FAAM)

Table No. 5 mean of group A FAAM and group B FAAM

Parameters	Group A	Group B	T Value	P Value
FAAM	33.4±1.957	28.73±2.374	5.874	<0.0001 (ES)

ES: Extremely significant.

Statistically significant:

Physical assessment

Table No. 6 Mean of group A gait parameters and group B gait parameters

Parameters	Group A	Group B	T Value	P Value
Stride Length	66.6±3.961	28.73±2.374	5.874	0.0021(CVS)
Step Length	33,6±2.324	71.6±4.220	3.391	0.0378(CS)
Cadence	93.73±2.738	35.4±2,197	5.955	<0.0001 (ES)

CVS: Considered very significant, CS: Considered significant, ES: Extremely significant.

Statistically significant:

Discussion

The purpose of this study to investigate effect of neuromuscular electrical stimulation verses electrical stimulation on gait parameters in subjects having plantar fasciitis.

The objectives of this study were to investigate the effect of neuromuscular electrical stimulation verses electrical stimulation on gait parameters in subjects having plantar fasciitis, investigate the ratio of the effect in both males and females and compare the effect of neuromuscular electrical stimulation verses electrical stimulation on gait parameters in subjects having plantar fasciitis.

This project was done in six months of duration with sample size and age group 40-60 years. The subjects were taken randomly from Krishna college of physiotherapy. 30 subjects having plantar fasciitis were taken for the study and were divided into two groups. Group A was given electrical stimulation and group B was given neuromuscular electrical stimulation.

The following interpretations were noted:

1. According to score of foot and ankle ability measures scale subjects receiving Neuromuscular electrical stimulation showed improvement in score to subjects receiving electrical stimulation.
2. According to foot print for gait parameters like stride length, step length and cadence subjects receiving

neuromuscular electrical stimulation showed marked improvement in foot print compared to subjects receiving electrical stimulation.

The average mean age of participants in Group A was 47.33±4.70 and Group B was 47.06±4.68, which showed there is a no significant difference in age of subjects in both groups ($t = 0.1557$ & $p = 0.8774$) which was done by unpaired t-test. The total number of participant included over 30 out of which 14 were males and 16 were females. Group A contained 7 males and 8 females and Group B had 8 males and 7 females.

30 subjects clinically diagnosed with plantar fasciitis and fulfilling inclusion and exclusion criteria with age between 40 to 60 years were included in this study. They were allotted into two groups, Group A and Group B each containing 15 subject.

Electrical stimulation was given in Group A and neuromuscular electrical stimulation was given in Group B. The outcome was measured with foot and ankle ability measure scale and gait parameters are stride length, step length and cadence.

In group A the pre interventional Foot and Ankle Ability Measures was 58.26±3.515 and post interventional was 37.3±3.889. The P value was <0.0001 which is statistically extremely significant ($t=23.470$) this shows improvement in Foot and Ankle Ability Measures.

The physical assessment of gait parameters pre intervention of stride length was 52.8 ± 2.569 and post intervention was 66.6 ± 3.961 . The P value was <0.0001 which is statistically extremely significant ($t=13.410$) this shows improvement in stride length.

The physical assessment of gait parameters pre intervention of step length was 27.33 ± 1.633 and post intervention was 33.6 ± 2.324 . The P value was <0.0001 which is statistically extremely significant ($t=16.883$) this shows improvement in step length.

The physical assessment of gait parameters pre intervention of stride length was 77.06 ± 2.492 and post intervention 93.73 ± 2.738 was. The P value was <0.0001 which is statistically extremely significant ($t=20.316$) this shows improvement in cadence.

In group B The pre interventional Foot and Ankle Ability Measures was 56.4 ± 4.595 and post interventional was 28.7 ± 2.374 . The P value was <0.0001 which is statistically extremely significant ($t=25.190$) this shows improvement in Foot and Ankle Ability Measures.

The physical assessment of gait parameters pre intervention of stride length was 51.13 ± 2.825 and post intervention was 71.66 ± 4.220 . The P value was <0.0001 which is statistically extremely significant ($t=28.938$) this shows improvement in stride length.

The physical assessment of gait parameters pre intervention of step length was 26.26 ± 1.876 and post intervention was 35.4 ± 2.197 . The P value was <0.0001 which is statistically extremely significant ($t=28.391$) this shows improvement in step length.

The physical assessment of gait parameters pre intervention of cadence was 78.86 ± 2.669 and post intervention was 99.13 ± 2.200 . The P value was <0.0001 which is statistically extremely significant ($t=33.484$) this shows improvement in step length.

Paired t-test was used to analyze the effect of neuromuscular electrical stimulation verses electrical stimulation on gait parameters in subjects having plantar fasciitis.

There result was extremely significant for group A and group B.

Between the group comparison the unpaired t-test was used to analyze group A and group B post treatment values and there was significant difference between

outcome variables in in FAAM ($p=<0.001$) and gait parameters. Following are the p values which lead to analysis of improvement in stride length (0.0021), step length (0.0378) and cadence ($p=<0.001$).

Group A received electrical stimulation for plantar fascia. Group B received neuromuscular electrical stimulation for plantar fascia.

Paired t-test was used to analyze the effect of electrical stimulation on gait parameters in individual having plantar fasciitis. There result was extremely significant on foot and ankle ability measured scale and gait parameters post 4 weeks for Group A. The neuromuscular electrical stimulation on gait parameter in individual having plantar fasciitis there result was extremely significant (<0.0001) post 4 weeks for Group B.

Between the group comparison: Post test there was significant difference between outcome variables in FAAM ($p=<0.001$) and gait parameters. Following are the p values which lead to analysis of improvement in stride length (0.0021), step length (0.0378) and cadence ($p=<0.001$).

The result from the statistical analysis of present study support the null hypothesis is rejected which stated that there will be beneficial effect to the subject treated with neuromuscular stimulation than electrical stimulation.

Conclusion

Based on the statistical results and interpretation it was concluded that Neuromuscular electrical stimulation showed significant reduction in pain and improvement in gait parameters in individual having plantar fasciitis.

Both the groups showed significant results but, post intervention Neuromuscular electrical stimulation group showed extremely significant effect than the electrical stimulation group

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Conflicts of Interest: The authors declare that there are no conflicts of interest concerning the content of the present study.

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Ethical Clearance: the institutional ethics committee has given permission to initiate the research project entitled Effect Of Neuromuscular Electrical Stimulation Verses Electrical Stimulation On Gait Parameters In Subjects Having Plantar Fasciitis.

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Prevalence of Musculoskeletal Disorders in Small Scale Food Industry in Karad

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Abstract

Background: Musculoskeletal Disorders or MSDs are injuries and disorders that affect the human body's movement or musculoskeletal system (i.e. muscles, tendons, ligaments, nerves, discs, blood vessels, etc.). Work activities that involve heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions may contribute to the development of these problems. Industrial workers are more prone to develop musculoskeletal disorders.

Objectives: Objectives of the study were to the prevalence of common musculoskeletal disorders and survey among the workers.

To find out the severity of specific musculoskeletal disorders prevailing in the food industry in Karad.

Material and Method: In this observational study, 60 subjects were assessed using Visual analogue scale (VAS), Posture assessment and Nordic questionnaire.

Results: Statistical analysis of VAS were found to be extremely significant with a P value of <0.0001.

Conclusion: The current study concluded that there are chances of musculoskeletal disorders in small scale food industry workers. The musculoskeletal disorders which appears with maximum duration initiates with neck pain followed by low back pain and knee pain.

Keywords: Musculoskeletal disorders (MSD), small scale food industry, VAS, posture assessment and Nordic questionnaire.

Introduction

Generally in developing countries, small scale industries employ high percentage of workers as a substitute of automation. Such industries contribute to major economic growth to these countries. Usually, health

and safety initiatives for workers are less considerate in such industries. Most of the time workstations are not designed according to the principles of ergonomics, as a result number of Work Related Musculoskeletal Disorders (WMSDs) are generated among workers. WMSD's have a significant influence on both labour and industries all over the world.¹²

The SSIs are backbone for the growth of the country. This sector contributes about 40 percent of the gross industrial value added in the economy of India (MSME, 2014). The SSI sector produces more than 6,000 products including handloom products, carpets, soaps, pickles, auto and machine parts for Indian and foreign markets in most of the SSIs are labour intensive

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in which the use of traditionally designed hand tools and un-ergonomic work places result MSDs among workers. MSDs are the most common injuries related to poor ergonomics. If these injuries are taken lightly, these will progress to permanent problems.¹⁰

What is musculoskeletal disorders?

Musculoskeletal system—two components the muscular system and the skeletal system.

- Acute
- Chronic
- Conditions that involve the nerves, tendons, muscles and supporting structures of the body and compromise their function.

What is work related musculoskeletal disorders?

Work is the only identifiable cause.

Work contributes significantly as one of several causative factors.²

The definition applies to any disorder of the musculoskeletal system, i.e., the structures that make the body move, use its motor and prehensile abilities, or allow it to be kept in the different static positions – upright, seated and variants – which we call postures.⁶

MSD is therefore a general term used to describe a range of ailments connected with:

- **Sites:** Upper extremities (arm, hands and fingers), lower extremities (thighs, legs and feet), trunk or spinal column (including the neck), pelvic or thoracic girdles.
- **Tissues or organs:** Bone, tendon, joint (and components), nerve, vessel, etc.
- **Pathogenic mechanisms or causes:** mechanical (force, load, movement, vibration), organizational (speed, just-in-time, lean production), psychosocial (climate, culture, organizational relationships), etc.⁶

Musculoskeletal disorders (MSD) is a common health problem in the working population.⁸

Work activities that involve heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions may contribute to the development of these problems.⁵

This study was steered to find the prevalence of health related problems in rural industrial sectors.

Aim and Objectives:

Aim:

- To study the prevalence of musculoskeletal disorders in small scale food industry in Karad.

Objectives:

- To find the prevalence of common musculoskeletal disorders and survey among the workers.
- To find out the severity of specific musculoskeletal disorders prevailing in the food industry in Karad.

Materials and Methodology

- **Type of study-** Observation study
- **Study Design-** Survey
- **Place of Study-** Karad
- **Sample formula** – $n = 4pq/L^2$
- **Sample size** – 60
- **Sampling Method-** Simple random sampling
- **Study duration-** 3 months

Materials Required:

- Data collection sheet
- Assessment chart
- Pen
- Paper

Selection Criteria:

Inclusion Criteria:

- Both genders are included
- Age 30-50
- More than 5 years
- Suffering from Musculoskeletal disorders (Neck pain, Low back pain, Bicipital tendinitis, Knee pain, Plantar fasciitis).

Exclusion Criteria:

- Pregnant women
- New comers
- Physically fit workers
- Cardio-vascular diseases
- Other industrial workers

Outcome measures:

- **Visual Analogue Scale (VAS pain assessment)**
- **Posture assessment**
- **Nordic Questionnaire**

Procedure:

- As per the inclusion and exclusion criteria subjects will be requested to participate in the study.
- The nature of the study will be explained to the subjects and consent will be taken from subjects who were willing to participate.
- The data will be collected by using demographic data, VAS, Posture assessment and Nordic questionnaire.
- With the help of data we will come to know types of musculoskeletal disorders most of the subjects are suffering from in food industry.
- And awareness can be done to prevent that health problems.
- Thus the study will be concluded by statistical analysis of the outcome measures.

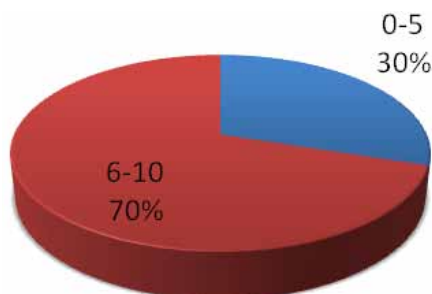
Findings:

1. Visual Analogue Scale

Table 1. VAS

VAS	Total
0-5	18
6-10	42
MeanSD	6.481.864
P value	<0.0001
Interference	Considered extremely significant

In this study, 18 subjects range between 0-5 VAS and 42 subjects range between 6-10 VAS with mean VAS 6.48. The interference of VAS is considered extremely significant with p value <0.0001.



Graph 1. VAS

In this graph, out of 100%, 30% subjects have pain ranged between 0-5 and remaining 70% have pain ranged between 6-10.

Result: The statistical analysis shows that there is significant difference with respect to mean value of VAS in small industrial food workers are 6.481.864 with p value <0.0001. Nordic questionnaire and postural assessment shows that low back, knees, neck and shoulder are more prone to musculoskeletal disorders.

Discussion

This project was done in 3 months with sample size 60.

This research was undertaken considering all the mentioned points and the aim to find out the prevalence of musculoskeletal disorders in small scale food industry in Karad.

Generally in developing countries, small scale industries employ high percentage of workers as a substitute of automation. Such industries contribute to major economic growth to these countries. Usually, health and safety initiatives for workers are less considerate in such industries. Most of the time workstations are not designed according to the principles of ergonomics, as a result number of Work Related Musculoskeletal Disorders (WMSDs) are generated among workers.¹²

Musculoskeletal disorders (MSD) is a common health problem in the working population.⁸ Work activities that involve heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions may contribute to the development of these problems.⁵

The study was carried out and the result was drawn by using VAS, postural assessment and Nordic questionnaire as the outcome measures. 60 subjects (27 Males and 33 Female) were undertaken for the study. The age group was between 30-50 years. Study place was Karad. Data collection sheet and consent form was taken. 30% subjects have pain ranged between 0-5 and remaining 70% have pain ranged between 6-10 with mean VAS 6.48. The interference of VAS is considered extremely significant with p value <0.0001. As per the postural assessment, 6 subjects neck were tilted and 24 subjects neck were forward. 11 subjects shoulders were elevated, 9 subjects shoulders were winged and 32 subjects shoulders were round. 9 subjects tx spine

were in kyphotic posture and 8 subjects tx spine were in scoliosis. 13 subjects lx spine were in lordosis and 10 subjects lx spine were flattened. As per the Nordic questionnaire, 38 subjects were having trouble in neck, 22 subjects in shoulder, 39 subjects in upper back, 13 subjects in wrist/hand, 42 subjects in low back, 9 subjects in hip/thigh, 32 subjects in knees and 11 subjects in ankles/feet had trouble during last 12 months. 11 subjects in neck, 5 subjects in shoulder, 17 subjects in upper back, 2 subjects in wrist/hand, 14 subjects in low back, 5 subjects in hip/thigh, 9 subjects in knees and 4 subjects in ankles/feet, during the last 12 months had been prevented from carrying out normal activities (e.g: jobs, housework, hobbies) because of trouble. 11 subjects in neck, 4 subjects in shoulder, 12 subjects in upper back, 6 subjects in wrist/hand, 23 subjects in low back, 7 subjects in hip/thigh, 17 subjects in knees and 9 subjects in ankles/feet, during the last 12 months had seen a physician for this condition. 22 subjects in neck, 12 subjects in shoulder, 18 subjects in upper back, 13 subjects in wrist/hand, 31 subjects in low back, 13 subjects in hip/thigh, 31 subjects in knees and 13 subjects in ankles/feet, during the last 7 days had trouble.

The result of this study shows that 14% subjects were having problem in neck, 8% subjects in shoulder, 12% subjects in upper back, 9% subjects in wrist/hand, 20% subjects in low back, 9% subjects in hip/thigh, 20% subjects in knees and remaining 8% subjects in ankles/feet. The musculoskeletal disorders in small scale food industry workers have developed mostly due to high ergonomic risk as they have poor working posture and improper handling techniques. Even low back pain, knee pain and neck pain increases with increased duration of work and with increased duration it leads to gradually increased complaints like shoulder pain, upper back pain, wrist/hand pain, hip/thigh pain and ankle/feet pain.

Therefore this study shows that there are maximum chances of musculoskeletal disorders in small scale food industry in Karad.

Conclusion

The study concluded that there are chances of musculoskeletal disorders in small scale food industry workers. The musculoskeletal disorders which appears with minimum duration initiates with neck pain followed by low back pain and knee pain. The musculoskeletal disorders which occurs after maximum duration of work are neck pain, low back pain, knee pain which increases

with increased duration of work and with increased duration it leads to gradually increased complaints like shoulder pain, upper back pain, wrist/hand pain, hip/thigh pain and ankle pain.

Conflict of Interest: There is no conflict of interest concerning the content of the study.

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Ethical Clearance: The study was approved by the institutional ethics committee of KIMSDU.

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Effectiveness of Home-based Physiotherapy on Functional Outcome among Stroke Participants in India

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Abstract

Background: Stroke is one of the leading causes of mortality and disability, especially physical impairments that significantly limits the activities of daily living (ADLs). Stroke survivors who eventually return home post discharge from hospital need to undergo a home-based rehabilitation as their needs cannot be met exclusively in the hospital. Thus, home based rehabilitation provides an alternative to hospital-based treatment and helps patients form a therapeutic connection to their activities of daily living. Therefore, this study was done to analyze the effects of home -based physiotherapy on ADL's in participants with stroke.

Material and Method: 119 stroke participants registered with Health care at Home from January 2018 to December 2018 were included in the main analysis who received average 66.6 number of physiotherapy sessions in the form of exercise therapy, approximately for 45-60 minutes. The Barthel Index (BI) scores as a functional outcome were recorded fortnightly.

Findings: The study demonstrated that the home-based physiotherapy program significantly improved functional outcome in stroke participants.

Conclusion: Based on the analysis, it is concluded that home-based physiotherapy improves functional outcomes in terms of activities of daily living of stroke participants. Study also revealed some initial insights on the stroke cases that did not show considerable improvement.

Keywords: Stroke, Barthel Index, Home-Based Physiotherapy.

Introduction

Stroke is one of India's leading causes for death and disability.¹ The cumulative incidence of stroke in India ranged from 105 to 152/100,000 people per year in different parts of the country over the last two decades.²

Stroke most commonly results into motor impairment, which usually affects the control of movement of the face, arm, or leg of one side of the body in approximately 80 percent of patients of varying degrees.³ Motor dysfunction can impair the patient's ability to perform daily activities and develop a state of dependency. Further disability will bring patient into decreased social participation/function.⁴

The most important treatment for people with stroke is well organized dedicated care, which enables well-

coordinated assessment, goal setting, intervention and reassessment, which focuses largely on the reduction of impairment and stroke-related disability.⁵ Stroke recovery is heterogeneous and dynamic and is likely to occur through a combination of spontaneous and learning-dependent mechanisms.⁶

Home care not only meets the standard of hospital care, but also offers patients the added benefit of comfort at home. Moreover, care is being delivered in a real-life scenario so patients can adapt to their limitations.^{7,8}

Pandian JD et.al reported that approximately 35 stroke units were available mainly in private sector hospitals in cities in India till the year 2013.¹ Very few centers have established in-hospital and out-patient rehabilitation centers in the country. Even though proper

stroke unit and rehabilitation facilities may meet medical, physical and psychosocial needs during the early post-stroke stage, the long-term requisites of patients and families cannot be addressed merely in the hospital.^{9,10}

Advocates for early-supported discharge and home-based stroke recovery, centered on a structured stroke unit model of treatment claim that it provides many advantages: accommodating patient choice; mitigating complications associated with inpatient care through decreases in length of hospital stay; optimizing rehabilitation, as the home environment is more focused on rational objectives; social inclusion; and a supportive environment.^{11, 12}

Keeping in mind that the standardized home care physiotherapy services is an evolving model of care in India that can help bridge the gap in accessibility and possibly meet the functional rehabilitation needs of stroke survivors, this study was therefore conducted to analyze the effectiveness of home-based physiotherapy on functional outcomes in terms of activities of daily living among stroke participants in India.

Material and Method

Out of 181 individuals with stroke receiving Healthcare at Home physiotherapy services across various locations in India from January 2018 to December 2018, 119 individuals (76 males and 43 females) who consented with mean age (65±13 years) were included in the study. 62 participants were excluded from this study as 13 dropped during the sessions within a week, in 35 cases outcome data were missing and 13 participants started with other treatments.

Individuals who had bilateral affection, took self-discharge within one week of physiotherapy were excluded from the study. Before starting treatment, the concerns and expectations of the participants had been clearly understood and the SMART goals were set individually by consensus, which was documented as part of standard process at health care at home.

All physiotherapists were trained on skills and techniques required to manage participants with stroke. Individual care plans were designed for all patients which were reviewed and modified as per change in the patient's condition by the physiotherapists.

The study was conducted in agreement with the principles of the Helsinki Declaration of 1975, as revised in 1996.

To analyze the impact of home-based physiotherapy on functional independence, the Barthel Index (BI) score as a functional outcome was taken at the time of initial assessment and reviewed fortnightly.

In the present study BI scale of 10 tasks that describe ADL and mobility, scoring zero to 100 with five-point increments was used.^{13,14} Total BI score of 0 to 20 indicates total dependence, severe dependence of 21 to 60, moderate dependence of 61 to 90 and mild dependence of 91 to 99, a score of 100 indicates that the patient is free from any assistance from others.¹⁵

Studies have reported minimal clinically important difference (MCID) with an average improvement in BI score of 1.85-2 points and a minimal detectable change (MDC) in BI of 4.02 in stroke.^{16,17,18}

All outcomes were recorded in the registered platform Patient Care System (PCS). Each patient received 45-60 minutes of individually supervised physiotherapy session at home.

Physiotherapist had decided the duration of treatment and the frequency of treatment, depending on the severity of the patient's condition. The average duration of treatment cycle was 83±74 days (mean number of sessions delivered, 67±69).

The goals of the treatment were to reduce complications, restore function and provide patients with strategies to overcome their condition and their immediate environment. The interventions aimed to normalize the postural tone, enabling the mobility of the patient in bed, helping the patient in transfers, improve balance and allow the patient to walk with or without assistive equipment.

Care giver and family members were explained about the condition, its outcomes, precautions, risks involved as well as about the home exercise program. Progression in the exercise program was done basis the patient's performance and feedback during the sessions.

Data were analyzed using the Wilcoxon signed rank test and the average change in BI before and after the intervention was observed. The significance level α was set at 0.05.

Findings: After implementing home - based physiotherapy program, the mean BI score significantly improved from 37.07±28.64 to 54.21±30.00 ($p<0.05$) (Table 1).

Table 1: Count of participants, mean age, mean number of sessions, mean number days of service, initial and final mean values of BI with mean improvement

	Number of participants	Mean Age	Mean number of sessions	Mean number of days of service	Mean Initial BI Score±SD	Mean Final BI score ±SD	Mean BI Improvement ±SD
Total	119	65	67±69	83±74	37.07±28.64	54.21±30.00	17.14±20.00*
Male	76	65	58±57	75±67	39.4±30.7	55.1±32.0	17.12±20.09*
Female	43	64	82±84	98±83	33.0±24.3	52.6±26.3	18.21±20.14*

BI: Barthel Index, *Significant difference at P<0.05

Statistically significant differences (p<0.05) between the initial and final mean BI values among different age groups (less than 50, 50-65, more than 65 years) were

also observed, with highest improvement in individuals with stroke of 50-65 years age group (43.13±29.52 to 62.74±28.75) (Table 2).

Table 2: Age wise improvement with initial and final mean BI values.

Age Wise Improvement	Number of participants	Mean number of sessions	Mean Number of days of service	Mean	Age Wise Improvement
<50	11	54	69	54.73±19.05	68.82±19.9*
50-65	47	68	86	43.13±29.52	62.74±28.7*
>65	61	66	82	29.21±27.13	45.00±29.8*

BI: Barthel Index, *Significant difference at P<0.05.

Further, the BI scores showed significant improvement (p<0.05) basis the level of dependence with

highest improvement was observed in total dependence BI group.

Table 3: BI scores basis the level of dependence with initial and final mean BI and mean BI improvement.

Interpretation	Number of participants	Mean number of sessions	Mean initial BI Score±SD	Mean final BI score±SD	Mean BI improvement±SD
0-20 (Total dependence)	46	87	8.17±7.05	30.54±24.20	22.37±22.2*
21-60 (severe dependence)	50	58	43.46±11.48	61.70±22.67	18.24±19.0*
61-90 (Moderate dependence)	18	51	75.94±8.55	81.33±12.49	5.39±10.71*
91-99 (slight dependence)	1	11	95.00±0.00	97.00±0.00	2.00±0.00*
100 (independent)	4	26	100.00±0.00	100.00±0.00	0.00±0.00

BI: Barthel Index, *Significant difference at P<0.05.

Discussion

The present study reflected that individuals with stroke improved on activities of daily living after home based physiotherapy. The mean BI scores improved by 17 which is higher than what MCID and MDC reported in previous studies.¹⁶⁻¹⁷

The findings were in accordance with the results of other studies that found that interventions designed

to reduce spasticity, strengthen muscles and train individuals with stroke on a normal pattern of movement will help to improve physical function and restore activities of daily living.¹⁸

Family support, the home environment of rehabilitation, an individually designed treatment plan and close follow-up have been considered to be the key factors in facilitating functional improvement.¹⁹⁻²²

Literature suggests that home-based physiotherapy in a controlled environment enable the individuals with stroke to perform the daily routine activities effectively.²³⁻²⁵

Previous studies²⁶⁻²⁸ have shown that home rehabilitation programs after stroke provide significantly better outcomes in terms of physical function and reduced disability than other conventional care programs offered in various settings.

Remedios Lopez-Liria et al. conducted a follow up study comparing two post stroke rehabilitation programs among primary versus specialized health care and the results showed average improvement of BI score of 37.17 in the home-based rehabilitation group and 22.35 in the hospital group. Patients in the home-based rehabilitation group showed more improvement in BI score as they had received physiotherapy within the first week after stroke and were treated by a multidisciplinary team.²⁹

In a study done by Rune Skovgaard Rasmussen et al. it was concluded that 20-70 minutes of daily home-based exercise session for a month post discharge from hospital increased modified Barthel index scores from 75 to 99 which were taken 90 days post stroke.³⁰

Our study also revealed some valuable insights that 23% of stroke participants were unable to show functional improvement following home-based physiotherapy due to recurrence of stroke, self-discharge prior to completion of recommended physiotherapy sessions, multiple co-morbidities, infection, long standing stroke and severe stroke.

In addition, functional status was declined among 3% stroke participants because of disability resulted from 10 years old stroke, no co-operation and lack of confidence towards improvement with the help of physiotherapy. Out of total 119 participants included in this study, 71% had shown average improvement in BI score of 24.

The present study had few limitations, such as prognosis were not differentiated on the basis of ischemic or hemorrhagic stroke. Impact of comorbidities on post stroke recovery was also not evaluated. We also could not track the long-term outcome of home -based physiotherapy.

Future research should focus on measuring quality of life from the perspective of subsequent studies that track the overall impact of home physiotherapy services for stroke participants.

Conclusion

In conclusion, goal oriented home-based physiotherapy with consistent monitoring of outcomes led to significant improvement in functional outcome in participants with stroke.

The result of present study can be used as guide and may provide direction for organizations providing home-based physiotherapy care in India. Large scale studies are needed to support our findings and long-term follow-up is required for further analysis.

Conflict of Interest: The authors declare that they have no financial or non-financial conflict of interest.

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Ethical Clearance: Ethical clearance was not required in this study.

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The Effect of Visual Feedback Assisted Bicycle Ergometry in Improving Functional Activities of Lower Extremity among Post Stroke Patients-Quasi Experimental Study

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Abstract

Objective: The most common and widely recognised impairment caused by stroke is motor impairment. Motor impairments of lower limb limits the patient's ability in standing and walking. The motor recovery of the lower limb can be enhanced by repetitive training at the early phase of rehabilitation. The aim of this study is to find out the effect of visual feedback assisted cycle ergometry training in improving the lower extremity function among post hemiparetic stroke patients.

Study Design: Two groups pre test and post test Quasi experimental study design.

Subjects: 30 patients of age group between 40-70 years who had a first stroke were randomly assigned into two groups, experimental cycling (N=10) group and conventional physiotherapy (N=10) group.

Interventions: Patients of two groups received conventional physiotherapy training for 50-60 minutes a day. Additionally experimental group patients received 30 minutes of leg cycling training.

Outcome Measures: The motor function of the lower extremity was assessed by the Fugl-Meyer Assessment. dynamic standing balance was assessed by Step test and the functional ability was assessed by functional ambulation category scale.

Results: In the with in-group comparison, both the cycling group and the conventional therapy group had improved significantly with respect to Fuglmeier lower extremity score, step test score and functional ambulation category score. In between group comparison, experimental cycling group patients demonstrating better performance in both Fuglmeier lower extremity score, step test score and functional ambulation category scale than the conventional therapy group patients.

Conclusion: This study shows that there is a significant improvement in lower limb function among the experimental group patients after an early short duration of cycling training.

Keywords: *Stroke, conventional physiotherapy, MOTO-med bicycle ergometry, fuglmeier motor assessment scale, steptest, functional ambulation category scale.*

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Introduction

Stroke is defined as a rapidly developing clinical signs of focal or global disturbances of cerebral blood function with symptoms lasting for 24 hours or longer or leading to death, with no apparent cause other than vascular origin- WHO.

The incidence of stroke increases dramatically

with age, doubling after every decade after 55. India is witnessing a stroke epidemic silently. By 2020, India will report about 1.9 million cases of stroke per year, at least one-third of whom will be disabled.

Stroke is a major health problem not only because it is the third major cause of death but also because it leaves patients with several residual disabilities like physical dependence, cognitive decline, dementia, depression and seizures. The costs involved in caring for these patients are enormous and it creates adverse social implications²

Individuals with hemiparesis following a stroke will often have difficulty in bearing weight or “loading” the paretic lower extremity and transferring weight from one leg to the other. As a result, these individuals commonly shows asymmetry during sitting and standing activities and during walking, with a greater amount of body weight distributed on the unaffected lower extremity than on the affected lower extremity.

The motor recovery after the stroke occurs depending on the severity of the lesion and rehabilitative training. Several studies have revealed that motor experience plays a vital role in the subsequent physiological reorganization occurring in the intact tissues adjacent to the lesion. Clinical studies on central motor neuroplasticity support the role of goal-oriented, active, repetitive movements in the training of the paretic limb to enhance motor relearning and recovery³.

The recovery of standing and walking ability is considered the most important objective of the lower limb rehabilitation of individuals after stroke³.

Cycling and walking share a similar kinematic pattern. Both tasks are cyclical, require reciprocal flexion and extension movements of hip, knee and ankle and have an alternating activation of agonist/antagonist muscles in a well-timed and coordinated manner^{14,15}. The cycling provides the mechanical coupling between the two legs helps the stroke patients to pedal cyclically so that a steady pattern of excitation emerge in the affected limb⁹. Furthermore, cycling avoids problems of balance and can be safely performed even from a wheelchair, without requiring support from any robotic devices or the constant supervision of a therapist. Though cycling leg exercise is not exactly like walking, the task of maintaining a simplified locomotor pattern and learning to shift weight between affected and unaffected extremities is task oriented. For all these reasons,

leg cycling training is a safer and more economic intervention to give functional ambulation training after stroke and it is also becoming an interesting option for home rehabilitation³.

In this study the cycling leg training is given using MOTO-med bicycle ergometer which is with visual feedback. In MOTO-med the motion given are from passive motion to assistive motion to active training. Irrespective of the mode of motion, the MOTO-med allows a very great number of repetitions. Greater numbers of repetitions are considered to be effective concerning the use of the central nervous system’s plasticity⁶. Also the resistance offered by the MOTO-med cycle ergometer may increase the muscle strength. As MOTO-med provides visual feedback about symmetry in weight transfer from one leg to other while pedalling, patient by himself can correct the asymmetry if occurs. This training using visual feedback will reduce the non-use of affected lower extremity and make the patient to use his paretic leg.

Need for the Study: Loss of movement is the common consequence of stroke for which a wide range of interventions has been developed. Recovery of stroke depends highly on the area of brain involved and also the nature of rehabilitation. Recently many studies suggested that earlier rehabilitation will soon recover the patient’s functional status. Therefore, much of the focus of stroke rehabilitation and in particular the work of physiotherapists and occupational therapists, is on the recovery of impaired movement and the associated functions. There seems to be a direct relation between motor impairment and function; for example, independence in walking (function) has been correlated with lower-limb strength (impairment). Therefore, the ultimate goal of therapy for lower-limb motor impairment is to improve the function of walking and recovery of movement. In stroke rehabilitation motor activity of lower limb possess an important component of regaining gait and expanding activities of daily living. Recently the duration of hospital stay is getting reduced because of increased medical expense. So it is essential to find out the techniques that will complement the present conventional therapy to enhance the post stroke motor recovery in potential way. An exercise that has been considered suitable for hemiparetic stroke is pedaling on a cycle ergometer with variable limb loading. Short-term changes in muscle coordination in the paretic leg have been demonstrated after a single session of ergometer cycling. In addition, functional improvements have been

reported in balance and walking ability following longer-term cycling exercise. Cycling training will provide the large number of repetitions which is predicted to fasten the cortical re-organization and functional recovery of the patient after the episode of stroke. To find a more effective treatment protocol for post middle cerebral artery stroke patient to improve their motor function. Therefore in this study the training using activity based programme (with bicycle ergometer) is been selected to compare it with the regular conventional therapy and to achieve maximum lower extremity function of hemiparetic patient following repetitive bilateral leg training as much as possible at the earliest.

Methodology

Study Design: Quasi-Experimental Pre-Post test control group design.

Sampling Technique: Purposive sampling

Sample Size: 30 patients satisfying the criteria were selected. They were divided into 2 groups.

Group A: Visual feedback assisted bicycle ergometry training group (15 patients)

Group B: Conventional therapy group (15 patients)

Inclusion Criteria:

- Age group 45-70 years of age
- First time unilateral stroke
- Less than or equal to 4 weeks of MCA stroke
- Ischaemic stroke
- Patients with stable cardiovascular parameter.
- Both males and females
- Co-operative patients (able to follow commands)
- Able to initiate the movement (FMA Score between 18-24)
- Patients with mini mental score > 24
- Right or left hemiparesis.

Exclusion Criteria:

- Chronic stroke
- ACA and PCA territory Stroke
- Bilateral lesion
- Hemorrhagic stroke

- Visually impaired patients
- Recurrent stroke
- Severe joint deformities
- Rheumatoid arthritis
- Recent fractures
- Any other neurological problems
- Cognitive and mental impairment
- Non co-operative patients
- Recent cardiac problems and unstable cardiac parameters

Treatment Procedure: Totally 20 patients who satisfied the criteria were selected and allocated randomly into two groups with 10 in each group, experimental group and conventional therapy group. The patients were examined before and after the treatment. They were given assigned treatment for the study duration.

Treatment Duration: 15 sessions were given after the pretest assessment.

- Group A received one hour of conventional physiotherapy followed by 30 minutes of cycle ergometry training consist of forward and backward p
- Group B received one hour of conventional physiotherapy alone

Conventional Physiotherapy: Conventional physiotherapy includes Active assisted exercises to all affected joints, manual stretching, bed mobility exercises, Balance training exercises (both in sitting and standing), Co-ordination exercises (both equilibrium and non-equilibrium exercises) and Gait training exercises.

Bicycle Ergometry Training:

In the cycle ergometry, Based on the initial cycling performance, each patient have been assigned with an individual exercise programme. The patient was advised to use the affected extremity for pedaling. Symmetry of limb usage being displayed in the monitor, it gives the visual feedback to the patient to perform efficiently and the exercise will be stopped if the patient reports fatigue or discomfort in the affected extremity.

Pulse rate and blood pressure measurements was continuously monitored for any adverse cardio vascular reaction during the exercise period.

Cycle ergometry training consist of 2 sets of exercising in each session, the duration of each set is 15 minutes with intermittent rest period of 5 minutes between the sets.

Set 1: Forward pedaling alone with 0 resistance and gradual increase in resistance based on patients ability.

Set 2: Backward pedaling alone with 0 resistance and gradual increase in resistance based on patients ability.

Each session consist of 30 minutes, totally 15 sessions was given.

Outcome Measure:

- The lower extremity section of the Fugl-Meyer assessment of motor recovery after stroke.
- Step test (a dynamic balance test)
- Functional ambulation category scale.

Statistical Analysis: Pre-test and Post-test values of the study were collected and assessed for variation in improvement & their results were analyzed using Independent ‘t’ test and Paired ‘t’ test,

Table 1: Paired t Test result for all three outcome measures

Scale	Groups	Mean Values		Calculated ‘t’ Value	Table ‘t’ Value	Level of Significance
		Pre Test	Post Test			
Fugl Meyer Lower Extremity Scale	A	20.1	30	11.1802	1.8331	0.05
Fugl Meyer Lower Extremity Scale	B	19.6	25.4	6.3010	1.8331	0.05
Step Test Score (Unaffected As Standing Leg)	A	1.8	5.1	19.6061	1.8331	0.05
Step Test Score (Unaffected As Standing Leg)	B	1.9	3.1	10.0000	1.8331	0.05
Step Test Score (Affected As Standing Leg)	A	0.9	3.1	8.8196	1.8331	0.05
Step Test Score (Affected As Standing Leg)	B	0.9	1.5	2.2942	1.8331	0.05
Functional Ambulation Category Scale	A	0.8	3	10.5393	1.8331	0.05
Functional Ambulation Category Scale	B	0.7	2.1	5.9648	1.8331	0.05

Table 2: Independent t Test

Scale	Pre Test/ Post Test	Mean Values		Calculated ‘t’ Value	Table ‘t’ Value	Level of Significance
		Group A	Group B			
Fugl Meyer Lower Extremity Scale	Pre Test	20.1	19.6	0.3597	1.734	0.05
Fugl Meyer Lower Extremity Scale	Post Test	30	25.4	2.8328	1.734	0.05
Step Test Score (Unaffected As Standing Leg)	Pre Test	1.8	1.9	0.1855	1.734	0.05
Step Test Score (Unaffected As Standing Leg)	Post Test	5.1	3.1	3.9380	1.734	0.05
Step Test Score (Affected As Standing Leg)	Pre Test	0.9	0.9	0.0319	1.734	0.05
Step Test Score (Affected As Standing Leg)	Post Test	3.1	1.5	5.5668	1.734	0.05
Functional Ambulation Category Scale	Pre Test	0.8	0.7	0.6306	1.734	0.05
Functional Ambulation Category Scale	Post Test	3	2.1	2.0672	1.734	0.05

Discussion

Repetitive bilateral leg training is an effective method for improving lower extremity motor function in hemiparetic middle cerebral artery stroke patients. The cycling treatment has been given only half an hour a day but still the patients treated with cycle ergometer have shown better improvement than the patients treated

only with conventional therapy. After the stroke, the physiotherapy given by the therapists as well as the self directed exercises is short, therefore the cycling will be an effective treatment. In additional when it is given earlier at the acute stage, it helps the patient in reducing his disabilities and regain his functional activities as soon as possible. The intensity of the treatment after the stroke

also contribute to the earlier recovery of the patients regarding his functional abilities. In data analysis, all the post test scores shows significant improvement in all three scales in both the groups but very effectively in Group A. The Calculated 't' value is greater than table 't' value, rejecting the null hypothesis shows there was a better improvement in Group A patients lower limb activities assessed with fuglmeier lower extremity scale, step test and functional ambulation category scale Comparing to Group B patients

Summary and Conclusion

Results have shown that the lower limb functional activities was improved statistically in bicycle ergometry group than the conventional therapy group. It has been shown to improve lower extremity motor functions and the patients find the method relatively easy to perform. So bilateral training can be considered as an effective method for home or clinical based rehabilitation of stroke patients.

Limitations:

1. Sample size was small.
2. Study assessed only the short term progress of the patient and no follow-ups have been done.
3. Lesion side was not considered.
4. Only middle cerebral artery territory stroke was taken.
5. First time stroke patients only were taken.
6. Only subjects were selected between the age groups 45 – 70 years.
7. Only ischaemic type hemiparetic stroke patients have been included in this study.
8. In this study no detailed gait assessment was taken.

Suggestions:

1. Larger sample size can be used.
2. Further carry over and transfer of training can be assessed.
3. Treatment technique can also be studied in other types of stroke and considering the lesion side.
4. Follow up can be done.
5. Further studies can be done with detailed gait assessment.

6. Study can also be done with younger stroke patients with age group less than 45 years

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Conflict of Interest: Nil

Ethical Clearance: Got consent form signed from patients.

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Immediate Effect of Dynamic Cupping on Pain in Teachers with Mechanical Neck Pain: An Experimental Study

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Abstract

Background: Mechanical neck pain occurs due to prolonged loading on neck, poor posture, stress and changes in connective tissues. Cupping therapy is ancient medical treatment, which use suction on skin. Dynamic cupping gives combine effect of cupping and massage. Which relive muscle tension by increasing microcirculation.

Aim: To find immediate Effect of dynamic cupping on pain in teachers with mechanical neck pain.

Material and Method: 40 male and female teachers with mechanical neck pain were included in the study and treated with dynamic cupping. Numeric Pain Rating Scale and Pain Pressure Threshold were taken for pain intensity Measurement.

Result: Paired t test was used for Intra group analysis. Significant difference was observed in pain intensity bychanges in score of in Numeric Pain Rating Scale and Pain Pressure Threshold ($p < 0.05$) immediately and after 280 minutes of treatment.

Conclusion: Hence, we conclude that there is a significant reduction in pain after the treatment with dynamic cupping in teachers with mechanical neck pain. So, dynamic cupping can be used clinically in patients with mechanical neck pain.

Keywords: *Mechanical Neck Pain, Teachers, Cupping Therapy, Dynamic cupping, Pain Pressure Threshold (PPT), Numeric Pain Rating Scale (NPRS).*

Introduction

International association of pain define neck pain as a pain arising from anywhere from superiorly through nuchal line to inferiorly by first thoracic vertebra and laterally up to shoulder¹. Its prevalence in general population is up to 50% and in teachers up to 56.8%².

Neck pain can arise due to some pathology including different type of infection, fracture and degeneration. Among this majority of people suffering from mechanical neck pain because of poor posture and prolonged loading on neck, stress and changes in connective tissues³.

As well as pain between occiput, thoracic vertebrae and shoulder is also considering as a neck pain.⁴ alteration of activity of cervical extensor muscles like splenius capitis, trapezius⁵ and trigger point in head, neck and shoulder⁶ play relevant role in patients with mechanical neck pain⁶.

There are intrinsic (i.e., concurrent medical or psychosocial factors) and extrinsic factors (i.e., occupational, ergonomic, or medico legal issues) that

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affects the neck pain. Lack of knowledge about neck pain is an important issue⁷.

Cervical region is more mobile than thoracic and lumbar and also bear less weight. Load on cervical region is depends on position of head and body. When we awake or asleep neck moves 600 times in all movements of flexion, extension, rotation. Alteration in this normal rhythm cause biomechanical changes in neck region⁸.

There are many therapies are available to treat the neck pain like Myofascial Release, Muscle Energy Technique, massage, dry needling, Cupping, mobilization etc. From last few years there is growing evidences of cupping therapy in neck pain³.

There are 10 types of different cupping method viz.¹⁰ Weak/light cupping, Medium cupping, Strong cupping, moving cupping, Needle cupping, Moxa/hot needle cupping, Empty/flash cupping, Full/bleeding cupping, Herbal cupping and Water cupping.

Before years suction was creating by flame placing into cup, after few second it will heat the air than removed the flame and quickly apply the cup on skin. So, that the skin is drawn into cup by negative pressure and the cup was made up of glasses they also used bamboo, horn, brass etc. Now a day's suction will be creating by hand pump, electrical pump or soft silicon pump⁸.

In Ayurveda also mention use of cupping therapy by AcharayaSushruta named as a raktmohana in 'Pradhanakarma', it implies on blood refine from blood stream^{11, 12}. The main aim of this therapy is elimination of vitiated blood from the body.

Thought of act of cupping is mainly by increase blood circulation and relive painful muscle tension.

There are growing evidences of cupping therapy for decreasing pain and increasing pain pressure threshold. Few studies show long lasting effects of dynamic cupping in various conditions. But there is lack of evidence for its immediate and short term effect. So, here need of the study is to find out post immediate effect and effect after 280 minutes of dynamic cupping on pain & PPT in teachers with mechanical neck pain.

Material and Method

- **Study design:** A Pre post experimental study

- **Study setting:** Varies Schools of Savarkundla, Dist: Amreli
- **Study duration:** 6 months
- **Sampling technique:** Purposive sampling
- **Study population:** School Teachers
- **Sample size:** 40
- **Inclusion Criteria**^{13,34}:
 1. Teachers of age between 30-60 years,
 2. Neck pain according to Van schalkuyk & parkinsmith's criteria for mechanical neck pain since at least previous 3 months.
 3. Average neck pain intensity had to be 4 points or more on a 0-10NPRS.
 4. Teachers who had more than 5 years of experience.
- **Exclusion Criteria**¹³:
 1. Having conditions other than mechanical neck pain.
 2. Patient who is not willing to participate.

