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Scapular Asymmetry among Elite Swimmers of Jorhat District Using Lateral Scapular Slide Test

Begum Affrin Zaman¹, Babita Basumatary², Chayanika Borah²

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Abstract

Background: Shoulder pain is particularly common among swimmers with up to 91% of swimmers¹⁹. Ninety percent of the propulsive force in swimming comes from the upper extremity^{4,5}. The scapular asymmetry is alterations in scapular positioning which can have an effect on shoulder function. Scapular positioning has a direct relationship to shoulder stability¹². Asymmetry in scapular position between sides is often assumed as pathological¹¹.

Objective: To determine scapular asymmetry as a factor causing shoulder pathology among elite swimmers of Jorhat district using lateral scapular slide test.

Method: A descriptive study has been undertaken. 50 swimmers have been selected randomly for the study and all swimmers are the members of Jorhat Swimming Society. Duration for the study is 8 weeks. The significant and relevant test for this study is Lateral Scapular Slide Test (LSST). Dr. W Ben Kibler was the first person who proposed this test to assess scapular asymmetry based on the idea that asymmetry is an abnormality and it needs to be identified and rehabilitated^{18,19}.

The swimmers selected for the study are between the age group of 12-25 years within training sessions of minimum 6 times per week and 12 hours weekly. Subjects are excluded who has any shoulder pathology like fracture, surgery or any other traumatic injury.

Results: The statistical analysis was carried out using 'z test' to determine the significance of scapular asymmetry. There is no significant asymmetry at 0 degree shoulder resting position and there is significant asymmetry in 45, 90 and 135 degrees of shoulder abduction respectively.

Conclusion: Based on the statistical analysis, it is concluded that there is significant asymmetry found with the LSST test position at 45 degree, 90 degree and 135 degree, mostly it increases with the elevation of the shoulder joint. Also they may be characterized of having movement restriction of shoulder joint as well as shoulder pain in their later stage of life.

Key words: Scapular asymmetry, Shoulder pain, Lateral scapular slide test.

Introduction

Swimming is an individual or team sport that requires the use of one's entire body to move through

water. Swimming can be recreational, rehabilitation or a highly competitive sport which require high levels of training and performance¹. Swimmers begin their career earlier than a lot of other sports, typically at an age of 8 to 12 years².

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Usually, swimming represents a competitive overhead sport³. Ninety percent of the propulsive force in swimming comes from the upper extremity^{4,5}.

Shoulder injuries frequently occur in swimming athletes: 47% to 80% of all competitive swimmers reported shoulder injuries⁶. Scapular positioning on the thoracic cage is a part of a comprehensive evaluation in patients with suspected shoulder dysfunction⁷. The scapula is vital in shoulder function and scapulohumeral rhythm and scapulothoracic rhythm⁸. In swimming an athlete's scapular musculature also plays a pivotal role in stabilizing and maintaining strength of the shoulder joint⁸. Physiologically, it is important in scapulohumeral rhythm, the coupled and coordinated movement between the scapula and the arm that allows placement of the arm in the optimum position and achievement of the proper motion to accomplish tasks. Biomechanically, the scapula provides a stable base for muscle activation and a moving platform to maintain ball and socket kinematics. It also serves as an efficient link between the core, which develops force, and the arm, which delivers the force⁹.

The scapula is internally rotated 35° to 45° from the coronal plane, is tilted anteriorly approximately 10° to 15° from vertical, and is upwardly rotated 5° to 10° from vertical⁹. The scapulothoracic joint is one of the least congruent joints in the body. No actual bony articulation exists between the scapula and the thorax, which allows tremendous mobility in many directions, including protraction, retraction, elevation, depression, and rotation¹⁰. The movement of the scapula on thorax contributes to 50° to 60° of the shoulder flexion and abduction. The glenohumeral joint contributes to 100° to 120° of abduction. This combination of scapula and glenohumeral joint movement results in a maximum range of elevation 150° to 180° of shoulder joint. A number of studies have investigated that this rhythm with ratios reported varying between 1.25:1 and 2.69:1. This is called as the "scapulohumeral rhythm"⁹.

Asymmetry in scapular position between sides is often assumed as pathological¹¹. Asymmetries can affect both resistance and propulsion which, together with physiological capacity of the swimmer, are the key determinants of performance. It can affect resistance primarily through their effect on shape and posture. On affecting propulsion include uneven contributions by right and left upper and lower limbs due to strength and flexibility imbalances.

The scapula performs 3 major roles in the production of smooth, coordinated movement about the shoulder girdle. The first role of the scapula is the maintenance of dynamic stability with controlled mobility at the glenohumeral joint. Secondly, while maintaining dynamic stability, the scapular musculature must at the same time provide controlled mobility. Thirdly, the scapula must also rotate upward with overhead activities¹⁰. Asymmetry decreases stability of the scapula and leading to functional deterioration of most of the muscles contributing to the stability¹². Dyskinesia (dys [alteration of] kinesis [motion]) is a general term that is used to describe loss of control of normal scapular physiology, mechanics and motion¹³.

The high prevalence of injury in swimmers has been associated with the instability to maintain a fine balance between strength and instability, in combination with poor endurance of shoulder musculature¹⁴. The correct stroke pattern must be accompanied with equal body rotation to avoid injury¹⁵.

Swimmers are notorious for having poor posture; they are characterized as having forward head, rounded shoulders, and increased thoracic kyphosis, which can affect scapular kinematics, muscle strength and range of motion¹⁶. Improper head position, forward-sloping shoulders, and scapular instabilities are also implicated in arm, shoulder, upper-back, and neck pain¹⁵.

The lateral scapular slide test is proposed as a practical, quantitative method for assessing medio-lateral inferior angle displacement and recognizing scapular asymmetry in clinical setting (Kibler 1998)³. This is a readily usable tool with high reliability².

Dr. W Ben Kibler was the person who first proposed the Lateral scapular slide test to assess the scapular asymmetry, based on the idea that the asymmetry is an abnormality and it needs to be identified and rehabilitated^{12,13}.

Kibler proposed a method characterizing scapular position in 4 different test positions that place the upper extremity in 0 degree (test position 1), 45 degree (test position 2), 90 degree (test position 3) and 135 degree (test position 4) of abduction in

the coronal plane. Kibler asserted that a bilateral difference of 1.5 cm should be the threshold for deciding whether scapular asymmetry is abnormal. Regardless of the threshold, Kibler contended that the injured side should exhibit a greater scapular distance than the uninjured side¹⁷.

According to Kibler, the LSST measures the ability of the posterior shoulder muscles to stabilize and position of scapula¹⁷. Asymmetry was verified using difference in the left and right values, after the distance between the spinous process of the thoracic vertebra 7 was measured in the horizontal plane⁵. For the muscles of the glenohumeral joint to work in a normal coordinated fashion, the scapula must be stabilized by its muscles to act as a firm base for the glenohumeral muscles. Thus, during the test procedure, the examiner has to watch for movement patterns of the scapula as well as scapular dyskinesia¹⁸.

Objective of the study

To determine scapular asymmetry among the elite swimmers of Jorhat District using lateral scapular slide test.

Materials and Methods

Source of data

1. Jorhat Swimming Society, Swimming club, Jorhat, Assam
2. Titabar Swimming Pool, Madhapur Rd, Titabar, Assam

Sample selection

Population: Competitive swimmers

Sample Design: Simple Random Sampling

Sample Size: 50 swimmers

Study Design: Descriptive Study Design

Duration of the study

Two months i.e. 8 weeks

Inclusion criteria

1. Swimmers within the age limit between

12-25years³.

2. All swimmers are members of the same swimming club⁶
3. Training sessions of minimum 6 times per week and 12 hours weekly³.

Exclusion criteria

1. Previous shoulder surgery, or shoulder pain that interfered with swimming training⁶.
2. Presence of shoulder instability due to previous injury in the past six months³².
3. A subject with history of clavicular pathology³⁵.
4. A history of cervical or thoracic pathology³².

Materials Used

1. Measuring tape
2. Goniometer
3. Marker pen
4. Clip board

Procedure

50 elite competitive swimmers fulfilling the inclusion criteria were selected for the study. They were then randomly selected for the test procedure. All subjects were explained about the purpose of the study and were educated about the test procedure that is to be conducted. Before participating in the study, the subject was asked to sign informed consent documents.

The lateral scapular slide test

The subject was in standing position and the back of the subject was adequately exposed. First the distance from inferior angle of scapula to the spinous process of T₇ was measured¹⁸. With a marker, the inferior angle of scapula and spinous process of T₇ were marked.

Kibler stated that in each position the distance measured should not vary more than 1 cm to 1.5 cm (0.5 inch to 0.75 inch) from the original measure^{8,18}. The distance from the inferior angle of scapula to T₇ spinous process was

measured in centimetre using a measuring tape.

The examiner was standing behind the subject and asked the subject to keep his/her hands at various positions were measured:

In the first position, the subject’s hands were at the side of the body with 0 degree of shoulder abduction. In the second position, the subject’s hands were at the waist of the body with 45 degree of shoulder abduction. In the third position, the subject’s hands were perpendicular to the body with 90 degree of test position. In the fourth position, the subject’s hands were raised to 135 degree shoulder abduction.

When the test was done, the movement pattern of the scapula as well as scapular dyskinesia was also being noticed¹⁸.

Data Analysis and Results

All analysis was carried out in SPSS Windows Version 16.0. An alpha level of 0.05 was used to determine statistical significance. Microsoft word and excel has been used to generate tables and pie diagram.

Statistical analysis was performed using z-test to determine the significance of scapular asymmetry using lateral scapular slide test. The test was carried out in four different positions of shoulder abduction.

Table1: The percentage of symmetry and asymmetry in the respondents at 0 degree scapular position:

	Frequency	Percentage
Asymmetry	24	42
Symmetry	26	58
Total	50	100

For 0 degree, z= -.98928, p value= 0.00139. The result is significant at p<0.05. It has been inferred that there is no significant asymmetry of scapula.

At 0 degree, the frequency of scapular asymmetry is 48% and symmetry is 52%.

Table 2: The percentage of symmetry and asymmetry in the respondents at 45 degree scapular position:

	Frequency	Percentage
Asymmetry	32	64
Symmetry	18	36
Total	50	100

For 45 degree, z= 0.11918, p value= 0.45224. The result is significant at p<0.05. It has been inferred that there is significant asymmetry of scapula.

At 45 degree, the frequency of scapular asymmetry is 64% and symmetry is 36%.

Table 3: The percentage of symmetry and asymmetry in the respondents at 90 degree scapular position:

	Frequency	Percentage
Asymmetry	37	74
Symmetry	13	26
Total	50	100

For 90 degree, z=1.10704, p value=0.1335. The result is significant at p<0.05. It has been inferred that there is significant asymmetry of scapula.

Table 3 shows the frequency of scapular asymmetry is 74% and symmetry is 26%.

Table 4: The percentage of symmetry and asymmetry in the respondents at 135 degree scapular position:

	Frequency	Percentage
Asymmetry	34	68
Symmetry	16	32
Total	50	100

For 135 degree, z=1.22726, p value= 0.10935. The result is significant at p<0.05. It has been inferred that

there is significant asymmetry of scapula.

Table 4 shows the frequency of scapular asymmetry is 68% and symmetry is 32%.

There is no significant asymmetry at 0 degree shoulder resting position and there is significant asymmetry in 45, 90 and 135 degrees of shoulder abduction respectively.

Discussion

The purpose of the study was to determine scapular asymmetry among elite swimmers using lateral scapular slide test. The main objective of the study was to find out scapular asymmetry as a factor causing shoulder pathology. A descriptive study with 50 subjects fulfilling the inclusion criteria were allowed to participate in the study.

The study results shows that there is significant scapular asymmetry in 45, 90 and 135 degree of shoulder abduction respectively in among elite swimmers Jorhat district. Based on this result, young elite swimmers may be characterized of having movement restriction of shoulder joint as well as shoulder pain in their later stage of life.

The freestyle stroke, which places the humerus predominantly internal rotation as it helps to propel the body in the water, is practised extensively during training. During motion of the humerus in the shoulder, the location of the scapula can change or remain stable due to the motion of muscles adjacent to the scapula. The repetitive nature of strokes during swim practice has contributed to the changes we observed in scapular position during upper extremity elevation. As stability at the scapulothoracic joint depends specially on the surrounding musculature to resist fatigue, proper scapular kinematics requires adequate scapular muscle function. Fatigue of the scapular muscles may be a mechanism contributing to the shoulder pathologies.

The LSST used in this study is found to be reliable in finding out the asymmetry of scapula in elite swimmers.

Therefore the alternate hypothesis is accepted for the test position at 45, 90 and 135 degree respectively which states that there is significant asymmetry among elite swimmers of Jorhat district using lateral scapular

slide test.

Conclusion

Based on the statistical analysis, it is concluded that there is significant asymmetry found with the LSST test position at 45 degree, 90 degree and 135 degree, mostly it increases with the elevation of the shoulder joint. It can be inferred that repetitive overhead motion of the swimmers causes overuse of the shoulder musculature leading to shoulder pathology associated with various shoulder conditions.

Based on this outcome, the null hypothesis is rejected and the alternative hypothesis is accepted which states that- "There is significant scapular asymmetry among elite swimmers of Jorhat district using lateral scapular slide test".

Conflict of Interest: There is no conflict of interests regarding the publication of this paper.

Ethical Clearance: As this study involves human subjects, the Ethical Clearance has been obtained from the ethical committee of Department of Physiotherapy, Assam Women's University, Rowrah, Jorhat, as per ethical guidelines for Biomedical research on Human subjects, 2000 ICMR, New Delhi. Ethical Clearance Certificate is attached in the annexure.

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Effect of Transcranial Direct Current Stimulation on Balance and Stroke Specific Quality of Life In Stroke Patients

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Introduction: Stroke is the leading cause of disability which requires rehabilitation. It is defined as obstruction or restriction of blood supply to the brain, usually because a blood vessel supplying brain is burst or blocked by a clot; causing damage to the cells of brain. This in turn may result in physical and/or mental disabilities. Upper limb functions are most commonly impaired following stroke; which also deteriorates activities of daily living. tDCS is a novice approach which can improve upper limb function by modulating cortical neuronal excitability.

Objective: To investigate the effect of cathodal, anodal and sham tDCS on balance and stroke specific quality of life in stroke patients.

Method: 30 stroke patients meeting inclusion criteria were randomly allocated into three groups. Group A, B and C received cathodal tDCS, anodal tDCS and sham tDCS respectively. The intensity of the current was 2mA given for 20 minutes along with all the upper limb active and fine motor exercises. It was given for 12 sessions in 3 weeks. Berg balance scale and stroke specific quality of life questionnaire was taken to assess lower limb function respectively. It was taken before and after the 3 weeks.

Result: paired t test showed that the balance improved before and after treatment with cathodal (0.003) and anodal (0.000) tDCS and sham stimulation (0.917). and also for SSQOL cathodal and anodal showed improvement in quality of life but sham stimulation showed no improvement. (0.173). Kruskal Wallis Test showed significant difference in between the groups ($p < 0.05$) which showed balance improved more in anodal tDCS than cathodal and sham. Also cathodal tDCS balance compared to sham tDCS. but in SSQOL there was no significant improvement seen in all three groups.

Conclusion: Both cathodal and anodal tDCS improve balance over sham tDCS. Improvement of balance with anodal tDCS was better than cathodal tDCS. There was no change in SSOL.

Key Words: tDCS, balance, stroke, berg balance scale, stroke specific quality of life questionnaire.

Introduction

Stroke is defined as the unexpected death of brain cells because of need of oxygen which is caused by obstruction of blood flow or break of an artery to the brain. There is gradually loss of speech, weakness or paralysis of one side of the body are the symptoms⁽¹⁾. And therefore due to blockage there are mental and physical disabilities. There are around 15 million people according to WHO, who suffer from stroke each year in the world. According to world consensus, the second and fourth most causing stroke in patient is death and

impairment⁽²⁾. After 3 months there are approximately 56% stroke patients who recover their limb function (upper extremity and lower extremity).