Procedure: Ethical clearance for the study was obtained from the ethics committee Approved by CDSO, School Of Physiotherapy, RK University, Rajkot and CTIRI registration was done for the proposed research. A written informed consent of all the subjects was taken prior to the study.

Those who fulfilled the inclusion and exclusion criteria were taken up for the study. The whole procedure of the study was explained to all the subjects. Prior to treatment both outcome measures, Numerical pain rating scale³⁵ and Pressure pain sensitivity³³ were measured. And after immediately and after 280 minutes of treatment, again assessment was taken for these subjects.

Intervention: Patient was lied prone on couch with their upper torso unclothed, covered with massage oil than placed cup on skin and suction was created by pump. Than drawn over skin along the spine from cervical to thoracic up to lateral border maintain the suction within skin throughout the procedure. The cup massage was conducted for approximately 3–5 minutes. Patients were informed that the treatment area may become patchy and there are chances of ecchymosis on the same area.



Findings: The present study was carried out to find out immediately and after 280 minutes effect of dynamic cupping on pain in teachers with mechanical neck pain. Data was analyzed using SPSS software version 21 and Microsoft excel. Before applying statistical tests data was screened for normal distribution. All the outcome measures were analyzed at baseline and after immediate of treatment and after 280 minutes of treatment. Intra group analysis was done for all the outcome measures.

Table 1: Intra group analysis for Numeric Pain Rating Scale

	Mean	SD	p- value
Pre	6.30	1.11	0.00
Post immediate	4.08	0.85	0.00
Post 280 minutes	1.90	1.17	0.00

Table 2: Intra group analysis for Pain Pressure Threshold

	Mean	SD	P- value
Pre	7.83	1.11	0.00
Post immediate	1.65	1.7	0.00
Post 280 minutes	12.24	2.61	0.00

Here, the intra group analysis of NPRS and PPT was done by using **paired ‘t’ test**. Where the **‘p’ value is < 0.05**. Hence Null Hypothesis H_0 is rejected. So, both outcomes are considered to be improved after intervention.

Discussion

The intent of the study was to find out and compare the effectiveness of dynamic cupping in teachers with

mechanical neck pain. Baseline measurements of pain (NPRS score, Pain Pressure Threshold) were taken immediately after treatment and after 280 minutes of treatment. The result of the present experiment indicate that pain of teachers with mechanical neck pain diminished significantly after dynamic cupping that accepts the Experimental hypothesis.

In present study, when the mean NPRS score and PPT score were analyzed within group, it was statistically significant.

The exact Mechanism of pain reliving is unclear but there are several theories are available including.

1. Chemical transmitters, such serotonin, endorphin, cortisol that block pain.
2. Nociceptor activation and counter irritation.
3. Placebo effect, research finding suggested that placebo device is more effective in pain reliving compare to placebo pill.¹³

It might be reasonable to assume that dynamic cupping increase PPT at that spot because dynamic cupping leads to increased microcirculation in local areas that decreases the hypersensitivity of spasm related ischemia in neck muscles.¹²

On the other hand negative pressure generated by application of cupping therapy. Cup give mechanical effects including relief of muscle pain, recovery from adhesions release muscle.¹⁶

The study shows similar effects of **M. Teut, A Ullaman et al (2018)**²⁸ suggesting that pulsating cupping

decrease pain in patients with chronic back pain. Where **M. Imam And Mohammad Ishtiyaque et al, (2018)**²⁹ suggesting that oil cupping massage was effective and safe treatment for patients with frozen shoulder. **Felix J. Saha, Stefan Schumann et al, (2017)**¹³ studied that the effects of cupping massage in patients with chronic neck pain and they concluded that cupping massage appears to be effective in reducing pain and increasing function and quality of life in patients with chronic non-specific neck pain. They use NPRS, NDI, PPT in outcome measure which is also relevant to the present study.

NPRS is a reliable and valid subjective scale which depends on patients' feeling. It can be used to assess the pain in different conditions such as **James and Ian et al (2018)** used NPRS to assess the pain after applying cupping with neural glides for peripheral neuropathic plantar foot pain. Similarly **Mohammad Bilal and Rafeeq Alam Khan (2016)** studied the therapeutic effectiveness of hijama in sciatica pain by using NPRS for pain measurement. In the present study after the treatment patients felt better and which shows significant reduction in NPRS score.

PPT is an objective scale, at a point where we feel more pain, that area is more sensitive than other areas. Because of spasm or tenderness there is increased activity of nociceptors in the particular point. When we give pressure to a painful point all nociceptors get activated and give feeling of pain. When we give cupping therapy it activates mechanoreceptors as well as increases vasodilatation of that area which decreases nociceptive activity. **Ebru And Arzu (2016)**³¹ studied the reliability and responsiveness of algometry for measuring pressure pain threshold in patients with knee osteoarthritis and found that PPT is a reliable tool for the pain measurement. **M. Emerich, M. Braeunig et al, (2014)**²⁶ measured the metabolic changes in the tissue under the cupping glass and pressure pain threshold. It was found that cupping is effective to increase the lactate/pyruvate ratio after 160 minutes, indicating an anaerobic metabolism in the surrounding tissue with immediate increased pressure pain thresholds in some areas.

Limitation and Future scope: In this study PPT was checked for only one spot, further study could include many spots and pain can be assessed with other outcomes as well.

Conclusion

The study concludes that dynamic cupping is having

significant effect for reducing pain immediately as well as after 280 minutes in mechanical neck pain. It can be an effective regime for the mechanical neck pain treatment.

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Correlation between Body Mass Index and Postural Changes in Postmenopausal Women

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Abstract

Background: In women age 50 to 59 (typically the early menopausal years) the present age considered obese (BMI ≥ 30.0 kg/m²) has increased by 47.3%. overweight and obesity are known risk factors for insulin resistance, glucose intolerance, diabetes mellitus, hypertension, sleep apnea, arthritis, gall bladder disease and certain type of cancer. Therefore, it is important to determine the relationship between BMI and percentage of total body fat.

Objectives: Objectives of the study were to find out and determine the correlation between Body Mass Index and postural changes in postmenopausal women.

Method: This was an observational study with 40 subjects as a sample. subjects were selected as per inclusion and exclusion criteria. Inclusion criteria included female subjects of postmenopausal women in between age group 45 to 60 years. Subjects having a body mass index grading obese above ≥ 30 kg/m² were excluded from study. Exclusion criteria were Presence of neurological diseases with balance alteration. Musculoskeletal disorders with deformity of lower extremities. History of lower limb or spine injuries or illness. Medication that can change balance sedative and hypnotic agent.

Results: Statistical analysis of postural assessment chart stated that there is higher risk of obesity due to higher change of postural changes subjects of postmenopausal women.

Conclusion: The study concluded that there are high problems of postural changes in postmenopausal women and there is high problem of obesity in postmenopausal women.

Keyword: Postural changes, postmenopausal women, obesity.

Introduction

In women age 50 to 59 (typically the early menopausal years) the present age considered obese (BMI ≥ 30.0 kg/m²) has increased by 47.3%¹. Overweight and obesity are known risk factors for insulin resistance, glucose intolerance, diabetes mellitus, hypertension, sleep apnea, arthritis, gall bladder disease and certain type of cancer². Therefore, it is important to determine the relationship between BMI and percentage of total body fat¹. The multifactorial nature of musculoskeletal disease, a high BMI has repeatedly emerged as a key and potentially modifiable risk factor in the onset and progression of musculoskeletal disorder that affect

the lower limbs, such as knee and hip osteoarthritis³. Moreover, a higher BMI has profound effects on soft-tissue structures, such as tendons fascia and cartilage. Obesity is considered a predictor of postural stability and a high BMI is an important risk factor for falling⁴. Obesity and being overweight are major risk factors for many chronic diseases⁵. Being overweight and obese are associated with a musculoskeletal state and are responsible for significant disabilities and impaired quality of life⁶. Because of postmenopausal changes; body fat mass (kg) rises in women by 0.4 kg/year to the age of 50 then to 59 years it rises more rapidly and then slightly decreases there after⁷. Women with percent

body fat over 35% are considered obese⁸. Obesity in older people is often connected with excessive body mass, lower physical fitness rates and an increased number of falls⁹. In addition, older people with foot deformities have been identified as having an increased risk of falling¹⁰. Obesity is strongly associated with planus (low arched) foot posture, pronated dynamic foot function and increased plantar pressures when walking¹¹. widening of the forefoot and heel area transversal arch collapse in the metatarsal area, flat footedness¹². A good postural balance emerges from a complex interaction of an individual's sensorial detection of movement and position of body, the role of motor control for execution of organized motor synergies and last being the process of higher center involvement for integration and action plan¹³. Human locomotion is maintained by a stable posture and a good balanced body postural control of our body is so vital for all our activities of daily living¹⁴. To make up the normal postural control system the involvement of the sensory, the musculoskeletal and the central nervous system plays a major role¹⁵. The body mass index (BMI), calculated as weight (in kilograms)/height (in meters squared), is the commonly used metric to define the anthropometric height/weight characteristics which represents an index of an individual's fatness and it is used for categorizing them into groups¹⁶. The ankle and foot complex play a critical role in maintaining erect posture, as also in adaptation to supporting surfaces, in correcting postural sway in single limb stance, in shock absorption and in transition of ground reaction force in

order to aid the push off during normal gait¹⁷. Postural stability and balance decrease with age. Loss of balance and increased body sway are important risk factors for fall in the postmenopausal women¹⁸.

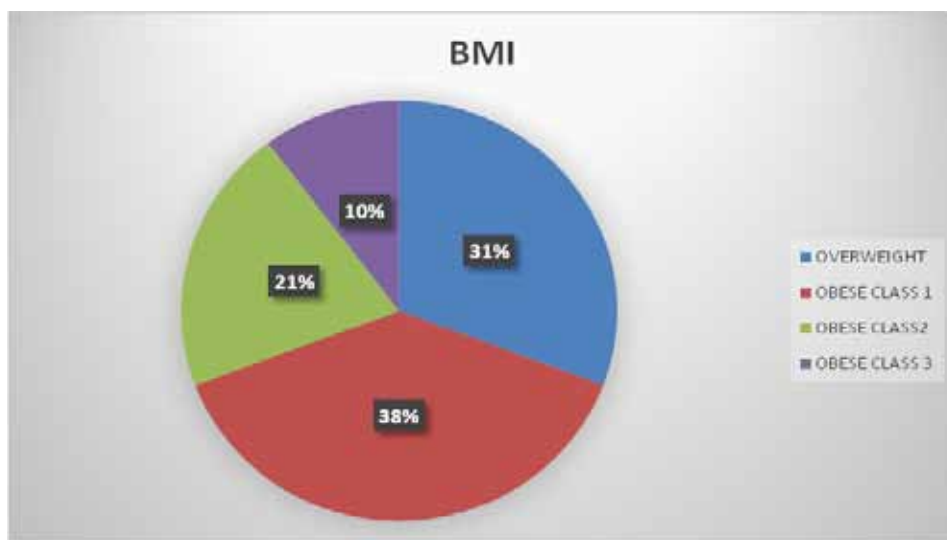
Method

This observational study was carried out in Krishna college of Physiotherapy, KIMS: Deemed to be University, Karad after obtaining the Ethical permission from Institutional Ethical Committee. The study included 40 subject in postmenopausal women. Patients were selected as per the inclusion and exclusion criteria. Inclusion criteria included female subjects of postmenopausal women in between age group 45 to 60 years. Subjects having a body mass index grading obese above $\geq 30 \text{ kg/m}^2$ were excluded from study. The patients were given all the information about what we are going to do. Later the demographic data such as name, age, gender, height & weight, outcome masseurs was taken. With the help of consent form, patients consent was taken and study was explained to subjects. With the help of postural chart, patients were assessed and survey was conducted. With the help of statistical analysis results were drawn and interpreted.

Results

Results was done manually and by using the statistics software INSTATsoas to verify the results derived.

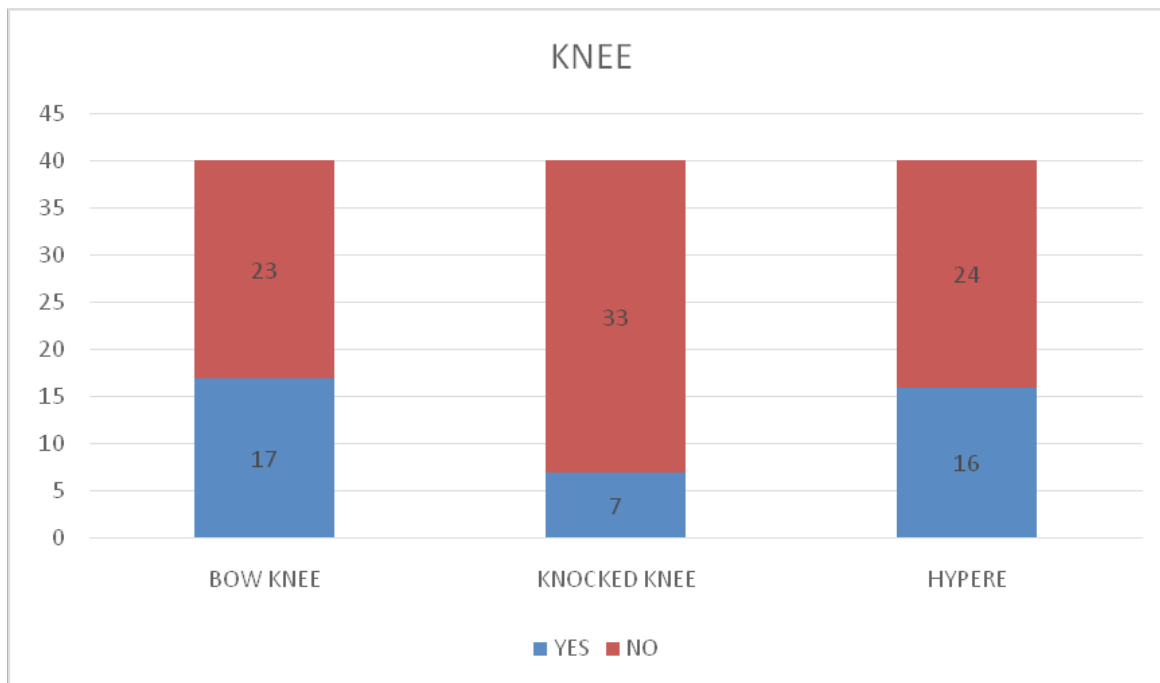
Graph No. 1: Body mass index



Graph 1

The graph shows BMI that out off 100% 38% subject are obese class 1, 31% subject are overweight, 21% subject are obese class 2, 10% subject are obese class 3.

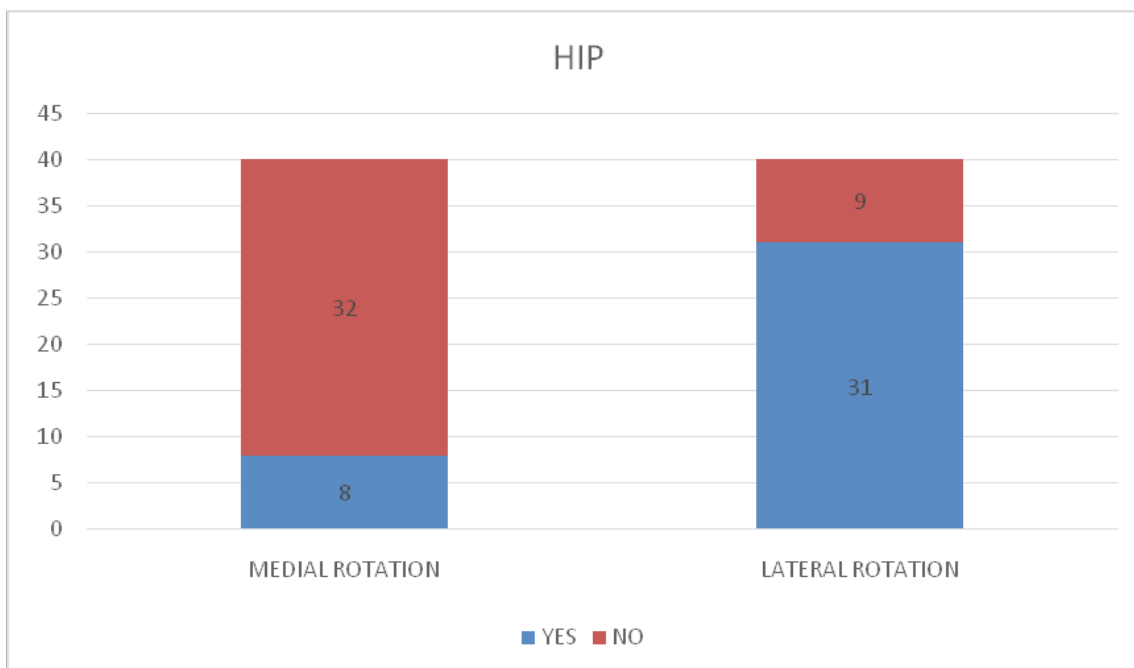
Graph No. 2: Knee



Graph 2

The graph represents that out of 40 subject are havening postural change in knee the havening three types bow knee, knocked knee, hyperextend knee the 17 subject having bow knee, the 16 subjects are havening hyperextend knee the 7 subjects are havening knocked knee.

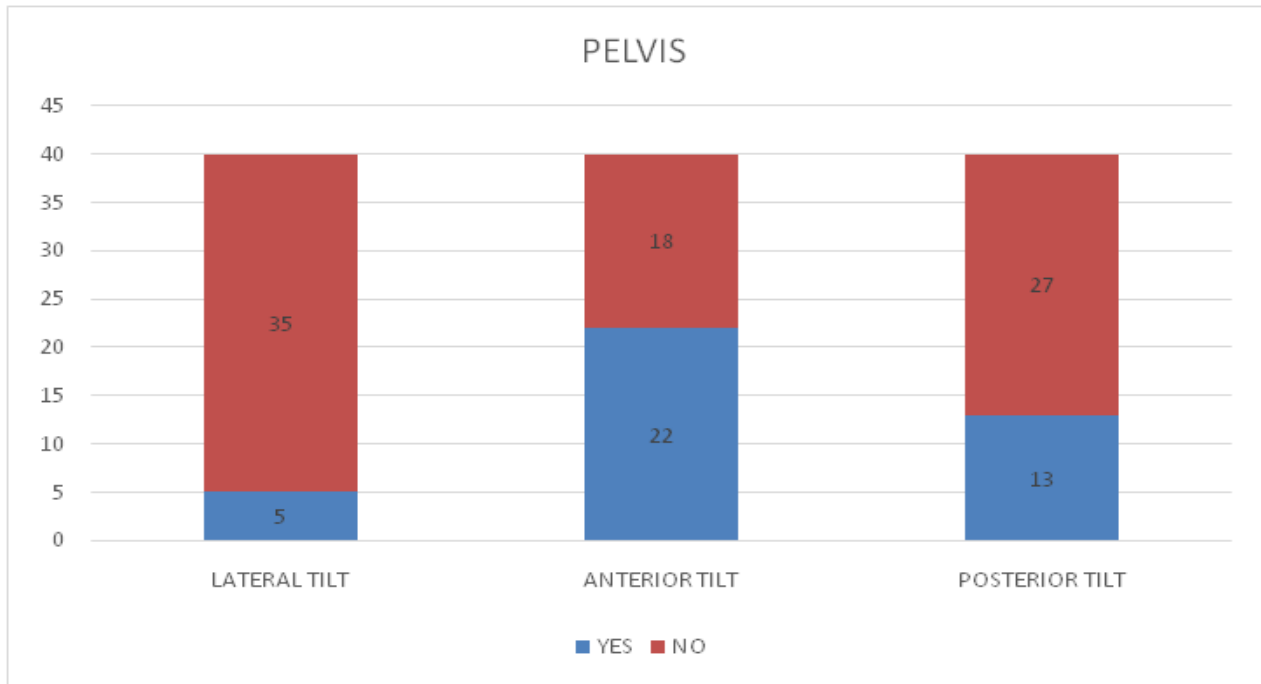
Graph No. 3: Hip



Graph 3

The 40 subject are havening hip problem the 31 subjects are havening lateral rotation of hip, the 8 subjects are havening medial rotation of hip.

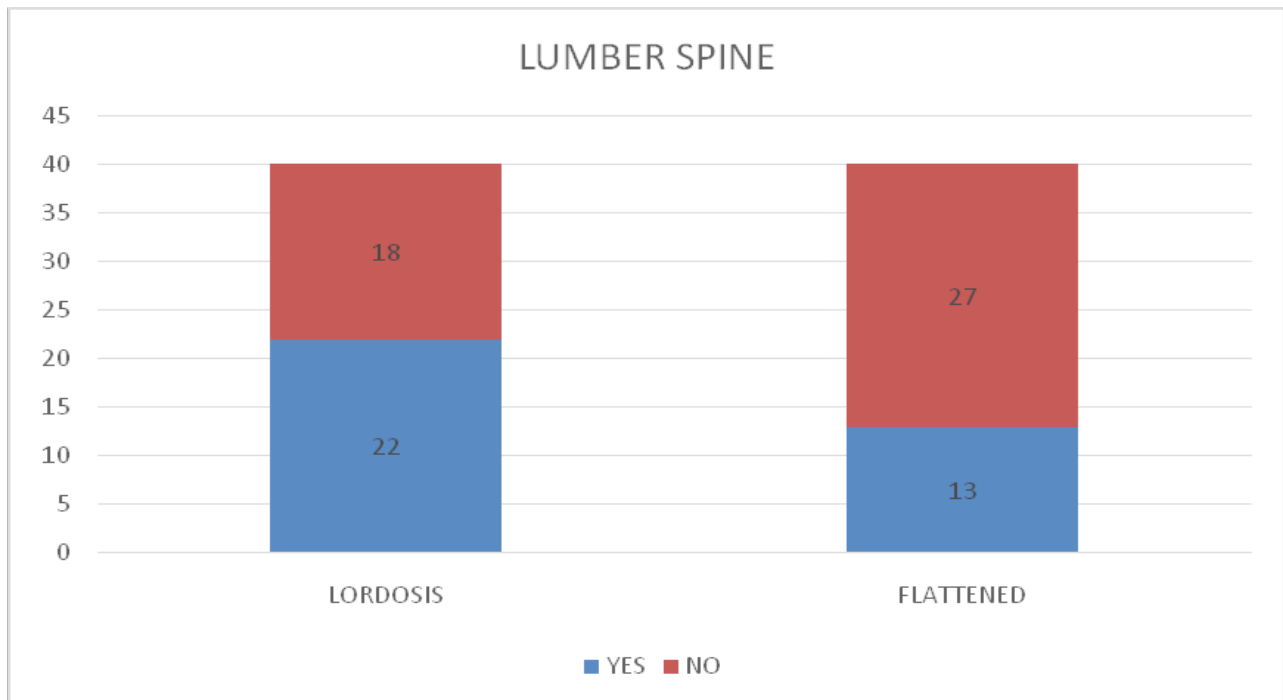
Graph No. 4: Pelvis



Graph 4

The 40-subject havening pelvis problem the 22 subject are havening anterior tilt of pelvis and 18 are not the 13 subject are havening posterior tilt of pelvis and 27 are not the 5 subjects are havening lateral tilt of pelvis 35 are not.

Graph No. 5: Lumber spine

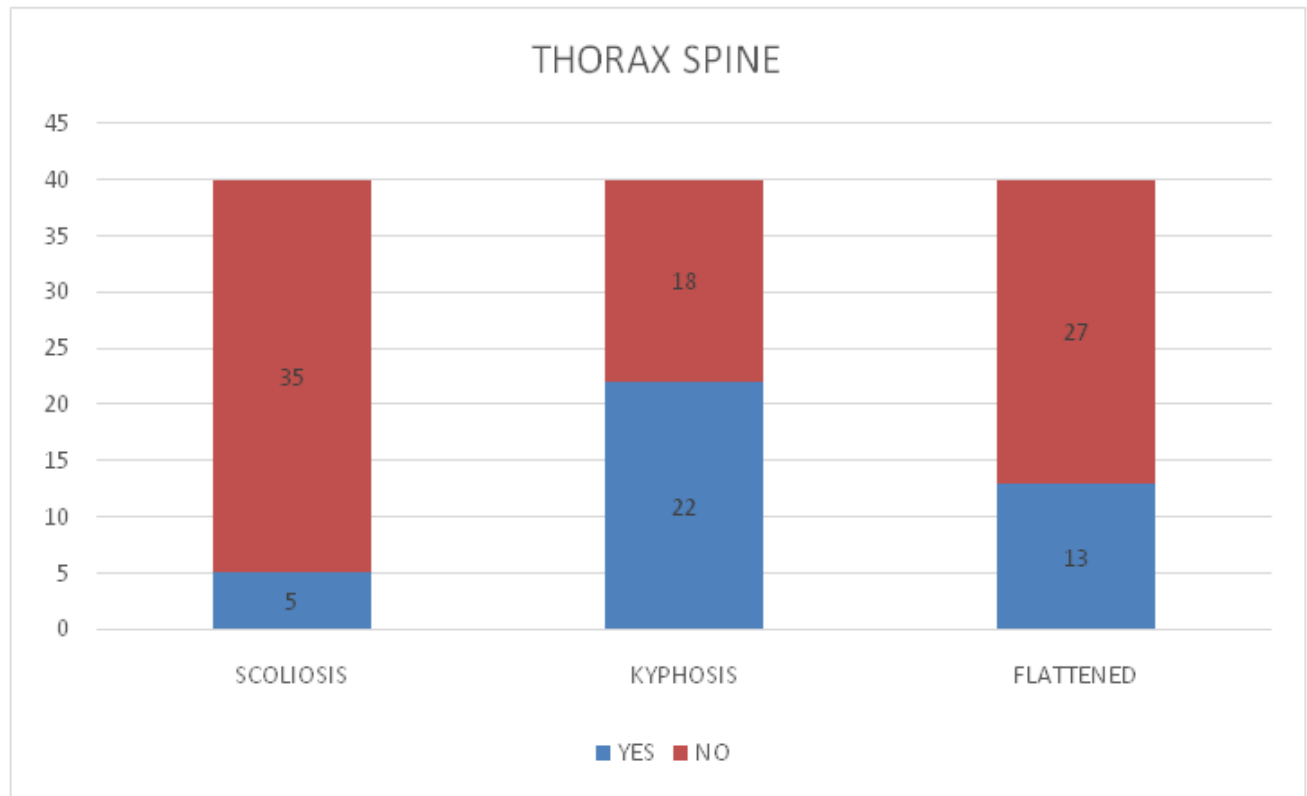


Graph 5

The 40 subjects are having lumber spine problems the 22 subjects are having lordosis spine and 18 are not the 13 subjects are having flattened spine and 27 are not.

Graph No. 6

Thorax Spine:



Graph 6

The 40 subjects are having thorax spine problems the 22 subjects are having kyphosis and 18 are not. the 13 subjects are having flattened and 27 are not. The 5 subject are having scoliosis and 35 are not

Discussion

This study was done to find out the correlation between body mass index and postural changes in postmenopausal women. The study included 40 subjects between the age group 45 to 60 year having obesity. A survey was conducted using the postural assessment chart to find out the correlation between body mass index and postural changes in postmenopausal women. This study was done to find out the correlation between BMI and postural changes in postmenopausal women. The study included 40 subjects between the age group 45 to 60 year having postural changes. A survey was conducted using the postural assessment chart.

The study included 40 subjects in postmenopausal women the having more problem of obesity.

The 20% women having the lumber problem the doesn't walk. The 5% women having the neck pain because of the working. The 5% women having knee problem the having pain in the knee the doesn't walk or stand on the leg for few minutes. The few subjects having also problem of obesity they don't do the exercise that why they cannot walk and stand for few second. The 10% subjects having problem but they are doing the daily exercise that why they having less problem in postmenopausal period

The study shows that two age group first age group 45 – 52 year and second age group is 53 – 60 year. The BMI is shows that 38% women are obese class 3, 31% women are overweight, 21% women are obese class 2, 10% women are obese class 1. The 40-subjects having

foot problem 18 subjects having pronated foot and 16 subjects having supinated foot. The 40 - subjects having knee problem 17 subjects having bow knee, 16 subjects having hyperextended knee, 7 subjects having knocked knee. The 40 – subjects having hip problem 31 subjects having lateral rotation, 8 subjects having medial rotation. The 40 subjects having pelvis problems 22 subjects having anterior tilt and 13 subjects having posterior tilt and 5 subjects having lateral tilt. The 40 subjects having lumbar spine problem the 22 subjects are having lumbar lordosis and 13 subjects having flattened spine. The 40-subject having thorax spine 22 subjects having kyphosis and 13 subjects having flattened spine and 5 subject having scoliosis. The 40 subjects having shoulder problem 22 subject are having rounded shoulder 13 subjects having winged shoulder and 5 subjects having elevated shoulder. The 40 subjects having neck 22 subjects having forward head neck and 13 subjects having flattened neck and 5 subjects having tilt neck.

I found that the more changes in postmenopausal women that the having postural problems. I found that more problem in women having kyphosis and lordosis. The women are having obesity in postmenopausal period.

Conclusion

This study concluded that there are high risk of obesity due to postural changes in postmenopausal women

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Conflict of Interest: There is no conflict of interest concerning the content of the study.

Source of Finding: Self

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Evaluation Of Functional Capacity in Asymptomatic School Teacher Using 6 Minute Walk Test

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Abstract

Aim: To evaluate functional capacity in asymptomatic school teachers using 6 min walk test.

Background: School teachers are exposed to different types occupational and environmental hazards resulting to various respiratory problems that can have an effect on their functional capacity, 6 MWT is an ideal measure used to analyze the cardio-pulmonary endurance.

Methodology: In this study a total of 93 asymptomatic school teachers between the age group of 30-40 years and with a BMI of 24.9 or less were included in this study. Prior to the test conditions that could interfere with the walking were asked for. A 6- minute walk test was performed and the total distanced covered was recorded. The data collected was statistically analyzed using Wilcoxin test.

Result: The test performed showed a significant reduction in the total distance covered by them, as compared to the age predicted distance. ($p = <0.0001$)

Conclusion: The decrement in functional capacity of asymptomatic school teachers an be due to the exposure of their occupational environment.

Keywords: BMI, MWT, mVOC, SBS.

Introduction

Classrooms with black board and chalk traditionally still dominate in many parts of India.⁽¹⁾ School teachers approximately work for 7-8 hours per day, with majority of their time spent in usage of black board and chalk.⁽²⁾ Chalks commonly contain limestone, silica and some metals. Dust and now available dustless chalks both are harmful, but comparatively dustless chalk is less harmful.⁽¹⁾

Indoor air quality and ventilation of the school also contributed to health related complaints, most often health complaint being "sick building syndrome" defined by WHO (1979) as a set of symptoms that occur in association with occupancy of a building and disappear when the occupant leaves the building, symptoms include headache, fatigue, nose and throat irritation and difficulty breathing or chest tightness. A study by the U. S. army, occupant of barracks with low ventilation rates and extensive air re-circulation had a 50% higher incidence of respiratory disease with fever than occupants of older, better ventilated barrack.⁽⁴⁾

Stress problems may majorly affect physical and mental health of teachers. It may cause unpleasant mental effects such as tension, frustrations, anxiety, depression and poor concentrations which may lead to lack of interest at work, reduced job satisfactions combined with worsening of performance.⁽⁵⁾

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Occupational and environmental lung disease are one of the major hazards of clinical medicine and about 15-20% of the adult related respiratory conditions are due to occupational factors.⁽⁶⁾

A recent study review of functional walking tests concluded that “6 MWT is easy to administer, better tolerated and more reflective of activities of daily living than other walk tests”.⁽⁷⁾

As walking is an activity performed daily by all and since 6 MWT is a practical simple test that requires a 30 m hallway but no exercise equipment or advanced training for technicians. However, because most activities of daily living are performed at sub maximal levels of exertion, the 6-minute walked distance may better reflect the functional exercise level for daily physical activities, as this test measure the distance that the patient can walk on a flat, hard surface in a period of 6 minutes. The self-paced 6 MWT accesses the sub maximal level of functional capacity.⁽⁷⁾

Material and Methodology

Study Design:

- Type of study- observational study.
- Duration of study - 6 months.
- Place of study- schools of metropolitan city.

Sample Design:

- Sample size-93.
- Sample population - School teachers (30-40 years).
- Sampling - Convenient sample.

Materials:

- Stop watch
- 2 cones
- 30 m hallway
- Borg scale
- BP apparatus
- Pulse oxymeter
- Measuring tape
- Stethoscope

Selection Criteria

Inclusion Criteria:

- School teachers willing to participate in the study.
- Work experience more than 5 years.
- Using chalk and board for at least 15 hrs/wk.
- Using both dust and dust free chalks.
- Age- 30-40 years and teachers with a BMI of 24.9 and less.

Exclusion Criteria:

- Previous history of respiratory conditions.
- Already on medications for any cardiopulmonary pathology.
- On exercise program.
- Smokers and obese individuals (more than 24.9)

Procedure: 93 subjects were taken for the study as per the inclusion and exclusion criteria. Informed written consent was obtained from the participants, explaining to them about the test that was performed.

Pre-test parameters (BP, RR, PR, SpO₂, RPE) was recorded. A 30 m hallway was used and was marked by colored tape or cone kept at each end. The patient was instructed to walk at their own pace from one end to the other, attempting to cover as much distance as possible within 6 min.

The walk was timed and the distance travelled was recorded by counting the number of laps the subjects walked.

Encouragement like “5 mins more to go” etc was given at intervals during the test. None of the subjects required rest pauses during the test.

Once the time was up the patient was asked to stop and post- test parameters i.e BP, RR, PR, SpO₂, RPE were recorded immediately post-test and again at two successions of 3 min intervals and then the subject was relieved.

And an age predicted formula is applied and the distance travelled is measured using the given formulas,

- Females $[2.11 * (\text{height}) \text{ in cm}] - [2.29 * (\text{weight}) \text{ in kg}] - [5.78 * \text{age}] + 667 \text{m}$.

The data collected was statically analyzed.

Data Analysis and Interpretation: The data was collected and analyzed using the Wilcoxin test in graph prism, which showed a significant difference between the age predicted distance and the total distance walked by them.

Table and Result

Table 1: Difference between mean of total distance covered and age predicted distance.

Variable	Total Distance Covered	Age Predicted Distance
Mean	360.19	667.20
P Value	<0.0001	<0.0001

Discussion

Occupational disease can be caused by a pathologic response of the patient towards an agent present in their working environment.

This study evaluated the functional capacity of asymptomatic school teachers using 6 MWT. A sample of 93 female teachers from the age group of 30-40 years, without the presence of any cardiovascular and respiratory related symptoms was taken. The functional test i.e. 6 MWT was performed on them. The data collected was analyzed using Wilcoxin test and it was found that the distance walked by them as compared to their age predicted distance was much less, the collected data was highly significant with a p value of <0.0001 with a discrepancy of 307.01 m.

School teachers are exposed to numerous occupational hazards that contribute to the decrement of their health. Indoor air quality of Institutional buildings has shown to affect the well-being of school teachers. Disturbance in proper ventilation can have an influence on the health outcome, as well as the air quality that may be perceived by them.

A study reported that lower ventilation rates were significantly associated with an increased health effects, worsened perceived air quality and also increased the risks for developing SBS symptoms. In a study the results of an assessment which was performed in buildings with lower ventilation, showed changes in the ventilation rate that had an influence on the concentration of indoor pollutants, which is also associated with higher risks of SBS symptoms.⁽⁸⁾

Development of tight buildings and a reduction in the amount of outdoor air can lead to poor ventilation of the school. A study by Whelan E A. reported results that suggest teachers and other staff maybe experiencing work related symptoms and illnesses. In another study conducted in 12 schools in Denver on 400 employees who were asymptomatic and had no previous indoor air quality complaints reported that 17% of the school employees presented with throat symptoms, 27% presented with eye symptoms and 35% of them presented with nasal symptoms during the previous week of work. In study 1 the results did not find a higher prevalence of physician diagnosed asthma among teachers, however a study conducted in Canada found an increased rate of physician diagnosed asthma in teachers and teaching related occupations when compared to other employed people in Canada.⁽²⁾

Indoor air quality is not the only concern of an institutional building; associated problems related to moisture with mold formation on the surface or within the building materials can give raise to an increased release in mVOCs that’s manifests as a mild/musty odor, which indirectly suggests that mVOC could be suggestive of a microbial contamination with the building materials. Water-damaged buildings, can lead to an increase in microbial contamination affecting the mVOC profile of the indoor air. These indoor microbial VOC’s can give raise to symptoms such as eye, nose, throat irritation, wheezing and cough, fatigue, nausea, dizziness and headache.⁽⁹⁾

One of the constant contributing factors is the lecturer’s chalk that is native to hydrated aluminum silicate, hydrous magnesium silicate and also calcium carbonate that is the major constituent in both dust and dustless chalks.⁽¹⁰⁾

Chalk dust remains suspended in the for sometimes before settling on the floor and body parts of the teacher and student, from here it is easily inhaled into the respiratory system of the lecturer via the nasopharynx, which is efficient in filtering large particles.⁽¹¹⁾

But particles that are smaller than 5 µm can penetrate into the lungs and get deposited within the alveoli. This deposition can exert an oxidative damage within the alveolar macrophages and cause cytotoxicity (Zhang et. al, 2015 a, b). Also, epidemiological studies suggest that both short- and long-term exposure to particulate matter (PM) is associated with adverse effects to health,

including cardiovascular illness and histopathologic markers of subclinical chronic inflammation of the lung (Pope and Dockery, 2006; Downs et. al, 2007).⁽³⁾

A significant reduction in the functional capacity of asymptomatic school teachers was seen in this study, as majority of schools taken in this study were government schools that were old and in poor condition and also were poorly ventilated i.e tight buildings. Along with this the usage of black board and chalk in these schools was at optimum.

Conclusion

- Based on the results of our data analysis we found significant reduction in the functional capacity in asymptomatic school teachers.
- The distance to be walked by them was significantly low when compared to their age predicted distance.
- Thereby we conclude that the reduction in the functional capacity of school teachers maybe due to an overall exposure to their occupational environment.

Limitations:

- Males were not included in the study.
- The sample size taken in this study was small, therefore the scope of the study can be improved by considering a bigger sample size.

Clinical Implications:

- Physiotherapeutic intervention like breathing exercise, incentive spirometer and daily aerobic training can be given to improve their functional capacity and also importance of physiotherapy should be explained to them. These exercises can also be given to school teachers coming to the OPD with Musculoskeletal related problems so that their lung function can be improved and the effect of their occupational hazards can be prevented.
- Along with physiotherapeutic interventions, ergonomic advice can also be provided like wearing a mask while teaching using the black board and chalk, upgrading to using a white board and marker in place of black board and chalk, also to ensure proper ventilation in the classroom while teaching by keeping the windows in the classroom open.

Acknowledgement: We thank Principal Dr. Ajay Kumar, Dr. Priyanka Gokhale, guide and all the staff of

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Conflict of Interest: Nil.

Source of Funding: Self

Ethical Clearance: Taken from the ethical committee of Dpo's Nett college of physiotherapy.

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Physical Activity in Diabetic Elderly

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Abstract

Background: In India there is a rising trend of prevalence of diabetes mellitus (DM) since many years. DM causes several complications in affected individuals by their physical, psychological and social aspects of quality of life. Moderate physical activity performed at 3 to 6 METS has been recommended for good health and optimal physical function of older adults

Methodology: 43 older adults with diabetes mellitus were included for the study according to the inclusion criteria. International physical activity questionnaire-short form (IPAQ-SF) was used to find out the level of physical activity. Physical activity was categorized based on IPAQ levels. Correlation between age and physical activity was also estimated using Pearson correlation coefficient test.

Result: About half of the subjects had low physical activity (46.5%), 41.9% had moderate physical activity and 11.6% had high physical activity. Pearson correlation coefficient test was used and found weak negative correlation ($r = -0.29$) between age and physical activity in the population studied.

Conclusion: A significant rate of physical inactivity was found in community dwelling older adults with diabetes mellitus. Age related decline in physical activity was seen in the population studied but the correlations were weak.

Keywords: Older adults, diabetes mellitus, physical activity.

Introduction

The rate of older adults is increasing in recent years¹. The aging population is an important issue around the world and in which the first priority is to maintain good health related quality of life. With increasing longevity there will be increase in multiple chronic conditions that may cause functional disability and need for assistance². Increasing age may be marked by declining health, reduced mobility, depression, isolation and loneliness.

Due to some age related changes there will be gradual decline in function due to biological senescence.

But scientists believe that age related decline in function is caused by increased exposure to risk factors rather than only by aging. The number of older adults with type 2 diabetes mellitus is quickly increasing worldwide because of increased life span and a high prevalence of diabetes in the elderly³. Reduced insulin sensitivity and increased risk of type 2 diabetes also occur due to genetics, sedentary life style and body composition².

Besides well identified microvascular (eg. retinopathy, nephropathy and neuropathy) and macrovascular (eg. coronary heart disease, cerebrovascular disease and peripheral artery disease) problems, disabilities associated with mobility and daily tasks are more in older adults with diabetes compared to those without diabetes⁴. In the United States, around 25% of diabetic older adults are impotent to walk one-quarter of a mile, climb 10 stairs, or do housework and almost 50% have difficulty in doing these tasks.

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Physical activity (PA) has been defined as any bodily movement produced by skeletal muscles which results in energy expenditure⁵. The recommended amount of physical activity is moderate physical activity performed at 3 to 6 METs (equivalent to brisk walking at 3 to 4 miles) for good health and optimal physical function of older adults.

Due to the health related problems of older adults there are barriers to engage in physical activity and exercise. Sedentary lifestyle is very common at any age². Regular physical activity participation will ultimately reduce need for health care services among the elderly by improving the health status⁵.

During physical activities there will be improvement in ability to perform the tasks of daily living along with improvement in muscle strength, endurance and flexibility². Based on the evidence, at least moderate physical activity is associated with substantial drop in all-cause of mortality in America and they recommended that every American accumulates at least 30 minutes of exercise on most and preferably all days. There is dearth of convincing data in Indian population. PA has been attributed with many beneficial effects on management of type 2 DM that can prevent many complications of diabetes mellitus by improving blood circulation, by improving muscle strength and by improving the muscle sensitivity of insulin etc⁶. A need was identified to find out the level of physical activity in community living elderly with type 2 diabetes mellitus.

Material and Method

This cross-sectional study was conducted in older adults with age group of 65 years and above clinically diagnosed as type 2 diabetes mellitus, referred by specialists in selected tertiary hospital. It was part of a larger study which included physical activity among other functional measures. Study protocol was approved by Institutional Ethics Committee. The study population was selected by convenient sampling method. The study was conducted in the course of 1 year. 55 patients were screened for the study from which 12 were excluded as 5 of them had a history of amputation and 7 excluded due to lack of independent ambulation. Both male and female subjects diagnosed with type 2 diabetes mellitus were included in the study. Subjects were excluded if there is diagnosis of dementia or cognitive deficits, severely impaired visual/auditory acuity, lower amputations and lack of independent ambulation.

A brief explanation about the procedure was given to all the participants following which a written informed consent was obtained from each of them. Each participant was given the questionnaire to fill up, with the examiner providing assistance as needed. Physical activity was measured using International Physical Activity Questionnaire- Short Form (IPAQ-SF). The IPAQ-SF records 4 types of physical activity, which includes vigorous activity such as aerobics; moderate-intensity activity such as leisure cycling; then walking and finally sitting. The 9-item IPAQ-SF records the last seven days of self-reported physical activity. IPAQ-SF has been reported to be valid and reliable to use in older adults.

The collected data was summarised using descriptive statistics. The data was analysed to categorize PA based on IPAQ-SF level. The correlation between age and PA was also estimated using Pearson’s correlation coefficient test. All data analysis was performed using SPSS version 17.0.

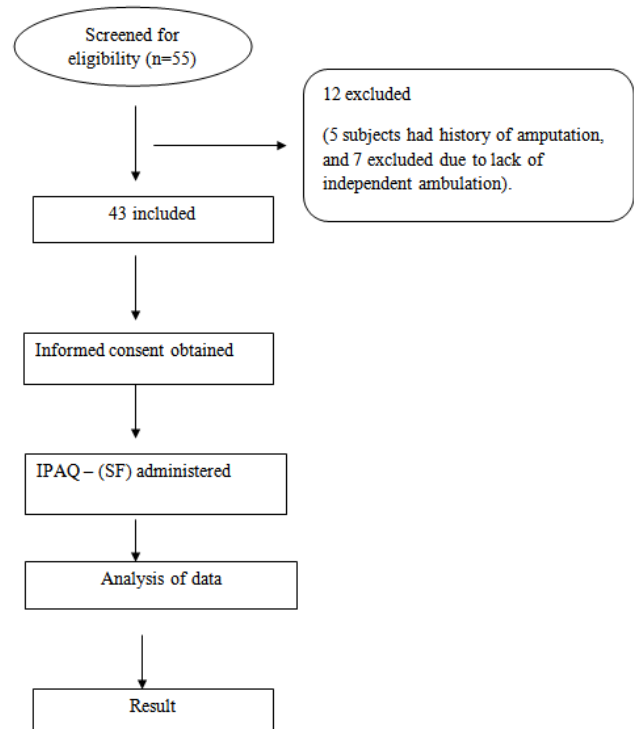


Fig. 1: Flow chart progress of participants through the study

Findings: A total of 43 elderly with type 2 diabetes mellitus formed the study population. Descriptive statistics was used to find out the frequency, percentage, mean and standard deviation from demographic data and variables studied.

Among 43 subjects 23 (53%) were males and 20 (47%) were females.

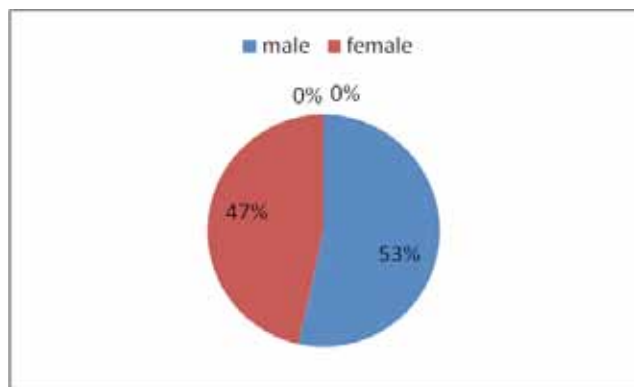


Fig 2: Gender distribution

Out of 43 subjects 5 (11.6%) elderly had high physical activity, 18 (41.9%) had moderate physical activity and 20 (46.5%) had low physical activity.

Table 1: Levels of Physical Activity

	Frequency	Percent
High	5	11.6
Low	20	46.5
Moderate	18	41.9
Total	43	100.0

Pearson’s correlation test was used to estimate the relationship between age and physical activity. A weak negative correlation ($r = -0.29$) was found between age and IPAQ-SF scores in the population studied

Table 2: Correlation between age and physical activity

		IPAQ
AGE	R	-.289
	P	.060
	N	43

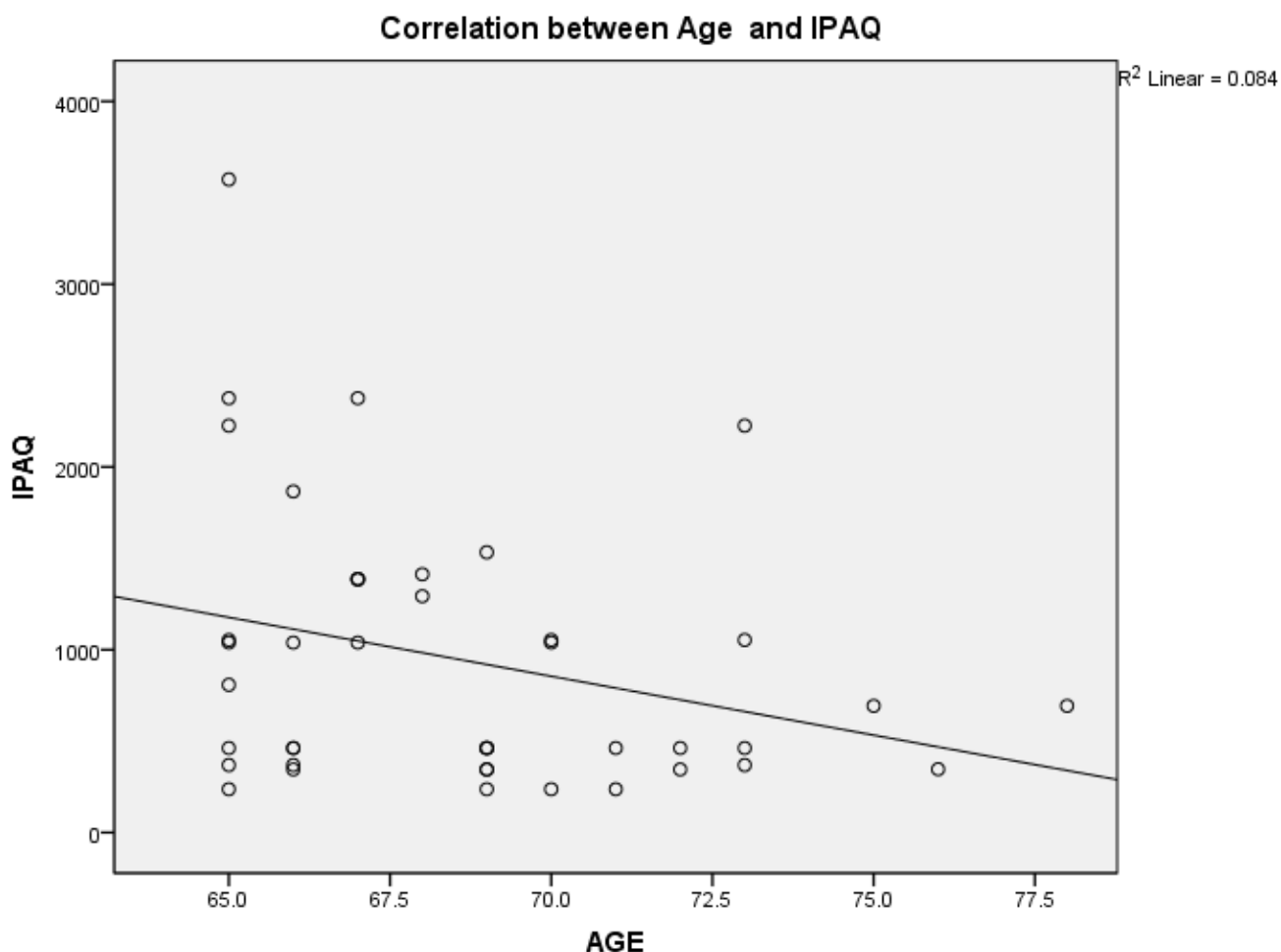


Fig. 3: Correlation between age and physical activity

Discussion

In India there is a rising trend of prevalence of diabetes since many years^{7,8}. The studies conducted in the southern Indian city of Chennai also reported a marked increase in the prevalence of diabetes in the urban population. In Urban India the prevalence of diabetes is high and they found that 12.1% of prevalence for diabetes and glucose intolerance. The diabetes and glucose intolerance showed increase with age. Diabetes showed positive relation with age, BMI and family history of diabetes.

Development of type 2 diabetes mellitus is characterized by a progressive worsening of glucose tolerance within several years⁹. Several cross-sectional and prospective data suggest that the underlying factors for the deterioration of glucose tolerance are body-weight gain and defects in both insulin secretion and insulin action. However the sequence of metabolic abnormalities develops during various stages of diseases remains unknown. Many authors observed that the insulin secretory dysfunction occurs only at the later stage and the predominant abnormality defect is in insulin action in the early stages of the development of type 2 diabetes.

Physical activity was evaluated using International Physical Activity Questionnaire- Short Form (IPAQ-SF) in the present study. The mean value of IPAQ was 941.58 ± 748.26 (in METs) in the present study. Out of 43 diabetic elderly 5 of them (11.6%) had high physical activity, 20 elderly (41%) had moderate physical activity and 18 of them (46%) had low physical activity.

Miriam E. Nelson et al mentioned in their study that for healthy aging regular physical activity, including aerobic activity and strengthening exercises are essential¹⁰. Especially elderly who have any chronic conditions should engage in regular physical activity for reducing the risk of developing other chronic diseases. To give the breadth and strength of the evidence, they also mentioned that physical activity has one of the highest priorities for preventing and treating disease and disablement in older adults.

The impact of diabetes on physical function includes lower limb dysfunction, cardiovascular diseases, polypharmacy and impaired balance, increased risk of fall and risk of frailty^{11, 12, 13}. The important predictor of disability in elderly is frailty. It's a geriatric syndrome characterized by reduced functioning in multiple system.

Evidence suggests that physical activity especially resistance exercises can improve the diabetes and its related complications like mobility, improving daily function in older adults. There are several clinical trials that support the role of impact of exercises programs and geriatric assessment and interventions in the management of falls prevention.

The coexistence of diabetes and major depression may be associated with increased use of health, increased health care costs and adverse health outcomes for diabetes⁴. Furthermore, depression that is associated with hyperglycemia and an increased risk for diabetic complications has the relief of depression when there is improved glycemic control. For the functional disability and quality of life, depression is also a major contributor. Functional disability in depressed diabetic older adults may because of decreased physical activity, decreased likelihood of seeking medical care and increased susceptibility to disease. So it is important to screen all diabetic elderly patients for mental health issues due to the interference with self-care and the overall management of diabetes. Future studies may include the relationship between depression and physical activity in diabetic individuals.

In the present study a weak negative correlation ($r = -0.29$) was found between age and physical activity in the population studied. Loretta DiPietro reported that the prevalence of physical activities reduces with older age among adults and the prevalence of inactivity is higher in women¹⁴. Author also mentioned that women aged 65 years and above reported no leisure-time physical activity.

There are number benefits of productive engagement in physical activity^{15, 16}. The uses of engagement in physical activities include maintenance of independence, social wellbeing etc. Through the influence on the factors like, body weight, insulin sensitivity, glycemic control, lipid profile etc. physical activity can slow the initiation and progression of type 2 diabetes and its cardiovascular risk factors. The underlying mechanisms of these protective effects include the regulation of body weight, insulin resistance, blood pressure, dyslipidemia and the improvement of insulin sensitivity, glucose tolerance and etc.

Recent investigators provided empirical support for the prescription of moderate intensity physical activity for 30 minutes a day⁶. As per the observational and

experimental data indications, regular physical activity has great beneficial effects on many risk factors for diabetes and cardiovascular disease such as reducing body weight, improving insulin sensitivity and glycemic control and reducing blood pressure, atherogenic dyslipidemia, inflammation, fibrinolysis and endothelial dysfunction. Both observational and clinical trial data suggested that there was improvement in insulin sensitivity, glycemic control and metabolic profile among both diabetic and non-diabetic populations when they have done regular physical activity, either alone or combined with dietary therapy. The sample size of the present study was limited; future study with larger sample size may be necessary to substantiate the findings.

Conclusion

A significant rate of physical inactivity was found in community dwelling older adults with diabetes mellitus. Age related decline in physical activity was seen in the population studied but the correlations were weak.

Conflicts of Interest: No conflict of interest

Source of Funding: None

Ethical Clearance: Ethical clearance has been obtained from institutional ethical committee.

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To Compare the Prevalence of Plantar Fasciitis among Females Wearing Flat Foot Wear and Heels in Young Adults

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Abstract

Introduction: The purpose of this research is to check whether there is any co-relation between the footwear and the foot alignment (foot position) for example there is decreased dorsiflexion of foot in females wearing high heels as compared to females wearing flat foot wears and whether it makes people prone to develop plantar fasciitis or not.

Methodology: 100 subjects were taken for the trial. The study included a total of 100 girls from Galgotias University out of which 2 groups were made of 50-50, that is, 50 girls who were regular heel users and 50 girls who wear flat foot wear. Subjects were tested in department's lab room. The subjects were informed to sit upright on plinth with their one leg crossed over the other to make figure of four and the subjects were informed to look straight. Then, manual plantar fascia stretch test was performed by grasping and stabilizing the heel with one hand and dorsiflexing the ankle and toes together with the other hand of the researcher, which in turn stretched the plantar fascia of the foot. Then the subjects were asked if there was any pain experienced or not at the heel or in the sole of the foot while the test was performed. Next step was to perform the windlass test with the subject maintaining the same sitting position and then coming in standing position.

Results and Conclusion: The result showed that out of total sample 20% subjects felt the plantar fascia stretch, 7%, subjects with positive windlass test, 27% of population in sample was prone to develop plantar fasciitis out of which 19% of the subjects were those who wear high heels. The 7% population who had positive windlass test were the females who were wearing heels

Keywords: *Plantar Fasciitis, Plantar Fascia. Windlass Test.*

Introduction

The sole of the foot works similar to palm of hand. The surfaces go in the order as superficial fascia, deep fascia and four layers with neurovascular bundles. There are two arches present in the foot- longitudinal (medial and lateral) and transverse (anterior and posterior). These arches lie between the third and fourth layer of the sole. The plantar fascia is a specialised form of deep fascia which helps in maintaining the longitudinal arch and also protects the deeper structures.

The deep fascia present in the sole of the foot which covers the centre as well as the sides of foot is called as plantar fascia. It is attached from medial tubercle of calcaneum and runs toward the head of metatarsal bones

for its second attachment.^[1] It aims at binding muscles into their respective functional groups and holding down tendons and facilitating their movements.^[2] During static stance and in dynamic function it has a significant role in shock absorption in weight bearing foot.^[3] Also, it maintains the medial longitudinal arch. Plantar fasciitis is a soft tissue injury commonly resulting in inferior heel pain. It is the inflammation of plantar fascia at the medial tubercle of calcaneum due to repetitive stress, decreased dorsiflexion, excessive walking or running as well as with obesity, biomechanical disorders like pes planus (flat foot), pes cavus (high arched foot) and tight tendo-achilles and work-related prolonged weight bearing.^[4]

When a rope or cable is tightened it is known as ‘windlass’. The plantar fascia works similar to a cable which connects the calcaneum to the metatarsophalangeal joints. During propulsion, the plantar fascia is tightened around the head of metatarsals during dorsiflexion phase. Due to tightened fascia the medial longitudinal arch elevates because of the decreased distance between the calcaneum and metatarsal.^[6] During plantar fasciitis, if the toes are dorsiflexed passively or done in weight bearing position, the test is positive if pain elicits. This is also known as passive toe dorsiflexion test.^[7]

With manoeuvres stretching the plantar fascia, tenderness increases hence marking the passive stretching test positive.^[8] It is done by dorsiflexing the ankle which in turn stretches the plantar fascia hence confirming the physical examination of plantar fasciitis.^[4] This pain hence limits the ankle dorsiflexion.

Plantar fasciitis functionally limits the foot.^[9] Plantar fasciitis makes people prone to increased risk of falls by altering the perception of foot hence impairing the balance.^[10]

Footwear is an important part of our daily life. It protects us from external injuries and trauma. It also serves the cosmesis function and provides comfort and support. Footwear has been reported to have the significant impact on the musculoskeletal system specifically, these factors are affected by footwear and in turn lead to inflammation, rupture or irritation of the plantar fascia. The purpose of this research is to check whether there is any co-relation between the footwear and the foot alignment (foot position) for example there is decreased dorsiflexion of foot in females wearing high heels as compared to females wearing flat foot wears and whether it makes people prone to develop plantar fasciitis or not. This research will rule out one more risk factor for plantar fasciitis that is the foot mispositioning due to different footwears.

Material and Method

The subjects were told about the objective of performing the test. A consent form was taken from them which included volunteer’s declaration, right to withdrawal and confidentiality of their details. After that a brief screening performa was then filled, which contained basic 10 questions related to inclusion and exclusion criteria mentioned in table 1.1. When all questions answered in satisfactory manner the students were selected for the study. The study included a total

of 100 girls from Galgotias University out of which 2 groups were made of 50-50, that is, 50 girls who were regular heel users and 50 girls who wear flat foot wear. Subjects were tested in department’s lab room. The subjects were informed to sit upright on plinth with their one leg crossed over the other to make figure of four and the subjects were informed to look straight. Then, manual plantar fascia stretch test was performed by grasping and stabilizing the heel with one hand and dorsiflexing the ankle and toes together with the other hand of the researcher, which in turn stretched the plantar fascia of the foot. Then the subjects were asked if there was any pain experienced or not at the heel or in the sole of the foot while the test was performed. Next step was to perform the windlass test with the subject maintaining the same sitting position and then coming in standing position. In high sitting position, the ankle was stabilized and the great toe was dorsiflexed (non-weight bearing). In standing position, the subject was asked to stand on toes of both the foot (weight bearing). In both the positions the subject was asked if there was any unpleasant pain in the sole or heel of the foot. Both the plantar fascia passive stretching test and the windlass test^{4,7,8} (in non- weight bearing position) were supposed to be performed on the both the limbs (foot) simultaneously. If the subject complained of any pain the respective test was marked positive and there was no pain the respective test was marked negative.

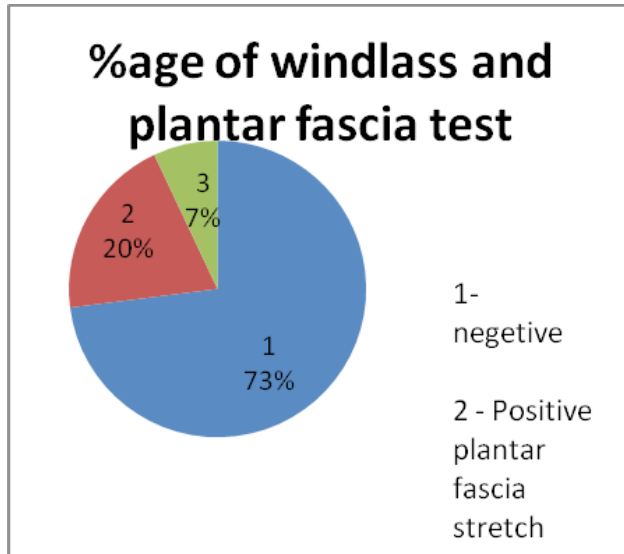
Table 1: Methodology Detail

Design
Convenient sampling with descriptive design
Participants inclusion Criteria
Young adults females
Half population wearing heels and half wearing flat foot wear
Participants exclusion Criteria
Any recent trauma, bone injury, Limb Length Discrepancy, Any musculoskeletal deformity, neurological deficit,
Intervention
Windlass test (weight bearing and non-weight bearing)
Passive dorsiflexion test
Outcome measures
Check the prevalence of plantar fasciitis in females wearing different footwear
Comparisons
Prevalence of plantar fasciitis in females wearing heels compared with females wearing flat foot wear

Findings: The result showed that out of total sample 20% subjects felt the plantar fascia stretch, 7%, subjects

with positive windlass test, 27% of population in sample was prone to develop plantar fasciitis out of which 19% of the subjects were those who wear high heels. The 7% population who had positive windlass test were the females who were wearing heels.

Figure 1: Percentage of Windlass Test and Plantar Fasciitis test



Discussion

Plantar fasciitis is a musculoskeletal disorder which is most of the time left ignored by the females.⁴ There are various risk factors which increases its chances to develop like prolonged weight bearing, improper footwear, biomechanical problems etc. one major risk factor which is left unnoticed is the type of footwear in females. This research focuses on the fact that who are prone to develop plantar fasciitis- females wearing high heels or flat footwear. The two tests performed plantar fascia stretch test and windlass test (weight bearing and non-weight bearing) showed that out of 100 females there were 20% females who felt plantar fascia stretch and 7% responded positive to the windlass test. 12% out of 20% were the females who wear regular heels and the rest 7% population were females who were wearing heels.

Hence, through this research we find out that the chances for high heelers are high to develop plantar fasciitis because of continuous strain on the sole of the foot and prolonged weight bearing. There is no proper management for the pain and not proper rest time is given to the micro traumas to heal. Due to plantar fasciitis, the females will have problem in walking, pain and soreness in the sole, initiating the first step in the

morning, swelling, tenderness. In long term cases there will be changes in the posture, gait and hence altered balance.

The females who reacted negative to the tests are not prone to develop but can develop plantar fasciitis as it is clinically stated that females who wear flat foot wear are more prone to develop plantar fasciitis. So, they should take proper care of footwear and the sole as well.

Through this research we can rule out that females who wear high heels are prone to develop plantar fasciitis, therefore, the footwear should be modified according to the occupation and the standing hours of the subject. If the person has a standing job, there shoes should have good soles and better cushioning.

Though there are no articles that compare the prevalence of plantar fasciitis in different footwear, but my study shows that females who wear regular heels are prone to develop plantar fasciitis because of decreased dorsiflexion of the ankle and prolonged weight bearing on such footwears.¹¹

Conclusions

Heels make females prone to develop plantar fasciitis.

Conflict of Interest :

1. Inconsideration of the weight of the patient.
2. Size of the heels was not categorized.
3. Number of hours the females is wearing heels
4. ADL activity was not acknowledged.

This research was self funded and ethical clearance was done by the ethical committee in Galgotias University.

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Correlation of Cognitive Impairment with Activities of Daily Living in Elderly Individuals

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Abstract

Aim: To correlate Cognitive Impairment with activity of daily living in elderly individuals.

Background: Cognitive Impairment is usually seen in Individuals above 75 Years. Activity of Daily Living can be affected in elderly individuals.

MOCA and Modified Barthel Index has been used for the investigation.

Methodology: This was an correlational study. 60 elderly individuals between the age group of 75-85 were included in the study. First, assessment of cognition was done by using Montreal Cognitive Assessment Scale (MOCA). If the score is below 26, in those individuals Modified Barthel Index was taken to check Activity of Daily living. If the score is below 100, it indicated decline in ADL's. The data was stastically analysed using Pearson Correlation Test.

Results: MOCA has a negative correlation between MBI.

Conclusion: There is a negative correlation between Cognitive Impairment and Activity of Daily living in elderly individuals.

Keywords: Cognitive impairment, Aging, Activity of daily living.

Introduction

Ageing is associated with decrease in muscle strength, aerobic capacity, neuromuscular co- ordination and flexibility which can affect physical performance.⁽¹⁾ Mobility, disability and decline in maintaining balance and walking is associated with loss of independence and disability.⁽¹⁾

Cognition helps the individual to simultaneously walk while carrying out other motor and cognitive

processes (e.g. talking to a companion during walking, reading a street sign, etc.)⁽²⁾ Decline in cognitive function is associated with decrease in physical activity and disability.⁽²⁾ Cognition is important for planning and monitoring performance such as attention and speed.⁽²⁾

Cognition is one of the important component which is affected in Geriatric Population⁽³⁾. Decline in Cognitive Impairment can lead to decrease in Activity of daily living in geriatric individuals.⁽³⁾ Cognitive impairment can be the risk factor for decline in Activity of daily living.⁽¹⁾

Risk Factors affecting cognition are biological and psychological. Biological factors are hormonal imbalance and obesity .Psychological factors include anxiety and stress.⁽¹⁾

The changes associated with old age that brings a cognitive decline is referred to as aging associated cognitive decline. Decline in cognitive ability from a

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higher level of function brings multiple problems that influence rehabilitation of the older individual. Memory loss is the cognitive component most often associated with ageing. Elderly cannot remember basic information and have severe lapses in memory. The most prominent structural theory of memory describes three distinct types: sensory, short term, long term memory.⁽⁴⁾

The concept of functional independence may be conceived in several ways. These include dependence or the degree of assistance needed to perform a task, how much pain accompanies the task, amount of time it takes to perform the activity, or whether an individual uses an assistive device or aid to perform the task.⁽⁴⁾ Loss of independence in activities of daily living in geriatric individuals is associated with caregiver burden and death.⁽⁵⁾

Common Activity of daily living includes feeding, Bathing, Dressing, grooming, Transfers, etc.⁽⁵⁾ Limitation in age related disability leads to decline in Activity of Daily Living. Decline in Activity of daily living leads to mortality.⁽⁶⁾ The ADL include all of the fundamental tasks and activities necessary for survival, hygiene and self- care. Incontinence and the ability to use bathroom are especially important elements in the assessment of physical function in some older adults.⁽⁴⁾

The Montreal Cognitive Assessment (MOCA) is a widely used screening assessment for detecting cognitive impairment. Montreal Cognitive Assessment tool more focuses on Frontal Executive Functioning and attention which helps in assessing dementia. Time to administer MOCA is 10 minutes. It is a 30 point.

Cognitive Screening test to assess cognition. It includes alternating trail making, visio -constructional skills (cube, clock), naming, memory, attention, verbal fluency Sentence repetition, abstraction, delayed recall, orientation etc. The total possible score is 30 points. A score above 26 is considered normal.⁽⁹⁾

The Modified Barthel Index is assessment tool for assessing self- care and mobility activities of daily living. The components of scale include Feeding, Bathing, grooming, dressing, bowel, bladder, toilet use, transfers, mobility, stairs. It helps to determine whether the patient is dependent or independent. There are various scales out of which Modified Barthel Index has good reliability and validity. The score ranges from 0- 100 out of which 100 is normal. The score below 100 indicates decline in activities of daily living.⁽¹⁰⁾

Materials and Methodology

1. Study Design

Type of study – Cross- sectional Study.

Duration of study – 1 Year

Area of Study - Metropolitan City.

2. Sample Design

Sample Size- 60.

Sample Population – 75 – 85 Years Geriatric Population.

Sampling – Convenient.

Materials Used:

1. Pen.
2. Book.
3. Consent Form.
4. Montreal Cognitive Assessment Scale.
5. Modified Barthel Index Scale.

Inclusion Criteria:

1. Elderly willing to participate.
2. Able to read and write.
3. Age group 75 – 85 years.
4. Community Ambulating Elderly.

Exclusion Criteria::

1. Musculoskeletal disorder.
2. Cardiorespiratory disorder.
3. Neurological disorder.
4. Diabetes Mellitus.
5. Visual disorder.
6. Hearing disorder.

Procedure: The subjects will be selected according to the inclusion and exclusion criteria. Prior to this study a written informed consent will be taken by each subject in the language best understood by them.

Before handling the questionnaire, each subject will be given detailed information about the purpose of the study.

Assessment of cognition is done using Montreal Cognitive assessment Scale. Subjects will be explained about the Montreal Cognitive assessment scale. Components of the scales will then be assessed (which includes visual spatial, execution, attention, memory, delayed record, orientation, language). If the score is less than 26, it indicates Cognitive Impairment.

Elderly having cognitive impairment will be then selected to assess activity of daily living using modified Barthel Index Scale. If the score is below 100, it indicates decrease in Activity of daily living.

The data obtained will be recorded and processed further for analysis.

Results

Data analysis was performed by using statistical package for social sciences SPSS 23.0 Version. The Shapiro-Wilk test was used for assessing normality of data. Since the data was found to be normally distributed the parametric test were used.

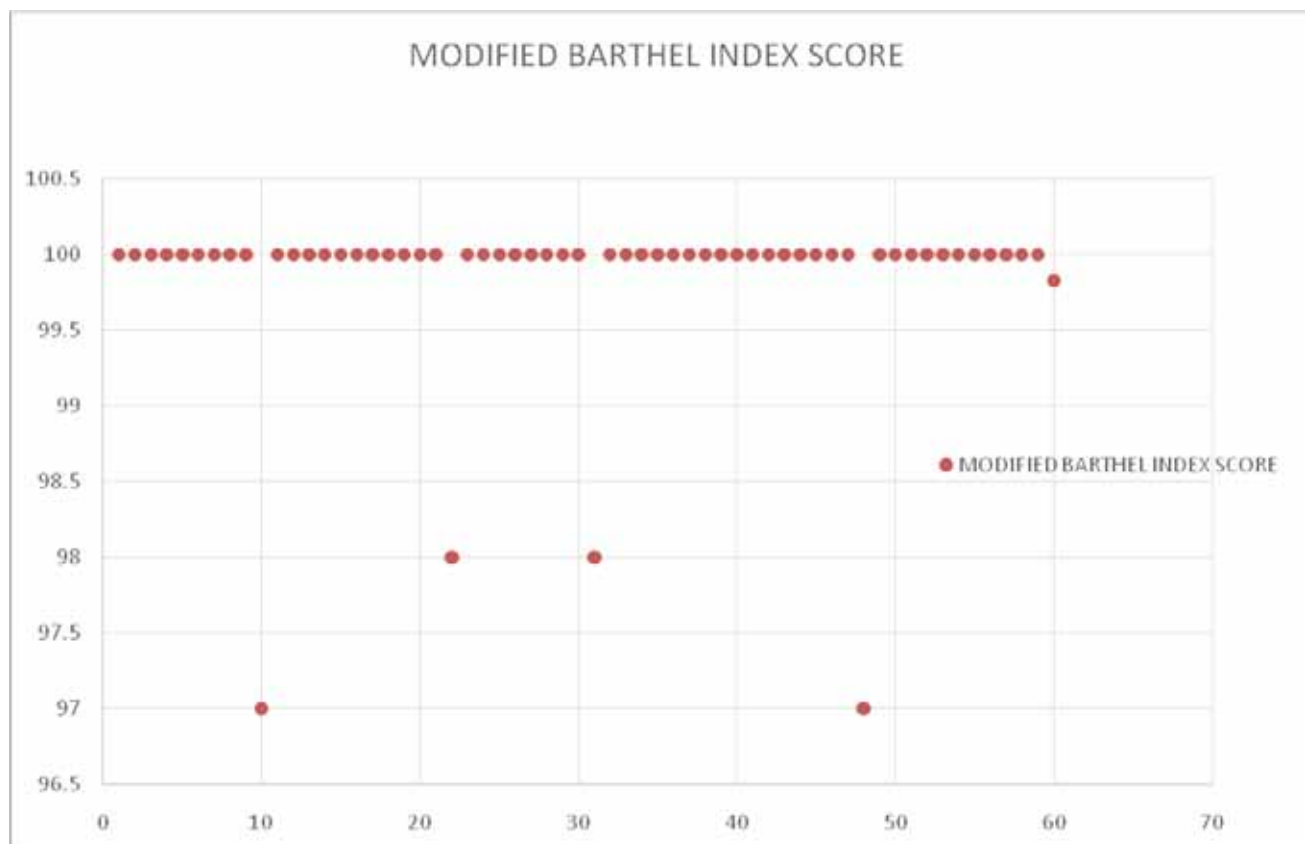
A p value of >0.05 was considered to be insignificant. Confidence interval of 95% was chosen.

1. The table 1 shows mean age.

Table 1:

Variables	Mean
Age	79.83

The table (1) shows mean of age group i.e. 79.83



Graph 1

Table 2

Variables	Mean	r value	P value	95% Confidence Interval
MOCA	20.16	-0.1391	>0.05	-0.3796 to 0.1190
MBI	98.83			

Table (2) shows $r = -0.1391$, p value $= > 0.005$ and 95% confidence interval (-0.3796 to 0.1190).

It shows that as cognition declines, activities of daily living are not affected in elderly individuals.

It concludes that there is a negative correlation between cognitive impairment and activity of daily in elderly individuals.

Discussion

The present study was done to find out the correlation between cognitive impairment and activity of daily living in elderly individual.

The result of study shows that: There is a negative correlation between cognition and activity of daily living.

This shows that as the score of MOCA decreases the score of MBI increases which means as cognition declines, ADL's are not affected.

Aron . S. Buchman et.al, showed that cognition is important for planning and monitoring such as attention. Decline in cognition function have been associated with both physical impairments and self reported disability. Due to aging there is decline in cognition function.

Ashwini . S. Kalsait et.al, performed that cognition impairment due to aging, which can lead to decrease in mobility associated with loss of ADL.

Mortiz .DJ el.al, mentioned that cognition is one of the important component which is affected in geriatric population. Decline in cognition can lead to decrease in ADL in geriatric individuals.

Philip A. Greiner et.al, concluded that loss of independence in ADL's is a marker of decline in elderly individuals. Cognitive impairment leads to decrease in mobility, which ultimately leads to decline in ADL.

Christian .K. Anderson et.al, showed that due to decline in cognition, ADL is hamper in elderly individuals.

Cognition was assessed using MOCA scale. MOCA is widely used screening assessment for detecting cognitive impairment.

In present study, we found out that age, cognitive impairment doesn't have significant association with ADL's.

The mean for MOCA is 20.16. The mean for MBI is 98.83.

The r value is -0.1391.

The p value is >0.05 .

By conventional criteria, it is considered to be non-significant

Conclusion

Since there was a negative correlation between MOCA and MBI.

This study concludes that as cognition declines, there is no decline in activity of daily living in elderly individuals.

Acknowledgement: We thank principal sir, guide, My colleague Miss. Julie Pawar and all the staff of DPO's Nett College of Physiotherapy, Thane, respected parents for support, co- operation and last but not the lease almighty for keeping spirits high throughout the study.

Conflict of Interest: None

Source of Funding: None

Ethical Clearance: Taken from the ethical committee of Dpo's Nett college of physiotherapy.

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Effectiveness of Tele Rehabilitation on Manual Dexterity and its Impact on Quality of Life in Patients with Parkinson's Disease: A Pilot Study

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Abstract

Background: Patients with Parkinson's disease exhibit disturbed manual dexterity. This impairment leads to difficulties in activities of daily living, such as buttoning a shirt or hand-writing. Recent advances in telecommunication technologies have boosted the possibility to deliver rehabilitation via the internet (i.e. telerehabilitation). The aim of the present pilot study was to investigate the effectiveness of Tele Rehabilitation to improve manual dexterity and its impact on quality of life in patients with Parkinson's Disease.

Method: This study was based on Quasi-experimental design and Convenience sampling method was used in Older Adults with Parkinson's disease of 60 to 80 yrs age. The sample size is 10 (n=10) Experimental group (Tele Rehabilitation) (n=5) and Control group (resistance training) (n=5). The study was conducted at home for the patients referred from SRM hospital and Research centre. Screening was done using UPDRS and MoCA. Outcome measures were analysed using Purdue peg board test, Chedoke Arm and Hand Activity Inventory(CAHAI-13), Parkinson's Disease Questionnaire-39(PDQ-39).

Results: The results revealed that the experimental group has shown significant difference at 5% level in all the metrics "Right, Left, Bi-manual, Assembly tasks of Purdue Peg Board test, CAHAI 13 and PDQ39. But comparing between the experimental and control groups significant difference at 5% level was observed only in bi manual task of Purdue Peg board test.

Conclusion: Task specific Tele rehabilitation-based dexterity program significantly improved fine motor skills in Parkinson's disease. Neuro Tele Rehabilitation is considered as an alternative effective mode of service delivery connecting the people in need with health care practitioners by providing effective interventions with minimal inconveniences.

Keywords: *Tele Rehabilitation, Manual dexterity, Resistance, Parkinson Disease, Technology, Quality of Life.*

Introduction

The most widely recognized neuro degenerative disorders is Parkinson's disease (PD). Geriatrics is the most common population with PD. More than 10 million people worldwide are living with Parkinson's Disease . With age the Parkinson's incidence increases and not to ignore, the individuals with PD are even diagnosed before age 50¹. Though the peak age of onset is 70 years, PD begins between the ages of 40 and 70 years. There are incidences where people in their 30's and 40's developed PD even though it is primarily a disease of elderly².

Parkinson's disease is a chronic, persistent, long term, progressive neurodegenerative disease represented by both motor and non-motor characteristics and it is progressive and degenerative disease, it significantly impacts not only patients but also families and caregivers^{1,2}. The progressive degeneration and destruction of dopamine- generating neurons in the substantia nigra, located within the basal ganglia is the most common result of the cardinal features of PD³.

The cardinal motor features in PD, described as "classical triad" includes resting tremors, cog wheel rigidity and bradykinesia⁴. Tremors are the most observed

by the caregivers among the three cardinal features in PD patient. The onset of tremors are more pronounced in older age patients above 64 years⁵. Bradykinesia is the second cardinal motor clinical of Parkinson's Disease. The third major cardinal feature of PD is rigidity. The rigidity of PD not only affects the extremities but also face, which is displayed as a "masked" expression (hypomimia)⁶. Postural instability is accounted as the fourth feature that usually occurs during the progression of the disease⁷. The performance of daily and functional activities is greatly hindered due to dexterity, postural stability and gait disturbances^{6,8}.

Dexterity is a motor skill which is learnt or developed through repeated repetition of motor learning⁹. Dexterity deficits affect the ability to perform functionally with the upper extremity like reaching, grasping and manipulating objects¹⁰ and found to be a strong predictor of functional independence in activities of daily living¹¹. Manual dexterity includes muscular, skeletal and neurological functions to produce small, precise movements¹². Dexterity training is effective in increasing fine manual control during goal-directed movements and dexterity-related ADL¹³. Specific to Parkinson's 30 min home based dexterity training program (HOMEDEXT) for a month was proven effective in enhancing manual dexterity skills along with dexterity related ADL¹⁴. Though the usage of drugs is very effective in reducing motor symptoms, most of the clients are not aware of the possible adverse effects of the long usage of the drugs¹⁵.

In the context of Parkinson's disease, the general aim of OT is to promote and enable meaningful contextual occupational performance¹⁶. The vital role of Occupational therapy practitioners in Parkinson's disease is widely recognized from the time of diagnosis^{17,18}.

Model of health delivery through telecommunication is called as Tele health¹⁹. Tele rehabilitation is application of rehab services through communication technology²⁰. The American Occupational Therapy Association (AOTA) acknowledges the use of Telerehabilitation technologies as a recognized and acceptable method of service delivery for many practitioners within the field of health care, particularly for individuals in remote areas where demands for services may exceed the services available²¹. Telerehabilitation is gaining popularity due to cost effectiveness and reduced transportation issues²² and widely recognized as a bridge connecting medical professional and the client²³.

Tele rehabilitation is an upcoming, technology based, cost effective rehabilitation. It was found that speech and language was effectively improved through Tele rehabilitation in PD²⁴ but motor domains especially hand functions which are the foundations of daily activities was not emphasised. Although the use of Tele rehabilitation is limited yet it is proven to be an effective method and can be used as an alternative mode for service delivery²⁵.

The Study:

Aim: To find the effectiveness of Tele rehabilitation on manual dexterity and its impact on quality of life in clients with Parkinson's Disease-Pilot study.

Participants: The participants were selected from SRM hospital and Research centre, Chennai. After scrutinization of the relevant papers and consent letter approval the research was approved by the research team of College of Occupational Therapy, SRMIST. Quantitative quasi experimental design intervention study was conducted to compare the means between independent groups of variables through a convenience sampling method. In this pilot study ten participants have volunteered to participate. Experimental group (n=5) and control group (n=5). The eligible participants were Patients with Parkinson's Disease, confirmed diagnosis time >6months within age group 40 to 80years, both male and female, Patients with stable drug usage, Hoehn and Yahr stages 1 to 4 and UPDRS(Unified Parkinson's Disease Rating Scale)>30. The Patients with other significant neurological disorders or psychiatric comorbidity including dementia, MoCA (Montreal Cognitive Assessment) score <21 and Patients participating in another intervention trail were excluded.

Intervention: Participants who had consented were screened using Unified Parkinson's Disease Rating Scale (UPDRS) and Montreal Cognitive Assessment Tool (MoCA). The eligible participants were allotted to either experimental group (Tele rehabilitation) or Control group (Theraband exercises). Both the groups were administered with outcome measures Purdue pegboard test for manual dexterity, CAHAI-13 to measure bilateral upper limb performance in Activities of daily Living skills and PDQ39 to assess the health related quality of life at baseline and after 4 weeks of intervention. Experimental and control group received intervention for 15 sessions for 30 minutes each¹³.

Experimental group (Tele Rehabilitation): Prior to the intervention through video call, Researcher gave a booklet¹³ explaining all the exercises with pictures and a brief explanation.

Six different exercises were taught through video call:

1. Finger tapping
2. Crossing circles
3. Turning disks
4. Nuts on bolt
5. Modelling clay 1
6. Modelling clay 2

Control Group: Patients were taught to perform 7 upper extremity strength training exercises using the theraband¹³.

The Exercises Includes:

1. Elbow flexion
2. Elbow extension
3. Hand abduction
4. Hand Pronation
5. Hand supination
6. Hand extension
7. Hand flexion

Instrumentation:

Screening:

Unified Parkinson's Disease Rating Scale - UPDRS
Montreal Cognitive Assessment Tool - MoCA

Outcome Measures:

Purdue peg board test – Manual dexterity
Chedoke Arm and Hand Activity Inventory (CAHAI-13)-ADL related dexterity performance
Parkinson's Disease Questionnaire-39(PDQ-39)-Health related quality of life

The Unified Parkinson's Disease Rating Scale (UPDRS): The UPD rating scale is the most commonly used scale in the clinical study of Parkinson's disease. The UPDRS consists of 6 sections which are evaluated by interview and clinical observation. Both Clinicians and researchers use the UPDRS and the motor section

in particular to follow the progression of a person's Parkinson's disease. Its Reliability is 0.92 and Validity is 0.76-0.96^{26,27}.

Montreal Cognitive Assessment (MoCA):

The MoCA test is a 30-point test administered in approximately 10 minutes. The test and administration instructions are available for clinicians online. In a very precise manner MoCA detects Mild Cognitive Impairment. According to the validation study, the sensitivity and specificity of the MoCA for detecting MCI were 90% and 87%²⁸.

Purdue peg board test: Purdue pegboard test measures manual dexterity and includes four subtests namely dominant hand, nondominant hand, bimanual and assembly task. The score is the number of pegs and pieces placed on the board. The Purdue pegboard test reliably evaluates manual dexterity in patients with Parkinson's disease. Reliability 0.37 to 0.68 and validity value 0.5 - 0.70²⁹.

Chedoke Arm and Hand Activity Inventory (CAHAI-13): The CAHAI-13 is a performance based test containing 8 real life upper limb functional test rated on a 7-points quantitative scale, with higher score indicating better performance. It has high inter-rater reliability of 0.96-0.99, convergent and discriminant cross sectional validity¹³.

Parkinson's Disease Questionnaire-39(PDQ-39):

Health related quality of life was assessed by PDQ39. It is the 39 items self report questionnaire which assess Parkinson's disease specific health related quality over the last month. It assess how often patient experience difficulties across the 8 quality of life dimension- Mobility, ADL, Emotional well being, stigma, social support, cognition, communication and bodily discomfort. Reliability-0.68-0.95, Validity-0.66³⁰

Ethical Consideration: This research was approved by the Research team of SRMIST College of Occupational Therapy, Chennai following thorough scrutinization of the relevant papers and consent letter approval from all the participants.

Results

Total of 10 participants participated in the pilot study. 40% are males and 20% are females. The results revealed that the experimental group has shown significant difference at 5% level in all the metrics

“Right, Left, Bi-manual, Assembly tasks of Purdue Peg Board test, CAHAI 13 and PDQ39. But comparing between the experimental and control groups significant

difference at 5% level was observed only in bi manual task of Purdue Peg board test.