Transcranial direct current stimulation (tDCS) device is a type of neurostimulation whose purpose is to use consistent low-level frequency current which is transferred by electrodes on the scalp. This device was used for helping patients who had injuries of brain or any psychiatric problems. It is a contemporary, portable, non invasive, neuromodulatory techniques that produces a low-level electric current to the head⁽⁴⁾. The typically

applied, fixed currents are 1 and 2 mA. In the device the constant current is produced by two electrodes and a battery powered device. Current has to enter and leave a given neuron to exert any physiological effects due to physical reasons. Thus, every neuron under the electrode will have depolarizing and hyperpolarizing effect. The anodal tDCS augments cortical activity and excitability. On contrary, the cathodal tDCS hyperpolarises the cortical resting potential membrane. ⁽⁵⁾The effect of tDCS is analogous to that of the long term potentiation (LTP); which hastens the process of neuroplasticity⁽¹⁵⁾. Hence it can augment the upper limb function along with rehabilitation.

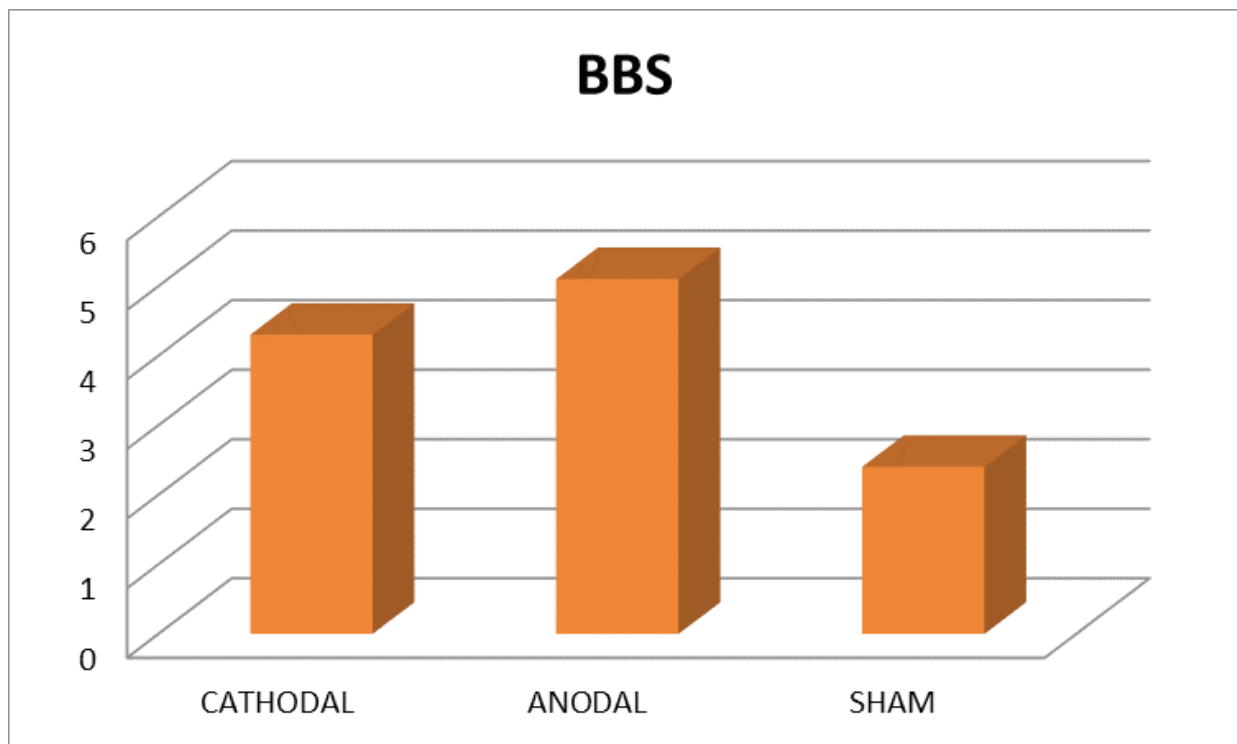
Materials and Methodology

30 Stroke patients were selected with inclusion criteria of one time stroke, above 18 years of age, MMSE score ≥ 24 and BBS score between 21-40 that is medium risk of fall. Patients with Traumatic brain injury or any injury to the brain, impaired skin over the placement of electrode which includes eczema, rashes, blisters, open wounds, burns and cuts, functional limitations due to musculoskeletal injuries ,cognitive impairment,

pacemaker, epileptic fit less than 1 year, intercerebral metal clip were excluded.⁸There were divided into three Groups with 10 patients in each Group. Treatment procedure was explained and a written informed consent was taken from each of them. Group A received cathodal tDCS, Group B received anodal tDCS and Group C received sham stimulation all along with conventional physiotherapy exercises. tDCS dosage was given at intensity of 2mA for 20 minutes with electrodes of area 25 cm². Lower limb exercises along with stimulation were hip, knee, ankle physiological movements. Conventional physiotherapy exercises included for reducing the spasticity of the muscles spastic muscles icing and stretching, mat exercises such as rolling, quadruped, kneeling, half kneeling along with reach outs and perturbations, balance and gait training. Treatment was given for 20 minutes, 4 days per week for 3 weeks

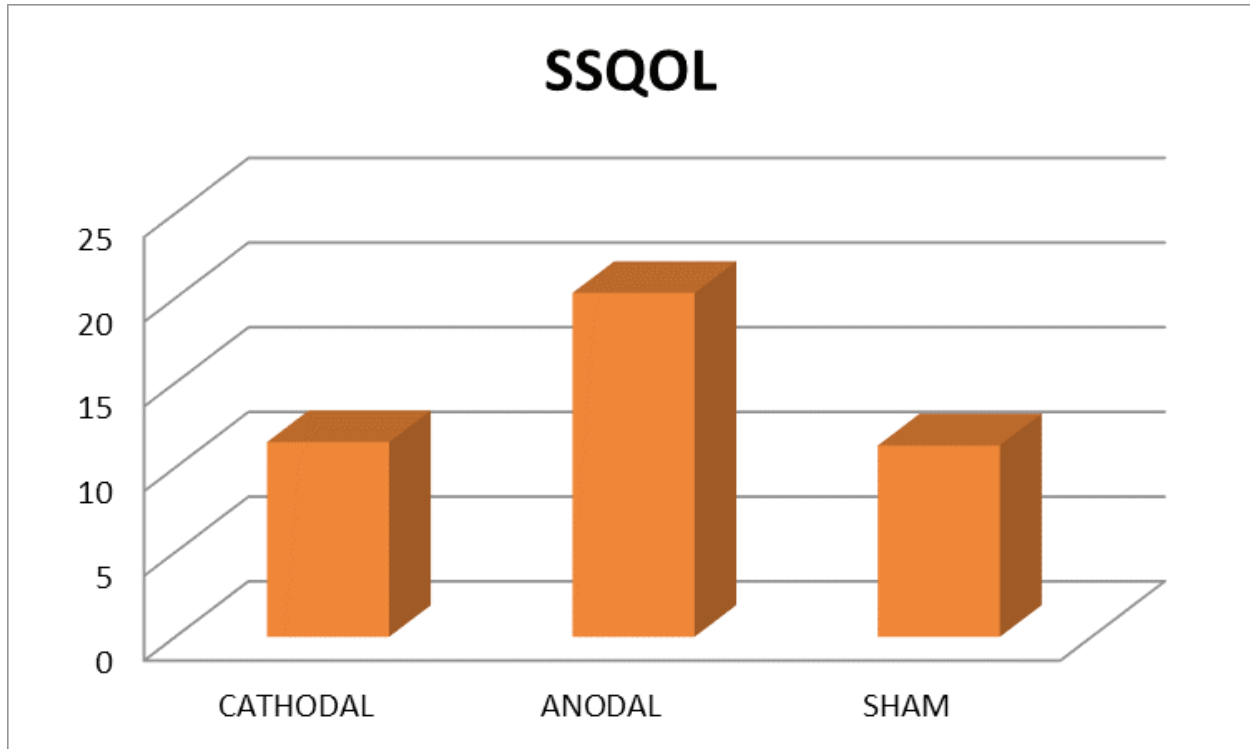
DATA ANALYSIS AND INTERPRETATION

Statistical analysis was done using Wilcoxon Signed Rank test for Pre and Post test within the group and Kruskal Wallis test for comparing the groups.