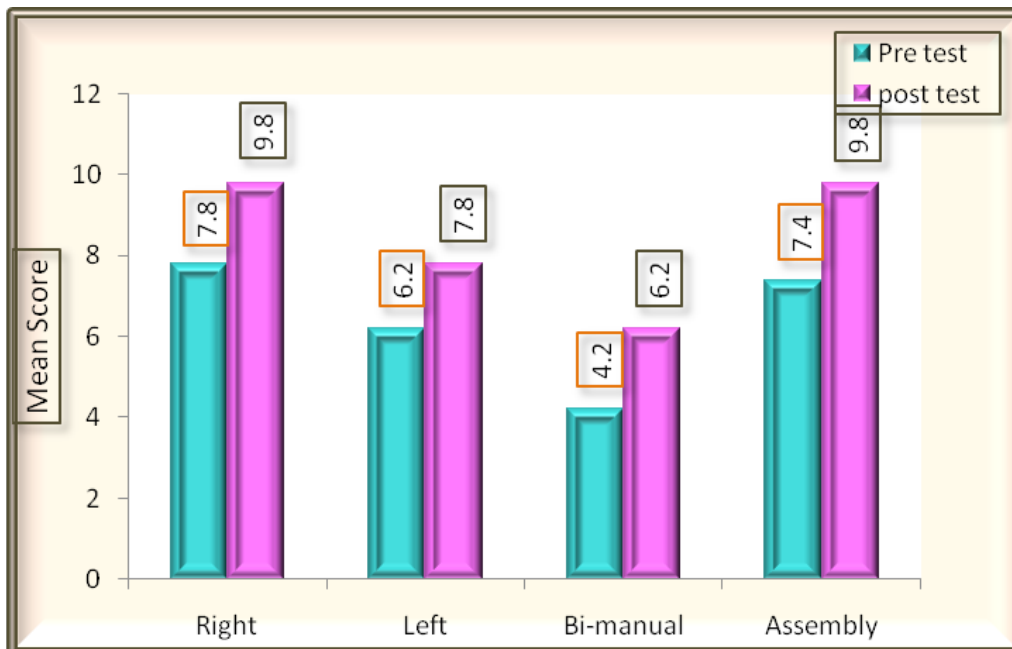
Table 1: Difference between pre and post test mean scores of various metrics in experimental Group

Metrics	Test	N	Mean	SD	t - value	DF	P-value
Right	Pre test	5	7.80	1.483	-6.325	4	0.003**
	Post test	5	9.80	1.789			
Left	Pre test	5	6.20	1.924	-3.138	4	0.035*
	Post test	5	7.80	2.387			
Bi-manual	Pre test	5	4.20	1.483	-3.162	4	0.034*
	Post test	5	6.20	1.483			
Assembly	Pre test	5	7.40	2.302	-6.000	4	0.004**
	Post test	5	9.80	1.924			
PDQ39	Pre test	5	60.40	14.117	-5.091	4	0.007**
	Post test	5	71.60	17.785			
CAHAI 13	Pre test	5	61.80	17.283	-4.727	4	0.009**
	Post test	5	79.40	9.685			

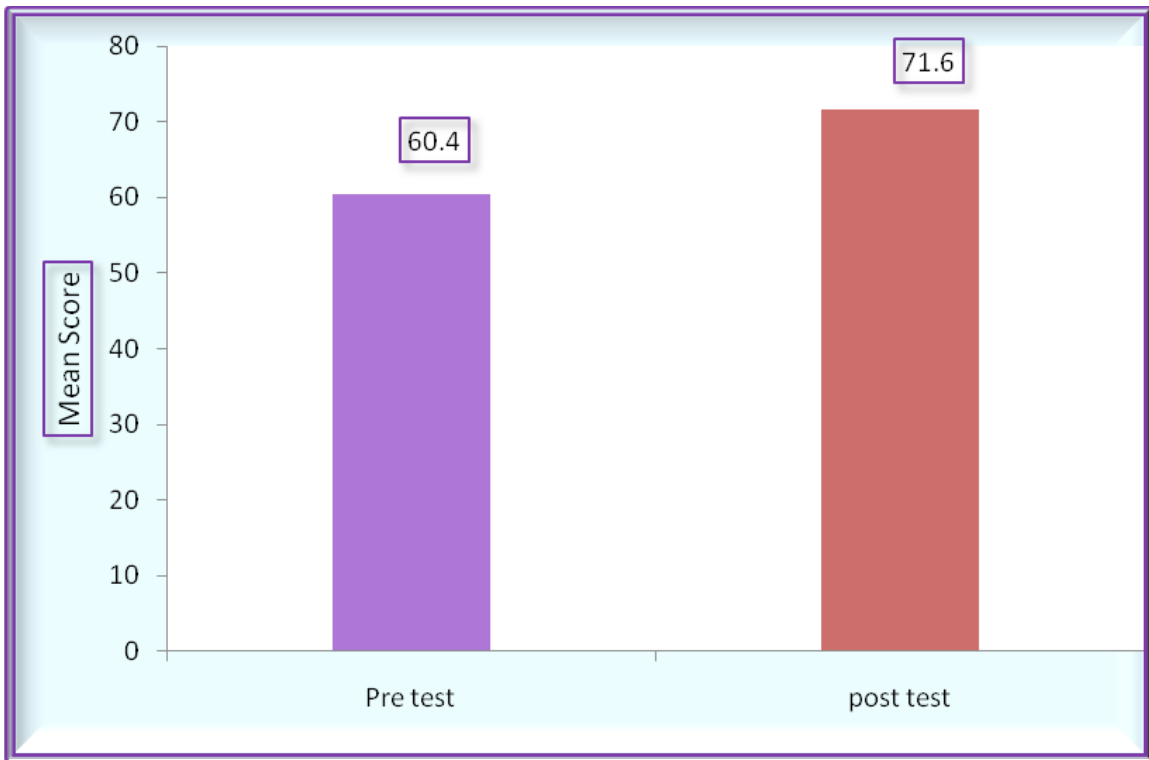
*-Significant at 5% level **-Significant at 1% level

Using paired t test analysis the P-values corresponding to the metrics “Left and Bi-manual” are significant at 5% level showing significant difference whereas the metrics “Right, Assembly, PDQ39 and

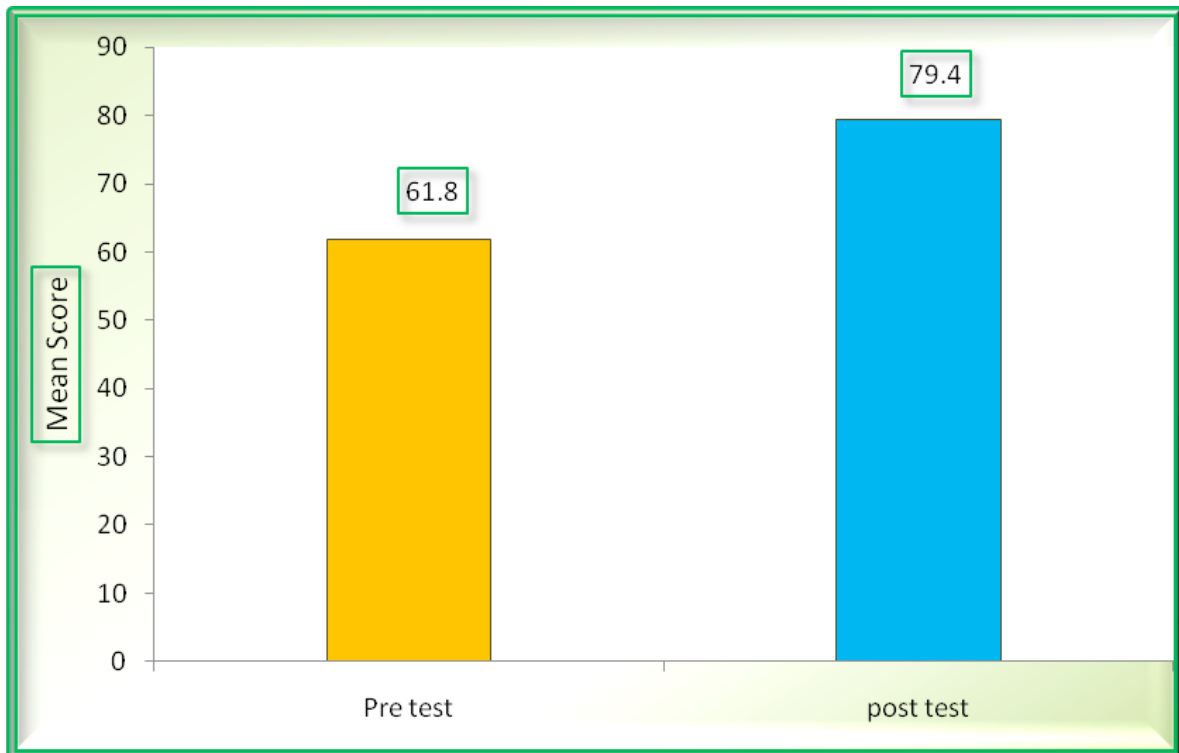
CAHAI 13” are significant at 1% level showing high significant difference between the mean scores of metrics “Right, Assembly, PDQ39 and CAHAI 13”.



Graph 1: Pre test and post test scores of Purdue Peg board test (PPBT) in experimental group



Graph 2 Pre test and post test scores of PDQ 3 in Experimental Group



Graph 3 Pre test and post test scores of CAHAI 13 in Experimental Group

Table 2: Comparison of various metrics between control and experimental group in post test level

S.No.	Metrics	Test	N	Mean	SD	t - value	DF	P-value
1.	Right	Control	5	7.80	1.483	-1.925	8	0.090
		Experimental	5	9.80	1.789			
2.	Left	Control	5	6.80	2.280	-0.677	8	0.517
		Experimental	5	7.80	2.387			
3.	Bi-manual	Control	5	4.20	1.095	-2.425	8	0.042*
		Experimental	5	6.20	1.483			
4.	Assembly	Control	5	6.60	2.608	-2.208	8	0.058
		Experimental	5	9.80	1.924			
5.	PDQ39	Control	5	52.60	12.720	-1.943	8	0.088
		Experimental	5	71.60	17.785			
6.	CAHAI 13	Control	5	59.60	18.703	-2.102	8	0.069
		Experimental	5	79.40	9.685			

*-Significant at 5% level **-Significant at 1% level

Using independent t test the p-value corresponding only to “Bi-manual” is significant at 5% level where as among other metrics no significant difference was observed.

Discussion

In this pilot study, researcher investigated the effectiveness of dexterity training program through online Tele-rehabilitation to improve manual dexterity and eventually dexterity related ADL(Activities of Daily Living) in patients with Parkinson’s Disease. Two groups for 4-week manual dexterity training programs focussed on different aspects on manual dexterity and arm and hand function. The dexterity training program predominantly consisted of finemotor dexterity exercises with in-hand manipulation of objects, whereas the Theraband training program predominantly consisted of hand and arm strength training exercises training through online Skype mode.

Table 1 Shows the difference in various metrics in experimental group. The P-values corresponding to the metrics “Right, Assembly, PDQ39 and CAHAI 13” are significant at 1% level and “Left and Bi-manual” are significant at 5% level hence concluded that Tele Rehabilitation was effective. Manual dexterity has been described as being affected in persons with PD^{13,31}. Persons diagnosed with PD have reported difficulty with fine manipulative activities and everyday hand activities, along with an impaired ability to perform bimanual tasks simultaneously. Additionally, the intervention showed

significant changes in speed and finger movements regarding the Purdue Pegboard Test. Furthermore, the CAHAI-8 as real-life upper limb functional tests and the dexterity questionnaire improved significantly, indicating a positive effect on dexterity-related ADL. The trained exercises improved significantly as well, which can be explained by training effects. This study was successful with the recent development of technology, but tele rehabilitation would be more successful in patients with higher status, with proper care taker or with further implications^{13,14}.

Table2 shows the mean score difference between control and experimental groups. Only in one metric i.e. bimanual task significant difference was observed but not in other metrics. The participants had difficulty in following instructions inspite of hand outs. Most of them required verbal and physical cues from the care givers as they were not well worsed in using technology. Some had net work disturbances. All this considerations could have influenced the scores.

Finally the dexterity training program after 4 weeks of intervention through Tele Rehabilitation has shown significant changes in manual dexterity.

Conclusion

Manual dexterity is an important component in day today life activities. Inadequate manual dexterity hinders the level of independence. Parkinson’s disease clients have compromised manual dexterity thereby dexterity

related ADL skills. HOMEDEXT program was effective in Parkinson's disease through Tele Rehabilitation.. In developing countries like India with vast population, neuro rehabilitation poses a great challenge with minimal resources, Tele rehabilitation could combat this issue.

Limitations: The main limitation of the present study is lack of technology facilities like poor network connection, need of care giver assistance and short study duration.

Implications: As this study has higher scope in neurological conditions various settings could be explored. People who can't reach clinical setup easily will find Tele rehabilitation more affordable.

Recommendations: Use of laptop instead of mobile phones is more convenient.

Selecting patients with proper care givers assistance will be more beneficial.

Further study can be done on a larger scale, on a random sample and in different parts of the country

Follow up studies should be included.

Source of Funding: Self

Conflict of Interest: Nil

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Comparison of Efficacy of Static Stretching and Sports Massage on the Removal Rate of Blood Lactate Level after Static Cycling in Female Individuals

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Abstract

Background: The Muscle soreness is a result of lactate accumulation after sub maximal exercise done by the athlete. It is necessary to clear the lactate for optimum performance.

Purpose: Hence the current study has been done to see the effect of static stretching and sports massage on removal rate of Blood lactate.

Methodology: The study was conducted on 60 female college students who fall into selection criteria. The subjects were randomly divided into two groups; Static Stretching was given to group A and Sports massage was given to group B to check the clearance rate of blood lactate after 20 minutes of static cycling. 3 readings of blood lactate level were taken i.e. first reading before the static cycling, second reading after the static cycling and the third after the interventions. The measurements were analyzed to check the efficacy of static cycling and sports massage on blood lactate removal rate.

Results: The results of the study showed both the techniques are effective with p value of 0.0001 to remove blood lactate where the static stretching improves the clearance with mean value of 1.0906 and sports massage improves with mean value of 0.0357.

Conclusion: It is concluded from the study that the static stretching and sports massage both the techniques are effective in improving blood lactate clearance rate but static stretching is more effective than sports massage.

Keywords: *Static Stretching, Blood lactate, Massage, Static cycling, Sports.*

Introduction

One of the major causes of muscle fatigue, soreness and cramp is accumulation of lactic acid due to submaximal activities done by the athlete. The intense muscular activity or the submaximal activity done by the athlete creates the imbalance in the production and clearance of lactic acid which leads to accumulation of

lactate in muscles and ultimately causes muscle fatigue, Soreness and muscle cramp.^{1,2} There is a significant difference in threshold or onset of accumulation when it is compared in trained and untrained person and it increases the endurance capacity of an individual at VO_{2max} .³

The lactate removal rate increases during aerobic exercises in trained person and produces adaptation and the blood lactate accumulates only in the situation of relative tissue hypoxia or lack of oxygen.³

The accumulation of lactate reduces the ability of muscle to contract and ultimately reduces the performance of athlete which makes the clearance of lactate crucial for better performance of an athlete.^{1,4}

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The lactate is an important metabolism in re-synthesis of ATP therefore lactate oxidation saves the muscle carbohydrate and helps to sustain anaerobic exercise intensity.⁵

The removal of lactate starts after 15 minutes of strenuous exercise during the recovery phase which also depends on physical condition of individual and also on the intensity of exercise. Removal rate of lactate can also be increased with the cool down exercise performed during recovery phase.^{1,6}

There are several techniques like passive recovery, sports massage, stretching exercise, cold immersion those have been reviewed to increase the removal rate of blood lactate. The current study aimed to compare the efficacy of static stretching and sports massage on the removal rate of blood lactate after static cycling in female individuals so that the best technique could be given in clinical practice for the removal of blood lactate for the better performance of an athlete.

Materials and Method

Total 66 subjects were screened for the study out of which 60 subjects matched the selection criteria. The obese females, females who were doing regular exercise and aerobics and the subjects with history of underlying pathology and cardiac disease were excluded from the study. All the subjects were apprised with all the risk factors and the benefits of the study and followed by the verbal and written consent form for the volunteer participation.

The randomization was done with chit method to divide the subjects into two groups i.e. Group A and Group B. Total 3 readings of the blood lactate were taken, first reading was taken prior to the static cycling and second reading was taken after static cycling whereas the third reading of blood lactate was taken after the interventions. The collected blood sample was sent to the laboratory for centrifusion and the plasma was separated in other vials. The samples were stored in defreezer at -20°C. Blood lactate level was measured to assess the fall in blood lactate.

Interventions: After the collection of first sample of Blood the static cycling was performed for 30 minutes by both the groups. The second sample was taken after the 10 minutes of static cycling followed by the Static stretching of major muscles (Quadriceps, Hamstrings, Adductors, Gluteus and gastronemeous) to group A and

sports massage to group B. The static stretching was given for 9 minutes with hold of 20 seconds at the level of mild discomfort and relaxed for 5 seconds with 5 repetitions to each muscle. The sports massage to group B was given for 5 minutes in supine as well as in prone position starting from the right leg and then left leg in both the positions. The third reading was taken and then all the three readings were compared.

Results

The results of the study showed improvement in clearance of blood lactate level with p value <0.0001 as the static stretching clears with the mean value of 1.0906 and sports massage clears with the mean value of 0.0357.

Table 1: Comparison of pre cycling, post cycling and post interventional mean differences of blood lactate level of both the groups.

Reading of blood lactate	Group A		Group B	
	Mean	SD	Mean	SD
Pre-cycling	4.5490	0.5966	4.6847	0.8082
Post Cycling	5.5883	0.6648	5.3810	0.7802
Post interventional	4.4977	0.6478	5.3453	0.8047

Table 2: Showing means clearance of blood lactate in both the groups

	Mean Level of lactate	
	Group A	Group B
Pre Interventional	5.5883	5.3810
Post Interventional	4.4977	5.3453
Mean Clearance	1.0906	0.0357

Discussion

The objective of the study was to find out the more effective technique to improve blood lactate clearance. Two groups were analyzed for blood lactate level after 30 minutes of static cycling using D (-) lactate measurement for blood lactate. The muscular fatigue occurs due to metabolic acidosis after aerobic exercise during glycolysis the hydrogen atoms fails to oxidize and leads to accumulation of lactate which ultimately leads to decrease in force production hence clearance of blood lactate is necessary for optimum performance and for those athletes who have multiple performances in a single day.

The results of this study support the use of static stretching to improve clearance of blood lactate. Rajpreet Kaur, Rajender Kumar in their study showed

the static stretching improves blood lactate clearance significantly; this may be due to sensitivity of nerve receptors increased and the speed of nerve impulses also increased which increases the muscle contractions.⁷

There are several factors that can account for our findings. One of the main concern about results of massage intervention in study can be aimed at previous exercise and type of massage intervention and also the speed of static bicycle which was varied as the subjects slows down the speed after they get fatigue. The type and time of massage is discussed in several studies that leg massage for 10 minutes is required for the proper effectiveness of massage.¹¹

Conclusion

Summarizing the findings of the study to investigate the effect of static stretching versus sports massage in improving the blood lactate clearance within the limitations of the study we concluded that both the techniques are effective in improving the blood lactate clearance after submaximal exercise but the static stretching is more significant in improving the blood lactate clearance.

Ethical Clearance: Ethical Clearance was taken from Ethical Committee of Adesh University, Bathinda, Punjab.

Source of Funding: Self

Conflict of Interest: Nil

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Efficacy of Supine, Sitting and Standing Hamstring Stretch Positions on Flexibility in College Students: A Randomised Experimental Study

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Abstract

Decreased hamstring flexibility is suggested to be one of the predisposing factors for hamstring strains and hamstring stretches are routinely used as part of a pre-exercise routine, usually after an aerobic warm-up. Static self-stretch is proved to be the most effective stretching for increasing hamstring flexibility; but the hamstring muscle, stretch can be done in a variety of positions.

Materials and Method: 60 with hamstring tightness, both male and female satisfying the inclusion criteria were included in the study (age 20-26 years). Their AK-ROM was measured prior to the stretching protocol and then once again three weeks post stretching protocol (which included warm up, protocol & cool down).

Results: The subjects showed an improvement in ROM after stretching and that supine and sitting position of hamstring stretching showed significant improvement as compared to standing hamstring stretch.

Conclusion: The subjects showed an improvement in ROM and hence increase in flexibility of the hamstring muscle. The supine position showed better improvement than the sitting and standing hamstring stretch.

Keywords: Flexibility, Hamstring, ROM, Static Self-Stretch.

Introduction

Anderson and Burke (1991) defined *flexibility* as “The range of motion available in a joint or a group of joints that is influenced by muscles, tendons, ligaments and bones”¹ Flexibility has also been described as the degree to which muscle length permits movement over that which it has an influence.² Flexibility of muscle has long been a concern of physical therapists and rehabilitation specialists, as well as physical educators and coaches. Claims have been made that increased flexibility resulting from stretching activities may decrease the incidence of musculotendinous injuries, minimize and alleviate muscle soreness and improve athletic performance.^{1,3,4,5,6,7}

Hamstring tightness a common musculoskeletal disorder, commonly undiagnosed and untreated . Many treatment approaches are used to increase hamstring flexibility like cold packs, deep heat, superficial

heat, MET, passive stretch and massage. Static self-stretch is proved to be the most effective stretching for increasing hamstring flexibility; but for the hamstring muscle, stretch can be done in a variety of positions. The positions commonly studied were the fundamental supine, sitting or standing. Research is still deficient as to which position of hamstring self-stretch is most effective, convenient and comfortable for different patients of both the sexes and across varied age group need to be done. The appropriate stretch position can hence be incorporated in the home exercise program.

Objectives of the Study:

1. To assess the effect of active self-stretching as a method of stretching.
2. To assess the relative effectiveness of supine, sitting and standing positions on hamstring stretching to increase its flexibility in study group.

Methodology

Research Design: A Randomized experimental study.

Sample Size: 60 subjects were taken from the total population based on selection criteria.

Group I: Subjects performing SUPINE hamstring stretch (20 subjects)

Group II: Subjects performing SITTING hamstring stretch (20 subjects)

Group III: Subjects performing STANDING hamstring stretch (20 subjects)

Sampling Design: Randomized design.

Study Duration: Three Weeks.

Source of Data: Students of Krupanidhi College.

Sampling Criteria:

Inclusion Criteria

1. Tight hamstrings are defined as a 30° knee-extension deficit with the hip at 90° degrees as described by Bandy and Irion.⁸
2. Subjects taken are volunteers who signed an institutionally approved informed consent statement.

Exclusion Criteria:

1. Histories of orthopaedic problems, such as episodes of hamstrings injuries, fractures and surgery in the past 1 year.
2. Pain in the spine or hamstring muscles over the past 6 months.
3. Hamstring muscles that were considered too flexible and were with an athletic profile.
4. Subjects with knee joint flexion contracture by checking knee extension.
5. Metal pins, plates or screws in the femur/tibia.
6. Any musculoskeletal disorders in the trunk e.g. Scoliosis and lower extremity deformities e.g. Genu varum, Genu valgum etc.

7. Subjects confirmed pregnant.

8. Noncompliance with the program.

9. Any discomfort that is more than normal sensation of stretched tissue during the study.

Procedure: The subjects, who after the preliminary screening by the testing physical therapist were eligible according to the selection criteria and were asked to sign in the “informed consent form”, were included in the study. The total of 60 samples was divided into three groups equally by block randomization method. Pre-test data were collected for AK-ROM before the intervention. The investigator was blinded during measurement procedure. **GROUP I** –Subjects performed SUPINE hamstring stretch (20 subjects), **GROUP II**- Subjects performed SITTING hamstring stretch (20 subjects) & **GROUP III**- Subjects performed STANDING hamstring stretch (20 subjects). Warm-up was performed before stretching by the patient. According to Jagannath Sharma, Colin White and Hideaki Senjyu (2004) warm-up consisted of the subject jogging on the spot for 3 minutes. By that time a light sweat had built up on the subject’s brow. No equipment was utilised for the warm-up period. The stretching consisted of the subject performing a warm-up followed by three repeats of a static self -stretch, each hold for 30 seconds, with 15 seconds rest between each stretch).⁹

Intervention: For all subjects hamstring stretching exercises were performed three times per week. Each session in a day consisted of three repetitions. A rest period of 15 seconds was given between the stretches. Each static hamstring self-stretch was of 30 seconds duration. Each session was approximately 5 minutes duration including the warm-up period.

After three weeks of stretching, post study measurements was taken in the same manner as the pre-stretching measurements. The two investigators were present; one to measure and other to read the measurement, thereby limiting bias in taking the new measurement.

Measurement of supine active knee extension ROM as described by Gajdosik et al as an indicator of hamstring flexibility was used in this study.¹⁰



Supine Stretch



Sitting Stretch



Standing Stretch

Results

The data was put for analysis using SPSS 11.0 software, to compare the pre and post therapy test scores, to find out the significance of the data. This chapter deals with analysis of the data to answer the research question through suitable statistical treatment.

1. Descriptive statistics was done for all the data of all three groups.

2. The mean difference of AK-ROM for pre-test and post-test (within group) was analysed with paired t-test.
3. The mean improvement for ROM between the groups was analysed with one way Anova with multiple comparisons.

Statistical Analysis:

Table 1: Age-Gender distribution of subjects studied:

	Supine	Sitting	Standing	Significance
Age	23.7 ± 3.67	23.4 ± 3.74	23.1 ± 3.17	1.000
Gender –M:F	10:10	10:10	10:10	1.000

The above table describes the age and gender distribution of all three groups. The mean age in supine group is 23.7 + 3.67, in sitting group mean is 23.4 + 3.74 and in standing group mean is 23.1 + 3.17; hence age is

not a confounding factor. Gender distribution was equal in all the three groups and so it is significant (1.000) in each of them.

Table 2: Comparison of mean change for ROM within the three groups:

AK- ROM	Pre test Mean±SD	Post test Mean±SD	Difference	Significance
Supine	112.65±8.70	128.9±6.59	16.25±7.34	0.000*
Sitting	113.15±8.63	112.60±6.49	9.45±6.85	0.000*
Standing	113.60±7.93	121.80±10.41	8.20±4.29	0.000*

In this study it has been observed that the Mean±SD of **Supine Group** during pre-test (stretch)112.65+8.70 is and during post-test it was 128.9+6.59. Hence, there is an increase in ROM of 16.25+7.34 from pre-test to post-

test stretching which is statistically significant (p<0.001) indicating an increase in flexibility of hamstring muscle by stretching.

In **Sitting Group**, Mean±SD during pre-test is 113.15+8.63 and that of during the post-test it is 112.60+6.49. The increase in ROM of 9.45+6.85 from pre-test to post-test stretching which is statistically significant ($p < 0.001$).

The increase in ROM in **Standing Group** is 8.20+ 4.29 which has Mean±SD of 113.60+ 7.93 and

121.80+10.41 during pre and post-test respectively which is also statistically significant ($p < 0.001$).

These values are significant with 95% confidence interval for difference. The statistical analysis of the data supports the beneficial effects of static stretching in increasing the ROM and thereby the flexibility of the hamstring muscle.

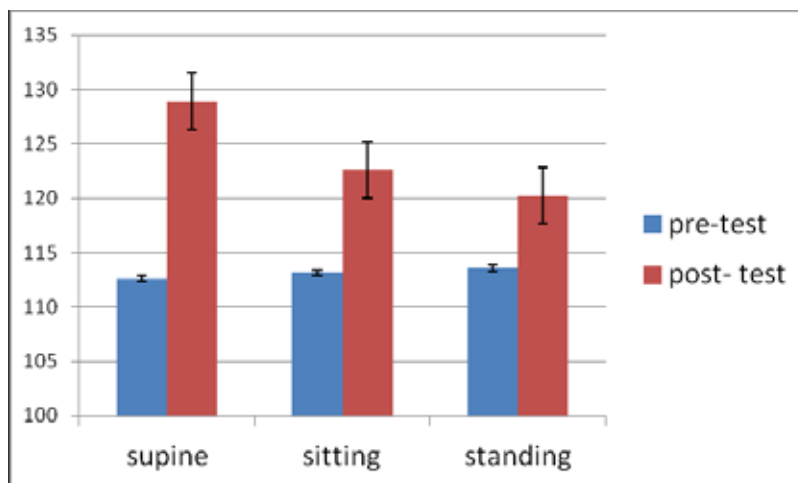


Figure 1: Pre-Test and Post-Test Rom Within Group

Figure 1—It shows the graphical representation of the increase in ROM by static self-stretch in all the three study groups (supine, sitting and standing) after the three week stretching protocol. This graph shows that there is significant difference in the improvement of

flexibility between 0 week (pre –stretching) and 3th week (post –stretching) based on ROM scores in all the three groups, which is significant at 95% confidence interval of difference.

Table 3: Comparison of mean difference for ROM between the three groups:

Range of Motion			
Supine stretching procedure vs. Sitting stretching procedure	Supine Mean±SD	Sitting Mean±SD	Significance
	16.25±7.34	9.45±6.85	.001*
Supine stretching procedure vs. Standing stretching procedure	Supine Mean±SD	Standing Mean±SD	Significance
	16.25±7.34	6.65±.67	.000*
Sitting stretching procedure vs. Standing stretching procedure	Sitting Mean±SD	Standing Mean±SD	Significance
	9.45±6.85	6.65±.67	.288

Comparative evaluation of ROM scores between three groups- supine, sitting and standing group was done and the result is presented in table 3. The mean ROM scores of Supine Group and Sitting Group was observed

after 3rd week and the mean values were 16.25+7.34 in supine group and 9.45+6.85 in sitting group which is significant in 95% confidence interval for difference. The mean ROM scores of Supine Group and Standing

Group was observed after 3rd week and the mean values were 16.25±7.34 in supine group and 6.65±6.67 in standing group which is significant in 95% confidence interval for difference. The mean ROM scores of Sitting Group and Standing Group was observed after 3rd week and the mean values were 9.45±6.85 in sitting group and 6.65±6.67 in standing group which is significant

in 95% confidence interval for difference. The mean improvement of ROM between the supine and sitting group, supine and standing group is significant, but the mean improvement between the sitting and standing group not significant. This was found out by use of multiple comparisons (Tukey HSD).

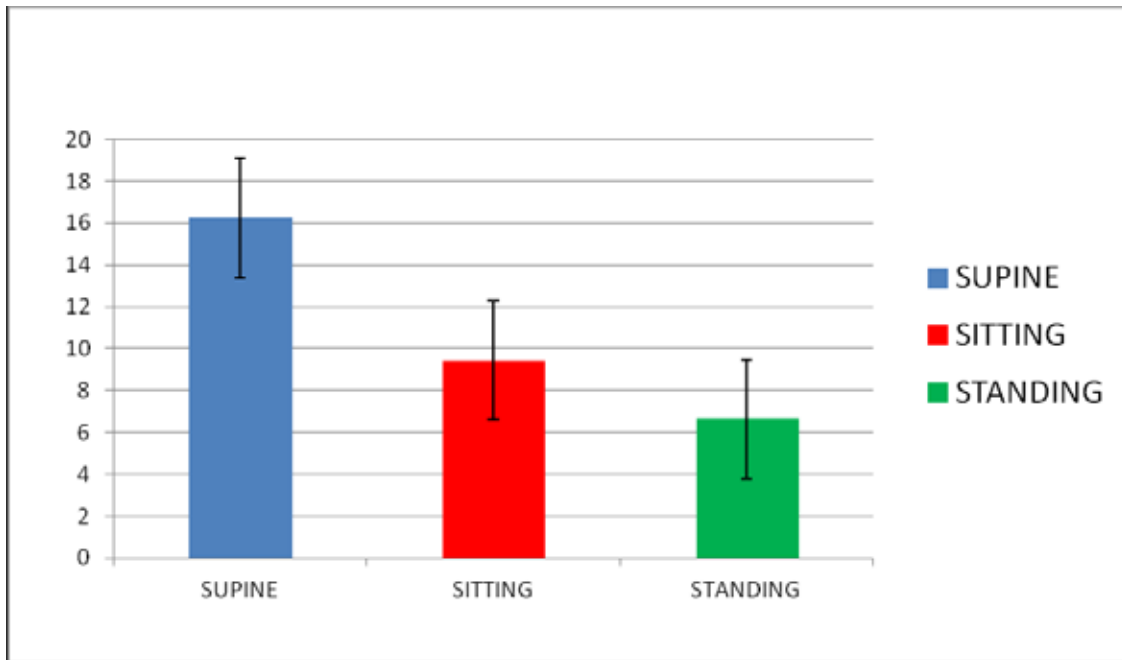


Figure 2: Comparison Of ROM Between Groups

This graph is the graphical representation of mean difference in ROM by static self-stretch with supine, sitting and standing position. The graph shows that there is significant increase in mean ROM scores in all the three groups post stretching. At 3rd week post- stretching there is significant difference in the increase in flexibility between the three groups.

The better improvement in ROM is gained in supine and sitting stretching position as compared to the standing position.

Discussion

The results were analysed by using suitable descriptive analytical method including Paired t- test and one way Anova with multiple comparisons. The statistical analysis of the data supports the beneficial effects of static self-stretch for increasing flexibility in tight hamstrings.

The results clearly indicate that static self-stretch has a remarkable effect in improving the flexibility of tight hamstring muscle. All the three groups showed improvement after three weeks of the stretching protocol.

A static stretch should be performed in the non-weight bearing position with the muscle relaxed for maximum gain in ROM. The supine stretch position thus showed significant difference of improvement in the hamstring muscle flexibility. The supine group felt comfortable in the position while the sitting and standing group were not very comfortable in the position that they performed the hamstring stretch.

The results suggest that “casual” supine hamstring stretching was as effective as the rigidly controlled standing stretching. For this reason, it may be preferable to use the supine method in unsupervised settings, such as home exercise programs or with athletes. Furthermore, supine stretching may better isolate the hamstrings,

allow improved relaxation, and, in general, be safer and more comfortable for people with a history of low back pain.

Limitations of this study:

1. This study has been done only on subjects between 20 and 26 years of age.
2. Measurement tool was a universal goniometer.
3. The long term effects of static self-stretch were not calculated.
4. This study was conducted on a small population.

Conclusion

The subjects were divided equally into three groups, each group consisting of twenty subjects with equal male-female ratio who performed static self-stretch in three different positions (supine, sitting and standing). They showed statistically significant increase in flexibility measured by ROM scores using the universal goniometer.

The results suggest that all the three stretch positions are comparably effective in improving hamstring muscle flexibility. According to the statistical analysis and results, it is concluded that there was a mild superiority in the effectiveness of supine and sitting stretching group over the effectiveness standing stretching groups in terms of increase in ROM which is evident by the third week (post-stretching). While all the three groups showed improvement in the AK-ROM post static stretching protocol. However, because the supine stretch does not require specific pelvic positioning and, therefore, requires less instruction and supervision, it may be more effective for independent programs.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effect of Maitland Technique (Posterior Glide) with Muscle Energy Technique for Subscapularis Muscle on Adhesive Capsulitis

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Abstract

Background: Adhesive capsulitis is the very common in people with diabetes and people between the age group of 40 – 65 years of age. It is essential to design a treatment protocol which reduces pain and improve ROM and functional activity of the shoulder in least possible. As this condition is very painful and hampers the functional activity of the shoulder.

Objectives: Objectives of the study were to determine the effect of posterior glide with MET for subscapularis muscle on adhesive capsulitis in reducing pain, improving ROM and functional activity of the shoulder.

Material and Method: In this experimental study, the subject with adhesive capsulitis were assessed with VAS, ROM and SPADI, the subjects were given Maitland Technique (posterior glide) along with MET for subscapularis with conventional treatment.

Results: Statistical analysis was done of VAS, ROM and SPADI in 40 subjects in which it was seen that post treatment showed extremely significant results in all the outcome measures.

Conclusion: The current study concluded that Maitland technique (posterior glide) along with MET for subscapularis is effective in the management of Frozen Shoulder. Maitland technique (posterior glide) along with MET for subscapularis given with Conventional Treatment is significantly effective in reducing pain, increasing range of motion and functional status of Shoulder and thus Alternate Hypothesis accepted.

Keyword: Adhesive capsulitis, Maitland technique, MET.

Introduction

Frozen Shoulder: Adhesive capsulitis refers to a common shoulder condition characterized by the global restriction in the shoulder range of motion in a capsular pattern i.e. limitation of passive lateral rotation and

abduction. To diagnose shoulder capsulitis the presence of capsular pattern is important. Depending upon the stage present the ROM varies¹.

This condition was first described by Duplay who called it “periarthritescapulo-humerales.” Codman first introduced the term “frozen shoulder” and described it as a “class of cases which are difficult to define, difficult to treat and difficult to explain from the point of view of pathology”. Neviasser¹ called it adhesive capsulitis, as he, under arthroscopy, observed that the capsule looked thickened and adhered to underlying bone and could be peeled off from the bone. There is no apparent cause in an idiopathic capsulitis. The shoulder gradually becomes painful and stiff.

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Types:

1. Primary adhesive capsulitis, which corresponds to idiopathic adhesive capsulitis i.e. unknown cause.
2. Secondary adhesive capsulitis consists of traumatic capsulitis or if some other medical condition is present alongside².

The natural course of the condition is longer than generally stated and not always complete, that is, not all get full recovery¹.

Prevalence: The prevalence of adhesive capsulitis 2% to 3% worldwide. It is common in the people between the age group 40 to 70 years of age. In patients with diabetes the incidence of adhesive capsulitis is increased to about 10% – 20%³.

Maitland Technique: The international Maitland Teachers Association (IMTA) defines the Maitland concept as a process of examination, assessment and treatment of neuromusculoskeletal disorder by manipulative physiotherapy⁴.

Glenohumeral posterior glide: Improves flexion, internal rotation and horizontal adduction once 90 flexion is achieved.

Only after a thorough assessment and examination appropriate selection of mobilization technique for treatment can be selected. As mentioned above, the capsulitis is challenging for therapeutic as well as rehabilitation purposes¹.

Muscle Energy Technique: Muscle Energy Techniques (MET) are a form of soft-tissue, or joint, manipulations or mobilizations, deriving from osteopathic medicine, employed in the treatment of musculoskeletal dysfunction. MET is generally classified as direct technique as opposed to indirect because the muscular effort is from controlled position in a specific direction against a distant counter force. The essence of MET is that it harnesses the energy of the patient (in the form of muscular effort) to achieve a therapeutic effect. Depending upon accurate diagnosis, appropriate levels of force and enough localization good result can be seen. Most of the time because of inaccurate diagnosis, improperly localized forces, or forces that are too strong, poor results are seen⁵

Aim and Objectives:

Aim: To find the effect of Maitland technique

(posterior glide) with MET for subscapularis muscle on adhesive capsulitis

Objectives: To find the effect of posterior glide with MET for subscapularis muscle on adhesive capsulitis in improving ROM.

To find the effect of posterior glide with MET for subscapularis muscle on adhesive capsulitis in reducing pain

To find the effect of posterior glide with MET for subscapularis muscle on adhesive capsulitis in improving functional activities of the shoulder

Materials and Methodology:

- Type of study- Experimental study
- Study design-Pre-test and post test
- Place of study-Krishna hospital, Karad
- Sample formula – $n = 4 \times SD^2 / (XE)^2$
- Sample size- 40
- Sampling method-Consecutive sampling
- Study duration- 6 months

Materials Required:

- Goniometer
- VAS scale
- SPADI questionnaire
- Hot Moist Pack (HMP)
- Ultrasound
- Aqua sonic gel
- TENS
- Towel

Selection Criteria:

Inclusion Criteria:

- Primary frozen shoulder
- Age 40 – 65 years
- Shoulder pain more than 3 months
- Both males and females

Exclusion Criteria:

- History of trauma or accidental injuries

- History of recent fractures
- Bursitis
- Tendinitis
- Neurological involvement
- History of shoulder surgery of the same side affected.

index and goniometer prior to the intervention.

Before the treatment protocol patient were given HMP for 15 mins.

Patients were given Maitland’s mobilization technique (posterior glide) of suitable grades with MET for subscapularis muscle for 3 consecutive sittings. 3-5 muscle contractions with 5-7 seconds each contraction (not more than 20% of total muscle strength) for three repetitions.

Patient were also given conventional exercises that are shoulder wheel, shoulder ladder and Codman’s pendular exercises.

After the exercise’s subjects were given ultrasound or TENS depending upon the area of pain

The patients have attended the physical therapy session daily, which was for 3 days consecutively.

Patients were assessed with (VAS, ROM, SPADAI) at the end of 3rd sitting of the treatment session. The pre and post assessment measures were compared with the help of VAS, ROM and SPADI questionnaire. Results were calculated with help of pre and post assessment.

Outcome Measures:

- VAS
- ROM
- SPADI

Procedure: The study was conducted at physiotherapy outpatient department in Krishna Hospital, Karad. 40 subjects were recruited as per the inclusion and exclusion criteria

Subjects were given proper knowledge about the condition and treatment given in the study

Prior informed consent form was taken from the subjects filled by themselves.

Pre-test measurements were taken with the help of Visual Analogue Scale, Shoulder pain and disability

Statistical Analysis:

Table No. 1: VAS – using paired t-test

	Pre-interventional Mean±SD	Post-interventional Mean±SD	P value	Inference
Results	7.125±1.343	2.975±1.143	<0.0001	Extremely Significant

Table No. 2: SPADI - using Paired t test

	Pre-interventional Mean±SD	Post-interventional Mean±SD	P value	Inference
Results	101.75±14.036	67.75±15.556	0.0001	Extremely Significant

Table No. 3: FLEXION ROM - using Paired t test.

	Pre-interventional Mean±SD	Post-interventional Mean±SD	P value	Inference
Results	92.875±10.854	107.7±11.815	<0.0001	Extremely Significant

Table No. 4: ABDUCTION ROM – using Paired t test.

	Pre-interventional Mean±SD	Post-interventional Mean±SD	P value	Inference
Results	83.475±14.169	110.8±13.890	<0.0001	Extremely Significant

Table No. 5: MEDIAL ROTATION ROM using Paired t test.

	Pre-interventional Mean±SD	Post-interventional Mean±SD	P value	Inference
Results	29.5±6.687	39.525±6.653	<0.0001	Extremely Significant

Table No. 6: LATERAL ROTATION ROM – using Paired t test.

	Pre-interventional Mean±SD	Post-interventional Mean±SD	P value	Inference
Results	22.8±5.902	30.4±6.113	<0.0001	Extremely Significant

Result

- The mean VAS score on pre intervention was 7.125±1.343 which was reduced to a mean of 2.975±1.143 post-sessions.
- The mean SPADI score on pre-intervention was 101.75±14.036 which was reduced to a mean of 67.75±15.556 post-sessions.
- The mean FLEXION ROM score on pre-intervention was 92.875±10.854 which was increased to a mean of 107.7±11.815 post-sessions.
- The mean ABDUCTION ROM score on pre-intervention was 83.475±14.169 which was increased to a mean of 110.8±13.890 post-sessions.
- The mean MEDIAL ROTATION ROM score on pre-intervention was 29.5±6.687 which was increased to a mean of 39.525±6.653 post-sessions.
- The mean LATERAL ROTATION ROM score on pre-intervention was 22.8±5.902 which was increased to a mean of 30.4±6.113 post-sessions.
- In all the above given results the p value in Paired t test was found to be <0.0001 which is extremely significant.

Discussion

The present study “Effect of Maitland technique (posterior glide) with muscle energy technique on subscapularis in adhesive capsulitis” was designed to test the hypothesis that Maitland technique (posterior glide) along with muscle energy technique on subscapularis in adhesive capsulitis would show significant improvement in decreasing VAS, increasing ROM and improving SPADI score. The objectives of the study were to determine the combined effect of Maitland technique (posterior glide) along with MET for subscapularis in adhesive capsulitis.

A total of 25 males and 15 females were included in this group. In a recent study it has been proven that frozen shoulder is more common in women than men but they had also stated that men are at a greater risk for longer recovery and greater disability⁶ this could be the possible reasons that this study is having more numbers of males than females. As in rural areas people don't tend to visit a doctor till the pain increases beyond the tolerating limits or till greater amount of disability is seen which limits the daily functional activities.

The mean age of subjects present in this study is 49.425±6.417. these results are consistent with the previous studies which have stated that frozen shoulder is more common in people between the age group of 40-60 years of age⁷.

The rationale for using all the modalities, exercises and techniques used in the treatment and the effect on the patient has been stated below.

Hot moist packs that transfer heat from the packs to the patient's body increase the temperature of the respective body part. ⁸ With increase in temperature, the stress-relaxation ability of the collagen fibres is enhanced, which enable larger deformation in these fibres when subjected to stretch.⁹

Therapeutic Ultrasound on the other hand has been proven in previous studies also for elevating collagen tissue extensibility, pain threshold and enzymatic reactions. Also, it causes alteration in nerve conduction velocity and the contractility of skeletal muscles. ¹⁰ Codman's Pendular exercises are a form of exercises that utilize the effects of gravity to provide a distraction of the humeral head from the glenoid fossa. ² These exercises help reduce pain via gentle traction and revolving movement and enhance early motion of the articulating parts and the joint synovial fluid.¹¹

The rationale for using Maitland mobilization techniques are that it is primarily used for treating joints limited by pain. The oscillations may have an inhibitory effect on the perception of painful stimuli by repetitively stimulating mechanoreceptors that block nociceptive pathways at the spinal cord or brainstem levels. These non-stretch motions help move synovial fluid to improve nutrition to the cartilage².

A literature done by Carolyn Kisner had stated that posterior glenohumeral mobilization improves flexion, abduction and internal rotation of the shoulder joint. This literature supports the current article as there has been seen significant improvement in flexion, abduction, external and internal rotation.²

A study conducted by Abhay Kumar, Suraj Kumar, Anoop Agarwal, Ratnesh Kumar and Pooja Ghosh Das had concluded that mobilization of the shoulder must be added to the supervised exercise program to achieve goals of reducing pain, improving ROM and function of the shoulder joint in adhesive capsulitis.¹ This study supports the current study and significant improvement was seen in reducing pain, improving ROM and improving the functional mobility of the shoulder in adhesive capsulitis patients.