Graph 1: Comparison of berg balance scale between Groups A, B, C

Interpretation: this represents there is significant difference in balance post treatment in groups A,B,C with p value $0.028 < 0.005$. The mean difference is higher in Group B (5.1), then Group A (4.3) followed by Group C (2.4). Thus suggesting, anodal being more effective than cathodal and sham tDCS given with conventional exercises.



Graph 2: comparison of mean difference of SSQOL in Group A, B, C

Interpretation: this represents there is no significant difference in quality of life in groups A,B,C with p value $0.539 > 0.005$. The difference is higher in Group B (20.3), then Group A (11.5) followed by Group C (11.3). thus suggesting anodal being more effective than cathodal and sham tDCS given with conventional exercise.

Results

In this study, 30 stroke patients were taken,. The Group A, B and C has 10 each patients respectively. The Group A, B and C were given Cathodal, anodal and Sham tDCS respectively with conventional physiotherapy exercises.

The normality of data was checked using Shapiro-Wilk Test. The data was not homogenous the P value being higher than 0.05.

By applying Wilcoxin Signed Rank Test and mean,shows statistical significance in balance in Group A, B and C.The mean difference was 4.3 ± 3.33 , $5.1 \pm$

1.37 and 2.4 ± 1.07 for Groups A, B, C respectively. There is statistically significant improvement in Group B than compared to Group A and C. Also it is significant difference in Group A compared to Group C. The Chi square value is 18.83 and p value = 0.028. this states that there is significant improvement in balance in anodal tDCS followed by cathodaltDCS and then sham stimulation. There is a significant difference in the mean values in the Groups A, B, C, the p value < 0.05 . Thus anodal tDCS and cathodaltDCS and sham stimulation are effective in improving balance activities in stroke patients.Freidman test was used for the comparison between berg balance score in Group A, B and C.

By applying Wilcoxin Signed Rank Test and mean,shows statistical significance in stroke specific quality of life for Groups A, B, C. The mean difference was 11.5 ± 7.28 , 20.3 ± 24.85 and 11.3 ± 24.15 for Group A, B and C respectively. There is a significant improvement in Group B than compared to Groups A and C. Also it is significant difference in Group A than compared to Group C. the p value = 0.539. Thus it states

that there is no significant improvement in quality of life. The mean value difference is higher in Group B that is anodal tDCS. Thus, anodal tDCS, cathodal tDCS and sham stimulation are not effective in improving quality of life. Friedman test was used for the comparison between SSQOL in Groups A, B and C.

Discussion

This present research is done to compare the effect of transcranial direct current stimulation which is given with conventional physiotherapy in stroke patients. There was a significant improvement for balance with cathodal, anodal, sham stimulation along with physiotherapy exercises in stroke patients. But not much improvement was seen in stroke specific quality of life in cathodal, anodal and sham stimulation. The treatment was given for 12 sessions in 3 weeks. There was significant improvement in balance with anodal tDCS followed by cathodal tDCS and then followed by sham tDCS. For stroke specific quality of life there was no significant improvement seen. The lower limb function that is balance was checked by berg balance scale and quality of life which was checked by SSQOL before and after 3 weeks. Also there was no significant difference between dominant and non-dominant affected lower limb. Hyu-Kyu Cha et al said that it is hard for patients to recover after stroke. Stimulation by tDCS which is a non-invasive technique controls the purpose of neural structures which are not specific that makes the cortical excitability and its motor function better. He also stated that tDCS could enhance the function of balance and ADL which has been damaged. In this research the motor function of both the limbs and Activity Daily Living assessment had seen improvement in the experimental group. Together these study results suggested that tDCS along with conventional physiotherapy exercises provide an input to motor cortex. This study shows that there has been a significant increase of lower extremity function by giving tDCS stimulation and conventional physiotherapy in stroke patients which supports the above study. as by giving tDCS there is increase in the neuronal activity of the brain which promotes functional recovery of lower limb.

Wanalee Klomjai et al investigated if a single session of dual tDCS before physiotherapy would immediately benefit lower limb function. They compared tDCS

and sham tDCS on the MVC of knee extensors and TUG and FISST scores in the similar patients. While comparing before and after no significant difference was found for sham group while for the actual tDCS group showed noticeably greater performance in TUG and FISST. Therefore, the study shows that there has been a significant improvement in balance when given anodal tDCS and cathodal tDCS than sham stimulation in stroke patients similar results were found in other researches. Eman Khedr in his study of effects of anodal and cathodal tDCS suggested that there has been no significant difference between anodal and cathodal tDCS effect, both effects had better improvement than compared to sham stimulation in the study. These effects were due to increase in cortical excitability and marginally increase in muscle strength in all 3 groups, and so improvement was also seen in lower limb function of the affected side. Jeffery in his study had found that anodal stimulation which was given at intensity of 1 mA had no effect on MEPs of lower limb. That was because the leg motor area is situated more inside than the arm area in the Primary Motor Cortex area. Therefore any anodal tDCS which is given at the intensity of 2mA shows improvement in leg EPs that is same as that of 40% increase in the improvement that is achieved by the hand MEPs at the intensity of 1mA. This study had also given anodal tDCS at the level of 2mA to increase the stimulation of the leg area of the Primary Motor Cortex.

The primary mechanism of tDCS on the cerebral cortex is a sub threshold modulation of neuronal resting membrane potential. Current has to enter and leave a given neuron to exert any physiological effects due to physical reasons. Thus, every neuron under the electrode will have depolarizing and hyperpolarizing effect. It modulates spontaneous neuronal network activity.

However in this study only stroke patients were included. Moreover the effect of dominance cannot be conclusive because of relatively small sample size within the group. Dominance plays important role in recovery of stroke and so should be studied separately.

The primary mechanism of tDCS on the cerebral cortex is a sub threshold modulation of neuronal resting membrane potential. Current has to enter and leave a given neuron to exert any physiological effects due to physical reasons. Thus, every neuron under the electrode

will have depolarizing and hyperpolarizing effect. It modulates spontaneous neuronal network activity.

Conclusion

This research study concludes that improvement in lower extremity function had significant improvement on balance and stroke specific quality of life was improved with anodal stimulation than cathodal transcranial direct current stimulation. There was no as such improvement in sham tDCS for balance and stroke specific quality of life.

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Conflict of Interest: There was no conflict of interest in this study

Ethical Clearance: Taken from Research and Recognition Committee

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Effect of Footwear on Strength of Vastus Medialis Obliques- to Check by Using Pressure Biofeedback

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Abstract

Background: - While using footwear, directly or indirectly the muscle force passing through the lower extremity such as knee so, the present study was conducted to analyze the muscle activity of vastus medialis obliquus in Female who are wearing shoes and who are wearing high heels. It is necessary to investigate the effect of heel height on activation of vastus medialis obliquus muscles.

Methods:-To check the strength of vastus medialis obliquus in Individuals 50 subjects were divided into two groups, Group 1 had individual wearing shoes and group 2 had individual wearing high heels. Strength of vastus medialis obliquus was assessed using pressure Biofeedback for both the groups.

Result:-Unpaired t test was used in between and paired t test was used in the groups to analyze the data. There was a significant difference in the strength of vastus medialis obliquus between both the groups(p <0.001).

Conclusion: -This study concludes that Females wearing heels had significantly decreased vastus medialis obliquus strength compare to the Subjects who wear Shoes.

Key Words: Heel, Patellar syndrome, Pressure biofeedback, Knee Pain, VMO strength

Introduction

Type of footwear affect the loading pattern in lower limbs. Also, lower extremity is a unit that is well interrelated with functional and mechanical activity. ⁽¹⁰⁾ Hence, while using footwear, directly or indirectly the muscle force passing through the lower extremity such as knee.

The VMO is an important component of quadriceps responsible for the stabilization and protection of the knee joint. ⁽²⁾It Promotes medial patellar Tracking and counteract the lateral pull of the Vastus Latralis.

^(3, 4)Evidence show that shoe heel height may affect muscle activation of this muscle. High heels tend to increase vertical and anterior-posterior ground reaction forces during walking or any other dynamic postures. ⁽¹¹⁾ Also there is increase in external adduction moment leading to increased medial Compartment load. Thus ultimately it leads to increase VMO activity.⁽⁶⁾

The imbalance of forces between the VMO and VL and difference in activation will lead to improper position of patella, and thus pain while performing any task. ⁽¹⁾ But what is the difference in the strength of VMO who are wearing shoes and who are wearing heel that is still questionable. Hence the purpose of this study is to assess the effect of shoes and heels on VMO strength.

Material and Method

This study was conducted at UkaTarsadia University Maliba campus bardoli in 2017. One time observational

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study, in those 50 subjects was included with the age group between 18 to 25 years. In those 25 subjects who wear high heels that is 4 to 5 cm height with more than 5 hours per day and more than 6 months. Remaining 25 subjects, who wear shoes more than 5 hours a day. Subjects having any musculoskeletal pain, trauma, or undergone for any surgery of lower limb were excluded.

The study was approved by institutional committee of ethics of Shrimad Rajchandra College of physiotherapy. The subjects were divided into two groups by convenient sampling: Group (a) who wear high heels, Group (b) who wear comfortable shoes. Strength of VMO was measured by pressure biofeedback. Subjects were asked to sit in long sitting and were told to maintain the pressure biofeedback at a baseline of 100 mm of hg. Inflated cuff of pressure biofeedback was placed under the 10 to 15 degree of flexed knee of subject and were instructed to perform isometric contraction of the quadriceps and pressure difference was noted down following isometric quadriceps contraction.

Normal value for isometric contraction of quadriceps was increasing it upto 90 mm/hg.⁽⁷⁾ Then subjects were asked to perform isometric contraction of quadriceps with hold time of 5-8s. Three trials were taken and whether subject could hold the pressure or not.



Figure 1: The unit was placed under the knee and procedure was carried out with ankle in contact to the couch while the trunk is inclined with hand support.

Results and Discussion

Data obtained were analysed using SPSS 16.0 and tested for significance by the unpaired one-tailed student's t-test was used for between group comparison and Paired t- test was used for within group comparison. Level of significance set at $p < 0.05$.

Table 1: Demographic data

Characteristics	Group 1(Shoes)		Group 2(Heel)	
	Mean	SD	Mean	SD
Age	19.92	1.552417	21.16	1.795364401
Working hours	7	0.912871	5.2	0.96

Table 2: Compression between group 1 (Shoes group) and Group 2 (Heel group)

		Mean Pressure	MD	T	P
Right side	Group :-1 (Shoes)	183.64	40.88	8.38	0.0001
	Group:-2 (Heel)	142.76			
Left side	Group :-1 (Shoes)	182.84	31.88	6.58	0.0001
	Group:-2 (Heel)	150.96			

Result shows statistically significant difference of VMO strength between Shoes and heel group ($p > 0.05$). While comparing the strength of VMO between right and left leg in heel group show statistically significant difference ($p > 0.05$).

Footwear is a fundamental garment that is found in most communities around the world. ⁽⁸⁾Shoes can have a significant impact on lower limb muscles. Decreases in muscle strength are associated with reductions in functioning when performing the tasks of daily living.

The results showed that high heel use interfered with VMO muscle strength in healthy females. In Female from the shoes group, no significant differences were registered in strength of VMO Between right and left leg; however, the use of high heels caused changes in Strength of VMO between Right and Left leg. Strength of VMO decreased especially in the Non dominant leg. ⁽⁸⁾

Cheung et al said that subject who are wearing motion control shoe they have significantly earlier onset of VMO relative to VL compare to cushion shoe. ⁽⁸⁾ In Our study we used normal sports shoes in that group we found strength of VMO is more compare to females with high heel.

In present study height of heel is between 4 to 7cm. Edward et al. They found that in healthy women, as heel height increased during sitting to stand there was an increase in EMG activity in both VM and VL activity. VL activity was increased significantly in 3 and 5 cm heel height. But for only 5 cm heel height VM activity was increased. No statistically significant change in the VM: VL ratio was observed. ⁽⁵⁾

To Considering the proposed importance of VMO and VL muscles activity in knee stability. ⁽⁹⁾Ho et al. Found that high-heeled shoes increase the tension of the patellofemoral joint due to increased knee extensor moment. ⁽¹⁾While Simonsen et al. showed that high heels cause the knee to abduct. According to these authors, the changes in internal moments in both the sagittal and frontal planes would be related to the increase in EMG activity of the knee extensor muscles, and to the greater stress on the patellofemoral joint, resulting from changes in patellar movement. ⁽¹⁾

However, a big increase within the inward moment caused by the lateral knee muscles may also increase the lateral slip of the knee. Therefore, the hyperbolic activity of the VL muscle should be followed by a synchronal increase in VMO, thus as for a balance of forces to occur and to avoid sesamoid bone lateral shift.

Some authors suggest that this decrease in the VMO: VL ratio is the consequence of a neuromuscular imbalance, which could be caused by alterations in the neurophysiological mechanism. This is because the presence of pain or inflammation signals in the knee joint has been reported to be responsible for inhibition of the quadriceps muscle, and the VMO muscle is most affected. Stefanyshyn DJ, et al conclude that walking in high-heeled shoes may lead to prolonged increases in RF activity particularly with heel heights > 4 cm, which could lead to knee overload. Which could leads to knee overload and it May leads muscle fatigue may be this was a reason why we found decreased VMO strength in females who were wearing high heel. ⁽¹¹⁾

Conclusion

We conclude that female who wearing high heel in that VMO strength is decreased compare female who wearing shoes. So it was suggested that permanent wearing of heeled foot wear could contribute to muscle overuse, repetitive strain injury and more prone for knees pathology compare to female wearing shoes.

Ethical Clearance- Taken from Institution Ethical committee.

Source of Funding- Self

Conflict of Interest – Nil

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Effectiveness of Yoga Based Exercise Therapy Program on Balance, Mobility and Gait Speed in Institutional Living Older Adults

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Abstract

Study Objective: To find out the effectiveness of yoga based exercise therapy program on Balance, Mobility and Gait speed in institutional living older adults.

Design: Pre and Post- test experimental design

Setting: Daivadan old age home, Chethimattom, Kottayam, Kerala

Subjects: 30 male older adults, they are divided into Group A and B with 15 subjects each

Measurement: After measuring Balance, Mobility and Gait speed scores Group A was given their normal exercise along with Yoga which includes several Asanas and Pranayamas. Group B continue with their normal exercise and they had not undergone any yoga. The treatment duration was 6 days in a week for a total period of 4 weeks

Result: The results showed that there was a significant result in Balance, Mobility and Gait speed scores for the older adults received Yoga based exercise therapy program

Conclusion: The study's results show that Yoga based exercise therapy program when added to standard care improves Balance, Mobility and Gait speed in old aged adults and enhance fall preventions in comparison to conventional exercise alone

Keywords Yoga, Exercise therapy, Balance, Mobility, Gait speed, older adults

Introduction

Our society is experiencing an extension in the life span and more people are reaching elderly age group than ever before.

As per the literature as many as 33% of aging adults experience at least one unexpected fall every year and represent third leading cause of death by injury^[1].

It is understood that group based therapeutic exercise are able to reduce risk of falling and fall occurrence in older adults. Well-designed group exercise program that incorporate strength and balance training contribute to improve physical and mental health.

There are many approaches like 'yogasanas' to design good group therapy programs. Yoga requires the stretching of major muscle groups to improve physical strength and flexibility. Yoga with its gentle movements

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can address non fall risk factors like poor balance, impaired mobility, reduced strength and flexibility and focus on increased awareness and proprioception, resulting in improved balance in older adults^[2, 3]. It is great as an exercise therapy program because it can be modified to the individual need or individual balance deficit. Currently yoga routine for health benefits is an established practice in first world countries. Huge literature exists encompassing a variety of yoga schools.

Psychological anxiety or fear of falling can also increase the risk beyond just physical weakness. The mindfulness component of yoga may be beneficial psychologically^[4].

Review of scientific literature shows that researchers have examined the effects of yoga in cardio-respiratory function, anxiety and depression, stress and low back pain^[5].