The rationale for using MET is that isometric contraction seems to set the muscle to a new length by inhibiting it via the influence of the Golgi tendon organ which opens the restricted barrier and a new barrier is found⁵.

Salameh Bweir Al Dajah, Radhakrishnan Unnikrishnan had conducted a study in which they had stated that subscapularis muscle is the most powerful rotator cuff muscle and stability.¹² Narayan, Anupama, Jagga, Vinay had conducted a study in which they had concluded that

MET is very much effective in treating adhesive capsulitis patients.¹³

Yatheendra Kumar G, Sudhakar S had conducted a study in which they had stated that subscapularis treated with MET technique showed significant improvement in treating adhesive capsulitis patients.¹⁴

Manmitkaur A Gill, Bhavika P Gohel, Sandhya K Singal had conducted a study in which they had stated that MET along with conventional Physiotherapy was more effective in reducing pain and improving shoulder

ROM and function as compared to conventional therapy given alone, they had also stated that MET promotes body own healing mechanism and can help to release and relax muscles. The increased ROM following MET may be due to various factors like neural and viscoelastic properties. After application of MET, musculotendinous junction acts in a viscoelastic manner and leads to properties of creep and stress relaxation.¹⁵

These studies support the current study stating that MET is effective in reducing pain, improving ROM and function of the shoulder in adhesive capsulitis patients.

In this study an attempt was made to analyse the effect Maitland technique (posterior glide) along with MET for subscapularis in relieving pain and improving Joint Range of Motion as well as functional status and strength in Frozen Shoulder patients. This study was done to investigate the reduction of symptoms after application of Maitland technique (posterior glide) along with MET for subscapularis in conjunction with Conventional Treatment in Frozen Shoulder patients and its post treatment evaluation in a standardized manner using VAS, SPADI and ROM scores. The result shows that there is significant difference in improvement of pain, functional performance, Flexion, Abduction, External and Internal rotation Range of Motions.

Conclusion

The current study concluded that Maitland technique (posterior glide) along with MET for subscapularis is effective in the management of Frozen Shoulder. Maitland technique (posterior glide) along with MET for subscapularis given with Conventional Treatment is significantly effective in reducing pain, increasing range of motion and functional status of Shoulder and thus Alternate Hypothesis accepted.

Conflict Of Interest: There is no conflict of interest concerning the content of the study.

Source of Funding: This study was self-funded.

Ethical Clearance: The study was approved by the institutional ethics committee of KIMSUDU.

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Effectiveness of Ground Walking Versus Stair Climbing on Exercise Capacity in Subjects with Moderate Chronic Obstructive Pulmonary Disease

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Abstract

Purpose: The purpose of this study is to find the effectiveness between ground walking and stair climbing on improving exercise capacity in subjects with moderate Chronic Obstructive Pulmonary Disease.

Method: 75 subjects who were clinically diagnosed of Chronic Obstructive Pulmonary Disease were assessed and only 60 were recruited who are willing to be in the study and they were randomly allocated into two groups. In Group A (n=30) subjects were trained with ground walking along with conventional physiotherapy, with duration five days a week for 4 weeks, where in Group B (n=30) subjects were trained with stair climbing along with conventional physiotherapy. The outcome of this intervention was Six minute walk test (SMWT) this was recorded before and after the session of 4 weeks intervention.

Results: Statistical analysis of the data revealed that in within group comparison both group showed significant improvement whereas in between group comparison showed there is no significant improvement in between groups.

Conclusion: It was concluded that ground walking and stair climbing are equally effective in improving exercise capacity in subjects with moderate chronic obstructive pulmonary disease.

Keywords: COPD; SMWT; Ground Walking; Stair Climbing.

Introduction

Chronic obstructive pulmonary disease (COPD), a common preventable and treatable disease, is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways. Exacerbation and co-morbidities contribute to overall severity in individual patients¹ (GOLD-2015).

According to World Health Organization (WHO), COPD affects more than 400 million people worldwide⁽¹⁾. COPD accounts for more than 3 million deaths per year globally making it the third leading cause of death worldwide².

In India prevalence of COPD is about 15 million cases (males and females ratio 9.1 and 5.8 million respectively). Average around 5% in adult population

was suffering with COPD with higher rates in smokers². Worldwide, the most commonly encountered risk factor for COPD is tobacco smoking Outdoor, occupational and indoor air pollution – the latter resulting from the burning of biomass fuels – are other major COPD risk factors.

The characteristic symptoms of COPD are cough, sputum production and dyspnoea on exertion. Cough and sputum production often precede the development of airflow limitation by many years; although not all individuals with cough and sputum production will develop COPD¹.

Pulmonary rehabilitation is recognized as an essential component of the management of people with COPD and improves exercise capacity and health - related quality of life (Lacasse et al 2006, Ries et al 2007)^{5,6}.

Walking is one of the important activities of daily living in patients with COPD. Ground walking training is one such mode of training, which requires no equipment. Compared to equipment-dependent training, walking is an easily available training modality, particularly for those living in places with limited resources^{12, 13}.

Stair climbing is extremely cost-effective, being simple, rapid and inexpensive, requiring few personnel and equipment and capable to predict cardio-pulmonary complications. Stair climbing represents a submaximal effort for the majority of COPD patients combined with a high metabolic cost¹⁴.

Six minute walk test is simple, easy reproducible outcome measure and requires no apparatus. A recent study suggested that the 6-min walking distance (6MWD) is a good predictor of mortality in COPD patients⁷. It is a self paced exercise that patients could perform this test alone. It can be carried out at same time of the day at any time^{8,10}.

Need of the Study: The Exercise tolerance is further affected by dyspnea. Though various modalities and techniques are available, but nevertheless none of the techniques so far has been shown significant results. To date, only a few studies have investigated COPD patients during stair-climbing. Exercise intolerance is the key disabling factor in COPD with decreased exercise performance, increased leg fatigue during lower limb training.

Pulmonary rehabilitation for 6 to 8 weeks yielded large results in improving exercise performance but the raise in COPD prevalence emphasized the need to find the shortest effective pulmonary rehabilitation program. Scarcity of the evidence on these topics urged me to conduct a study on the effectiveness of ground walking versus stair climbing on exercise capacity in subjects with COPD.

Aim of the Study: The Aim of the study is to compare the effectiveness of ground walking versus stair climbing on exercise capacity in subjects with COPD.

Objectives of Study: To compare the effectiveness of ground walking versus stair climbing on exercise capacity in subjects with COPD and to improve exercise tolerance.

Methodology

Subjects: Subjects were recruited from pulmonology department, GSL General hospital, Rajahmundry.

Method of data collection:

Study Sample: A Total of 75 COPD subjects, out of those 60 subjects were recruited who are willing to participate in the study after obtained the concern form and subjects who met the inclusion criteria. These 60 subjects were randomized into two groups by simple random sampling, selected by lottery method.

Group A: Stair climbing

Group B: Ground walking

Study design: Randomized control trail

Study period: 4 weeks

Outcome Measures: Six minute walk test.

Study setting: Pulmonology Department

Inclusive Criteria:

1. Age limit with 40-60 yrs.
2. Both Genders were included.
3. Stage 2-GOLD criteria.
4. Willing to participate on voluntary basis.

Exclusive Criteria:

1. Acute exacerbations of COPD.
2. Unstable vital signs.
3. Cardiac problems.
4. Untreated neoplasia.
5. Lung surgery in last three months.
6. Orthopaedic and neurological disorders that inhibit exercise training.
7. Psychiatric illness

Materials:

Recording materials:

Meter Tape.

Recording sheet

Assessment Performa

Data collection chart

Stop watch

Marker

Materials used:

- Pulse-oximetry
- Sphygmomanometer
- Oxygen cylinder with mask

Procedure: 75 subjects who were clinically diagnosed with COPD were assessed and only 60 were recruited who are willing to be in the study and they were randomly allocated into two groups. In Group A (n=30) subjects were trained with ground walking along with conventional physiotherapy, where in Group B (n=30) subjects were trained with stair climbing along with conventional physiotherapy. The outcome of this intervention was Six minute walk test; this was recorded before and after the session of 4 weeks intervention.

Stair Climbing (Group A): Patients were brought to a staircase, which consisted of seven flights of stairs. Each flight of stairs was 18 steps, each step measured 6.5 inches high and 12 inches wide. A landing occurred after every nine steps. Subjects were instructed as follows: “climb as far as possible at your pace using the railing only for balance.” They were told to stop once they could climb no more. On stopping, the number of flights of stairs climbed was noted. Half landings were rounded down. Participants were permitted to take short rest if needed with the total exercise time (exclusive of rests) being the target training duration (14, 15).

Ground Walking (Group B): In the walk group, participants trained on a 26-m circular indoor track with the initial training speed set at 75% of the participant’s peak walking speed. Each participant was given a goal of completing a set of number of laps in each five-minute period. All participants used a lap counter to monitor the number of laps walked during the prescribed duration.

The initial training intensity was chosen based on previous studies that are reported that this training intensity was tolerated by participants with COPD (Hernandez et al 2000). The training intensity of walking group was progressed as symptoms permitted so that the

dose of training was maximized, with participants in the walk group at a faster pace.

If walk speed became limited by stride length, further progress of training intensity was achieved by adding weight in 2 kg increments to a backpack.

The duration of training was 20mins in first week and increased by five minutes every two weeks to a maximum of take of 30mins by week 4. Participants were permitted to take short rest if needed with the total exercise time being the target training duration (12, 13).

Both the stair climbing group and ground waling group trained five times a week for four weeks. Conventional physiotherapy has given for both groups.

Outcome Measures: The outcome measure was six minute walk test. In this study baseline values and post test values of six minute walk test are compared for both stair climbing group and ground walking group.

Results

The results of this study were analyzed in terms of exercise capacity on six minute walk test.

Comparison was done both within group as well as between two groups. So to evaluate the intra group and inter group effectiveness of stair climbing and ground walking which are under considerations in the present study.

Statistical Analysis: Statistical analysis was done using the using SPSS version 20 with significance level kept at 0.05 for this purpose the data was entered into Microsoft Excel spreadsheet, tabulated and subjected to statistical analysis.

Within group analysis was done by Paired t- test and between groups analysis was done by Independent t-test.

Comparison of Pre and Post mean, it is observed that the post intervention have shown some significant impact on subjects.

Table 1: Analysis of Experimental Group A with pre and post mean

Parameters	N	Mean	Standard Deviation	t-value	Df	p-value
SMWT (pre)	30	284.50	46.634	-35.342	29	<0.000
SMWT (post)	30	320.03	45.377			

Comparison of Pre and Post mean, it is observed that the post intervention have shown some significant impact on subjects.

Table 2: Analysis of Experimental Group B with Pre & Post intervention

Parameters	N	Mean	Standard Deviation	t-value	Df	p-value
SMWT (pre)	30	289.50	55.310	-18.828	29	<0.000
SMWT (post)	30	307.37	55.332			

Table 3: Analysis of Effectiveness of the Treatment among Two Groups of the parameters.

Parameters	N	Mean	Standard Deviation	t-value	Df	p-value
Group A SMWT (POST)	30	320.03	45.377	.970	58	<.197
Group B SMWT (POST)	30	307.37	55.332			

On observing the means of post test parameters of group A and B the P- value is >0.05 . It shows no significant difference between the two groups.

Discussion

The results had shown that both stair climbing group and ground walking group who received four weeks of therapy has improved significantly on pre and post test values within the groups but when compared between the groups there is no statistical significance noted.

“However, regular exercise has been associated with reduced risk of hospitalization for exacerbated COPD and mortality among patients with COPD.”

The study, published in **Respirology**, examined 543 COPD patients from five respiratory clinics. The scientists looked at the distance the patients walked during the week. They found that COPD patients who committed to moderate or high levels of exercise over time lowered their risk of being hospitalized, while those who didn't exercise as much were more prone to taking trips to the hospital.

There have been multiple studies and meta-analyses of ground walking training in COPD patients. Ground walking training is associated with improvement in sub-maximal exercise capacity reflected by increased VO2 peak and peak work rate and greater endurance capacity.

S. Wootton et al. (2014), in their study aimed to examine the effects of short-term, supervised, ground walking training programme on health-related quality of life, exercise capacity and physical activity, concluded that ground based walking training increased health-related quality of life and endurance walking capacity compared to usual medical care¹³.

Regina WM Leung et al. (2010) in their study concluded that Ground walk training increased endurance walking capacity more than cycle training. The reduction in carbon dioxide production and minute ventilation could be due to improvement in oxidative capacity of the exercising muscles after walk training leading to a lower ventilation and dyspnoea at the workload. Their study provides evidence for ground walking as a mode of exercise training in pulmonary rehabilitation programs¹².

A previous study investigated the benefit of a home-based walking training program compared to usual care (No exercise training) (Hernandez et al 2000), participants in the walk training group trained six days per week for twelve weeks, unsupervised and improved endurance walk time by 960 seconds (99%) more than the usual care group.

Mazzocchi, Costa, et al analyzed the SpO2 alterations, it is verified that mean was of 93% in the six minute walk and 92% in the Stair Climbing, where significant decrease was not observed during the test or at resting basal situation¹¹. **Chirumberro A**, et al. (2014), in their study concluded that stair climbing represents a submaximal effort for the majority of COPD patients combined with a high metabolic cost. However, some COPD patients execute a maximal effort like the cycle ergometer test when climbing stairs¹⁴.

According to a study carried out which analyzed hemodynamic variables and efficiency in the stair climbing, they can be influenced by the stages of the progressive load during the climbing up and down. During exercise, the active musculature receives greater blood flow and the heart receives greater stimulation, comparing with rest. In the Stair Climbing there is high

participation of the lower limbs musculature and joints, besides the evident involvement of different angles which are able to cause alterations in the response of the physiological variables during exercise¹³.

I have taken six minute walk test, as an outcome for measuring exercise tolerance. I have observed improvement in the post test values of the both stair climbing group and ground walking group. But compare to ground walking group, stair climbing group got more improvement in exercise tolerance and amount of distance covered was increased during six minute walk test. I also observed that resting intervals or gaps taken by the subjects during six minute test was reduced after the completion of stair climbing than ground walking. The reason behind this change may be because stair climbing protocol is resistance exercise training protocol when compared with ground walking, which is easy to complete more walking distance during six minute test compared with ground walking.

The results of present study shows that is no significant difference between stair climbing method and ground walking method statistically but due to improved distance during six minute walk test, stair climbing group found effective than ground walking group in improving exercise tolerance in moderate COPD subjects .

Limitations:

1. The study did not include long term follow up.
2. Lack of control group.

Recommendations:

1. Follow up programmes can be included to assess the long term effects of treatment.
2. Effects of these trainings on other stages of COPD can be studied.
3. More studies should be done in separate males and females.

Conclusion

In conclusion, in patients with chronic obstructive pulmonary disease 4-week ground walking training or stair climbing training resulted in significant improvements in exercise performance. The results had shown that both stair climbing group and ground walking group has improved on post test values but when compared between the groups there is no statistical significance noted. So this study concluded that there

is no significant difference between stair climbing group and ground walking group in improving exercise tolerance among moderate COPD subjects.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: GSL Medical College Ethical committee.

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Effectiveness of Proprioceptive Neuromuscular Facilitation as an Adjunct to Conventional Therapy in Conservatively Managed Distal Radius Fractures: A Randomized Controlled Trial

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Abstract

Background: Distal radius fractures are most common injuries and cast immobilization being the method of traditional treatment. Thereby post immobilization wrist joint stiffness, swelling and pain are seen in patients. Rehabilitation with proprioceptive neuromuscular facilitation techniques (PNF) activates motor units of muscles improving strength, promote movement and return of optimal function.

Purpose: The purpose of the study was to find out whether PNF and conventional therapy can bring better functional outcomes in patients with conservatively managed distal radius fractures when compared to conventional therapy alone.

Method: 54 subjects with conservatively managed distal radius fractures were selected randomly. The study included 2 groups, control group and experimental group, the outcomes measures included were Numerical rating pain scale (NRPS), range of motion (ROM), Patient-Rated Wrist Evaluation Questionnaire (PRWE), Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH).

Results: Both the groups showed statistically significant difference, in all parametric values ($P < 0.05$) at 12th week. The mean difference, chi-square test values and paired t-test values of experimental group were greater in comparison to control group, at the end of 12 weeks.

Conclusion: This study concludes that there were significant improvement seen in both the groups in NPRS, ROM, PRWE, DASH but the experimental group treated with PNF along with conventional therapy showed better results than control group treated with conventional therapy alone.

Keywords: Distal radius fractures, PNF, conventional, PRWE, DASH.

Introduction

Distal radius fractures are one of the most common

injuries encountered in orthopedic practice where the radius snaps near the wrist. They make up 8%–15% of all bony injuries in adults and its prevalence increases with age. When force of impact is severe enough even healthy bones can end up broken⁽¹⁾.

In younger age group the trauma occurs due to sport activity or motor vehicle accidents accounting for 1/6th of long bone fractures at emergency department or orthopedic department⁽²⁾ while the patient complains pain on movement and tenderness on palpation⁽³⁾.

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These fractures are caused by a fall on the outstretched hand with the wrist in dorsiflexion. The form and severity of the fracture as well as the concomitant injuries⁽⁴⁾, such as soft tissue injuries like skin, ligaments or muscles⁽⁵⁾, depend on the position of the wrist at the moment of the fall⁽⁴⁾

Colle's fracture is defined as metaphyseal injury of cortico-cancellous junction, within 2–3 cm of articular surface,⁽⁶⁾ of the distal radius with characteristic dorsal tilt, dorsal shift. In Smith's fracture there is palmar tilt of the distal fragment⁽¹⁾. Conservative treatment in undisplaced or slightly displaced fractures closed reduction, if needed, with stabilizing bandage has played an important role in the treatment of distal radius fractures⁽³⁾.

The squeal of distal radius fractures will result in pain, stiffness of the hand due to prolonged immobilization. The patients are advised to perform active finger movements while the wrist is in the cast to prevent swelling and stiffness⁽⁴⁾.

Soft tissue injury leads to disruption of the mechanoreceptors⁽⁵⁾ in distal radius injuries there is effect over the triangular fibrocartilage complex and pronator quadratus muscle which inserts into the joint capsule so there is alteration⁽⁷⁾ in generation and transmission of the sensory motor and neuromuscular reflex patten leading to impaired joint position sense. Thus proprioceptive neuromuscular facilitation techniques in wrist joint rehabilitation is proposed in various studies⁽⁵⁾

Studies have shown that passive mobilization shows positive effects in decreasing pain and increasing range of motion. Therefore, it is often used in the management of distal radius fractures⁽⁸⁾.

Proprioceptive neuromuscular technique is a skilled and the most recognized treatment in physical therapy. Movement is our way to interact with our environment and motor learning principles⁽⁹⁾. Proprioceptive neuromuscular technique is a progression from preceding activity leading to the next activity⁽¹⁰⁾.

Proprioceptive neuromuscular facilitation is based on the application of resistance to facilitate muscular contraction. The main purpose is to achieve their specific requirements and thus promoting functional independence. The technique uses facilitation, inhibition, strengthening and relaxation of muscle groups. Rehabilitation with proprioceptive neuromuscular

technique supports synchronization and coordination training of movement, improves activities of daily living and quality of life.⁽¹¹⁾

It enhances active and passive range of motions in both athletic and clinical settings with a view of optimizing motor performance and rehabilitation⁽¹²⁾.

Various studies have shown that pnf stretching increases the ability to store and release elastic energy⁽¹³⁾ thus, improving muscle elasticity having a positive effect on range of motion⁽¹⁴⁾ and strength of the muscles in wrist⁽¹⁵⁾.

Participants: 60 subjects were randomly allocated in group 1 or group 2 by simple random sampling using lottery method. Pre intervention and post intervention measurements are blinded. There is no interaction between the subjects.

Group 1: Conventional therapy

Group 2: Proprioceptive neuromuscular facilitation + conventional therapy.

Patients in the age group 20 to 60 years of either gender, radiologically diagnosed distal radius fracture, reporting to the physiotherapy department after immobilization and cast removal were included in this study. Exclusion criteria were other ipsilateral upper limb fractures, neurovascular deficits, Sudeck's Dystrophy. Informed consent was taken and subjects were explained about the intervention they were going to be given. PNF techniques were applied by IPNFA trained therapist.

Study Procedure: Patient screening was done based on the inclusion and exclusion criteria. Informed consent was obtained by the patient who met the inclusion criteria. Randomization of the subjects was into two groups. Control group (conventional therapy), experimental group (Conventional therapy + PNF), both for 12 weeks. Initial assessment was done, before any intervention. The Parameters were assessed again on the 2nd, 6th and 12th week. Both the groups were encouraged to regularly follow home exercises program. There were 6 dropouts in total (4 in control group and 2 subjects in experimental group). Statistical analysis was done after excluding the data of the dropouts, completely.

Physiotherapy Intervention: The subjects with conservatively managed distal radius fractures, post cast-removal were randomly assigned into 2 groups by lottery method, without any bias if they met the

inclusion criteria. Informed consent were obtained from patients, pre-treatment evaluation was done on the first day as baseline measurements by using Numerical Pain Rating Scale (NPRS), the functional disability of each patient was assessed by Patient-Rated Wrist Evaluation Questionnaire (PRWE), Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH) and Range of motion using a universal goniometer. Subjects in groups 1 and 2 were taught conventional physiotherapy exercises on 0th day and were advised to perform the exercises at home, based on the dosages mentioned below. Follow up evaluation was done at the end of 2nd week, 6th and 12th week and documented for both the groups. At 12 weeks final readings of all outcome measures were taken and data analysis was done for final results.

Dosage: (Exercises 3 sets x 5 repetitions each) 3 times a week for the first week, 1 clinical/department session a week for the next 9 weeks and home exercises program explained. Assessments were done at the end of the 2nd, 6th and 12th week.

Group-A: Receives Conventional Therapy

Participants received Maitland’s passive mobilizations, initially grade I oscillations dorsal glide for increase in flexion, volar glide for increase in extension and dorsal glide for increase in supination, volar glide for increase in pronation at proximal and distal radio ulnar joint and cryotherapy for 15 minutes, followed by home exercises.

There were 4 dropouts in this group.

Home Exercises Program: Active assisted and isometric exercise range of motion of wrist, supination and pronation activities, grip strengthening and intrinsic muscle strengthening were taught to the patients as home exercise program for each group.

Group-B: Receives Proprioceptive Neuromuscular Facilitation + Conventional therapy

Maitland’s mobilization followed by PNF techniques such as rhythmic initiation, combinations of isotonic, dynamic reversals, stabilizing reversals rhythmic stabilization, repeater stretch, hold relax and contract relax were tailored to individual needs of the patient, followed by home exercise program.

There were 2 dropouts in this group.

Statistical Analysis: Study was conducted on 54 subjects with 95% statistical power and 5% level of significance. Initially all data parameters were tabulated and subjected to statistical analysis on SPSS software. Chi-square test was used to compare the scores of NPRS, DASH and PRWE, at 0th week and 12th week within groups. Mann-Whitney’s test was done to compare the results in NPRS, PRWE and DASH scores between groups. The data of Range of motion (ROM) within the groups at 0th and 12th week was analyzed using F- value while ANOVA testing was done to find the between group results of ROM values.

Results

Table 1: Mean, Standard Deviation and Chi-square in both the groups of NPRS, PRWE, DASH.

		Mean±SD		Chi-square
		0th week	12th week	
NPRS	Control	8.43±1.06	3.96±1.18	77.44
	Experimental	8.78±1.10	2.32±1.27	84
PRWE	Control	83.92±7.70	35.01±12.29	77.71
	Experimental	83.53±8.41	22.12±9.05	84
DASH	Control	78.01±8.75	20.12±8.24	73.2
	Experimental	75.42±17.54	10.10±8.74	84

Table 2: Mean, Standard Deviation and F-value in both the groups Range of Motion.

	Control			Experimental		
	Mean±SD		F value	Mean±SD		F value
	0th week	12th week		0th week	12th week	
Flexion	17.19±8.78	53.65±8.08	476.16	17.92±12.17	65.64±8.63	819.26
Extension	14.19±9.60	55.11±10.10	493.43	12.25±11.44	64.25±9.11	795.63
Supination	15.76±6.90	58.11±9.60	529.29	20.89±14.99	70.50±9.5	346.24
Pronation	54.46±15.40	75.76±8.44	813.74	43.03±19.78	80.64±8.05	106.94

Table 3: Study results between the groups of NPRS, PRWE, DASH.

	0th week			12th week		
	p value	Z value	Mann Whitney	p value	Z value	Mann Whitney
NPRS	0.147	-1.45	284	0.000	-4.16	128.5
PRWE	0.91	-0.11	357.5	0.000	-3.63	154
DASH	0.597	-0.52	333.5	0.000	-3.74	148

Table 4: Study results between the groups Range of Motion.

	0th week		12th week	
	p value	t- value	p value	t-value
Flexion	0.801	-0.25	0.000	-3.13
Extension	0.504	0.67	0.001	-1.6
Supination	0.117	-1.59	0.086	-4.75
Pronation	0.022	2.35	0.035	-2.17

Control vs. Experimental:

NPRS: On comparing the mean values of the NPRS, between control and experimental group, It was evident statistically that NPRS of the experimental group at the end of 12th week (Mean±SD: 2.32±1.27) improved greatly, in comparison to the control group (Mean±SD: 3.96±1.18).

PRWE and DASH: On comparing the mean values of the PRWE and DASH, between control and experimental group, It was evident statistically that PRWE and DASH of the experimental group at the end of 12th week (Mean±SD: 22.12±9.05), (Mean±SD: 10.10±8.74) respectively improved greatly, in comparison to the control group (Mean±SD: 35.01±12.29), (Mean±SD: 20.12±8.24) respectively.

Flexion: On comparing the mean values of the flexion range, between control and experimental group, It was evident statistically that flexion of the experimental group at the end of 12th week (Mean±SD: 65.64±8.63)

improved greatly, in comparison to the control group (Mean±SD: 53.65±8.08).

Extension: On comparing the mean values of the extension range, between control and experimental group, It was evident statistically that extension of the experimental group at the end of 12th week (Mean±SD: 64.25±9.11) improved greatly, in comparison to the control group (Mean±SD: 55.11±10.10).

Supination: On comparing the mean values of the supination range, between control and experimental group, It was evident statistically that supination of the experimental group at the end of 12th week (Mean±SD: 70.50±9.53) improved greatly, in comparison to the control group (Mean±SD: 58.11±9.60).

Pronation: On comparing the mean values of the pronation range, between control and experimental group, It was evident statistically that pronation of the experimental group at the end of 12th week (Mean±SD: 80.64±8.05) improved greatly, in comparison to the control group (Mean±SD: 75.76±8.44).

Discussion

The results indicate that both, the control group and the experimental group show significant decrease in pain and improved functional disability and improved range of motion at the end of 12 weeks treatment program as observed in NPRS, PRWE, DASH and range of motion values. It also indicates that, even though both the treatment modes show significant improvement, the improvement of experimental group was better statistically, in comparison to the control group.

The present study shows a significant statistical difference in NPRS, suggesting that 12 weeks of PNF with passive mobilization significantly helped in reducing pain in patients suffering with stiff wrist joints post immobilization in conservatively managed distal radius fractures when compared to control group. Myotactic reflex inhibiting the muscle activations causes muscle relaxation and has an analgesic effect increasing the pain threshold and proprioceptive input accuracy. This finding is supported by a study done by Hincapie et al., have shown in their study that proprioceptive retraining is effective in improving neuromuscular control and functional outcomes and reducing pain in chronic wrist pain secondary to ligament injuries⁽¹⁶⁾⁽¹⁷⁾.

There is significant improvement in all the range of motions in experimental group when compared to control group as seen in the statistical output by the end of 12th week. Repeated stretch to the target muscle causes the presynaptic inhibition of the muscle spindle sensory signal leading to decrease in the response amplitude of the Hoffmann⁽¹⁸⁾ and muscle stretch reflexes following a contraction and causes releases of actin myosin bonds and reduces passive stiffness, tension on the muscle tendon unit improving the muscle flexibility and range of motion while stretching the opposite muscle causes relaxation of the target muscle, thereby, functional outcome. So the present study is in agreement with the studies done by Rees et al and Khamwong et al.⁽¹³⁾⁽¹²⁾

The present study also assessed the functional outcome based on PRWE and DASH scores. PRWE has standardized literature and has a specificity to wrist, reliable for distal radius fractures subjects and is considered in any wrist conditions for outcome and DASH score has good reliability and includes different functional aspects there by disability score is used as an outcome in any upper limb conditions which includes various functional activities of daily living.

Limitations: Grip strength evaluation could not be included in the study due to lack of proper assessment tools..

Future Directions: A detailed study with different techniques of PNF can also be studied. Studies can be done including the grip strength to assess the effect of PNF on grip strength.

Conclusion

From the results, it could be concluded that there is significant improvement in both the groups. However, experimental group shows more significant improvement. The PNF techniques as an adjunct to conventional therapy is more effective in reducing pain, functional disability, improving range of motion when compared to conventional therapy alone in conservatively managed distal radius fractures.

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Effects of Diaphragmatic Training on Posture and Stability in Asymptomatic Subjects: A Randomized Clinical Trial

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Abstract

Background: Diaphragm plays an important role in breathing and postural control and the potential factors are potentially involved with suboptimal respiration and suboptimal (faulty) posture and may be associated with musculoskeletal complaints. The zone of apposition is important because it is controlled by the abdominal muscles and directs diaphragmatic tension. The smaller the zone of apposition, there will be less inspiratory action of the diaphragm on the rib cage.

Objectives: To determine the efficacy of diaphragmatic training on posture and stability in asymptomatic subjects.

Study Design: A randomized clinical trial.

Method: 38 asymptomatic subjects were randomly assigned in the age group of between 20 to 55 years with poor posture and stability. All the participants were recruited on voluntary basis. The participants were divided into an experimental group (n=19) who were given Diaphragmatic training, Deep Cervical Flexor Strengthening, Thoracic Extensor strengthening and a control group (n=19) who were treated with Deep Cervical Flexor Strengthening, Thoracic extensor strengthening. To evaluate the subjects, two parameters were used photographic measurement to evaluate craniovertebral angle and star excursion balance test to evaluate dynamic balance. All subjects were evaluated pre intervention and post intervention after the 4 weeks of treatment. Independent t test was used to compare the outcome between the groups and paired t test was used to compare the outcome with in group.

Result: Out of the (n=58) participants, 38 participants met with an inclusion criteria. This study concluded that there was a significant difference between the two groups in posture and dynamic balance at 4 weeks. In the experimental group, significant improvements were demonstrated for Star excursion balance test and Craniovertebral angle measurement ($P < 0.01$), compared to the control group where craniovertebral angle was not statistically significant ($P > 0.01$).

Conclusion: The effect of diaphragm training along with deep cervical flexor training and thoracic extensor strengthening improve the dynamic stability and balance significantly.

Keyword: *Dysfunctional breathing pattern, Craniovertebral angle, Forward head shoulder, Transabdominal pressure, Zone of apposition, strengthening.*

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Introduction

“Posture” refers to the alignment of body parts in relation to each other and is frequently cited risk factor leading to musculoskeletal disorders. Faulty posture leads to excess work load on the musculoskeletal system¹. The prevalence of faulty posture was found

in lean and normal individuals (26.4%), overweight (22.4%) and obese (20.2%) subjects². Despite significant findings regarding adverse effects on measures of health and quality of life, posture is the only beginning to be recognised as a major health concern by clinician³. A combination of strengthening, stretching and behavioural/biofeedback treatment strategies were used to correct the abnormal forward head posture in patients with cervical spondylitis and radiculopathy which included strengthening deep cervical flexors through chin tucks, strengthening of shoulder retractors in standing using a theraband, bilateral pectoralis stretches⁴. A combination of thoracic stretching, thoracic extension exercises and cervical and scapular muscles exercises were performed to improve thoracic kyphosis⁵. An electromyography biofeedback training technique was used to improve trunk stability⁶. A combination of lumbar stabilization exercises and thoracic mobilization was used to improve posture in back pain patients⁷. A core stability exercise was performed to improve trunk and pelvic stability⁸. Core stability is dependent on the strength, coordination and adaptability of core musculature is necessary for efficient biomechanical function, throughout the kinetic chain⁹. The existing treatment method such as thoracic muscle stretching and strengthening exercises, lumbar stabilization exercise, electromyography biofeedback training, showed good short term results. Long term remains questionable. Part of the reason for weak evidence on long term may be result of ignoring the role of diaphragm. The diaphragm has long been of interest to the medical profession, basic science literature states that the anatomical attachments of diaphragm plays an important role in breathing and stabilization of the trunk during postural activity¹⁰. Diaphragm has two parts, the costal part and crural part. Ideal diaphragm breathing exhibits a lateral costal expansion. The Zone of apposition expands both the lower ribcage and the abdominal wall during contraction¹¹. The diaphragm has been found to contract prior to initiation of upper extremity movement, independently of the phase of respiration¹. Postural stability is an active maintenance of body segments; stabilization is biomechanically interconnected and depends on coordinated activity controlled by CNS. The tonic phase coordinates with the breathing cycle and the phasic phase coordinates with the postural stabilization of the trunk followed by complete flattening of the diaphragm muscle hence provides good postural function¹¹. Breathing biomechanics have been described with respect to expansion of the abdomino-thoracic region during inspiration at rest apical or upper

costal breathing occurs when superior thoracic expansion exceeds the abdominal and lateral costal expansion¹. If a greater muscle activity is needed the diaphragm flattens, however its excursion during breathing is smaller. In a situation like this individual usually hold their breath to increase postural stabilization and diaphragm is primarily activated for stabilization function¹¹. Postural correction and stability and in the wake of potential effect of diaphragm. The aim of this study to find the much needed input on the possibility of integrating diaphragm in to the treatment protocols for postural correction and improving dynamic stability.

Materials and Method

This single blinded randomised clinical trial was conducted among asymptomatic subjects age ranging 20 to 55 years both males and females who were clinically diagnosed with poor posture of the spinal curvature was based on photographic measurements with the craniovertebral angle less than 50 degrees and thoracic curvature greater than 60 degrees¹³. Prior to the data collection ethical clearance was obtained and study is registered with Clinical trial registration India (Registration No: CTRI/2019/01/016935. The participants were explained about the study and an informed consent along with the photography consent was obtained from them on voluntarily basis. 38 participants out of 58 were recruited based on the inclusion and exclusion criteria. Inclusion criteria were: age ranging between 20 to 55, both male and female. Exclusion criteria were: Subjects with vestibular dysfunction, Subjects with respiratory disease, Subjects with previous history of lumbar fracture. The subjects were assessed for their suitability, including demographic information (age, height weight, Body mass index (BMI)) and baseline measurements like craniovertebral angle, dynamic balance. Further the participants were randomly allocated into experimental group (n=19) and control group (n=19) by using purposive random sampling method.

Phase I:

Photo Graphic Measurements for Assessing Posture: Body markers were placed over the the tragus of the ear, spinous process of C7 vertebrae, acromion process, upper thoracic, mid thoracic, lower thoracic. Participants were made to stand on a posture pad and the photographs were taken in lateral view. The data of the photographs were transferred to body style analyser

software for the measurement of cervical, thoracic curvature¹⁴.

Star Excursion Balance Test for Assessing Dynamic Posture (SEBT): Was performed in three directions (anterior, posterior medial, posterior lateral) 3 tape measures were labelled in 0.5 cm increments securing to the floor. In which one tape measure was oriented to the apex (anterior reach direction)¹⁵. Two additional tape measures were anchored at 135 degree to the apex (postero medial and postero lateral). Anterior border of the 2nd toe at the junction of three reach direction was the stance foot starting position and area immediately adjacent to the stance limb in a non-weight bearing position to reach foot starting position. Participants placed their hands on iliac crest to standardize starting position while standing. 4 practice trials were performed in all 3 directions on each limb prior to administration of test after showing the online video available at www.jospt.org¹⁶. The participants were given verbal feedback regarding movement and posture by giving 2 minute rest periods prior to formal testing¹⁷. Sum of the greatest reach direction for each of the 3 directions were divided by 100, to get the composite reach distance for each leg.

Phase II:

Diaphragm Training Techniques: Diaphragm weight training was performed by using sand bags by putting the participants in supine lying position. A small weight (3-5 lbs) was kept over the epigastric region and participants were asked to breathe in deeply raising the weight and breath out slowly, the protocol was given once a day in a set of five for 10 to 15 minutes

Proprioceptive neuromuscular facilitation for Diaphragm (Intercostal Stretch Technique): In supine lying with all the limbs in neutral position. The supra sternal notch was palpated downwards about 5cm the angle of Louis, traced laterally. The Intercostal stretch technique was applied over 2nd and 3rd rib bilaterally towards the next rib. The techniques were applied during expiration phase for three breaths with 1 minute rest and for three repetitions, twice in a day.

90/90 Bridge with Ball and Balloon: -Participants in supine with the feet flat on the wall and knees and hips bent at a 90-degree angle. A 4-6 inch ball was placed between the knees with right arm placed above the head and a balloon in left hand by putting pressure on the ball by back of the thighs and inner thighs. Participants were

asked to inhale through the nose and slowly blow out into the balloon by maintaining the position constant with 3 second pause with tongue positioned on palate to prevent disruption of air from the balloon. The procedure was followed slowly stabilizing the balloon with the left hand and repeated for 4 weeks, 20 minutes/day. During exhalation pelvic tilt was observed off the mat and lower back flat on the mat.

Incentive Spirometry: The participants were asked to hold the mouth piece of the spirometer in mouth with lips tightly placed over it and were instructed to inspire slowly and deeply to raise the ball or the piston in the chamber to the set target. At maximum inhalation the mouth piece for 5-10 breaths/seconds followed by normal exhalation 10 sets, 5-10 seconds hold for 20 minutes

Deep Cervical Flexor Strengthening: The participant was asked to relax its neck muscles, an air filled visual pressure feedback device was placed under the cervical spine and to perform the flexion of the cervical spine to strengthen the deep flexor muscles of the upper neck and the flattening of cervical lordosis was confirmed using visual feedback from the sensor's dial at 20 mmHg. As the participant saw the dial and was instructed to press the bag slowly, the sternocleidomastoid muscle and the scaleneus anterior muscles were palpated by the investigator so that contraction did not occur. The pressure was increased slowly, by 2 mmHg each time until a value of 30 mmHg is reached. The contractions were maintained for 10 seconds and this was repeated 10 times, in three sets with a break of 2 seconds between contractions was done for 4 weeks for 20 minutes per day.

Thoracic Extension Exercise: -in a prone position on a bed a pillow was placed under the abdomen of the participant so that spine will be in a slightly flexed position. Participants were instructed to clasp both hands behind their neck and lift the upper trunk off the bed by holding neutral position for 30 seconds in set of five with ten seconds interval in between. The technique was administered for 4 weeks, for 20 minutes/day.

Statistical Analysis: The descriptive statistics was done to test the normality. Inferential analysis was carried out by non-parametric tests.

Findings: Out of the 38 participants, (n=19) were in experimental group and (n=19) were in control group with an average age of 39.02±9.1 and 37.2±7.6

respectively. The BMI for the both experimental group and control group was calculated as 24.5±3.0 and 23.6±2.7 respectively (Table 1). There were significant results in the pre and post comparison of experimental group of SEBT (left and right) and photo/cranio vertebral angle with the p value less than 0.05 and Mean±SD 85.3±2.9, 95.7±2.8 and 85.4±2.6, 95.7±2.3 and 44.5±1.9, 52.4±1.7 respectively (Table 2). In pre and post comparison of control group, there were insignificant results with P value > 0.05 in cranio vertebral angle with Mean±SDpre 46.1±2.2 and post 46.7±1.8 (Table 3). There were significant results

experimental & control group comparison with p value <0.001 in all Pre post difference of SEBT (left, right) and craniovertebral angle.(Table 4)

Table 1: Demographic data

	Experimental Group	Control Group
N	19	19
Age	39.02±9.1	37.2±7.6
Weight	1.60±0.30	1.59±0.10
Height	61.5±3.6	60.0±2.6
BMI	24.5±3.0	23.6±2.7

Table 2: Pre post comparison of experimental group (Paired t-test)

Variables	Minimum	Maximum	Mean±SD	t- value	p- value
sebtleft Pre test	80.3	88.7	85.3±2.9	68.2	<0.001*
Post test	90.7	98.7	95.7±2.8		
sebtright Pre test	80.3	88.7	85.4±2.6	77.3	<0.001*
Post test	90.3	98.7	95.7±2.3		
Photo Pre test	41.4	47.6	44.5±1.9	29.6	<0.001*
Post test	50	55	52.4±1.7		

*p<0.001 statistically significant in both pre and post.

Table: 3 Pre post comparison of control group (Paired t-test)

Variables	Minimum	Maximum	Mean±SD	t- value	p- value
sebtleft Pre test	80	87.3	83.5±2.3	20.7	<0.001*
Post test	85	92.3	88.2±1.9		
sebtright Pre test	77.5	85.7	81.8±2.2	23.9	<0.001*
Post test	85.3	90.6	87.4±1.6		
Photo Pre test	42	48.5	46.1±2.2	1.6	0.126
Post test	44	50	46.7±1.8		

P value > 0.05 in cranio vertebral angle which is not statistically significant

Table 4: Experimental & Control group comparison (Independent t-test)

Variables	Experiment	Control	t- value	p- value
	Mean±SD	Mean±SD		
Pre post difference of sebtleft	10.5±0.7	4.8±1.0	20.5	<0.001*
Pre post difference of sebtright	10.3±0.6	5.6±1.02	17.5	<0.001*
Pre post difference of Photo	7.9±1.2	0.6±1.6	16.3	<0.001*

P<0.001 shows statistically significant in both experimental and control group

Discussion

We conclude that there is a significant improvement of SEBT (right & left) in both the groups, but there is no significant improvement of craniovertebral angle (CVA) in Control Group. In Between group analysis

in the Experimental Group improved significantly better than Control Group in SEBT (left & right) and CVA. A proper diaphragmatic breathing style have increased the strength of the diaphragm and deep core musculature and this increase in strength and proprioception

have positive effect to the increase in balance¹. To evaluate the inspiratory muscle recruitment affects on proprioceptive use during postural control with low back pain (LBP), the author concluded that inspiratory muscle training facilitate the proprioceptive involvement of the trunk in postural control in individuals with LBP¹⁴. During extensive diaphragmatic training increase in the activation of abdominal musculature helps in maintaining the ideal zone of apposition which helps in relaxation of the trunk extensors by decreasing the lumbar lordosis and decrease in pain by reciprocal inhibition^{1,12}. Diaphragmatic breathing style increases the strength of the diaphragm and deep core musculature and increase in strength leads to improvement in balance¹.

Conclusion

Correcting the faulty breathing pattern by proper diaphragmatic training reduces the load on the scalene and trapezius muscles and reduces upper chest breathing which leads to correction of posture and proper proprioceptive input helps in improving dynamic balance

Ethical Clearance: Ethical Board of the Faculty of physiotherapy, Srinivas University

Source of Funding: Self

Conflict of Interest: Nil

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Mental Health in Physiotherapy Students During Internal Examination

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Introduction

Stress is a complex dynamic process even in student life & physiotherapy students are not spared which may adversely affect academic achievements, personal well beings and long-term professional capabilities. Student's stress is an established phenomenon worldwide. Stress is matter of perception, because not all are equally affected. Physiotherapy education is changing and educators are increasingly concerned about mental health. So, study was aimed to measure the current mental status with general health questionnaire during internal examination in physiotherapy students.

Method: Descriptive study on 100 physiotherapy students appearing for internal exams who volunteered to participate in the survey based on a general health questionnaire (GHQ). GHQ-12 as suggested by GOLDBERG & WILLIAMS was used for measuring current mental health. GHQ focuses on two major areas, inability to carry out normal function and appearance of new and distressing experiences. Each item is rated on 4- point scale that is from 0-3 and the responses were taken from the respondent.

Results: 22% students were not able to concentrate, 37% lost much of sleep over worry and 26% were unhappy or depressed, 14% losing confidence, 5% thinking of themselves as a worthless person.

Conclusions: Students were Unhappy or depressed, losing confidence, feeling worthless and indicating poor mental health during internal exams.