The purpose of this study is to examine the effects of yoga based exercise therapy program on balance, mobility and gait speed in institutional living older adults.

Material and Methods

A total of 30 patients were taken for the study based on inclusion and exclusion criteria. All the subjects were informed about the nature and purpose of the study. The outcome measures used were Berg-Balance Scale, Timed-Up and Go Test and usual and fast Gait-Speed, measured before and after completion of the study.

Inclusion Criteria:

- Subjects within 65 years to 80 years.
- Able to maintain balance with eyes open, arms crossed and bare feet independently for 30 seconds.
- Intact lower extremity sensation.
- Preferred gait speed more than 4.4 ft. /sec for men and 4.2 ft. /s for women.

Exclusion Criteria:

- History of Neurologic pathology.
- Recent (3 Months) Orthopaedic surgery for lower extremities.

- Visual Impairments.
- Psychological impairment.
- History of serious Cardiac Conditions.

Study Design

Pre, Post-Test experimental design with random allocation of subjects into 2 Groups

Group A: - Yoga based exercise therapy program with conventional exercises

Group B: - Conventional exercise alone

Independent variable - Yoga based exercise therapy program.

Dependent variable- Balance, Mobility, and Gait speed

PROTOCOL

GROUP –A [EXPERIMENTAL GROUP]

Fifteen subjects were selected to participate in the yoga based exercise therapy program. The subjects were allowed to continue with their on-going physical activities and were given additional yoga based exercises.

Each session were started with seated centring and pranayama. The pranayamas used are anulom and vilom. After pranayama 10-minute warm-up was performed. Warm-up activities consisted seated shoulder circles, wrist rolls, standing heel and toe raises and heel walking. Yoga postures were used in the program was tadasana, virabhadrasana, trikonoasana, vrikshasana. Standing poses were chosen for their ability to increase strength in the quadriceps, tibialis anterior and gastrocnemius to target potential gait and balance deficits. Vrikshasana requires the subject to attain and maintain unilateral standing. Other poses which were included are adhomukhasavasana to increase upper extremity weight bearing , setubandhanasana which promote lower extremity strengthening and baddakonasana to increase hip range of motion. The participants were asked to perform asanas strictly upon their individual abilities, and thereby progressing to the attainment of the Yoga postures.

Pre-test and post-test were conducted by berg-balance scale timed up and go test and usual and fast gait speed for measuring balance, mobility and gait speed.

GROUP-B [CONTROL GROUP]

Fifteen control subjects were recruited from a second facility. These subjects were continued with their usual activity and they were not exposed to attend yoga classes.

Pre-test and post-test were conducted by berg-balance scale, timed up and go test and usual and fast gait speed for measuring balance, mobility and gait speed.

Statistical Analysis

STATISTICAL ANALYSIS OF BERG BALANCE SCALE USING T TEST

Mean S.D. and t-value to compare Pre-test Post-test Balance on Berg Balance in Experimental Group and Control Group

Table 1

Experimental group							
Test	Mean	SD	Mean change	n	t	table value	p-value
Pre-test	48.13	3.79					
			3.2	15	7.29	2.15	p < 0.05
Post test	51.33	3.42					
Control group							
Pre-test	47.4	4.69					
			0.67	15	4.18	2.15	p < 0.05
Post-test	48.07	4.51					

The mean change 3.2 is the difference between pre-test and post-test (48.13 & 51.33). Since the t-value, 7.29 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test balance scores among the older adults in the experimental group. This proves the effect of Yoga based Exercise Therapy to improve the balance.

The mean change 0.67 is the difference between pre-test and post-test (47.4 & 48.07). Since the t-value,

4.18 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test balance scores among the older adults in the control group also. So regular exercise is also useful to improve the balance.

Mean S.D. and t-value to compare the changes in Balance scores between Experimental and Control Groups using t-test

Table 2

Group	Mean change	Difference in change	t	table value	p-value
Experimental	3.2				
Control	.67	2.53	5.43	2.05	p < 0.5

The difference in change (2.53) shows the difference between mean changes in two groups (3.2 & 0.67). Since the t-value, 5.43 is greater than the table value, 2.05, p-value < 0.05, there is a significant difference in the improvement in balance scores between the experimental and the control group. So we can conclude that the Yoga based Exercise Therapy has significant effect than the regular exercise to improve the balance.

STATISTICAL ANALYSIS OF TIMED UP AND GO TEST USING t-TESTS

Mean S.D. and t-value to compare Pre-test Post-test Mobility on TUG test in Experimental Group and control group

Table 3

Experimental group							
Test	Mean	SD	Mean change	N	T	table value	p-value
Pre-test	14.67	4.06					
Post-test	11.07	3.28	3.6	15	8.09	2.15	p < 0.05
Control group							
Pre-test	13.27	7.24					
Post-test	12.6	6.93	0.67	15	2.87	2.15	p < 0.05.

The mean change 3.6 is the difference between pre-test and post-test (14.67 & 11.07). Since the t-value, 8.09 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test mobility scores among the older adults in the experimental group. This proves the effect of Yoga based Exercise Therapy to improve the mobility.

The mean change 0.67 is the difference between pre-test and post-test (13.27 & 12.6). Since the t-value, 2.87 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test mobility scores among the older adults in the control group also. So regular exercise is also useful to improve the mobility.

Mean, S.D. and t-value to compare the changes in Mobility scores between Experimental and Control Groups using t-test

The difference in change (2.93) shows the difference between mean changes in two groups (3.6 & 0.67). Since the t-value, 5.84 is greater than the table value, 2.05, p-value < 0.05, there is a significant difference

in the improvement in mobility scores between the experimental and the control group. So we can conclude that the Yoga based Exercise Therapy has significant effect than the regular exercise to improve the mobility.

Mean, S.D. and t-value to compare Pre-test Post-test GAIT Speed in Experimental Group and control group

Table 3

Experimental group							
Test	Mean	SD	Mean change	N	T	Table value	p-value
Pre-test	0.89	0.26					
			0.34	15	9.38	2.15	p < 0.05
Post-test	1.23	0.23					
Control group							
Pre-test	0.83	0.21					
			0.04	15	2.45	2.15	p < 0.05
Post-test	0.87	0.2					

The mean change 0.34 is the difference between pre-test and post-test (0.89 & 1.23). Since the t-value, 9.38 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test Gait Speed scores among the older adults in the experimental group. This proves the effect of Yoga based Exercise Therapy to improve the Gait Speed.

The mean change 0.04 is the difference between pre-test and post-test (0.83 & 0.87). Since the t-value, 2.45 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test GAIT Speed scores among the older adults in the control group also. So regular exercise is also useful to improve the GAIT Speed.

Mean, S.D. and t-value to compare the changes in GAIT Speed scores between Experimental and Control Groups using t-test

Table 4

Group	Mean change	Difference in change	t	table value	p-value
Experimental	0.34				
		0.3	7.55	2.05	p < 0.05
Control	0.04				

The difference in change (0.3) shows the difference between mean changes in two groups (0.34 & 0.04). Since the t-value, 7.55 is greater than the table value, 2.05, p-value < 0.05, there is a significant difference in the improvement in Gait Speed scores between the

experimental and the control group. So we can conclude that the Yoga based Exercise Therapy has significant effect than the regular exercise to improve the Gait Speed.

Findings

Control Group

1. Evaluation of Berg-Balance Scale

By comparing the pre-test and post-test Balance scores is the standard of older adults in the control group, mean change 0.67 is the difference between pre-test and post-test (47.4 & 48.07). Since the t-value, 4.18 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test balance scores among the older adults in the control group also. So regular exercise is useful to improve the balance.

2. Evaluation of Timed-Up and Go Test

By comparing the pre-test and post-test mobility scores of older adults in the control group, mean change 0.67 is the difference between pre-test and post-test (13.27 & 12.6). Since the t value, 2.87 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test mobility scores among the older adults in the control group also. So regular exercise is useful to improve the mobility.

3. Evaluation of Gait-Speed

By comparing the pre-test and post-test Gait Speed scores of older adults in the control group, mean change 0.04 is the difference between pre-test and post-test (0.83 & 0.87). Since the t-value, 2.45 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test GAIT Speed scores among the older adults in the control group also. So regular exercise is useful to improve the Gait Speed.

EXPERIMENTAL GROUP

1. Evaluation of Berg-Balance Scale

By comparing the pre-test and post-test Balance scores of older adults in the experimental group, mean change 3.2 is the difference between pre-test and post-test (48.13 & 51.33). Since the t-value, 7.29 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test balance scores among the older adults in the experimental group. This proves the effect of Yoga based Exercise Therapy to improve the balance.

2. Evaluation of Timed-Up and Go Test

By comparing the pre-test and post-test mobility scores of older adults in the experimental group, mean change 3.6 is the difference between pre-test and post-test (14.67 & 11.07). Since the t-value, 8.09 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test mobility scores among the older adults in the experimental group. This proves the effect of Yoga based Exercise Therapy to improve the mobility.

3. Evaluation of Gait-Speed

By comparing the pre-test and post-test Gait Speed scores of older adults in the experimental group, mean change 0.34 is the difference between pre-test and post-test (0.89 & 1.23). Since the t-value, 9.38 is greater than the table value, 2.15 there is a significant difference existing between the pre-test and post-test Gait Speed scores among the older adults in the experimental group. This proves the effect of Yoga based Exercise Therapy to improve the Gait Speed.

Discussion

The purpose of this study was to find out the effectiveness of Yoga based exercise therapy program on Balance, mobility and gait speed in institutional living older adults. Yoga is a group of physical, mental and spiritual practices which originated in ancient India.

In this study institutional living older adults were taken into consideration. Subjects are selected by proper screening and fulfilling the inclusion and exclusion criteria. 30 old age peoples were selected and divided into 2 groups- control group and experimental group. The treatment duration was 45 min including a warm up period of 10 minutes for a regular period of 6 days in a week.

Statistical data revealed that yoga based exercise therapy program shows significant effect on balance, mobility and gait speed on institutional living older adults. Imbalance is a main cause of mortality and morbidity for older adults due to frequent falls^[6]. If the spine is not properly aligned or if there is tightness or stiffness in the back, the result is often an imbalance in the body^[7]. As the posture is held and the breath, mind and body are quieted various effects will surface to

indicate the difficulties of the spine^[8].

The proper execution and continual practice of the yogasana helps to retrain the body to stand correctly and reverse the negative effects of poor posture^[9].

Statistically significant improvement in function is seen in both the groups and between the groups. However, the improvement in experimental group is greater than that of control group. Improvement in function may be attributed to the improvement of balance, mobility and gait speed. Yoga based exercise therapy program may helped to decrease the frequency of falls by improving the overall muscular activity and confidence level.

Hence the study concludes that yoga based exercise therapy program have a significant role in improving balance, mobility and gait speed in institutional living older adults.

Conclusion

Statistically it is observed that, yoga based exercise therapy program leads to a significant improvement in balance, mobility and gait speed of the subjects under study. Based on the performed study, it can be concluded that yoga based exercise therapy program can be performed as a daily routine to improve balance, mobility and gait speed and it can decrease the tendency of falls which is a major cause of mortality and morbidity among old aged people.

Conflict of Interest: None

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Evaluation of Maximal Isometric Hand Grip Strength in Different Sports

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Abstract

Background: Grip strength has proven to have a positive effect on sports performance in which a sport implement is grasped in the hand.

Objective: To compare Hand Grip Strength in males of different sports.

Materials and Methods: 400 male sportsmen, 100 in each sport (Cricket, Hockey, Tennis and Badminton) aged 18-25 yrs volunteered to participate in this study were engaged. Each participant was asked to perform at least three maximal isometric grip strength measurements using a Jamar Handgrip Dynamometer and the average of the three grip strength trials readings was recorded.

Statistical analysis: R-Programming Language Software was applied for statistical analyses of the data; the results were statistically analyzed by ANOVA.

Results: The findings of the present study showed that the maximum grip strength measured in both hands is higher in Cricket players than in Hockey, Tennis and Badminton players ($P < 0.05$).

Conclusion: In the present study hand grip strength might have increased due to regular training. It would be beneficial to the sportsmen in terms of optimizing training programs separately for particular sports.

Key Words: Hand Grip Strength, Jamar dynamometer, sports

Introduction

Grip strength has proven to have a positive effect on sports performance in which a sport implement is grasped in the hand⁹. Sporting success depends on conditional and coordinative ability such as strength, speed, endurance, mobility and skills, technical-tactic ability, personal abilities, physical characteristics and health factors¹⁸. In sports, strength is known to increase sporting success and performance. Especially, hand grip strength (grasping strength) the most important determinant. Hand grip strength is a physical trait that plays an important role providing effectiveness and efficiency during daily work and sports activities. For all

the ball games in which the use of the hand is essential, hand morphology and functional properties could be important for the performance¹⁰. Moreover, in terms of performance, hand grip is an important indicator in many sports. Hand grip strength is a general term used by strength athletes, referring to the muscular strength and force that they can generate with their hands. The strength of a hand grip is the result of forceful flexion of all finger joints, thumbs, and wrists with the maximum voluntary force that the subject is able to exert under normal bio kinetic conditions²¹. Assessment of handgrip muscle strength tests has been a popular form of testing muscle function in sports and exercise as well as in

other movement related sciences for several decades. It is often used as an indicator of the overall physical strength. The aim of athletic strength testing has been to provide normative values for particular sport disciplines, to select young athletes, to distinguish among different performance levels, or to evaluate the effects of physical exercise in athletic training procedures. The assessment of hand grip strength is important in a number of situations.

Many researchers have evaluated on the gross anthropometrics measurement such as BMI, arm circumference, skin folds, arm length and comparison of muscle strength, pattern of movements between hand dominance in sports. So this study is designed to compare the hand grip strength difference between right-handed and left-handed players.

There are many sports where your hands get quite stressed i.e. in cricket, badminton, volleyball, basketball and tennis. All these sports require good grip strength which is very important to avoid injuries of any kind.

Nowadays, strength and strong athletes are evaluated according to the ratio of the body characteristics and body weight, its preparation to the power they produce²². Consequently, the purpose of this study is to research the athletes hand grip strength of different sports.

Methodology

The Participants in this study were males (N =400) intermediate level players. The players age ranged from 18 to 25 years, hundred each from Cricket, Hockey, Tennis and Badminton, who are actively engaged in sports .All the participants were informed about the aim and methodology of the study and they volunteered to participate in this study. A written consent was obtained from the subjects. Demographic data –age, height, weight were collected and BMI was calculated.

Exclusion and Inclusion criteria

All the participants were selected on the basis of inclusion and exclusion criteria. The players with cardiovascular and respiratory disorders and those who had a history of fracture in the past 3 months or a deformity in the upper arms were excluded. The students who were between the ages of 18-25 years, those who

had a BMI below 30 and those with no history of smoking or alcoholism were included in the study.

Outcome Measure

The instrument used for grip strength measurements was the Jamar handgrip dynamometer, which is considered the gold standard for measurement of grip strength⁷. The participant performed a standardized warm-up that included two to three preliminary trials for familiarization with the recording procedure and instrumentation. The data were collected under natural environmental conditions. The study was approved by the ethical committee of Maharaj Vinayak Global University Jaipur, India.

Participants were seated with the shoulder at 0° abduction and 0° flexion, while the elbow was at 90° flexion, as recommended by American Society of Hand Therapists²³. The participants were instructed on proper technique (i.e. hand placement) for the grip strength measurements. The participants allowed acquainting themselves with the Jamar by grasping and squeezing the Jamar prior to the execution of study trials. The participants were informed to execute a maximal grip effort for 3 seconds during the grip test trials. Verbal encouragement was provided by the test administrator to the participants during the tests trials. There were three trials of maximal grip collected with each trial separated by approximately 1-2 minutes. The greatest maximal grip from the three trials was used for subsequent analysis.

Statistical Analysis

Statistical analyses and its evaluation were made using R-Programming Language Software. Descriptive statistics (mean ± standard deviation) were determined, ANOVA was tested for the comparisons of data among 4 group players. A 5% level of probability was used to indicate statistical significance.