Keywords: *Mental health, Physiotherapy students, Stress, Internal examination.*

Introduction

Stress is a complex dynamic process of interaction between a person and his life. It is a war one reacts physically, mentally and emotionally to the various conditions^{1,2}. It can lead to mental distress and it can have a negative impact on their cognitive functioning and learning^{1,3}. The stress which is experienced by student may adversely affect their academic achievements, personal well beings and long term professional

capabilities¹. Undergraduate students need to cope up with the academic and social demands that they may encounter in university studies in their preparation for professional careers¹.

Medical colleges are recognized as a stressful environment that often exerts a negative effect on the academic performance, physical health and psychological well being of the students. Numerous studies have revealed psychological well being in medical students including various psychological problems. Stress in medical students is an established phenomenon encountered worldwide and such students seem to be under stress at all stages of their academic career, including pre-clinical and clinical years^{4,5}.

Stress may foster anxiety, fear and depression in medical students. Causes of stress in medical student

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are pressure of rigorous academic curriculum coupled with frequent examination schedule in obvious factor, long working hours, lack of peer support, competitive environment, rigid authoritative non encouraging faculty, an imbalance between professional and personal lives, lack of recreational activities, staying away from home, financial problems, residency queries⁶.

Stress is matter of perception, because not all are equally affected. The personality of medical students suggests that they are highly motivated, action orientated achievers, securing high grades prior to admission. They cannot tolerate the feeling of helplessness, dependency and are therefore more prone to stress or incapable of handling it⁶. Physiotherapy is branch of medical science in which disease/disability is treated with the help of physical means/agents. In perspective of today's health conscious society physiotherapy is not only concern with treating disease rather it has become an indispensable part of healthy living lifestyle.

Physiotherapy education is changing and educators are increasingly concerned about various problems faced by students. Physiotherapy education is demanding field and students are subjected to different kind of stressors such as academic demand and pressure, completion of good grades, social adjustment interpersonal and family problems, uncertainty of future, lack of leisure time, coping with high stimulating environment in college, exams, too much work load and financial concern.

Aim: To measure the current mental status with general health questionnaire during internal examination in physiotherapy students.

Objectives: Identifying the current mental status of physiotherapy students with the responses obtained from the general health questionnaire during internal examination.

Materials and Method

Descriptive study was carried out in V. S.P. M College of Physiotherapy.

Subjects: The students of bachelor and masters in physiotherapy, studying in VSPM College of physiotherapy were considered for the study. The students of first to fourth year B.PTh and first and third year M.PTh who were present on the day of internal examination were included. Convenient sampling for first come first serve basis for 100 subjects was carried out.

Inclusion Criteria: Students of both genders were present on the day of internal examination.

Exclusion Criteria: Students who were not voluntarily willing to participate in the survey.

Materials:

Questionnaire: A general health questionnaire GHQ-12 as suggested by GOLDBERG & WILLIAMS was used for the study. This questionnaire measures current mental health, it focuses on two major areas, inability to carry out normal function and appearance of new and distressing experiences. Each item is rated on 4 - point scale that is from 0-3 and the responses for the same were taken from the respondent.

General procedure- requisite permissions and ethical clearance was obtained from institutional ethics committee. This was followed by interacting with students and the nature of the study was explained. Consent form was obtained from the students who were willing to be part of the study. The participants were then handed over with questionnaire and instruction regarding the marking of responses was also explained. Adequate time was given for marking the responses. Later on, the marked questionnaire was taken back for analysing the data.

Data analysis: The raw data collected was spread in Microsoft excel sheet 7 and was statistically analysed with epi info software version 7.

Result

The study is supporting the aim and was able to measure the current mental status with general health questionnaire during internal examination in physiotherapy students. The 12 question which were given to the subjects when analysed, yielded the response which is as depicted in graph 1 according to the responses obtained.

49% of individuals were able to concentrate on what they were doing whereas 20% of individuals were less than usual and 2% responded to much less than usual. 36% of subject responded to not at all when asked regarding lost much sleep over worry whereas 26% responded to rather more than usual and 11% responded to much more than usual.

15% of individual felt that, they are not playing the useful part in things among which 14% felt less so

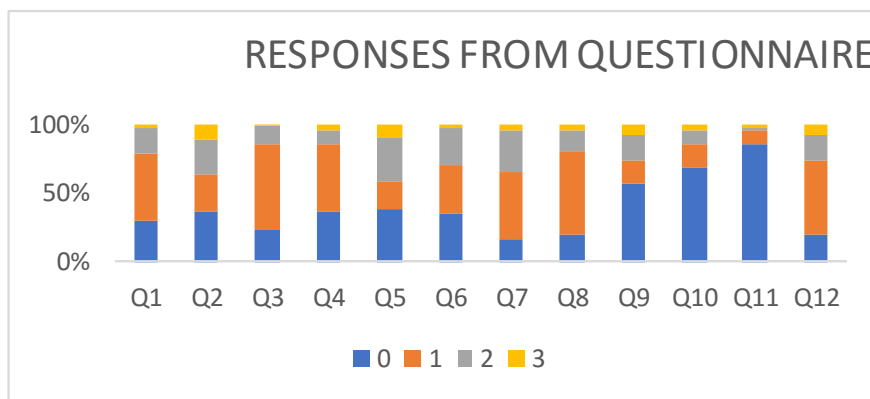
than usual and 1% felt much less than usual. 31% of individual responded to less so than usual and much less than usual and 4% were much less than usual and over well being 50% individuals reported same as usual and 36% more so than usual when questioned regarding felt capable about making decision about things.

38% of individual did not at all feel constantly under strain and 21% not more than usual, 31% rather more than usual and 10 felt much more than usual. 27% of student felt rather more than usual to could not overcome their difficulties and 2% felt much more than usual to overcome their difficulties. When question regarding able to enjoy normal day to day activities was asked 49% felt same as usual and 17% more so than usual, 29% felt less so than usual and 5% much less than usual.

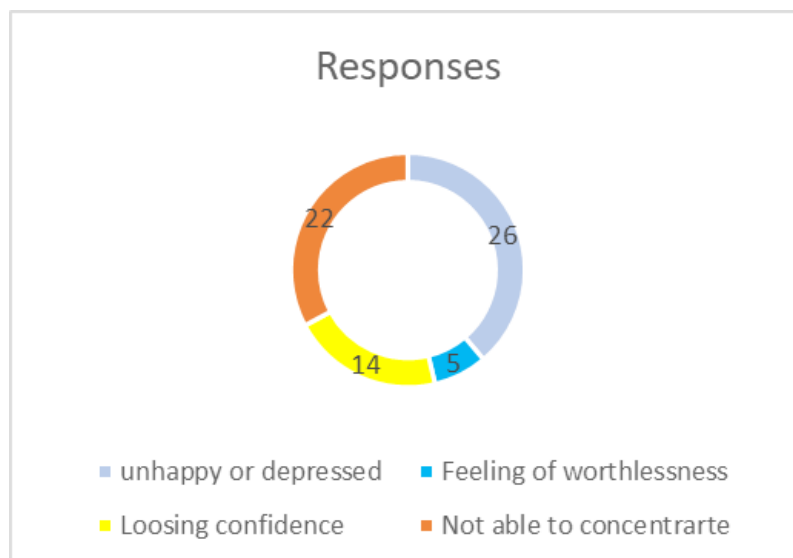
Regarding been able to face up problem 61% felt same as usual 20% more so than usual 15% more so than usual 4% felt much less than usual. When asked about feeling unhappy and depressed 50% not at all, 17% felt not more than usual 18% rather more than usual and 8% much more than usual.

When question regarding losing confidence in yourself 68% felt not at all 18% not more than usual 10% rather more than usual and 4% much more than usual. When asked about thinking of yourself as a worthless person 86% felt not at all, 9% more than usual 3% rather more than usual 2% more than usual.

In last question of being feeling reasonably happy 20% responded not at all, 64% not more than usual 18% felt rather more than usual and 8% felt much more than usual.



Graph 1: responses obtained



Graph 2: responses obtained

Discussion

This study was in position to understand the current mental health in physiotherapy students. 22% of individuals were not able to concentrate on what they are doing during internal examination (graph 2), proved that they are stressed. More over 37% were losing sleep due to worry which is also one of the factor for stress because it is been noted that when worrying over examination rises the stress level automatically increases thereby sleeplessness is induced.

15% felt that they were not playing useful part in things again indicates that they were stressed. 14% of individual were not capable of making decisions indicates that this group is in dilemma which indicates stress.

41% felt constantly under strain indicating that a huge number of individual are stressed because of internal examination but some overcome it positively and perform much better during examination and some become depressed as and thereby their performances deteriorate and the same was reflected with 29% of individual responding couldn't overcome difficulties and such individual are prone to give up when challenges are posed to them in real life situations.

34% were not able to enjoy normal day to day activities, 29% less so than usual and 5% much less than usual indicating the role of stress in preventing to enjoy day to day activities about 15% felt less so than usual to face up problem indicate that they are under stress and 4% responded to much less than usual indicates that they are to higher degree of stress.

From the sample it was found that 18% had been feeling rather more than usual unhappiness and depression and 8% much more than usual again indicating impact of examination on the examination of the mental psychic and these individual are not able to cope up with the stress of internal examination and therefore almost about 14% felt losing confidence (graph 2) in themselves which is not a good sign of healthy mind and 5% of individual were feeling rather more than usual, for feeling a sense of worthless person which is initial indicator of suicidal tendency and almost about 20% felt not at all reasonably happy so there is sense of un satisfaction and almost 20% during the internal examination period felt much more than usual.

Conclusions

From this study we can came to a conclusion that the student of physiotherapy are stressed during internal examination. The response of the student obtained from the feedback helped us to measure the current mental status with help of general health questionnaire. It was found that 26% of the students were unhappy or depressed and 14% of the students felt they are losing confidence in themselves and 5% of the students are feeling worthless which are indicator for the poor mental health.

If such students are given proper counselling and motivation this will not only help them to overcome exam related stress but also can prevent onto ward effects caused due to poor mental health which in turn would act in reducing the suicidal tendency after examination process.

Recommendations: Further studies in this regard should be carried out in different situation and real-life areas in order to completely generalize the statement.

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Conflict of Interest: There are no conflicts of interest.

Finance: It was a self-financed study.

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Correlation of Obesity and Peak Expiratory Flow Rate in Young Adult Females

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Abstract

Background and Purpose: Pulmonary functions are determined by respiratory muscle strength, compliance of the thoracic cavity, airway resistance and elastic recoil of the lungs. Peak Expiratory Flow Rate (PEFR) is the maximum rate of airflow achieved during a forced expiration after maximal inspiration. Obesity can affect diaphragm, thoracic and abdominal muscles. Increased respiratory effort and impairment of gas transport system can result in altered pulmonary functions. In India, obesity has reached epidemic proportions in the 21st century, with 5% of the country's population being affected with morbid obesity. The prevalence of obesity among Indian women has increased from 10.6% to 12.6%, i.e. an increase by 24.52% in a seven year period. Markers of obesity such as Body Mass Index (BMI) and Waist Hip Ratio (WHR) may be correlated to PEFR. Thus, the aim of this study is to correlate the effects of obesity on pulmonary functions.

Objectives: To assess the effect of BMI on Peak Expiratory Flow Rate (PEFR) in young adult females. To assess the effect of WHR on Peak Expiratory Flow Rate (PEFR) in young adult females. To compare BMI and WHR as a measure of obesity in terms of correlation with PEFR

Design: Correlational study

Methods: 45 subjects between the age group of 20 to 40 years were recruited for the study. Written informed consent and institutional ethical clearance were obtained. Anthropometric measurements were obtained using the Quetelet index for BMI and WHR was derived by dividing the waist circumference from the hip circumference. PEFR was obtained using the Wright's portable peak flow meter in standing position. Results: Data has been derived using SPSS 16.0 software. Pearson's correlation coefficient test was used to find the correlation between BMI and PEFR and WHR and PEFR. Correlation coefficient for BMI and PEFR was $r = -0.48$ and is statistically significant ($p < 0.001$). The correlation coefficient between WHR and PEFR was $r = -0.074$ which is not statistically significant ($p = 0.31$). Conclusion: PEFR was found to be significantly influenced by BMI, irrespective of the type of body fat deposition. Thus, the study concluded that there is a reduction in the lung volumes as the BMI increased.

Keywords: Obesity, Peak Expiratory Flow Rate, Body Mass Index, Waist Hip Ratio.

Introduction

Pulmonary functions are determined by the strength of the respiratory muscle, thoracic cavity compliance, airway resistance and elastic recoil of the lungs.¹ Pulmonary functions vary according to the physical characteristics including age, gender, height, body weight² and altitude.³ Different expiratory flow rates are employed for demonstrating the narrowing of airways.

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Peak Expiratory Flow Rate (PEFR) is the maximum rate of airflow achieved during a forced expiration after maximal inspiration.⁴ Hadorn introduced PEFR in 1942 and it was accepted as a parameter of pulmonary function test (PFT) in 1949.⁵ Peak Flow Meter is an easy and cost effective instrument by which PEFR can be measured.⁶ Impairments in lung function can be caused due to accumulation of excess body fat (obesity). Obesity can be defined as a state of excess adipose tissue mass.⁷ Obesity increases morbidity and mortality due to many chronic health ailments, such as cardiovascular disease, type 2 diabetes, dyslipidemia and fatty liver disease.⁸ Obesity also affects diaphragm, thoracic and abdominal muscles. Altered pulmonary functions arise due to increased respiratory effort and impairment of gas transport system.⁹

Body Mass Index (BMI) is significantly associated with body fat. It is also known as the Quetelet index and is defined as weight in kilograms divided by the square of the height measurement in metres (kg/m^2), and is commonly used as a practical means to assess body fat.¹⁰ Obesity (in adults) is defined by WHO as having a BMI greater than or equal to $30\text{kg}/\text{m}^2$; the normal BMI range being between 18.5 to 24.99.¹¹ Internationally, a BMI over $25\text{ kg}/\text{m}^2$ is considered overweight. Due to genetic tendency of Indians towards abdominal obesity and its associated risk of diseases like diabetes and heart diseases, guidelines for diagnosis of obesity for India are: Normal BMI: 18.0 – 22.9 kg/m^2 , Overweight BMI: 23.0 – 24.9 kg/m^2 , Obesity: $>25\text{ kg}/\text{m}^2$.¹² Weight and BMI as measures of overall obesity are used as predictors of pulmonary function in many epidemiological studies.^{13, 14, 15} BMI is not an ideal measure for excess body weight as of pulmonary function compared with Waist Circumference (WC)¹⁶. Waist Hip Ratio (WHR)¹⁷ and Waist Circumference (WC)^{18, 19} often used as a surrogate measure for abdominal or upper body obesity may influence pulmonary function mechanically²⁰ by changes in compliance, work of breathing and the elastic recoil.^{21, 22} Therefore, markers of obesity, such as BMI,²³ WC²⁴ and WHR²⁵ may be correlated to PEFR. The aim of this study was to correlate the effects of obesity on pulmonary functions.

Materials and Method

Informed consent was obtained from each subject after explaining the study and test procedure. Demographic data was collected and recorded.

Materials Required:

- Wright's Portable Peak Flow Meter.
- Measuring tape.
- Weighing scale.
- Stationery

Sample and sampling technique:

Sample Size: 45 samples calculated from prevalence studies.

Sample Size Calculation: $\alpha = 0.05$ (type- I error), $d = 10\% = 0.1$ (anticipated error), $p = 0.126$ (prevalence), $q = 0.874$ (1-p)

$$n = \frac{Z_{\alpha/2}^2 \times pq}{d^2}$$

Sampling Technique: Purposive sampling.

Inclusion Criteria:

- Subjects who were willing to participate in the study and signed the written informed consent.
- Subjects belonging to the age group of 20 to 40 years.
- Subjects must be females.
- BMI over $25\text{kg}/\text{m}^2$ and WHR above 0.85.

Exclusion Criteria:

- Subjects with history of smoking.
- Subjects with severe chest trauma.
- Subjects with obvious chest and spinal deformity.
- Subjects with personal history of asthma, chronic obstructive pulmonary diseases and other cardiorespiratory diseases.
- Subjects who were physically active and into fitness training under supervision.

Procedure:

Anthropometric Measurements: Height was recorded without shoes in meters (m) and weight was recorded without shoes and light clothes in kilograms (kgs) to calculate the BMI.²⁶ $\text{BMI} = \text{Weight (in kgs)} / \text{Height (in squared meters)}$.

Waist Circumference (WC) was measured with measuring tape with the subject's feet 25-30 cm apart

between the lowest rib bone and the iliac crest²⁷ i.e. at the level of the umbilicus (more than or equal to 80 cm in females were defined as abdominal obesity using World Health Organization Asia Pacific prospective guidelines).²⁸

Waist-to-Hip Ratio (WHR) was calculated as Waist Circumference (WC) divided by hip circumference (HC).²⁹ The WHO states that abdominal obesity is defined as a WHR above 0.85 for females.

PEFR Procedure: After the above values have been recorded, the subjects were instructed to have a light breakfast and refrain from beverages like coffee or tea on the morning of the test. The test was performed after 1-2 hours following breakfast.

The subjects were asked to perform the test in standing position, with the peak flow meter held horizontally in front of their mouth and were allowed to take a deep breath in, and close the lips firmly around the mouthpiece, making sure that no air leaks around the lips. The subject was asked to breathe out as hard and as fast as possible.

One or two trials were given prior to the actual procedure. This manoeuvre was repeated 3 times with a rest of 5 minutes between each. The best of the 3 readings was taken as final reading.²¹

Result

Data has been derived using descriptive and inferential statistics. SPSS16.0 was used. Data was expressed as Mean±SD. Pearson’s correlation coefficient test was done to see the correlation between BMI and PEFR and WHR and PEFR. The non- zero values of ‘r’ between -1 to 0 indicate negative correlation. The non- zero values of ‘r’ between 0 to +1 indicate positive correlation. Scatter diagrams have been plotted for the variables correlated.

Table 1: Age Distribution of the Subjects

Age	Frequency
20-25	11
26-30	10
31-35	12
36-40	12

Table 2: Mean & SD of Age, Weight, Height & BMI

Parameters	Age	Weight (Kgs)	Height (cms)	BMI (kg/m ²)
Mean	30.86	73.90	157.44	29.81
SD	6.17	12.64	7.08	4.52

Table 3: Mean and SD of WC, HC, WHR & PEFR

Parameters	Waist Circumference (cms)	Hip Circumference (cms)	WHR	PEFR (l/min)
Mean	100.02	111.22	0.89	290.33
SD	10.24	10.43	0.039	56.64

Table 4: Correlation between BMI and PEFR and WHR and PEFR.

Correlation Between	‘r’ Value	‘P’ Value
BMI and PEFR	-0.48377	p< 0.001
WHR and PEFR	-0.07425	p=0.31

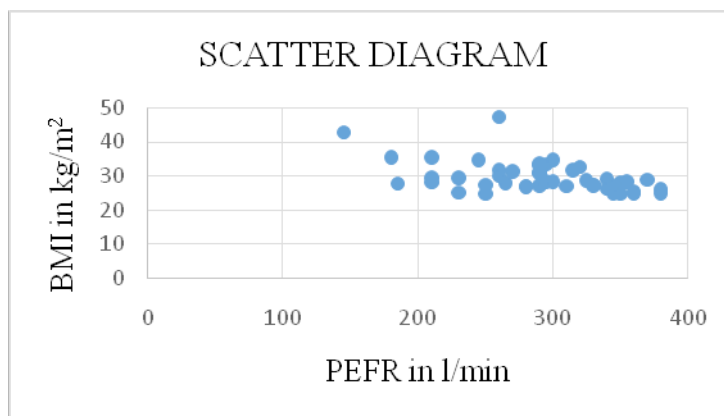


Fig. 1: Scatter diagram showing the correlation between BMI and PEFR in Young Adult Females.

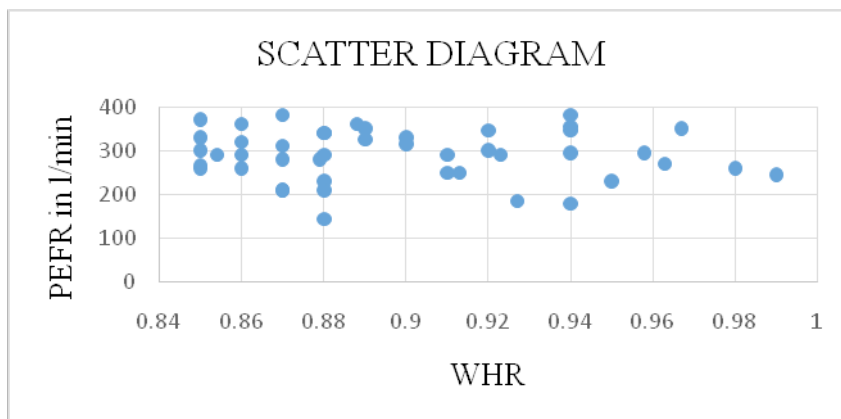


Fig. 2: Scatter diagram showing the correlation between whr and pefr in young adult females.

Discussion

The present study was conducted to find out the effects of obesity on Peak Expiratory Flow Rate (PEFR) in young adult females between the age group of 20-40 years. Body Mass Index (BMI) and Waist-to-hip Ratio (WHR) were taken as the markers of obesity. A total of 45 subjects were recruited into the study. Obesity criteria was taken based on Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR).

The results of the present study showed a significant correlation between BMI and PEFR in young adult obese females. The primary factors that affect PEFR are the strength of the expiratory muscles producing the contraction, the recoil pressure of the lungs and the airway competency. According to Naimark A et al. the compliance of the lung and thoracic cavity was reduced to one third of the normal lung compliance due to obesity induced increase in pulmonary blood volume and closure of dependent airways.¹ Jones et al

also found that the reduction in PEFR is proportional to the increase in BMI.² King GG et al observed a strong relationship between body mass index and both lung volume and airway calibre in obese individuals which reflects that, with increasing body mass index, airways were narrower than expected on the basis of the reduction in lung volume, suggesting that there were structural or functional changes in the airways.³ The current study also found that there is a negative but not significant correlation between WHR and PEFR. Lazarus et al observed no effect of the central pattern of fat distribution (WHR) in the mean age 35.2±1.3 years, whereas subscapular skin fold thickness may have been significantly associated with spirometric measures after adjustment for overall obesity.⁴ Lazarus et al and Collins et al also did not find any correlation between WHR and PEFR.⁵ However, Yogesh Saxena et al found that abdominal adiposity, measured as WHR, is a better predictor of expiratory flow than weight or BMI.⁶

Conclusion

The results of the present study showed a significant correlation between BMI and PEFr in young adult obese females. The primary factors that affect PEFr are the strength of the expiratory muscles producing the contraction, the recoil pressure of the lungs and the airway competency. According to Naimark A et al., the compliance of the lung and thoracic cavity was reduced to one third of the normal lung compliance due to obesity-induced increase in pulmonary blood volume and closure of dependent airways.³

King GG et al observed a strong relationship between body mass index and both lung volume and airway calibre in obese individuals which reflects that, with increasing body mass index, airways were narrower than expected on the basis of the reduction in lung volume, suggesting that there were structural or functional changes in the airways.²² A study conducted by Anuradha r. Joshi found that in males, the body fat % showed negative correlation with expiratory reserve volume (ERV), forced vital capacity (FVC), maximum ventilatory volume (MVV), peak expiratory flow rate (PEFR) and forced expiratory volume at the end of first second (FEV1). They also observed that in females, body fat % had negative correlation with ERV, FVC, and MVV²⁶. This could explain the insignificant relationship between WHR and PEFr found in this study.

The current study also found that there was a negative but not significant correlation between WHR and PEFr. Lazarus et al observed no effect of the central pattern of fat distribution (WHR) in the mean age 35.2±1.3 years, whereas subscapular skinfold thickness may have been significantly associated with spirometric measures after adjustment for overall obesity.¹⁷ Lazarus et al and Collins et al also did not find any correlation between WHR and PEFr.²⁷ However, Yogesh Saxena et al found that abdominal adiposity, measured as WHR, is a better predictor of expiratory flow than weight or BMI.²⁹

The study concluded that there is a significant negative correlation between BMI and PEFr in young adult females. Although the correlation between WHR and PEFr is not significant.

LIMITATIONS: Larger sample size could have yielded better results and better understanding. Classification of the subjects based on the physical activity levels was not included. **FURTHER RECOMMENDATIONS:** An interventional study to

find out if the effects of obesity on PEFr are reversible or not.

Conflict of Interest: There was no personal or institutional conflict of interest for this study.

Source of Funding: Self.

Ethical Clearance: Ethical clearance taken from R.V. College of Physiotherapy, Bengaluru

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Correlation between Socioeconomic Status and Quality of Life in Cerebral Palsy Children between 4 to 12 Years of Age

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Abstract

Aim and Objective: To analyze the correlation of socio-economic status and quality of life of cerebral palsy children.

Methodology: 98 subjects of age group “4-12” were selected. They were briefly interviewed by their age, sex and socioeconomic status.

Results: It was statistically analyzed and it was found that there is positive and significant correlation between socioeconomic status and quality of life.

Conclusion: Quality Of Life of patients with cerebral palsy depends on socioeconomic status of family

Keywords: CPQOL (Cerebral Palsy Quality of Life Questionnaire), SES (Socioeconomic Status), CP (Cerebral Palsy).

Introduction

The term cerebral palsy refers to a number of disorders of movement and posture that are due to a nonprogressive abnormality of the immature brain⁽¹⁾. It is a static motor impairment, occurring during the prenatal, perinatal, or postnatal period with associated handicaps that may include vision and auditory deficits, seizures, mental retardation, learning disabilities, feeding, speech and behavior problems. Cerebral palsy influences the way children develop, it is known as a developmental disability. Because the disability is primarily motor

in nature, it is distinguished from conditions such as organic brain deficits, autism, emotional disorders or mental retardation syndromes. Socioeconomic status is evaluated as a combination of factors including Income, level of Education and Occupation. It is a way of looking at how individuals or families fit in to society using economic and social measures that have been shown to impact individual's health and wellbeing⁽²⁾. Socioeconomic status is typically broken into three categories, high socioeconomic status, middle socioeconomic status and low socioeconomic status to describe the three areas a family or an individual may fall into. According to WHO quality of life as individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is broad ranging concept affected in a complex way by the person's physical health, psychological state, level of relationships, personal beliefs and their relationships to salient features of their environment⁽³⁾. In such environmental context, a family's socioeconomic status may likely have an impact

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on these children's functional mobility opportunities, as families from a higher socioeconomic status may have resources that allow them to obtain various mobility devices, thus supporting functional mobility in different environments. Children from high socioeconomic levels used a wheelchair more frequently and crawled less frequently for mobility compared to those from the low socioeconomic group, which reported lower frequency of wheelchair use and higher frequency of crawling⁽⁴⁾. Aim of the study is to analyze the correlation of socioeconomic status and quality of life of cerebral palsy children.

Methodology

A. Research Design: Correlational study, (survey)

- Independent variable-Kuppuswamy socioeconomic status scale
- Dependent variable-Cerebral palsy quality of life questionnaire

B. Subject Design:

Subject Size: 98 subjects

Source of Subject: Amar jyoti rehabilitation centre New Delhi, HCRA Delhi, Gzb, Saksham special school Ghaziabad.

Sample Design: Convenience sampling.

Inclusion Criteria:

1. Parents of children with cerebral palsy.
2. Age group 4 -12 years.
3. Both gender

Exclusion Criteria:

1. Children with Autism
2. Behavioral problems like ADD and ADHD.

C. Outcome Measure:

1. Kuppuswamy socioeconomic status scale
2. CPQOL Questionnaire Parent Proxy Version.

D. Procedure:

1. Study was explained to parents and caregivers of cerebral palsy children.

2. Informed consent was taken from the parents and caregivers which are recruited from special schools and NGO's located in Delhi and Ghaziabad.
3. General information of each candidate to be taken and pertaining to identification data and detailed assessment of socioeconomic status and quality of life administered using standardized outcome measures – Kuppuswamy socioeconomic scale and Cerebral palsy quality of life questionnaire for children.
4. The detailed assessment was taken of 98 subjects. Mater chart was formed and analyzed using STATISTICA software.

Data Analysis: The continuous data were summarized as Mean \pm SD while discrete (categorical) in numbers and percentage (%). Pearson correlation analysis was used to assess association between SES and QOL. A $p < 0.05$ was considered statistically significant. All analyses were performed on STATISTICA software (Windows version 6.0).

Results

A. Basic Characteristics: The present study evaluates the correlation between socio-economic status (SES) and quality of life (QOL) in 4 to 12 yrs cerebral palsy children. A total of 98 convenient children either sex were recruited. The demographic characteristics (age and gender), SES and QOL score of all recruited children are summarized in Table 1

The age of all cerebral palsy children ranged from 4-12 yrs with mean (\pm SD) 7.52 ± 2.56 yrs. Among children, mostly males (67.3%), mostly belong to Upper middle class (42.9%) followed by Lower middle class (21.4%), Upper lower (19.4%) and Upper the least (16.3%).

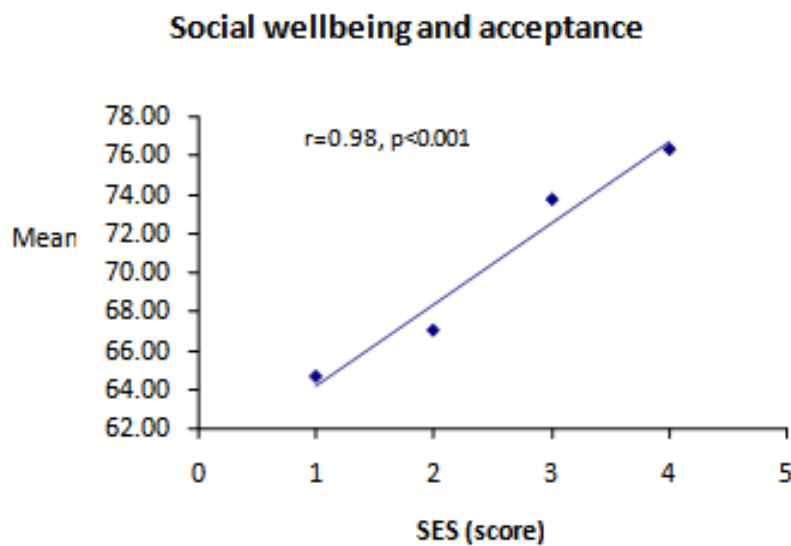
Similarly, in all cerebral palsy children, the mean score of QOL of Social wellbeing and acceptance (SWB) was the highest (70.94 ± 8.88) while Pain & impact of disability (PID) was the least (38.76 ± 19.05). The mean overall quality life (OQOL) score of all children was 56.07 ± 10.19 .

Table 1: Basic demographic, SES and QOL score of cerebral palsy children

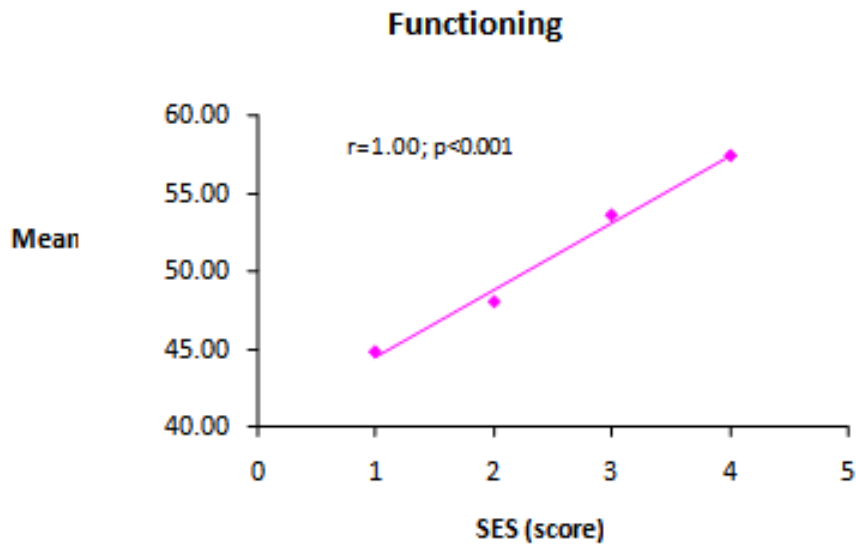
Characteristics	Variables	Statistics
Demographic	Age (Yrs)	7.52 ± 2.56
	Gender:	
	Males Females	66 (67.3%) 32 (32.7%)
SES	Upper	16 (16.3%)
	Upper middle	42 (42.9%)
	Lower middle	21 (21.4%)
	Upper lower	19 (19.4%)
QOL	Social wellbeing and acceptance	70.94 ± 8.88
	Functioning	51.31 ± 11.14
	Participation and physical health	51.12 ± 16.52
	Emotional wellbeing	64.78 ± 9.45
	Access to services	51.38 ± 14.19
	Pain and impact of disability	38.76 ± 19.05
	Family health	64.19 ± 20.96
	Overall QOL	56.07 ± 10.19

B. Correlation between SES (scores) and QOL in cerebral palsy children: To see the correlation (association) between SES and QOL, the mean scores of QOL parameters were further correlated with SES scores (Upper lower=1, Lower middle=2, Upper middle=3, Upper=4) by Pearson correlation analysis and summarized in Table 2 The QOL parameters SWB (r=0.98), FUNC (r=1.00), PID (r=0.95) and FH (r=0.94) showed significant and

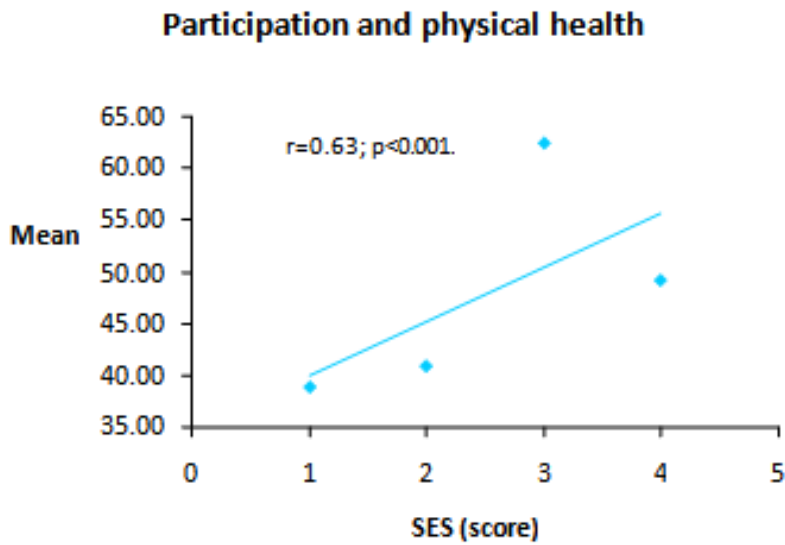
positive (direct) correlation with SES. Conversely, though both PPH (r=0.63) and AS (r=0.85) also show high correlation with SES but did not reach statistical significance. In conclusion, QOL (r=0.97) showed significant and direct association with SES. A positive correlation was analysed in SES and all variables of QOL(Graph1 to 5) implies that for an increase in the value of one of the variables, the other variable also increase in value



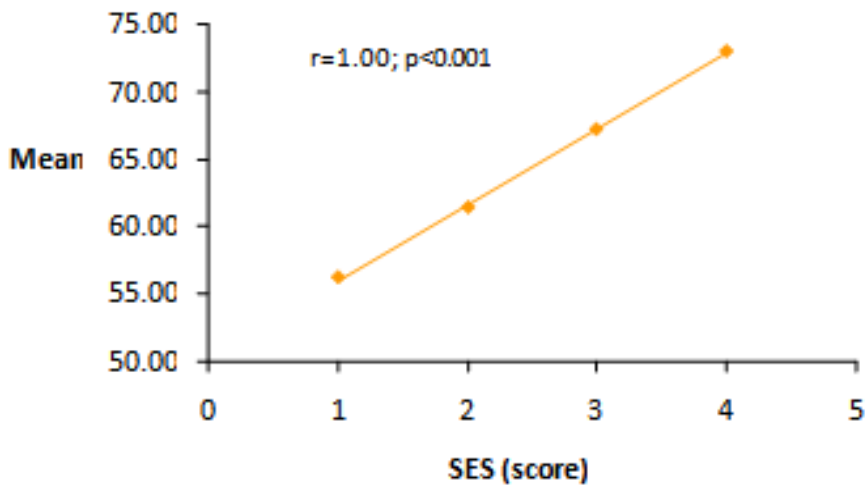
Graph. 1. Correlation between SES and SWB in cerebral palsy children.



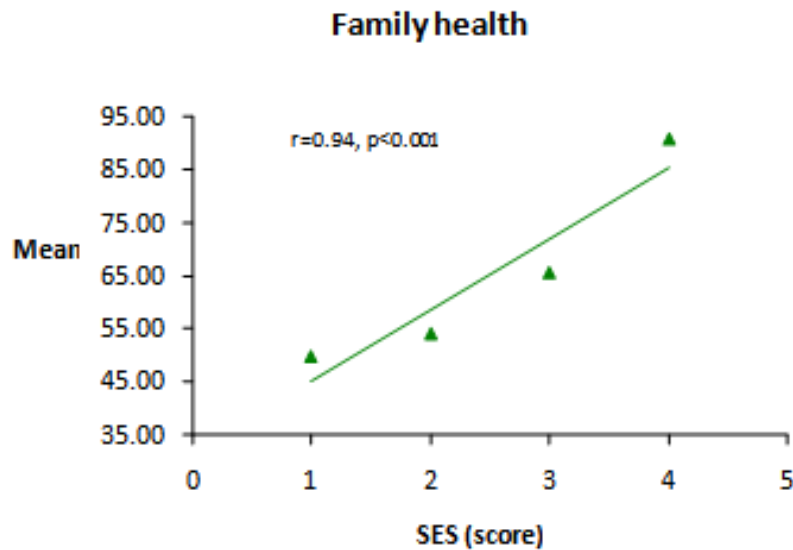
Graph. 2. Correlation between SES and FUNC in cerebral palsy children.



Graph. 3. Correlation between SES and PPH in cerebral palsy children.



Graph. 4. Correlation between SES and EWB in cerebral palsy children.



Graph. 5. Correlation between SES and FH in cerebral palsy children.

Discussion

Correlation between socioeconomic status and quality of life was done by using one way analysis of variance (ANOVA). 98 subjects were included in survey with SD of age 7.52 ± 2.56 and percentage of males and females were 67.3% & 32.7% respectively. Pearson correlation coefficient was calculated and result showed positive correlation between socioeconomic status and quality of life which means a one variable increases other will also increases. p value was calculated & was found to be 0.001 and also done correlation between socioeconomic status and all parameters of quality of life questionnaire which are participation and physical health, social wellbeing & acceptance, family health, functioning, access to services, emotional wellbeing & self-esteem and pain and impact of disability.

Correlation of participation and physical health with socioeconomic status showed there is positive correlation between participation and physical health and socioeconomic status which was supported by Kathryn N. Parkinson et.al 2011⁽⁵⁾. In their study both children and parents emphasized the importance of siblings and friend as companions but parents also tended to focus on how their child got frustrated at being unable to physically participate in the ways that nondisabled children could. Parents tried hard to facilitate their child social life often expending much effort in the process. Parents and children emphasized the discomfort and distress that medical and therapeutic procedures could

also the amount of the time spent and attending hospital visits is distressful and bothered.

Social wellbeing and acceptance was correlated along with emotional wellbeing & self-esteem both of them showed positive association with socioeconomic status. Functioning with socioeconomic status reflected positive correlation. because of the person's belonging to higher socioeconomic status they afford higher technologies and regular treatment

Access to services with socioeconomic status reflected positive correlation which was supported by Valeria. C.R in 2012⁽⁴⁾ that could be because the lower income group people cannot afford wheelchair for mobility more often than higher income group due to greater challenges in architectural modification, restricting the use of wheelchair for mobility at home. Pain and impact of disability with socioeconomic status also showed positive correlation.

Family health with socioeconomic status showed that there is positive correlation which was supported by Elise Davis et.al 2009⁽⁶⁾ that parents referred to the importance of the financial resources in caring for their children to fund therapist, medical intervention an equipment they further indicated that being financial stable enough to meet all of their children's need. Play a major role in their own coping and the Quality of life of their adolescent. This statement was contraindicated by Catherine Arnauld et.al 2007⁽⁷⁾ stated that the

socioeconomic determinants were associated weakly with quality of life. The explanation may be that a parent with higher levels of education tends to have higher expectations for their child and the difference between those expectations and reality influences their child's quality of life negatively. This will help to preparing the goals in the form of Rehabilitative and Compensatory approach according to the need of patients along with respect of socioeconomic status.

Limitations:

1. Groups of analysis in socioeconomic status cannot be done.
2. In this study taken two scales used for two different variables, more scales can be used which have more sensitivity with higher reliability values

Conclusion

The study identifies the socioeconomic status with relation of quality of life in cerebral palsy children. This study suggests that lower economic or uneducated group of cerebral palsy children is associated with poor quality of life. Socioeconomic status and quality of life reflected positive relationship between the two variables and which was supported alternative hypothesis

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Observational study; informed consent were taken from all subject.

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Is There a Relationship between Proprioception and Vibration Sense on the Shoulder?

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Abstract

Objectives: The purpose of this study is to examine the relationship between shoulder proprioception and vibration sense in healthy individuals.

Method: 23 individuals of age 18-25 years participated in the study. Shoulder proprioception sense was evaluated with an isokinetic dynamometer. And also 128 Hz tuning fork was applied to evaluate vibration sense and the vibration perception time (VPT) was measured with a chronometer.

Results: The study included 10 women (43.5%) and 13 men (56.5%) in total. The relationship between proprioception sub-parameters the threshold to detect passive motion, reproduction of passive and active positioning and the VPT time was not found significant ($p>0.05$).

Conclusion: This is the first study to evaluate the proprioception and vibration sense relationship in the shoulder joint and these findings will guide other studies in the future. In addition to various known proprioceptive sense measurement method, the diversification and objectification of the vibration sense measurement technique is gaining importance. Whether the vibration threshold time results are affected by different pathologies should also be investigated.

Keywords: Perception, Proprioception, Isokinetic, Shoulder, Vibration.

Introduction

The shoulder joint with relatively poor osseous and capsule-ligamentous stability, requires more neuromuscular control and stability than other joints in

the human body.¹ There is a precise connection between mobility and stability in the shoulder joint. Dynamic and static stabilizers interact to provide stabilization of the shoulder joint. Although there is no emphasis on neuromuscular control in post-injury rehabilitation programs, the rotator cuff muscles, which are the primary dynamic stabilizers, must be evaluated in terms of neuromuscular control.²

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'Proprioception' means that the individual feels and recognizes himself/herself and is used for sensory inputs from the neural receptors in the joints, muscles and tendons.³ Studies on proprioception including kinesthesia, the threshold to detect passive motion (TTDPM), joint position sense, meaning reproduction of passive positioning (RPP) and reproduction of active positioning (RAP), vibrations, ability to generate force

and ability to perceive changes in extremity or joint velocity, have become increasingly comprehensive over time.⁴ It is important to assess shoulder proprioception because of sports, daily living activities and hand usage during occupational tasks and during upper limb activity as required for proper functioning.²

Vibration sense progresses along similar central neurological pathways with proprioceptive senses while proprioceptive senses are provided by various sensory receptors such as peripherally articular mechanoreceptors, muscle receptors and cutaneous tactile receptors, whereas cutaneous tactile receptors are also responsible for providing vibration sense.⁵ Considering the difficulty of evaluating the proprioceptive senses, a simpler vibration sense test can be used to gain an idea on neuromuscular control. Also, knowledge of relationship between proprioception and vibration senses, when the one of these senses has trained or assessed, it can provide insight into the present state and development of the other senses in clinical evaluation and physiotherapy rehabilitation. Therefore, evaluation of proprioception sense with vibration sense is important.

There is no study evaluating the relationship between proprioception and vibration sense in the literature. The primary purpose of the study is to examine the relationship between shoulder proprioception and vibration sense in healthy individuals. Additionally, this study aimed to compare sex-related differences between proprioception and vibration sense.

Material and Method

Patient Selection: The study was conducted under coordination by researchers of the Eastern Mediterranean University (EMU) at neuromuscular laboratory. Ethical approval was obtained from the EMU Health Ethics Subcommittee (No:ETK00-2018-0073) and the study was carried out on February and May 2018.

23 healthy individuals who signed an informed consent form participated in the study. Individuals of age 18-25 years and right dominant extremity were included and those with a musculoskeletal, neurological and systemic problem in the neck and shoulder region and body mass index (BMI) > 25 kg/m² were excluded. The socio-demographic characteristics of the participants were recorded.

Assessment of shoulder proprioception sense: Shoulder proprioception was evaluated with an

isokinetic (Cybex Humac Norm) dynamometer.⁴ The individuals were tested in the supine position. The arm of the tested shoulder was positioned at a 90° elbow flexion and a 90° shoulder abduction and the extremity was fixed at the forearm. For limiting visual and acoustic stimuli during the procedure, bands were placed over the eyes and ear plugs were inserted so that the participant was not affected by external factors. Dominant and non-dominant extremities were assessed by 60 s intervals randomly. All measurements were repeated 3 times and average values were calculated.⁶⁻⁷

For RAP testing, neutral rotation and 45° maximal external rotation (ER) were used as reference angles.⁸ After being taken passively to 30° ER and left there for 10 seconds, the extremity to be tested was expected to be actively taken by the individuals. The difference between the presented angle and the angle that was repositioned by the individual was calculated as the error of reproduction.⁶

For RPP testing, in addition to the RAP testing, the arm was placed in an air splint to limit sensory stimuli from the skin during the test. The limb was held in the 30° ER for 10 seconds. The subject was then instructed to press the remote control which was used to stop the dynamometer that rotated the shoulder at a constant angular velocity of 0.5° per second.^{7,9,10}

For TTDPM testing, the individuals were tested in the same position and conditions as RPP. While dynamometer rotated the shoulder at a constant angular velocity of 0.5° per second, the subject disengaged to press a remote control upon perception of sensation of movement at the shoulder.^{5,7,10,11}

Assessment of shoulder vibration sense: A 128 Hz tuning fork was applied perpendicularly to the tested sites (acromion and coracoid process) with its prongs maximally swinging to evaluate vibration sense while the individuals were in the supine position. They were asked to indicate the exact time no longer perceived vibration. This was called the vibration threshold time (VTT) that was measured with a chronometer. The average of 3 replications 10 s intervals was recorded.^{5,12}

Statistical Analysis: Sample size was determined to be a minimum of 15 participants by the G*Power software¹³, based on the results of a pilot study with ten healthy individuals. The confidence level was set at 5% with power 80% and two-tailed test was performed using correlation: bivariate normal model. The statistical

analysis was conducted using SPSS 18. Descriptive statistics such as socio-demographic properties are given as mean±standard deviation (X±SD) or percentages (%). The level of significance for all statistical analysis was set at p<0.05. Spearman rank correlation analysis (two-way) was used to assess the relationship between senses and Mann Whitney U test was used to compare senses between genders.

Results

The study included 10 women (43.5%) and 13 men (56.5%) in total. The mean age, height, weight and BMI of the individuals were 20.17±1.64 years, 1.70±0.08 m, 65.39±10.92 kg and 22.38±3.17 kg/m² respectively. Sex-related differences between the proprioception and vibration sense stated in table 1. There were no significant differences between the genders both proprioception and vibration sense parameters (p>0.05). The relationship between proprioception sub-parameters TTDPM, RPP and RAP and VTT was not found significant (p>0.05, Table 2).

Table 1: Sex-related differences between the proprioception and vibration sense

	Women (n=10) X±SD	Men (n=13) X±SD	p value
Dominant RAP (°)	5.26±3.03	3.39±1.05	0.134
Non-dominant RAP (°)	6.76±4.69	4.68±1.89	0.336
Dominant RPP (°)	8.21±4.62	7.16±5.02	0.515
Non-dominant RPP (°)	9.93±4.68	7.82±3.80	0.192
Dominant TTDPM (°)	4.86±3.94	3.41±2.81	0.383
Non-dominant TTDPM (°)	5.91±5.40	4.92±3.79	0.975
Dominant acromion VTT (s)	3.29±1.08	3.51±1.05	0.710
Non-dominant acromion VTT (s)	3.69±1.26	3.20±0.96	0.306
Dominant coracoid process VTT (s)	3.34±0.98	3.30±1.59	0.457
Non-dominant coracoid process VTT (s)	3.26±0.79	3.37±1.01	0.877

Mann Whitney U test; RAP: reproduction of active positioning; RPP: reproduction of passive positioning; TTDPM: Threshold to detection of passive motion; VTT: vibration threshold time; °: degree; s: second.

Table 2. Relationship between proprioception and vibration sense in all individuals

Parameters		Dominant acromion VTT	Non-dominant acromion VTT	Dominant coracoid process VTT	Non-dominant coracoid process VTT
Dominant RAP	r value	-.178	.021	-.052	.136
	p value	.417	.923	.813	.537
Non-dominant RAP	r value	-.291	-.009	-.409	.012
	p value	.177	.968	.053	.958
Dominant RPP	r value	.303	-.077	.351	.034
	p value	.160	.726	.100	.878
Non-dominant RPP	r value	.072	.083	.202	.094
	p value	.745	.705	.355	.669
Dominant TTDPM	r value	.106	.177	-.024	.263
	p value	.631	.418	.914	.225
Non-dominant TTDPM	r value	-.034	.106	.014	.120
	p value	.879	.629	.950	.587

Spearman rank test; RAP: reproduction of active positioning; RPP: reproduction of passive positioning; TTDPM: Threshold to detection of passive motion; VTT: vibration threshold time.

Discussion

Proprioceptive detection is a complex process. Although position and vibration sense are the same in the basic neural pathways, mechanoreceptors that perceive these senses may be different.¹⁴ In various studies, it has been shown that vibration affects both kinesthesia and position sense and directly participates in the proprioceptive process.^{15,16}

In recent years, studies have been conducted on the basis of the hypothesis that the joint position sense may be improved by vibration training.¹⁷⁻¹⁹ However, in these studies, the relationship between these two senses was not investigated while the effect of vibration training was examined. Studies investigating the relationship between these senses are quite inadequate in the literature. Since there is no study that examines this relationship, it is thought that research should first be made on healthy individuals.

It has been reported that the perception of vibration and proprioception sense differ between genders in the literature.²⁰⁻²² The difference between the genders was compared before assessing the relationship of these senses. As a result, no significant difference between the genders was found. So, the study led us to more objective results about proprioception parameters that no significant correlation was found in this study.

When evaluating vibration sense, there are various measurement tools such as vibrometers, biothesiometers or tuning forks.²⁴⁻²⁶ In our study, we used a 128 Hz tuning fork. The question of how to measure the vibration threshold in a clinically meaningful manner in normal and pathological situations is an important issue. While the Pacinian corpus responds to a frequency of 120-250 cycles [Hz] per second at most, 128 Hz tuning forks are accepted as the most suitable frequency today. However, clinicians may generate variable intensity at variable times by tapping the tip of the tuning fork into their hands or knees, resulting in inconsistent energetic techniques.²⁷ Electromechanical devices such as vibrometer have disadvantages such as the need to be connected to an electrical point for activating the probe, usage of an accelerometer and their large sizes, they have advantages that vertical pressure can be applied more accurately and objectively.²⁶⁻²⁷ Insufficient VTT measurements may reveal no correlation between proprioception parameters. VTT test method with a tuning fork is used for a tissue-specific limited area, different vibration measurements should be used for

effective results.

During the evaluation of shoulder proprioception sense, the arm of the tested shoulder was positioned at a 90° elbow flexion and a 90° shoulder abduction that shown it was the most reliable position for measurement and the most reliable instrument was the isokinetic dynamometer.⁴ While assessment of shoulder vibration sense test was done in neutral position of the shoulder. The difference between the two testing positions may have affected the outcome of study. The relationship of these senses should be examined in future studies in the same shoulder position.

While there are various proprioceptive sense measurements²⁻⁴ there is only one study evaluating vibration sense in the shoulder region in the literature. Rombaut et al. assessed vibration sense in the shoulder region in individuals with Type-III Ehlers-Danlos syndrome was measured with a biothesiometer in terms of volt (V).⁵ In our study, we evaluated VTT by a 128 Hz tuning fork at the same reference points. Studies on reliable reference points for use of a tuning fork on the shoulder joint and for establishment of a valid and reliable tuning fork usage protocol are gaining importance in obtaining valid and objective results.

Problems such as injury in muscular and articular structures and mechanoreceptors in the shoulder joint may cause further injury and damage to the mechanoreceptors.²⁸ Since the primary purpose of the study was to assess the relationship between proprioception and vibration sense in healthy individuals, assessment made in healthy individuals should be replicated in different shoulder pathologies and the influence of VTT should be examined.

Conclusion

This is the first study to evaluate the proprioception and vibration sense relationship in the shoulder joint and these findings will guide other studies in the future. In addition to various known proprioceptive sense measurement method, the diversification and objectification of the vibration sense measurement technique is gaining importance. Whether VTT results are affected by different pathologies should also be investigated.

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An Infant's Recovery from Bacterial Meningitis: Navigating Care Internationally

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Abstract

Bacterial meningitis is an infection that requires immediate medical management. If contracted as an infant, he or she is unable to report the symptoms. This report describes a 2-month-old male who was diagnosed with Group B streptococcal meningitis. Initially, he presented with a fever that continued to rise. He was transferred to a neonatal intensive care unit and diagnosed with meningitis. The infant was administered intravenous antibiotics, glycerol and phenobarbital as an anticonvulsant and was discharged to go home with his parents. Over the course of months, the infant received early intervention physical therapy to improve head and trunk control and positioning, as well as facilitating transitions and mobility. The infant did recover and achieve normal developmental milestones by 12 months of age. The parents of the infant were not in their native country at the time of the infant's infection and thus experienced confusion. A physiotherapist acted as the translator between the parents and nursing staff and assisted the parents in understanding his current status, plans for intervention and discharge at the hospital and recommendations for follow-up medical care.

Keywords: Bacterial meningitis, Infant Recovery, Physiotherapy, International Care, Language Barriers.

Introduction

Bacterial meningitis is a serious disease and often considered a medical emergency. Meninges function as a cushion to protect the brain and spinal cord. Meningitis is an infection of the meninges, which function as a cushion to protect the brain and spinal cord. Meningitis occurs between the pia and arachnoid mater, in the subarachnoid space; the infection triggers an immune system response, resulting in inflammation.^{1,2} Blood may carry infectious agents, allowing them to pass the blood brain barrier, resulting in swelling or bleeding within structures of the brain, hence neurological sequelae.¹

The most common organisms causing meningitis in children are *Haemophilus influenzae type b* (HiB),

Group B streptococcus (GBS), *Streptococcus pneumoniae* (pneumococcal) and *Neisseria meningitidis* (meningococcal). The most common forms of meningitis in the neonate are *Group B streptococcus*, *Listeria monocytogenes* and *Escherichia coli*.² There are currently vaccines for HiB, pneumococcal and meningococcal forms, which have greatly reduced the number of reported cases of those forms of meningitis.^{1,2}

For the past two decades, there has been a widespread push to prevent GBS through antenatal screening and perinatal prophylactic treatment.³ Despite these efforts, neonatal GBS is a leading cause of sepsis⁴ and a leading cause of serious infection that results in mortality and disability.⁴⁻⁶ The two forms of neonatal GBS are early-onset, occurs within the first seven days of life and late-onset, occurs from seven days to three months after birth.⁴⁻⁸

The following case report details the care of a 2-month-old infant diagnosed with Group B streptococcal meningitis. The infant was diagnosed in a non-native country, where his parents did not speak or understand the language being used in the hospital.

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Case Report: Two English-speaking parents residing in a Spanish-speaking country took their healthy, 2-month old infant to the pediatrician for a routine well-baby check. After, the parents proceeded to the immunization clinic for the infant's first round of shots. He received at least four shots in his left thigh. Within a few hours of the immunizations, the infant began to fuss and develop a fever. Per recommendation from the pediatrician, the parents gave the infant over-the-counter medicine to control the fever. The next day, the infant's fever continued to rise. He began to seize and was taken to the emergency room. The infant was transferred to a hospital with a Neonatal Intensive Care Unit, located approximately 40 minutes from the emergency room where he was first admitted. Frustration and confusion ensued for the parents. A language barrier already existed between the parents and hospital staff and medical jargon used elevated the stress of the situation.

Within 36 hours of the well-baby appointment, the hospital staff performed analysis of cerebral spinal fluid (CSF) via lumbar puncture and diagnosed Group B streptococcal meningitis. This exact diagnosis was relayed to the parents, but the staff did not successfully relay details of the condition in English. Thus, the parents struggled to understand the significance of the infant's condition. Cefotaxime, glycerol and phenytoin were initiated intravenously. The infant remained in pediatric intensive care (PICU) for five days. A bilingual physiotherapist with a pediatric clinical specialty was visiting another infant in the same hospital. This therapist was part of the discharge planning team and assisted with translation and coordination of care between healthcare systems for families needing assistance in the foreign country. She was informed by her Team of the infant with meningitis and contacted the parents. Parents had a positive demeanor, reporting their infant was receiving intravenous antibiotics and fluids and was doing well. They openly welcomed the therapist to visit their infant.

The therapist greeted the parents in the room and observed the baby actively convulsing in his mother's arms. The parents were completely unaware the seizure was occurring. The therapist proceeded with a quick neurological assessment, observing the infant and questioning the parents about the infant's status. She recognized that there was a deficit in the parents' ability to speak Spanish, as well as knowledge of the infant's condition and symptoms. The parents were uninformed and unaware the hospital was administering any medications other than antibiotics and intravenous

fluids. A language barrier was present and although the staff had told them the infant had a streptococcal infection, the parents did not understand if their infant had meningitis or strep.

During the therapist's initial examination, the infant presented with clonus, opisthotonos, inability to visually track from the right where his eyes stayed fixed and inability to turn his head to the left. The infant's left side was more affected than the right, with a full head lag and poor quality of movement. He was involuntarily moving his legs, with minimal volitional movement. Additionally, the infant required full head support and was unable to lift and hold his head in prone or upright position. These atypical neurological signs continued to present after discharge and in the following months.

The infant's mother tested positive for GBS during her prenatal screening and underwent prophylactic antibiotic treatment during labor. The infant contracted late-onset GBS meningitis that happened to coincide with his immunizations. There is no evidence to indicate that immunizations played a role in contraction or development of the disease.

The therapist assumed the role as translator with the nursing staff. The nurses reported a lumbar puncture had been performed, which confirmed GBS diagnosis. The infant was receiving intravenous antibiotics, glycerol and Phenobarbital. While a pediatric neurologist had not evaluated the infant yet, the pediatrician was consistently consulting with a neurologist. The neurologist recommended the infant take Keppra for three months, as the infant was continually experiencing seizures. The parents were grateful for the translation of Spanish and medical jargon to English layman's terms. The parents felt they would now be more integrated in the care of their infant.

Once discharged, the infant was eligible for early intervention services based on on medical diagnosis and gross motor developmental delay. The goal of early intervention through physiotherapy was to maximize the infant's outcomes and provide support to his family. Physiotherapy for meningitis is dependent on neurological sequelae, as there are no specific clinical practice guidelines. To effectively rehabilitate the infant and educate his parents, the therapist utilized the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY).⁹ The ICF-CY emphasizes function rather than disability.

The framework captures affected body structures and functions, activity limitations, participation restrictions and pertinent environmental factors.⁹

The physiotherapy took place 2-3 times per week, until the mother moved back to her native country. Therapy consisted of parent education and coaching, handling and positioning techniques and improving head and trunk control in supine, prone and upright positions. As head and trunk control improved, the focus revolved around facilitation of transitions and mobility and integration of neurological reflexes.

Within a week of being released from the hospital, the therapist noticed the infant was not responding to sound consistently. This response improved, but he did not localize to sound despite improved head control and the ability to consistently track horizontally while in supine. Aware of potential for hearing loss, the therapist consulted with a pediatric speech pathologist and audiologist. Results from the infant's hearing tests were inconclusive, but there was a possibility that the infant may have experienced sensorineural hearing loss with damage to the middle hairs of his ear.

At three months after discharge from the hospital, the infant continued to take Keppra and demonstrated mild side effects including irritability and drowsiness. Some neurological reflexes, such as startle, Moro, positive support and ATNR, were suppressed. Later on, the infant exhibited a subtle ATNR, which later integrated. Despite the therapist's encouragement, the parents did not set up a follow-up appointment to renew the expired prescription, and abruptly stopped giving the infant medication. Within two weeks, the infant began to respond to toy sounds and voices and continued to make developmental gains.

The infant was examined by a developmental pediatrician and localized to sound in five of six trials. Motor delays continued to improve. When the infant reached six months of age, he pulled to sit without a head lag, rolled prone to supine and supine to side lying, pushed onto extended arms and held his head up at 90 degrees in prone. He tracked left and right and sat with minimal external support. Movement quality continued to be jerky and at times athetoid-like. Physiotherapy continued for the next two months, with the therapist providing information to transition him from services in the non-native country to the native country. At 12 months of age, all of the infant's developmental skills

were within typical range and, he was no longer receiving early intervention services. The mother reported 3 years later that the infant had not received services in more than 2 years, was in preschool and daycare and, was performing on par with his peers.

Discussion

Bacterial meningitis is considered a medical emergency and delayed diagnosis can impact the patient's prognosis. Infants, children, older adults and immunocompromised patients usually possess a susceptible immune system and are at an increased risk for developing meningitis. Specifically, infants born prematurely or with low birth weight, infants with hypotension or apnea and children with cochlear implants are also at an increased risk for bacterial meningitis.⁵

At least one neurological complication occurs in 75% of bacterial meningitis cases, including loss of consciousness, seizures and focal neurological abnormalities.¹⁰ Systemic complications including cardiorespiratory failure and sepsis occur in 40% of cases of bacterial meningitis. Cranial nerve palsies occur 30% of the time with hearing impairment, but more than 50% of the individuals will have full return. Children with meningitis can suffer from long term neurologic consequences: developmental impairment, hearing loss, blindness, hydrocephalus, hypothalamic dysfunction, hemiparesis and tetraparesis.^{1,4,6} Children diagnosed with GBS meningitis have the highest proportion of disability. Mortality ranges from 5 to 25%, depending on infecting bacteria, age and health of the patient, with most deaths occurring within the first two weeks of contracting the infection.¹⁰ Once diagnosed, children who are underweight at the time of onset of bacterial meningitis have a significantly increased probability of neurological abnormalities and death.¹¹

In a prospective study of 297 patients with suspected meningitis and 80 diagnosed with CSF analysis, 85% presented with a headache, 68% with a fever, 58% with nausea or vomiting, 53% with photophobia and 46% with stiff neck.¹² Other symptoms include confusion, difficulty concentrating and fatigue or difficulty waking from sleep. When an infant contracts meningitis, verbal report of symptoms is impossible. Signs and symptoms for infants are fever, vomiting, high-pitched cry, feeding poorly and bulging fontanelles.¹⁰

The gold standard in diagnostics for meningitis is a lumbar puncture, which can also identify the target

organism for antibacterial therapy. However, antibiotics should not be delayed and can be modified once the organism is confirmed. In addition, a corticosteroid such as dexamethasone can be used to reduce inflammation in the subarachnoid space.^{7,13} Theoretically, reducing inflammation should diminish effects of pressure on cerebral structures and improve outcomes. However, there is controversy around the effectiveness of early administration of dexamethasone or glycerol combined with antibiotic therapy. Use of anti-inflammatory therapy via dexamethasone did not significantly prevent neurological sequelae, but glycerol did, particularly in HiB type meningitis.¹³ In addition, hearing impairment was not prevented or significantly reduced by using dexamethasone or glycerol, or the timing of the antibiotic.¹³ This challenged previous interventions using intravenous dexamethasone as the adjuvant medication of choice. Similarly, in a meta-analysis, dexamethasone did not significantly reduce mortality or neurological disability in patients with meningitis.¹⁴

Conclusion

The beginning of this infant's infection was a source of fear and confusion for the parents. They were in a country where they did not speak the native language and concepts were lost in translation. The parents were fortunate that a bilingual physiotherapist was on the premises to assist them with translation and, subsequently, rehabilitation of their infant. A question exists as to whether medical follow-up and rehabilitation would have been successful if the language barrier was not resolved. This situation may make one ponder, what are health care teams doing to ensure proper care of someone who does not speak their native language and translation services are not readily available? Communication impacts patient satisfaction and clinical outcomes.¹⁵⁻¹⁷

Despite exhibiting the potential for a prognosis secondary to the neurological sequelae after contraction of GBS meningitis¹⁸, the infant ultimately exhibited optimal outcomes. He recovered without disability or long-term effects. However, his healthcare team needed to be aware that a meta-analysis estimated worldwide there were 90,000 deaths of infants < 3 months old and at least 10,000 with disability each year.⁸ Another meta-analysis of long-term outcome studies indicated 29% of GBS meningitis survivors developed moderate or severe disabilities and there is a relative risk for reduced academic achievement.⁷ Awareness of the

potential challenges helped with encouraging medical and rehabilitative follow-up.

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Ethical Clearance: Taken from the University Institutional Review Board and informed consent from parent was obtained.

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Working Posture and Musculoskeletal Pain among Restaurant Chef

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Abstract

Background: Among the workers in the catering industry, the chef is reported to have the highest prevalence of Work-related Musculoskeletal Disorders (WMSD). Even though working posture was documented as one of the risk factors, the analysis of working posture and musculoskeletal pain was not extensively studied in Malaysia.

Objectives: The objectives of this study were to determine the prevalence of musculoskeletal pain and to assess the working posture to determine the risk of getting musculoskeletal disorders among restaurant chef.

Methodology: This cross-sectional study was completed with convenience sampling of restaurant chef from Johor and Melaka state. Musculoskeletal pain was recorded using a General questionnaire of the Nordic Musculoskeletal Questionnaire (NMQ) and working posture was assessed by the Rapid Entire Body Assessment (REBA).

Results: Total of 126 participants were analysed in this study. Ankle and foot pain (59.5%), Lower back pain (52.4%) and shoulder pain (48.5%) was the most prevalent pain among restaurant chefs. The majority (64.3%) of the participants having a medium risk of getting musculoskeletal disorders as per the REBA score.

Conclusion: All the chefs in this study reported musculoskeletal pain. As the majority of them are having a medium risk of developing WMSD proper ergonomic education and job modification has to be considered for the prevention of musculoskeletal pain.

Keywords: Work related musculoskeletal disorder, working posture, restaurant chef, REBA.

Introduction

Musculoskeletal disorders (MSD) are the second largest reason for disability globally¹. Musculoskeletal

conditions include those disorders which affect the muscles, bones, joints and associated tissues. It is typically manifested by pain and activity limitations¹. Work-related musculoskeletal disorders (WRMSD) are conditions which are caused or exaggerated by work, though often other activities also aggravate the problem^{2,3}. The prevalence of WMSD in Malaysia has been reported to be high in various professions as high as one in three⁴⁻⁷. Hence it is an important issue to address worldwide and it leads to fatigue, production loss, disability and economic burden⁸⁻¹⁰.

The Catering industry is a business of providing food to the customers outside the home¹¹. Among the

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catering industry workers, chefs are the lead cooks managing the kitchen¹². Surveys from various Asian countries (India, Hong Kong and Taiwan) has shown that the prevalence of WMSD is high among restaurant chefs especially among Chinese restaurant chefs¹³⁻¹⁵. A study conducted among 52,261 Chinese restaurant cooks in Taiwan has shown that nearly 25% of cooks suffer WMSDs¹⁴. Similarly, a study in Hong Kong reported that more than two third of chef suffers from WMSDs¹⁵. However, studies about Malaysian restaurant chef's WMSDs are scarce and limited information only available. As restaurant chefs are the major workforce in the Malaysian industry, understanding their WMSDs are important to address the needs of the workers.

Working posture has been identified as one of the major risk factors for the WMSDs among restaurant chefs¹⁶. Ergonomic assessment of Taiwan food industry workers and chefs reported that the work involves repeated flexion and extension postures which increases their risks to WMSDs¹⁷. Similarly, onsite working assessment of chefs from Hong Kong has shown that the chefs are working in awkward postures like bending and twisting for a prolonged period of time with repeated movements^{15,16}. Therefore, the analysis of working posture is important to identify the risk of WMSDs so that appropriate measures can be taken. However, only a few studies assessed the whole body working posture risk of chefs specifically in Malaysia with valid and reliable tools^{18,19}. As food recipes vary from country to country, the chefs work also vary based on the recipe's they prepare. Therefore, this study was planned to determine the prevalence of musculoskeletal pain among restaurant chef and to assess the working posture to determine the risk of getting MSD among restaurant chef.

Material and Method

This cross-sectional study was conducted from 3/9/18 to 14/10/18 in Johor and Melaka. The full time (at least 5 days a week) restaurant chefs with at least 5 years of working experience were selected by a convenience sampling method irrespective of their gender. The chef who was already diagnosed with any Neuro-musculoskeletal disorders or taking medication or underwent surgery were excluded.

Outcome Measures: The General questionnaire of the Nordic Musculoskeletal Questionnaire (NMQ) was used to collect the WMSD of chefs²⁰. Studies conducted

in various populations shown that NMQ is a valid, sensitive and reliable screening tool for musculoskeletal symptoms^{21,22}. The Rapid Entire Body Assessment (REBA) was the tool used to evaluate the whole body posture during the task or jobs and determine the risk of job tasks to develop WMSD. The total REBA score was then calculated to assess the risk of developing WMSD^{23,24}. The REBA has acceptable validity and reliability for screening the working posture²⁵. In the dominant task, which is the activity often performed during the work, both validity (correlation with the gold standard method) and reliability (Intraclass correlation coefficient) for REBA are 0.512 and 0.907. For the risk task, which is the activity that has the highest chance of leading to injury or require a lot of energy to perform, both validity and reliability are 0.521 and 0.864 respectively²⁶.

Procedure: The ethical clearance was obtained from the INTI International University research ethics committee. The restaurant chefs from Johor and Melaka were chosen by a convenience sampling method and informed consent was obtained from each participant. Demographic data, medical history and basic health screening were conducted to identify the eligible participants based on inclusion and exclusion criteria. Then the participants were requested to report their WMSD using the general questionnaire of the NMQ. The subjects are required to fill up the questionnaire according to their own WMSD. Then from the observation of daily task and interview with the chefs, the most difficult postures and work tasks that involve sustained posture was selected for analysis and a digital photograph with a smartphone was taken in that posture. Then the activity was analyzed using REBA and the total risk score was calculated.

Statistical analysis: Data analysis was done by IBM-SPSS version 23. The descriptive analysis of mean, standard deviation, frequency and percentages were used to report the NMQ and REBA score.

Result

A total of 129 of the participants was recruited for this study. However, 3 of the participants were excluded due to a pre-existing medical problem, the only 126 participants were included in this study. The demographic data were given in table 1 and table 2.

Table 1. Demographic data

Demographic data	Mean and Standard deviation (N=126)
Age	39.06±10.804
BMI (kg/m ²)	24.5245±3.51421
Working history as chef (Year)	17.11±9.494
Working per week (Day)	6.43±0.558
Working hour	10.55±2.050

Table 2. Demographic data

Demographic Data	Category	Frequency (Percentage) N=126
Gender	Male	100 (79.4%)
	Female	26 (20.6%)
Marital status	Single	29 (23%)
	Married	97 (77%)
Position	Executive chef	3 (2.4%)
	Sauce chef	66 (52.4%)
	Commis chef	44 (34.9%)
	BBQ chef	5 (4%)
	Dim Sum chef	8 (6.3%)
Lifting heavy object	Never	3 (2.4%)
	Sometimes	58 (46%)
	At least once a week	65 (51.6%)

The WMSD recorded by NMQ was reported in Table 3. The shoulder, wrist/hand, lower back and ankle/feet pain were reported in a very high percentage.

Table 3. Prevalence of WMSD

Body region	Pain	Frequency N=126	Percentage (%)
Neck	Yes	33	26.2
Shoulder	Right	4	3.2
	Left	6	4.8
	Both	51	40.5
	Total	61	48.5
Elbow	Right	5	4
	Left	1	0.8
	Both	18	14.3
	Total	24	19.1
Wrist/hand	Right	15	11.9
	Left	4	3.2
	Both	40	31.7
	Total	59	46.8
Upper back	Yes	13	10.3
Lower back	Yes	66	52.4
One/both hips/thighs	Yes	13	10.3
One/both knees	Yes	51	40.5
One/both ankles/feet	Yes	75	59.5

The overall risk score of REBA was reported in table 4. Majority of the participants having a moderate risk of getting musculoskeletal injuries based on the working posture analysis by REBA.

Table 4. Frequency and percentages of REBA score (N=126)

Chef Position	Low Risk	Medium Risk	High Risk	Very High Risk
Executive chef	0 (0%)	2 (1.6%)	1 (0.8%)	0 (0%)
Sauce chef	0 (0%)	40 (31.7%)	19 (15.1%)	7 (5.6%)
Commis chef	1 (0.8%)	30 (23.8%)	11 (8.7%)	2 (1.6%)
BBQ chef	0 (0%)	5 (4%)	0 (0%)	0 (0%)
Dim Sum chef	0 (0%)	4 (3.1%)	2 (1.6%)	2 (1.6%)
Total count	1 (0.8%)	81 (64.3%)	33 (26.2%)	11 (8.7%)

Discussion

This study assessed the WMSD among restaurant chefs from Johor and Melaka and their working posture risk of getting musculoskeletal disorders. All the participants reported musculoskeletal symptoms. Based on the results of this study, the highest prevalence of WMSD among chef are the feet (59.5%), lower back

(52.5%) and shoulders (48.5%). It is similar to other previous studies reports that the highest prevalence of WMSD among chef are shoulders and lower back, except neck pain which was reported lower percentage in this study^{13-15,18,27,28}. The feet have the highest prevalence in this study possible due to prolonged standing during long working hour. Besides, most of the chef will be wearing the metal shoes that are heavy and poor cushion

for the feet. A study from India by Subramaniam and Murugesan reported that the knee/foot pain has the highest percentage among cooks aged 41 years and above¹³. Since nearly half of the chefs in this study are aged 41 years and above, the foot pain reported matches with the previous results.

The lower back has second high risk may be due to prolonged bending of the trunk and lifting a heavy object by using more trunk effort which was also reported in the previous studies^{16,29}. The shoulder pain was the 3rd highest prevalence due to repetitive movement and prolong static position of the shoulder for each position of chefs which was matching with the literature report^{16,17}.

This study used the REBA tools to analyse the entire body working posture of chefs. The analysis only uses the most difficult postures and the total score was calculated. The overall total REBA score reported the moderate risk of getting musculoskeletal pain in the majority of the participants. Even though the prevalence of WMSD in this study was 100%, only a small percentage of participants' work involves high and very high risk of musculoskeletal injuries. Previous studies from various countries also reported the working posture and ergonomic assessment of chefs. However, the tools used were different and most of the studies used the Rapid Upper Limb Assessment (RULA) and National Institute of Occupational Safety and Health (NIOSH) lifting equations for ergonomic assessment^{16,17,19}. Conversely, in order to include the whole body analysis, this study used REBA tool. Even though the scoring and assessment are different in different tools, the score should be comparable since all the above-mentioned tool assess the risk of getting musculoskeletal disorders.

An ergonomic assessment of chefs conducted in Hong Kong by Xu and Cheng reported a RULA score of 5 for dim sum cook and 7 for the general cook and barbecue cook. The score of 5 requires further investigation and changes soon. A score of 7 requires an immediate change in the working conditions. It also reported the NIOSH index of more than 1 which is a risk of lower back injury among barbecue cook¹⁶. Similarly, a study conducted in Malaysia by Ali et al, 2018 reported a RULA score of 7 during food production activities of cooking, service, dish clothing and utensils washing staff¹⁹. However, in this study only chefs are included and nearly two-third of the chefs are having a moderate risk which means further investigation and changes required soon. The difference could be due to more than

half of the chefs are sauce chef and also only chefs are included for analysis in this study. However, a study conducted in Taiwan by Chyuan, 2007 reported the overall RULA score of 5.08 for pre-prep staff and 5.11 for preparation staff among commissary foodservice workers, meaning further investigation and changes required soon which is similar to this study results¹⁷. Another study conducted in Malaysia by Salleh et al utilised Quick Exposure check to analyse the working posture of catering workers, which reported a majority of moderate score for back, shoulder and arm which is comparable to this study results¹⁸.

Considering the workforce of the catering industry in Malaysia, the small sample size may be one of the limitations of this study. Since the REBA only analyses the most difficult postures, identification of difficult postures may be affected by subjectivity²⁵. Also, the duration of maintaining the posture, frequency of repetitive small movement is not assessed in this study. Since all the chefs reported WMSD and a majority having a moderate risk of getting musculoskeletal disorders, further investigation of working posture, ergonomic modification of the workstation and tools have to be done soon to prevent the MSD in the future.

Conclusion

All the chefs in this study reported musculoskeletal pain. Ankle and foot pain (59.5%), Lower back pain (52.4%) and shoulder pain (48.5%) were the top three most prevalent pain among restaurant chefs from Johor and Melaka. The majority (64.3%) of the participants having a medium risk of getting MSD as per the REBA score. Therefore, further assessment and ergonomic modification of the working environment or posture has to be implemented soon to prevent the development of MSD among restaurant chef.

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Effects and Benefits of Physical Therapy in the Mood, Quality of Life and Cognition Psychological and Cognitive Effects of Physical Therapy

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Abstract

The objective of this study is to quantify the effects of aerobic physical exercise program in the affective, quality of life and cognition aspects. This study included a sample of 40 participants with some physical pathology. All patients answered some questionnaires about clinical symptomatology (STAI, BDI, EUROQOL - 5D) and cognition (WAIS – IV). This battery test was performed before the intervention and after 10 weeks. The intervention was aerobic physical exercise consisting of an elliptical bicycle and walking on a static tape for a total of 45 minutes, three days a week. To evaluate the results, the statistical software IBM SPSS 23 was used. Values indicated a significant improvement in the affective and quality of life tests as well as higher scores in the cognitive tests once the physical exercise was performed. The results showed that aerobic physical activity improves cognitive qualities, affective status and perception of quality of life. The results show very positive possibilities for this field and for its more assiduous implementation as complementary therapy in some physical pathologies.

Keywords: *Aerobic exercise; cognition; mood; quality of life; physical therapy.*

Introduction

The effects of physical exercise in cognition and mood have been studied in general population. The literature references are extensive and comment on improvements in depressive symptoms and emotional states¹, anxiety² and advances in cognitive aspects such as attention, information processing speed, or working memory³⁻⁵.

Physical activity such as gymnastics, volleyball and athletic play are an important role in the elimination of anxiety among university students². It has also been shown that in middle-aged adults, a 20-week aerobic exercise program reduced physical anxiety, as well as body weight and body fat⁶. More specifically, aerobic physical exercise combined with yoga and meditation

exercises has been shown to reduce the stress levels of a work employee, continuing the effects of this exercise even 6 months after its completion⁷. It has been shown that moderate aerobic exercise in subjects experiencing difficulties regulating their emotions may help to reduce negative emotions¹.

Depression can have detrimental effects on one's health, even resulting in a loss of muscle mass and a poorly regulated hypothalamic-pituitary-adrenal system⁸ causing uncontrolled reactions of stress, as well as influencing in the immune system and in the emotions of these people.

As a result, it is shown how aerobic activity is associated with a lower risk of depressive symptoms such as decreased interest or pleasure in activities,

insomnia or hypersomnia, fatigue or loss of energy and recurrent thoughts of death among others⁹ in adults¹⁰⁻¹¹. The decrease of these symptoms as a result of physical activity is a very positive advance in non-pharmacological treatment.

People who perform physical activity subjectively perceive a higher quality of life than sedentary ones. This perception of a higher quality of life increases in areas such as social relations and psychological functioning¹².

Regarding neuroplasticity, it has been demonstrated that aerobic exercise has a strong influence in increasing cerebral plasticity. This increase happens especially in the hippocampus, the brain region related to learning and memory processes. Therefore, aerobic exercise has been suggested as a promising therapeutic pathway to improve these processes⁴. Physical activity improves working memory⁵ and distractibility, more specifically, it has been shown that aerobic exercise and resistance exercise resulted in an improvement in visual and spatial memory³.

Another important point of cognition is selective attention, which shows how performing previous aerobic exercise creates an improvement in a visual search task¹³. There is also improvement in reaction times in election tests¹⁴.

Regarding information processing, we observe that in a specific double-task¹⁴ moderate intensity exercise improved overall cognitive performance, while low intensity exercise compensated for the negative effects of a double task.

There are studies that show different effects on cognition depending on whether aerobic exercise or strength exercise is performed; the former being the most associated with academic performance and intelligence¹⁵. It has also been studied that people who participated in more organized and multiple extracurricular physical activities had better cognitive performance in several areas¹⁶.

Finally, the findings in the improvements in the cognition facilitate research about degenerative diseases such as Alzheimer's or Parkinson's¹⁷. Aerobic exercise intervention in people with early Alzheimer's disease can improve memory performance and reduce hippocampal atrophy¹⁸. Also, in Parkinson's disease, physical therapy has been shown to improve cognitive functioning and information processing¹⁷. Regarding other physical

pathologies, some researches find how physical exercise are very beneficial in people with osteoarthritis¹⁹, low back pain²⁰ or cervical pain²¹. Aerobic exercise improves both their psychological functioning and their perception of quality of life.

However, at this moment it is unknown which is the better kind of exercise, frequency and the time of physical activity that the programs need to get significant improvements. The objective of this work is to conduct a pilot study exploring how physical activity affects affective state, quality of life and human cognition in patients with diverse somatic conditions.

Method

Participants: 40 participants were included between 27 and 58 years old with a mean age of 43.48 ± 9.87 . The inclusion criteria were ages from 18 to 60 years old, all participants were in the mutual and they had a physical pathology that had failed the usual pharmacological and physiotherapeutic treatment, in a period of at least 3 months.

We excluded participants if they met any of the following criteria: a severe pathology incompatible with aerobic exercise.

All participants were informed that this work was done according to protocols previously established by a committee and they were asked to sign an informed consent explaining what the test consisted of and what the data will be used for. Additionally, participants were required to sign a protection of confidentiality according with the law of Spain. The data was anonymized for statistical analysis so it couldn't be traced back to specific people.

These 40 people answered some questions and questionnaires before beginning the physical therapy intervention to check their affective state, their perception of their quality of life and their cognitive ability. After 10 weeks, participants were evaluated for possible short term changes.

Instruments:

The instruments that were used were the following:

- State-Trait Anxiety Questionnaire (STAI)²² to evaluate the state anxiety.

- The BDI Beck Depression Inventory (BDI)²³ to detect and evaluate the severity of depression.
- EUROqOL-5D (EQ-5D)²⁴ to measure health-related quality of life.
- Wechsler Adult Intelligence Scale IV (WAIS-IV)²⁵ were the Digit-Symbol coding scale evaluates the visomotor speed and processing speed, attention and short-term memory and The Digits (D) test scale assesses attention and distraction resistance and immediate auditory memory and working memory. The Verbal Fluency Task is used to measure both phonological fluency and semantic fluency.

Intervention: The participants perform aerobic exercise at a moderate level for forty five minutes for three days a week. Every fifteen minutes of exercise there is a five minute break.

Physical activity consisted of a thirty minute elliptical cycle with a rest period of five minutes after the first fifteen minutes and after thirty minutes after elliptical cycle fifteen minutes of walking on a treadmill at a constant speed. The moderate level of activity depended on the physical capacity of each person, in a percentage range of between sixty and seventy percent of the maximum heart rate.

If the participants noticed any discomfort or pain they could stop the exercise immediately and rest in order to relieve the discomfort. In the case of a participant not improving, they could take to the nearest health centre to avoid possible subsequent adverse reactions.

Statistical measurement: The statistical software IBM SPSS version 23 was used to analyse data from the sample that composed this pilot study. To verify the sociodemographic characteristics of the sample, we used descriptive and relevant frequencies. To perform a comparison analysis of the patients' psychological status, quality of life and cognitive basal, a non-parametric mean comparison (Mann-Whitney U) was used. A non-parametric comparison was used because the variances were not homogeneous. To compare the effect of physical exercise therapy during the 10 weeks, a t-Student test was made for the comparison of means for related samples.

Results

Basal analysis of the results: Data on mood, quality of life and cognition of patients are presented. Patients had a mean anxiety score of 16.10 and this score indicate anxiety scores within a normal range. Only four patients who participated in the study showed high anxiety scores. The 57.5% of the participants showed absent or minimal depression, 25% showed mild depression, 17.5% showed moderate depression and none of the participants showed serious depression. We found that 60% of the participants had an average perception of quality of life, while 40% perceived a high quality of life.

With regard to cognitive functioning, approximately 50% of the patients did not reach the minimum number of words in phonological verbal fluency. With respect to the semantic fluency, 60% of the participants struggled to reach the minimum number of the words. The performance of the digit-symbol coding task was generally consistent, with 75% of the participants successfully executing the task in normal range; however, with respect to memory, 30% obtained poor results, while 65% obtained average results and 5% high scores.

Pre and post treatment comparison: Table 1 shows the results obtained in cognitive, affective and quality of life tests before exercise after a 10 week period.

Participants showed a 95% confidence level which verified the hypothesis that participants have improved in all the cognitive tests. The cognitive scores in all domains, except in working memory, improve after 10 weeks of intervention. In general, all participants showed a higher score in affective tests and the quality of life after the intervention.

Using the STAI test, which measures anxiety, the average score decreased by more than 6 points, being clinically significant. The BDI test, that measures depression, showed a slight decrease of almost 2 points. With regard to quality of life, the patients showed an increase in the perception of the health status of more than 8 points.

Table 1. Results in pre-test and post-test

	Pretest		Posttest		T	p
	Mean	SD	Mean	SD		
Anxiety State (STAI)	16,10	7,629	9,73	5,277	9,362	,000
Depression severity (BDI)	4,65	4,016	2,75	2,743	6,136	,000
Health-related quality of life. EUROqOLPT3	69,13	17,863	77,88	11,260	-5,309	,000
Verbal Fluency - F (WAIS-IV)	9,50	2,364	10,30	2,053	-2,629	,012
Verbal Fluency –S (WAIS-IV)	10,08	2,485	10,88	2,015	-2,611	,013
Verbal Fluency – Animals (WAIS-IV)	12,53	3,234	13,42	2,581	-2,356	,024
Numbers Key PE (WAIS-IV)	10,80	2,066	11,17	2,194	-2,423	,020
Digits - Direct (WAIS-IV)	7,53	1,301	7,85	1,075	-2,061	,046
Digits – Reverse (WAIS-IV)	5,13	1,285	5,42	1,279	-1,740	,090
Digits – PE (WAIS-IV)	8,75	2,362	9,30	1,964	-2,598	,013

The cognitive data shows significant improvements in the three fields of the verbal fluency test, the digit-symbol coding and the digits tests. The reverse digits test did not significant.

Comparing the data obtained in the key of numbers tests and digits tests in the post-test with a sample of standardized with those ages, the average of the score of the digital test approaches the optimal mean for that population. And in the key of numbers test the average of the subjects exceeds the standardized average optimal.

Discussion

The purpose of this study was to verify if there was an improvement after performing physical exercise over a period of time with established guidelines in the cognition, affectivity and quality of life perception. Previous studies show how there is a significant change in various parameters measured in patients who have participated in these activities; however, it hasn't yet been clarified what type of exercise, duration, frequency and time frame is necessary to reach lasting improvement in both psychological and cognitive aspects. The results of this study are similar with previous results that showed improved psychological parameters. Specifically, participants who underwent 10 weeks of aerobic exercise significantly improved their anxiety and depression scores, these results are reported in previous studies².

The quality of life was another parameter evaluated in this study, which tried to verify if the health

perception of the subjects improves after patients enrol in the physical exercise therapy. The results show how subjectively patients perceive a higher quality of life during the first 10 weeks of exercise pattern; our data is consistent with these findings¹².

The patients who presented previous physical pathology had difficulties realizing the activities of the daily optimal way. Based on the results of the EUORqOL participants who have problems walking, maintaining personal care, performing daily activities, or managing pain showed improvement and reduction of pain after starting the exercise.

Additionally, other aim of this study is to analyze if the exercise could improve the cognition; specifically, memory, attention, processing speed and verbal fluency. The verbal fluency test and the number key and digits revealed participants showed improvement in attention, semantic memory, working memory, processing speed, visomotor skills and resistance to distraction. These results reinforce that exercise improve several domains of cognition^{13,14}. All these parameters are essential for the day to day and an adequate and efficient use of them is a necessary requirement for a correct autonomy and to perform a productive work activity. The cognitive effects of aerobic exercise could be very important because these findings will facilitate research regarding degenerative pathologies as Alzheimer in improving memory performance and reducing hippocampus atrophy¹⁸. Additionally, the study could benefit subjects who are still healthy and increase their cognitive qualities.

Conclusion

After 10 weeks of aerobic exercise, participants showed significant improvements in all the studied parameters. A re-evaluation is needed to check if they are maintained over time or if there are variations to the low or the high. This allows us to be more precise with the optimum time to guide physical exercise, confirming in this way if aerobic exercise has only short-term effects or if it is necessary to increase the intensity of the exercises in the long run to maintain the effects.

These results of the three parameters show possibility of great advances in complementary therapies, which improve aspects present both in physical therapy and in psychological consultation in patients who maintain ailments for long periods of time.

This study has limitations since the pathology of the patients is not similar and the path and time of the disease either. The ages and gender of the patients is also very heterogeneous. The usual treatment that patients follow is also heterogeneous, as indicated by the corresponding specialist. The intervention exercise is similar in each one, however, it adapts to the aerobic capacity of each of them. Therefore, it is necessary to go deeper into the line of this research.

Ethical Clearance: Taken from The Ethics Committee for Research related to Human Beings of the Mutual center where the investigation was conducted. Ethical and deontological principles in relation to the people taking part in the study and handling the data obtained were complied

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Increased Upper and Lower Trapezius Muscle Activities During Rest in Side-Lying Position in Young Adults with Forward Head Posture

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Abstract

Forward head posture (FHP) is a problem with muscle imbalance around neck and shoulder girdle. The FHP might be a silent threat for young adults in their later stages of life. An impact of the FHP on muscle activities in upright posture has been well established; however, how it influences neck and shoulder muscle activities in side lying-position has been still elusive. This study was aimed to investigate electrical muscle activities (% maximum voluntary contraction, %MVC) on both upper and lower sides of 4 neck and shoulder muscles—sternocleidomastoid (SCM), upper trapezius (UT), middle trapezius (MT) and lower trapezius (LT) using surface electromyography (EMG) in 34 participants (normal head posture (NHP) group, aged 21.24±0.97 years old, n=17; and FHP group, aged 20.83±1.20 years old, n=17). Each participant performed side-lying position with a self-selected pillow for 5-min of acclimatization and another 12-min for EMG recordings. Results showed that there was no significant difference between %MVC on upper and lower sides of all muscles in both groups. In contrast, the %MVC of the trapezius muscles on the upper side of the FHP group were significantly higher than the NHP group i.e., 1.26±0.76 vs 0.79±0.44 in UT; and 3.06±1.86 vs 1.74±1.14 in LT, respectively. Despite symmetrical activation of bilateral muscles can be seen in both groups; however, the FHP could induce over activation of UT and LT while resting in side-sleeping position. Therefore, selective technique to minimize muscle activation during resting position might be required as preventive regimen for this group of young adults.

Keywords: Forward head posture, muscle activity, sleep, electromyography.

Introduction

Previous studies showed that ~70% of adult population with and without craniocervical pain prefer to take a rest in side-lying position¹. Forward head posture (FHP) is one of the most common poor postures in patients with craniocervical pain². It can be identified when the external auditory meatus is positioned anterior to the plumb line through the shoulder joint³. The FHP is a cause of craniocervical pain in adults and might be a

silent threat for young adults in their later stages of life due to muscle imbalance⁴. Biomechanically, an increase of cervical lordosis and a change of the distance of the apex of its convexity from line of gravity impose an extra cervical flexor torque compared to normal posture. This results in compensatory contraction of dorsal neck muscles to counterbalance the imposed load⁵. The primary problem of muscle imbalance in FHP is shortening of the splenius, sternocleidomastoid (SCM) and upper trapezius (UT) muscles; thereby increasing their electrical activities^{6,7}. In upright posture, the FHP altered activation of SCM and scapular upward rotator during neck or shoulder movement^{8,9}. Theoretically, neck and shoulder muscles require minimal and symmetrical activation between bilateral sides to maintain posture during bedtime¹⁰. To date, however, effects of FHP on electrical activities of these muscles in lying position has

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not been investigated. Therefore, this present study was aimed to examine the symmetrical activity of bilateral muscle (sternocleidomastoid: SCM, upper trapezius: UT, middle trapezius: MT and lower trapezius: LT) and compare muscle activities during side-lying position by self-selected pillow in normal head posture (NHP) and FHP participants.

Materials and Method

Participants: Thirty-four healthy participants (FHP, n=17) and NHP, n=17) were recruited to this study. The sample size calculation was executed by power analysis. The effect size of 0.67 was calculated by % MVC of UT (1.28±0.48 and 2.35±1.56) from pilot study. An α error of 0.05 and power of 90% were used whereby yielded at least 13 participants in each group. Their demographic data were presented in Table 1. For exclusion criteria's, the participants have any history of neck pain, office syndrome, shoulder joint lesion during in the last 3 months, trauma to the cervical spine, or inflammatory from infectious diseases of the spine, spinal surgery and congenital spinal deformities. This study was approved by the Human Ethics Committee of Burapha University (protocol no. sci 079/2562, approval no. 194/2562).

Forward Head Posture Determination: Sagittal plane head posture during standing with relaxed arms by their sides was observed from lateral view image from digital camera (Sony model HDR-PJ440, Sony, USA)^{2,11}. The 2-step measurement including plumb line assessment and craniovertebral angle (CVA) measurement was performed to identify head posture¹². First, FHP was defined as the participant's ear tragus in front of the plumb line while the plumb line was passed anteriorly to their lateral malleolus². Second, the CVA was as the angle between the horizontal line passing through C7 spinous process and the line joining the ear tragus and C7 spinous process. The participant with CVA less than 48 degrees were grouped into the FHP and those with CVA higher than 48 degrees were defined as NHP¹¹.

Pillow Selection and Lying Position: Participants were asked to choose their preferential pillow from 3 standard pillows (SUPREME model[®]) based on perception of visual analog scale of comfort (VAS-comfort scale 1-10). The pillows were rectangular shape, size 48 x 73 cm, filling with 100% microfiber, fabric 100% cotton, providing by Index living mall (Bangkok, Thailand) was purchased for studying. The

initial heights of the pillows were 13.5, 15, 16.4 cm for the pillows No. 1, 2 and 3, respectively. Representative appearance of the participants on each pillow is shown in Fig. 1. The test position was side lying on the usual side that the participants typically sleep. The participant's head rested on trial pillow, their knees flexed together at 90 degrees and their hips flexed at 60 degrees with the pillow support between their knees, both arms positioned at 45 degrees in front of the trunk with pillow support. The participants laid on trial pillow for 12-min interval. For the first 5-min, the participants received relaxation exercise involving 5 cycles of deep breathing with pressing head against the pillow simultaneously and alternately with 1-min relaxation. For last 7-min, the participants laid with relaxation without falling in sleep. The room was kept quiet dim light that to let the video recording for consideration of participant's relaxation without movement during data acquisition. The participant wore earplugs and eye patches that to block external stimulation. The pillow with the highest VAS-comfort was used for surface EMG recording.

EMG Recordings: EMG recordings were performed using TELEMyo DTS telemetry (Noraxon Inc., Scottsdale, Arizona, USA) with sampling rate of 1500 Hz. The disposable standard Ag/AgCl electrodes (Blue-Sensor, Ambu A/S, Ballerup, Denmark) were fixed over muscle belly of the SCM, UT, MT and LT of bilateral sides. The electrode location and placement process were performed following the surface electromyography for the non-invasive assessment of muscles (SENIAM) guidelines. The maximum voluntary isometric contractions of each muscle were measured for normalization process which executed following manual muscle testing technique. The Myo Research-XP 3.8.2 software was used for data acquisition and analyses. A 20–500 Hz digital band-pass filter (Lancosh FIR), full-wave rectified and the root mean square (RMS) using a moving 50-ms window were processed. The %MVC of each muscle was calculated from 6-min EMG recordings (from totally 12-min lying) after 5-min side lying for acclimatization on a selected pillow. A symmetrical working of each muscle was described as no difference of each bilateral muscle activities.

Statistical Analysis: The difference of demographic data and VAS-comfort between 2 groups were tested by independent t-test. A Mann-Whitney U Test was used to compare numbers of lying sides between 2 groups. The effects of group and side were tested by a Two-way mixed ANOVA. The Bonferroni was conducted for post

hoc analysis. The statistical significance level was set less than 0.05.

Results

Participants demographic data and VAS-comfort in NHP and FHP group are shown in Table 1. No statistically significant difference between groups can be seen ($P>0.05$) including their lying sides of preference and VAS-comfort. Pillow No.2 was chosen by 9 and 8 participants in NHP and FHP group, respectively. None of participants chose the pillow No.1 (Fig. 2).

Pertaining to the electrical activities of neck and shoulder muscles in side-lying position, there no difference in %MVC between the upper and lower sides of the body in all 4 muscles in both NHP and FHP groups ($P>0.05$). There no significant main effect of group on %MVC of SCM ($P=0.330$) and MT ($P=0.698$), but significantly higher %MVC of UT ($P=0.019$) and LT ($P=0.004$) were observed in the FHP group compared to the NHP group as shown in Fig.3. In addition, no significant interaction effect on %MVC of all muscles can be seen ($P>0.05$).

Table 1 Demographic data

Parameter	NHP	FHP	T, Z	p-value
Age (Years)	21.24±0.97	20.83±1.20	1.086	0.286
Weight (kg)	54.31±8.34	54.61±8.50	0.107	0.915
Height (cm)	162.18±7.36	161.33±7.61	0.333	0.741
BMI (kg/cm ²)	20.58±2.14	20.92±2.84	0.398	0.693
VAS-comfort	8.21±1.02	8.19±0.88	0.073	0.942
Lying side: Right	12(70.59)	10(58.82)	0.707	0.480
Lying side: Left	5(29.41)	7(41.18)		

NHP, Normal head posture; FHP, forward head posture. Age, weight, height, BMI and VAS-comfort are expressed as mean±SD. Number of lying sides are expressed as frequency (%).



Figure 1 Representative appearance of participants on 3 standard commercially available pillows.

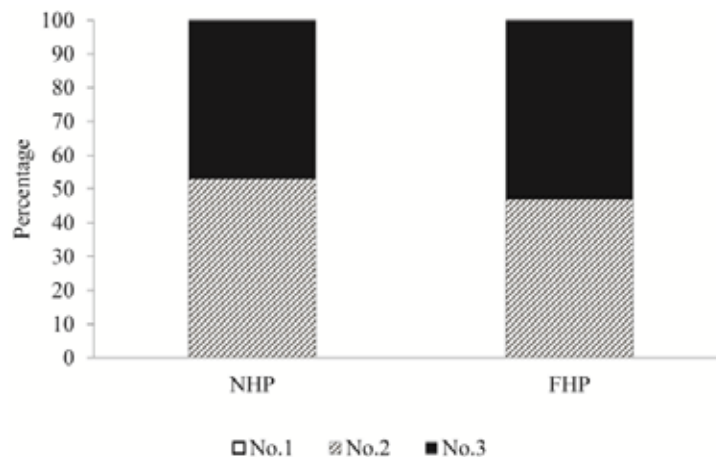


Figure 2 Percentage of selected pillow from 3 different pillows. NHP, normal head posture group; FHP, forward head posture group.

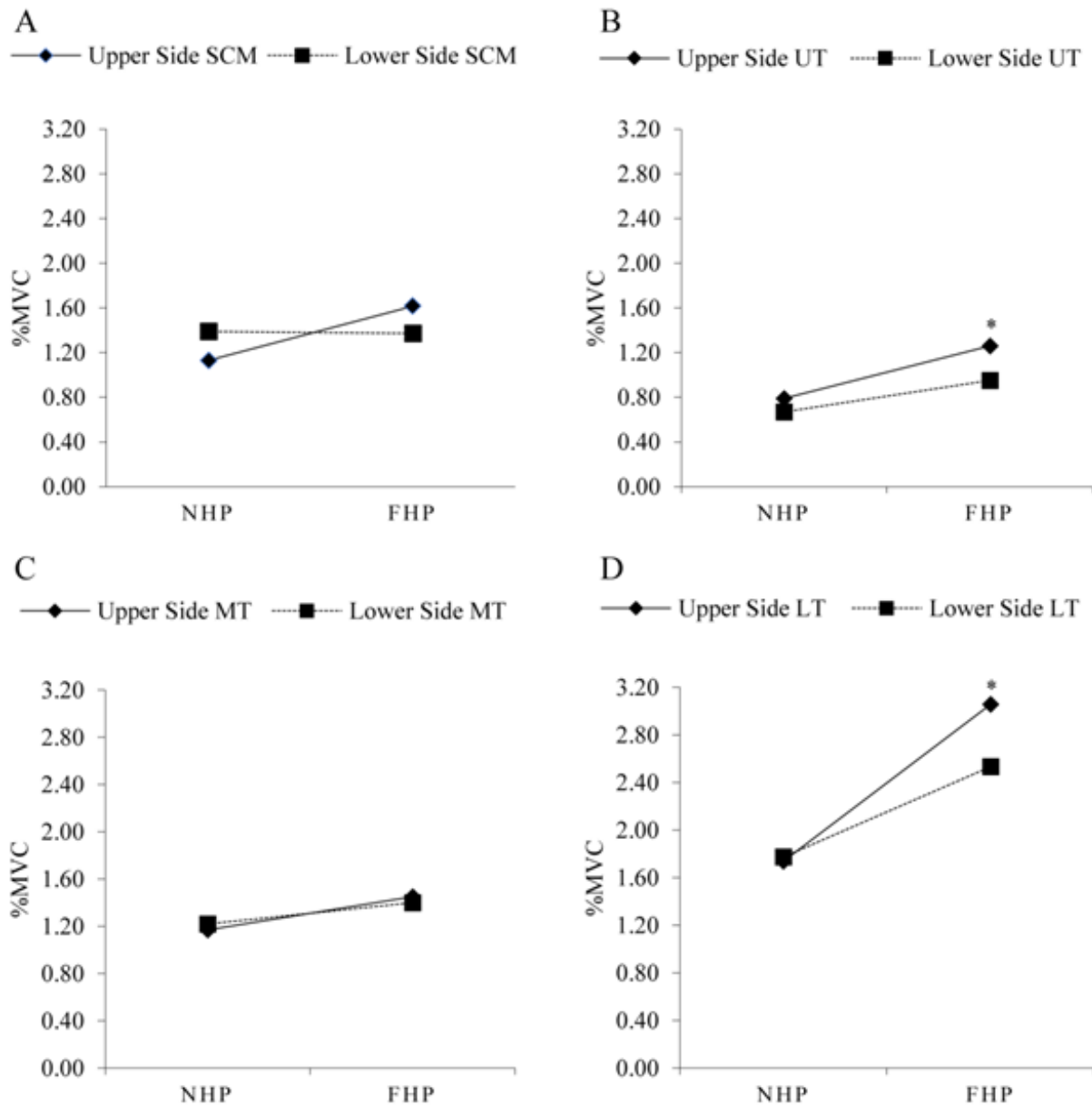


Figure 3: Comparison of neck and shoulder muscle electrical activities during side lying-position on selected pillow between normal head posture (NHP) and forward head posture (FHP) groups. SCM, sternocleidomastoid; UT, upper trapezius; MT, middle trapezius; LT, lower trapezius. The values are presented as mean±SD of %MVC. *P<0.05 compared with NHP.

Discussion

Majority of adult individual choose to spend their time to take a rest in the side-lying position¹. It was not known whether the head posture would influence neck and shoulder muscle electrical activities. Here we showed that 1) Both NHP and FHP individuals chose the same types of the pillows 2) Both NHP and FHP had symmetrical electrical neck and shoulder muscle activities and 3) The FHP resulted in increased UT and

LT electrical activities during rest in side-lying position. Our conclusion is based on the findings that %MVC of UT and LT in FHP participants is higher than in NHP group.

The finding of symmetrical working of bilateral muscles in both groups and the same level of VAS comfort compared between the groups indicates that the increased electrical activities of UT and LT are the real silent threats during maintaining side-lying position. The

young adults are asymptomatic as their cervical spine is still intact compared to elderly people¹³. The increment of the UT electrical activity has been previously documented as a consequence of muscle shortening¹⁴. The shortened sarcomere tries to compensate for its relatively less force compared to its optimal length according to the Frank-Starling law — shorter sarcomere lengths, the cause is the decreased sensitivity for calcium by the actin-myosin myofilaments¹⁵. However, Lee and colleagues reported that the UT and MT muscle activities were not changed during head protraction and retraction in the upright position⁸. Weon et al. found increased the UT and LT muscle activities during shoulder flexion with FHP⁹. Moreover, we found for the first time that the LT electrical activity in the FHP was also higher during rest on side lying. The exact cause of this discrepancy is not known, but it might be explained by a possible compensatory stabilization for UT contraction in the side-lying position¹⁶. In addition, co-contraction of other neck and shoulder stabilizing muscles might mask the basal activities of the trapezius in the upright position, which is not observed in the side-lying position with pillow support. In side-lying position, SCM electrical activity was symmetrical in both NHP and FHP groups. This was contrast to the report by Palazzi and colleagues that found asymmetrical SCM activity in myogenic cranio-cervical-mandibular dysfunction¹⁷. These different findings might be due to distinct pathology of the participants.

Of note, there is no significant difference of VAS-comfort between the NHP and FHP groups. It is interesting that the UT electrical activity increased in the FHP group inspite of the unchanged VAS-comfort. The participants might not be able to realize the subtle changes in muscle activities due to the comfortable supports by the pillows. The statement of Erfanian and co-workers “one pillow does not fit all” should be taken into account when healthcare practitioners recommend pillows to patients¹⁸. The proper pillow for individuals should have the following characteristics according to by Persson, who described pillow comfortability as one of the characterises of an “ideal” pillow¹⁹. It has been claimed that pillows suitable for stabilizing the cervical spine should be 14-15 cm in height²⁰. This might explain our finding that all participants chose a height of the pillow between 15-16.4 cm. The pillow keeps the head and neck region in neutral position, aligning the line of the shoulder in the side-lying position, thereby minimizing biomechanical stress in these regions during

sleeping²¹. However, limitation of this study was that firmness levels of pillows were not measured. Therefore, the future study should focus on the specific pillows for FHP and with longer time of sleep.

In conclusion, the FHP induces over activation of UT and LT muscle during side lying in young adult individuals. Therefore, selective techniques for removing this over activity should be studied to prevent further chronic muscle injuries in their later stages of life.

Conflict of Interest: The authors declare that they have no conflict of interest.

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Informed Consent: Informed consent was obtained from all individual participants included in the study.

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The Effect of Kinesio Taping on Gait Parameters in Osteoarthritic Knee Patients: Randomized Controlled Trial

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Abstract

Objective: To evaluate the effect of Kinesio taping facilitating technique on Vastus medialis oblique and gracilis muscles regarding gait parameters in osteoarthritic (OA) knee patients.

Method: Twenty-six OA knee patients randomly assigned into two groups; Kinesio taping group (50% tension facilitating technique applied on vastus medialis oblique and gracilis muscles) and placebo groups. Subjects were assessed gait parameters with the modified six-minute walk test by self-adjusted speed on the force distribution measurement systems (FDM-T) for three occasions: before, immediately and 48 hours after taping. Two-way repeated ANOVA was used to analyze the data.

Results: Significant increases of step length, stride length and cadence were found immediately after Kinesio taping with p-value 0.008, 0.015, 0.042 respectively. As well as after 48 hours the Kinesio taping group had significant improvement (p-value < 0.001).

Conclusions: The results of this study demonstrated that the Kinesio taping for osteoarthritic knee can improve walking pattern as shown in gait parameters and speed.

The Thai Clinical Trial Registration (TCTR) number: TCTR20180503003.

Keywords: Kinesio taping, Gait parameter, Osteoarthritic knee, FDM-T.

Introduction

Knee osteoarthritis (OA) is one of the most common disabilities in musculoskeletal patients. Degenerative change of knee joints can decrease the ability of lower extremity function such as walking and climbing stairs. In addition, the imbalance of muscle function around the knee can cause the difficulty in weight bearing including with walking pattern⁽¹⁾. Several studies^(2,3) presented that quadriceps muscles are the most important in providing the stability of knees while walking. Although, knee OA

patients were mostly found with the weakness of inner thigh muscles, which are vastus medialis oblique (VMO), gracilis, semitendinosus and sartorius⁽²⁾. According to the anatomy of VMO muscle which are aligned 50-55 degrees medially to the femoral axis and its action is to move patella medially. VMO muscle weakness could cause patellar malalignment in osteoarthritis knee patients⁽³⁾. Respectively, the strength of the hip muscle which include the gracilis muscle also involves in knee OA⁽⁴⁾. Consequently, the dysfunction of these structures can influence the gait quality.

For the analysis of the gait pattern such as the force distribution of forefoot, mid foot and hind foot, Force Distribution Measurement Treadmill (FDM-T) can be used. This instrument can measure the gait parameters that represent the mechanics of lower extremity (LE) structures such as cadence, step length, stride length

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and single stance phase. The study of Bejek et al⁽⁵⁾ investigated the gait parameters between knee OA patients and healthy subjects with the multicomponent measuring platform. Their results showed the decline of cadence, step length and single stance phase in knee OA patients. In addition, gait speed was found declining in aging people⁽⁶⁾. As aforementioned, from the dysfunction of the knee joints and muscles can affect gait pattern, which there are many evidences pertaining to physical therapy interventions for managing knee OA including mobilization, exercises and Kinesio taping (KT).

Kinesio Taping (KT) is a useful intervention for musculoskeletal patients, it has been proposed by Kenzo Kase⁽⁷⁾. There are several different techniques; facilitating, inhibiting, functional correction, space correction and lymphatic drainage. To activate the muscle, the application can be applied by starting the tape from the origin to the insertion of that muscle which is considered the facilitating method. The effectiveness of KT application lasts until 48 hours⁽⁷⁾. The studies^(8,9,10) presented the improvement of muscle function after KT application on rectus femoris, vastus medialis and vastus lateralis muscles in osteoarthritic knee patients. Several studies^(12,13,14) presented the benefits of KT application on decreasing pain and increase of knee joint proprioception in patellofemoral pain. Therefore, lack of the study investigate the effect of walking and gait quality on KT application.

This study aimed to evaluate the effect of KT facilitating technique in immediate and 48 hours on VMO and gracilis muscles in gait parameters (cadence, step length and stride length, distance, speed and pain of OA knee subjects. We hypothesized that KT application on these muscles could alter gait parameters in knee OA patients.

Materials and Method

The study design was randomized controlled trial (RCT), double-blinded. The participants were allocated randomly into two groups; Kinesio Taping group and placebo group. The randomized protocol was generated by the free randomization website (<http://www.randomization.org>) The investigators were blinded to all measured data and the participants were blinded to group allocation. The location of this study was at Physical Therapy Center, Mahidol University. The protocol of the study was approved by the Human Research Ethic Committee of Mahidol University

(MU-CIRB 2017/137.1309) with informed consent of all participants. This trial was registered to the Thai Clinical Trial Registry (TCTR) TCTR20180503003.

Participants: Twenty-six participants were recruited in this study. Inclusion criteria; participants aged between 45-70 years, males and females, having knee pain with crepitus sound, less than 30 minutes of morning stiffness⁽¹¹⁾, no medical history which affect to their gait abilities and no allergy with KT tape. Exclusion criteria were knee inflammatory conditions, knee joint dislocation, knee deformity (Intermalleolar distance > 4 centimeters)⁽³⁾ and past history with any knee surgery. The sample size of this study was determined based on the data of Lee K. et al⁽¹⁰⁾.

Outcomes

Gait Measurement: Force Distribution Measurement Treadmill (FDM-T) and Zebris Medical GmbH, Germany, were used to measure the gait parameters. The measurement parameters in this study were step length, stride length and cadence. The participants were asked to walk for 6 minutes with self-selected speed⁽⁵⁾. Distance and speed were recorded at the beginning and at the end of walking protocol. There were 3 occasions: before, immediately and 48 hours after KT application, were measured by blinded assessors.



Figure 1. Gait measurement on FDM-T



Figure 2. Application of KT on gracilis and VMO muscles

Kinesio taping application: Kinesio taping group, the certified KT researcher with more than 5 years of experience applied the facilitating technique with 50% tension; Y-strip kinesio tape on VMO and I-strip on gracilis muscles beginning from the origin to the insertion of each muscle the knee OA side and the KT length depended on each participant thigh length (figure 2). The

participants were in supine lying position starting in full knee flexion while applying the tape. Placebo group, the participants received KT with no tension on the same procedure. Both groups applied KT for 48 hours.

Data Analysis: The version of Statistical Package SPSS version 18 was used. In this study, the data were normally distributed. Therefore, two-way mixed ANOVA with repeated measures (group x time; 2x3) was used for analyzing the data between groups in three occasions. The statistical significance was set at $p < 0.05$.

Results

Twenty-six osteoarthritis knee participants (25 females, 1 male) were volunteered in this study. Age and BMI were not different between two groups (Table 1) and all baseline gait parameters were not different between groups (Table 2). KT intervention, the results presented the significant improvement of step length, stride length and cadence at immediately after taping with p -value 0.008, 0.015, 0.042. Similarly, 48 hours after the application of KT with p -value < 0.001 (Table 2).

Table 1: Characteristics of the groups: KT, placebo

Characteristics	KT Group	Placebo Group	p-value
BMI (kg/m ²)	25.77±2.92	24.63±2.34	0.284
Age (yrs)	59.76±5.87	62.07±8.66	0.435
Pain intensity (VAS)	2.60±2.08	2.33±1.75	0.724

Table 2: Gait parameters between 2 groups: KT and placebo during 3 occasions: pre, immediately, 48 hours after KT

	Gait parameter	Placebo Group	KT Group	p-value
Pre-Taping (baseline)	Step length (cm)	40.38±8.98	45.84±10.35	0.164
	Stride length (cm)	79.69±14.69	92.38±20.93	0.086
	Cadence (steps/min)	104.23±13.36	111.15±14.00	0.210
Immediately after KT	Step length (cm)	43.46±9.38	53.76±8.70	0.008*
	Stride length (cm)	87.92±17.90	106.53±18.15	0.015*
	Cadence (steps/min)	101.84±14.48	113.07±12.01	0.042*
48 hours after KT	Step length (cm)	41.69±7.06	54.30±7.57	<0.001*
	Stride length (cm)	83.15±13.61	108.23±16.35	<0.001*
	Cadence (steps/min)	103.38±12.71	117.30±12.50	0.010*

Values are represented in mean ± standard deviation (SD), * denotes significant difference

Moreover, the secondary results found that a significantly progression of walking speed and distance at immediately in KT group with p -value 0.008, 0.012. Similarly, 48 hours after the application of Kinesio taping with p -value < 0.001 (Table 3).

Table 3: Speed, distance and pain (VAS) between groups: KT and placebo groups in 3 occasions;pre, immediately, 48 hours after KT

Outcomes	Placebo Group	KT Group	p-value
Speed-Pre (km/hr)	1.53±0.38	1.86±0.48	0.066
Speed Immediately (km/hr)	1.65±0.48	2.23±0.52	0.008*
Speed 48 hrs. (km/hr)	1.60±0.40	2.36±0.48	<0.001*
Distance-Pre (m.)	228.44±53.26	280.58±74.02	0.050
Distance Immediately (m.)	253.63±73.46	333.63±75.99	0.012*
Distance 48 hrs. (m.)	240.19±58.04	350.79±69.31	<0.001*
VAS (cm.)	2.60±2.08	2.33±1.75	0.724
VAS Immediately (cm.)	1.73±1.77	1.76±1.71	0.973
VAS 48 (cm.)	0.74±0.97	1.80±1.95	0.092

Discussion

The objective of this study was to investigate the effect of KT facilitating technique on VMO and gracilis muscles during three occasions; pre, immediately and 48 hours after KT application of gait parameters in knee OA participants. The outcomes of gait parameters were step length, stride length, cadence, speed and distance. The results of this study showed significant improvements in KT group both immediately and 48 hours after application in every outcome.

The study of Bejek⁽⁵⁾, presented the significant reduction of cadence, step length, speed and time in OA knee to healthy subjects. It was determined that knee OA patients avoided to use quadriceps while they were walking which could lead to change their gait pattern. Due to the results of our study showed the change of gait parameters after facilitating on VMO and gracilis muscles in OA knee participants. This might explain that the benefits of KT facilitating application can activate muscle spindles of these muscles after applying⁽⁷⁾. Moreover, the recoil effect of KT facilitating application can decrease the onset time between electromyography signal and the muscle contraction⁽¹⁵⁾.

The study of N. M. Fisher et al⁽⁶⁾ showed that the gait parameters (cadence, speed and stride length) of knee OA patients were not significantly different after using the quantitative progressive exercise rehabilitation (QPER). The QPER program included isometric, isotonic with resistance, endurance and speed contraction exercises in knee muscles, thus in our study presented significantly improve the gait parameters after applying KT facilitating on knee and hip adductor muscles.

According to Kenzo Kase⁽⁷⁾ investigated of KT effects by the tension of the tape which applied to the skin. The recoiled effect of the KT could activate the inactive muscles to contract last to 48 hours. The study of Lemos TV et al. (14) presented the significant increase in hand grip strength after 24 and 48 hours KT facilitating application on wrist flexor muscles. In addition, the results of our study showed significantly improve in gait parameters ($p < 0.001$) on 48 hours after KT facilitating application.

There were several studies investigated the immediate effect of different KT techniques on quadriceps muscles in OA knee patients. The results of these studies presented the improvement in quadriceps muscle functions and walking quality; isokinetic quadriceps torque, walking task⁽⁸⁾ and knee active range of motion⁽¹⁾ at immediately after KT application. None of the previous study investigated the effect of KT in 48 hours on OA knee patients. According to the present study, the result showed greater significant improvement of KT effect after 48 hours on step length ($p < 0.001$), stride length ($p < 0.001$), cadence ($p = 0.01$), distance ($p < 0.001$) and speed ($p < 0.001$).

Aforementioned, the findings in this study showed the effect of KT facilitating technique with 50% tension on VMO and gracilis muscles which significantly increased gait function in OA knee participants in immediately and 48 hours after KT application. Therefore, other studies^(14,15,16) investigated the effect of KT facilitating technique in different tension; 25%, 35% and 120%.

Limitation of the study, the duration of this study

lasted 48 hours, although we still found the effect of KT application, the longer period after 48 hours is still questioning. The future study is therefore encouraged to commit with the longer period of investigation. The combination of the muscle training together with KT application might be beneficial for knee OA patients in order to strengthen the muscles by which the KT application could be firstly helpful for motor control and learning at the beginning. The next study warrants the investigation of the effects of the combination of muscle training and KT application for sustainable outcomes in knee OA patients which aimed for effective knee OA rehabilitation.

Conclusion

This study presented the effects of facilitating technique of Kinesio taping on vastus medialis and gracilis muscles in osteoarthritic knee patients at immediately and 48 hours after KT application. The results showed the improvement of gait parameters; step length, stride length, cadence, distance and speed after KT application. This can imply for clinical intervention for osteoarthritic knee patients to enhance their walking ability. Further study should consider the effects of amounts of KT application in OA knee patients.

Conflict of Interest: This study declares no conflict of interest which might influence the process and the findings in the study.

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Ethical Clearance: This study was approved by the Human Research Ethic Committee of Mahidol University (MU-CIRB 2017/137.1309).

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Prevalence of Musculoskeletal Disorder among Postmenopausal Women: A Cross Sectional Study

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Abstract

Background and objective: Postmenopausal women are subjected to various health issues amongst which the musculoskeletal conditions are most prevalent. Various studies have been done to find out the prevalence of numerous menopausal symptoms but, there are very few studies done especially in India to evaluate the burden of various musculoskeletal disorders using standardized questionnaire.

Objective: To find out the prevalence of musculoskeletal pain among postmenopausal women.

Methods: A total 351 postmenopausal women were screened as per inclusion and exclusion criteria from S.D.M College of medical sciences and hospital, Dharwad. Data was obtained on sociodemographic and region wise musculoskeletal pain using standardized Nordic questionnaire.

Results: The prevalence of musculoskeletal pain among postmenopausal women was found to be 56% with mean age of onset of menopause as 46 yrs. Region wise analysis of musculoskeletal pain among postmenopausal women showed back (57%) and knee (72%) pain to be most prevalent.

Conclusion: Prevalence of musculoskeletal pain in postmenopausal was considered to be higher in this part of India. Most of the postmenopausal women are affected with musculoskeletal pain mainly in the back and knee regions and the causes for the same are multifactorial among Indian population.

Keywords: *Musculoskeletal pain, postmenopausal women, Standardized Nordic questionnaire.*

Introduction

Musculoskeletal disorders are “diverse group of conditions with regards to their pathophysiology but are linked anatomically by pain and physical function”. Musculoskeletal pain arising from musculoskeletal conditions in general population is very common showing a prevalence of 74.5% lasting for past 12 months and 44.4% lasting for more than 3 months with 1 year prevalence of low back pain of (44%), neck pain (31%), shoulder pain (30%), wrist and elbow pain scoring (18%) each in general population.¹ According to standardized Nordic questionnaire the prevalence of many of these conditions increases with age and lifestyle factors such as obesity and lack of physical activity

adversely affect the severity and occurrence of such conditions. Musculoskeletal conditions caused 40% of all chronic conditions, 54% of all long term disabilities and 24% of all restricted activity days.²

Musculoskeletal pain has a higher prevalence in women, amongst which it is higher in postmenopausal women as compared to premenopausal women suggesting that the decline in the reproductive hormones is associated with increased pain perception.³ The prevalence of musculoskeletal disorder in postmenopausal women was 27.3% in Nepal⁴ and 53.3% in northern india.⁵ The most common disorders seen in postmenopausal women were osteoarthritis, osteoporosis along with associated bone fractures and

low back pain.⁶ The other symptoms associated with menopause are hot flushes, mood alterations, joints and muscle pain and sexual dysfunction.⁷⁻¹⁰

Postmenopausal musculoskeletal pain is generally associated with reduction of the ovarian function, where there is decline in the production of mainly estrogen hormone.⁵ Estrogen helps in maintaining the homeostasis of the joint and articular structure by regulating the molecular pathways. It also affects synovial lining, capsules, ligaments and muscles around the joint. Estrogen deficiency leads to increased cartilage wear and tear and joint surface erosion, reduction in bone mineral density, loss of muscle mass and strength, decrease in the collagen content of connective tissues which further leads to impairment in the muscle performance and functional capacity. All these changes lead to early degeneration in postmenopausal women.^{6, 11}

In Indian population, wide cultural diversity, inequality in socio-economic status and gender are some of the sensitive multi factorial determinants that influence the menopausal health.^{12,13} Postmenopausal symptoms are generally ignored in rural, suburban as well as urban India, even if they suffer from symptoms silently.^{14,15} There is under-reporting of symptoms due to sociocultural factors as well due to lack of awareness and knowledge about this conditions. Hence the aim of the study intends to find out the prevalence of musculoskeletal pain in postmenopausal women.

Materials and Method

In this cross sectional study, all the Postmenopausal women coming to SDM medical hospital, Dharwad were screened as per the inclusion and exclusion criteria. Subjects willing to participate in the study were briefed about the study and their written consent was taken. This study has been approved by institutional ethical committee, SDM College of Medical Sciences and Hospital, Dharwad, India. A total of 351 postmenopausal women (menopause for > 1 year) were included in the study. Sample size was calculated based on the prevalence of musculoskeletal pain among postmenopausal women which is taken as 53.3%.³

Inclusion Criteria:

1. All post-menopausal women (menopause for > 1 year)⁵
2. Women willing to participate in the study.

Exclusion Criteria:

1. Women not willing to participate due to personal reason.
2. Women who are unable to complete the questionnaire.
3. Women diagnosed with any medical condition of neurological, metabolic, musculoskeletal origin before menopause.
4. Women diagnosed with malignancy.

Demographic data of the subject was obtained by principle investigator in data collection sheet and Standardized Nordic Questionnaire was administered to the subjects by interview method. The data collection sheet included information regarding subject's socio demographic profile along with common postmenopausal symptoms. Standardized Nordic questionnaire was administered by collecting information on pain like site of pain, duration of pain and activity limitation due to pain in past 12 months and 7 days and painful regions were marked on the body chart.

Data Analysis: Statistical analysis was done by using SPSS (Statistical Package for the Social science) version 21.0 software. The descriptive analysis of gender, age, BMI, age of onset of menopause, occupation and socioeconomic status was done. Data was presented in percentage. Nordic scale was used for the analysis of musculoskeletal pain. From standardized Nordic questionnaire, column with pain during last 12 months and 7 days was used for data analysis.

Results

Table 1 shows the prevalence of musculoskeletal pain in postmenopausal women. The study population consists of 351 postmenopausal women, out of whom 198 women reported with postmenopausal musculoskeletal pain and 154 women with no pain.

Table 2 represents the socio demographic profile of the respondents. Maximum number of postmenopausal women, who were in the age group of 50-59 years, were affected with musculoskeletal pain 103(59%). The mean age of onset of menopause in our study was 46yrs. The region wise musculoskeletal pain(Figure 1), showed maximum number of postmenopausal women had pain in the low back (57%) and knee (72%) regions respectively in comparison with other regions.

Table 1: Prevalence of musculoskeletal pain among postmenopausal women

MSK Pain		NO MSK Pain		TOTAL	
n	%	n	%	n	%
198	56	153	44	351	100

Table 2: Socio demographic profile of the respondents

Variables	No MSK Pain		MSK Pain	
	n	%	n	%
Age				
39-49yrs	47	50	47	50
50-59yrs	71	41	103	59
60-69yrs	31	44	39	55
70-79yrs	4	31	9	69
BMI				
18-25	83	39	128	61
26-30	55	51	52	49
More than 31	15	48	18	52
Age of Onset of Menopause				
37-47yrs	97	44	123	56
48-58yrs	56	43	74	57
More than 58yr	0	0	1	100
Occupation				
Non-working	111	44	140	56
Working	42	42	58	58

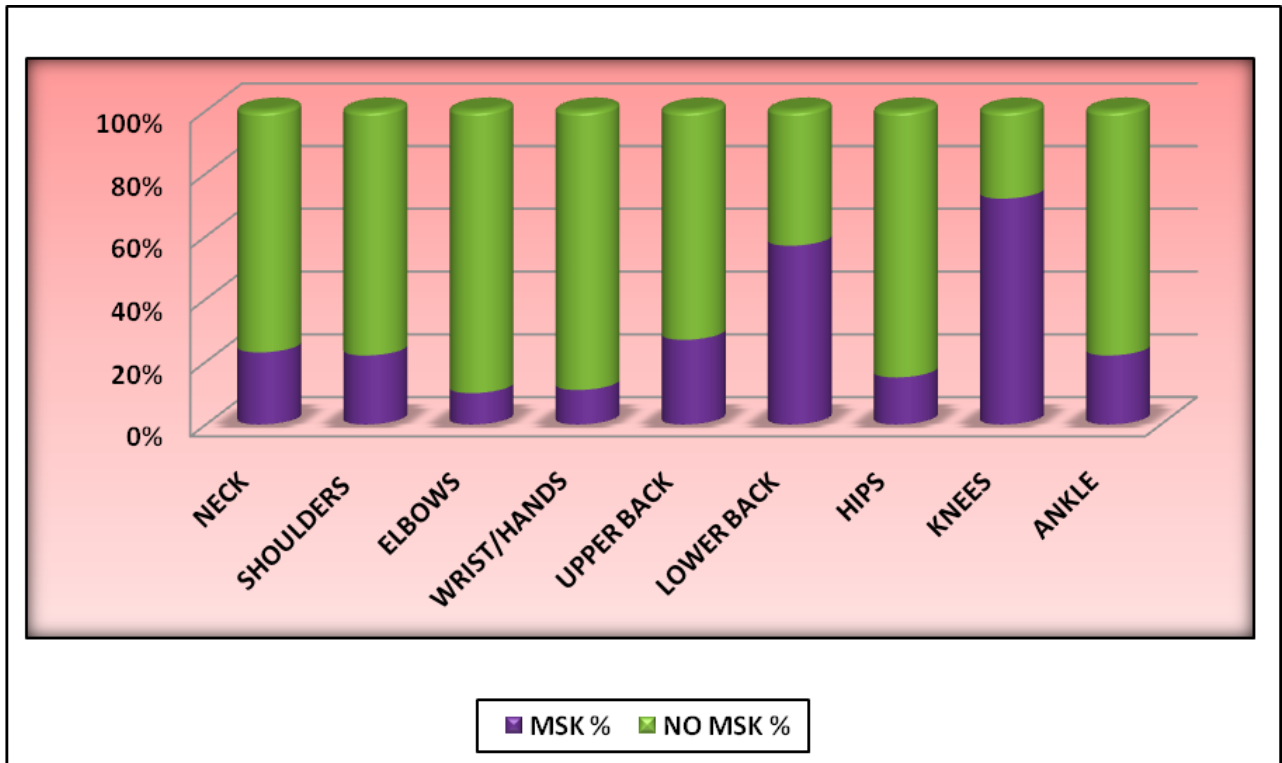


Figure 1: Region wise distribution of MSK pain in post menopausal women

DISCUSSION

This research aimed to find out the prevalence of musculoskeletal pain in postmenopausal women in this part of Karnataka. The prevalence of musculoskeletal pain in postmenopausal women in India was 53.3%⁵ and Nigeria was 60.79%.¹⁶ Similarly your study has revealed similar prevalence of 56% (TABLE 1, FIGURE 1), which states that maximum postmenopausal women are affected with musculoskeletal pain in India and abroad population.

Women who belong to the age group of 50-59 years mainly were affected with musculoskeletal pain and their mean age was 54 yrs. This shows that as the age advances, the prevalence of musculoskeletal pain increases.

A study done by Kohlman also has found out the similar findings that prevalence of MSK pain in adult women population was age dependent and maximum prevalence was found in age group of 50-60 yrs.¹⁷ During postmenopausal period women is challenged to undergo various changes related to physical and psychological factors. Few of the factors are weakness in the muscle, reduction in the size of the muscle, osteoporosis etc. Most of these factors are associated with age advancement. As the age advances musculoskeletal complaints increases.¹⁸ Also there is reduction of estrogen hormone which has important role in maintenance of musculoskeletal system. Hence as age progresses, this hormone reduces which in turn affects the musculoskeletal system. Based on our results in comparison with previous literature it is proved that age is one of the important factors for musculoskeletal pain in women along with the postmenopausal symptoms.¹⁹

The mean age of onset of menopause in our study was 46 yrs which is similar to the studies done in northern India which was 46, in western and Arab countries it was 48 and 50 yrs respectively. When compared to India, western countries have shown higher mean age of onset of menopause. According to earlier studies this was the topic of debate and the reason for which is explained as lifestyle in Indian population, ethnicity and other socio-demographic factors.^{3,4,20}

The study justifies the previous literature done in Nigerian population which revealed the similar results when region wise musculoskeletal pain assessment was done. Osteoporosis can be one of the causes for women to have increased pain in back and lower

extremity during postmenopause period. There are lots of hormonal variations in postmenopausal women and due to this bone resorption rate increases which is the cause for osteoporosis. According to the literature osteoporosis is most commonly manifested in the low back and in the joints. Our study has similar findings of Scharla et al, as low back and joint pain were the regions to be mostly affected. The common condition in the back due to osteoporosis was spondylosis, fractures and osteoarthritis in knee.¹⁶ Another reason for the postmenopausal women to get affected with low back and knee pain may be attributed to degeneration. As the age progresses degeneration begins. Due to degeneration there may be various changes associated with muscle, ligaments, facets joints, intervertebral disc.^{21,22}

Along with this it is already proved that because of low Socioeconomic status, there is lack of intake of calcium, due to low education status there is lack of exercise and awareness regarding health. And the studies have also proved that osteoporosis increases with advancement of age.²³

Conclusion

The present study concludes that 56% of postmenopausal women have musculoskeletal pain, which signifies that there is high prevalence among this part of India. Region wise assessment has revealed that pain is mostly confined to back and knee regions.

Limitations of the Study: In this cross-sectional study sample size considered was small and subjects were recruited from only one hospital. Post menopause transition symptoms were not classified as early and late post menopause. Musculoskeletal disorder diagnosis was not done, only musculoskeletal pain was considered and severity of musculoskeletal pain was not assessed.

Future Scope of the Study: Future studies are recommended with larger sample size. A study can be done to assess the severity of musculoskeletal pain using visual or visual analogue scale (VAS), numeric pain rating scale (NPRS). A comparative study of musculoskeletal pain pre and post menopause can be conducted.

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Conflict of Interest: The authors declare that there was no conflict of interest.

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