Results

The findings of the present study showed that the maximum grip strength measured in both hands is higher in Cricket players than in Hockey, Tennis and Badminton players (P<0.05).

Table: Jammer hand Dynamometer Right and left hand grip values in all groups

Sportsmen	N	Left hand grip strength (kg)	Right hand grip strength (kg)
Cricket	100	50.6864 + 4.90140	55.6900 + 5.79897
Hockey	100	48.9431 + 4.75536	54.4235 + 4.72357
Tennis	100	47.3634 + 4.16756	53.3863 + 4.27568
Badminton	100	42.5401 + 3.72517	48.5060 + 4.00065

Discussion

In the present study the participants showed significant difference of right and left hand grip strength in different sports ($p < 0.05$). Among the four groups the maximum grip strength measured in both hands is higher in Cricket players than in Hockey, Tennis and Badminton players. In sports, strength is known to increase sporting success and performance. Especially, hand grip strength (grasping strength) the most important determinant.

Hand grip is an important, though often overlooked, component of strength in sports². Before a player begins playing a hand grip strength test is important for determining a player's workout.⁶ Hand grip strength determines a player's readiness for sports. In hockey, hand grip strength is used to angle the shot of the puck, whether they are passing the puck or shooting for a goal. Hand grip strength is essential for the execution of skills in hockey¹. Nowadays, strength and strong athletes are evaluated according to the ratio of the body characteristics and body weight, its preparation to the power they produce²². Gender, age and weight are the factors that impact grip strength¹¹. Different sports have no significant difference of right and left hand grip when comparing grip strength.³

The aim of athletic strength testing has been to provide normative values for particular sport disciplines, to select young athletes, to distinguish among different performance levels or to evaluate the effects of physical exercise in athletic training procedures. The assessment of hand grip strength is important in a number of situations. Many athletes and coaches believe that the forearm plays a significant role both in hitting and throwing the ball. Many studies describe upper extremity characteristics of baseball players^{25, 24, 27} and reports related to morphological/anthropometric characteristics

and hand grip strength of softball players are available. Handgrip strength is important for catching and throwing the ball in different team sports⁸.

The grip strength is measured in several sports disciplines and its importance to success is clearly identified. The estimation of hand grip strength is of immense importance in sports like wrestling, tennis, badminton, cricket, handball, basketball, hockey, baseball and softball, where sufficient degree of grip strength is necessary to be successful. Dopsaj, Koropanski (2007) confirmed that men showed significantly greater maximal hand grip force in both dominant and non-dominant hands than women.¹⁹ Observed that hand grip strength correlated with throwing speed in experienced pitchers. Hand grip strength plays an important role to predict the performance in various sports activities especially in baseball¹⁵, tennis¹³ and in cricket⁹. Grip strength is often used as an indicator of overall physical strength^{16,12}, hand and forearm muscles performances²⁶. The hand morphology and functional properties play an important role in performance⁴. The grip strength was reported to be higher in dominant hand with right handed subjects, but no such significant differences between sides could be documented for left handed people¹⁷. The purpose of this study is to research the athlete's hand grip strength of different sports. Based on results the study statistically proved significant difference among players hand grip strength. This finding indicates that specific training of these sports may influence handgrip strength.

Conclusion

It may be stated from the findings that not much difference were there among players may be due to structural and physiological, as well as the training program among them. The findings of the present

study carry immense practical application in sports anthropometry. It may be concluded from the present study that and should be useful in future investigation on player selection, talent identification in players and training program development. Future studies are required considering vast sample size with numbers of anthropometric traits.

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The Effects of Core Stabilization Training Program on Endurance and Balance in Cricketers

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Abstract

Background and Purpose: Core stability¹ is seen as being pivotal for efficient biomechanical function to maximize force generation and minimize joint loads in all types of activities ranging from running to throwing. The purpose of the study is to evaluate the effectiveness of core stabilization training program on endurance and balance in cricketers. **Materials and Methods:** A total of 40 male cricketers of age group 15-25yrs were included in the study and randomly assigned into two groups, 20 in each group. Group A -control group, who did not receive any training and Group B -core strengthening group, who received six weeks of core training. Before the start of the study and again after 6 weeks of training, 2 tests were used to measure core endurance and balance- Sorensen back endurance test and Star Excursion Balance Test. **Statistical analysis:** Analyzed by calculating mean, standard deviation, and comparison within the groups by paired t-test and between groups by unpaired t-test. **Results:** The results showed significant improvements in both Sorensen and Star excursion balance tests for the group undertaking the core training program ($p < 0.05$). **Conclusion:** Core endurance measured using Sorensen also showed increase in trunk holding time after 6 weeks of core exercise training, among the two tests Star excursion balance test improved more compare to core endurance after 6 weeks of training.

Keywords: Core stability, Sorensen test, Star excursion balance test

Introduction

Cricket is a dynamic sport that involves many abstract skills and movements. To enhance these skills and movements, many players ensure that their bodies are kept fit and strong¹. Studies found that the most common anatomical sites of injury were lower limb, followed by upper limb and lower back^{1,2,3}, reported that the lower limbs (50%), upper limbs (23%), and back and trunk (23%) were most commonly injured⁴.

Cricket requires considerable skills and is physically demanding because of the length of the game and the sudden changes of pace that it involves. If inadequately prepared, such muscles can become strained and injured. Although cricket is a non-contact sport, there is a wide variety of causes of injuries^{21,4}. It is a multi-

dimensional sport in which players engage in a wide range of activities (batting, bowling, fielding and wicket keeping). Achieving and maintaining an acceptable level of physical fitness is a vital ingredient towards being a balanced and consistent cricket player.

‘Core stability’ is seen as pivotal for efficient biomechanical function to generate maximum force and minimize joint loads in all types of activities ranging from running to throwing. A well-developed core allows for improved force output, increased neuromuscular efficiency and decreased incidence of overuse injuries. It also enhances an athlete’s ability to utilize the musculature of the upper and lower body, which allows for more efficient, accurate and powerful movements. The rate at which the core muscles stabilize the spine may have a direct effect on the power of limb movement.

In the field of physiotherapy, it is reported that the goal of a core stability program is to train the muscles of the core in order to maintain a sufficient amount of spinal stability. McGill claimed muscle strength may not be the optimal goal of a rehabilitation core stability program. He suggested that core stability is important in prevention and recovery from injury²². It has been proposed that core strength programs will improve stability and coordination of the deep abdominal muscles, which can reduce low back injuries¹⁰. Core exercises should first be performed in a stable environment and then progress to an unstable environment^{18, 11}.

Endurance is the ability of an athlete to withstand external physical pressures over time, or to maintain competitive and training focus under pressure. The Sorensen test (ST) assesses the posterior muscles of the trunk¹⁶, found to be the most reported back endurance test in the literature²³. In a recent study summarized that the Biering-Sørensen Muscular Endurance can be used for monitoring the effects of intervention¹³ or rehabilitation²⁴ and also in evaluating working capacity, investigation of back disorders, as well as being useful in preventive medicine and related to maintenance or enhancement of back muscle function²⁵.

Dynamic balance is the ability to maintain postural stability and orientation with centre of mass over the base of support while the body parts are in motion. The Star Excursion Balance Test (SEBT) is a clinical test used to assess neuromuscular control of the trunk, pelvis, and lower extremities, for the purpose of injury prevention and rehabilitation²⁰. Dynamic balance however comes very much into play during the batting, keeping, throwing and bowling action. Core stability and balance are important aspects of sports due to the three-dimensional movement patterns involved in most athletic events⁹.

Therefore, the goal of core stability training is to achieve significant strength, endurance, and recruitment patterns which will prevent injuries. Improving core stability will provide a more secure foundation, which will allow for greater force production in the upper and lower extremities¹¹.

Methodology

Male cricketers between ages of 15-25 yrs were

selected from Cricket Academy, Hyderabad. Study was done on 40 subjects who are randomly placed in 2 groups, 20 in each group (A- Control group, B- Core training group). All the subjects were evaluated by using a medical history questionnaire. Subjects who met the inclusion criteria were taken in to the study. Those subjects found to have impairments and disabilities were excluded. The purpose of the study, risk associated with the participation and nature of procedure involved in the study was explained to all subjects. A written consent form was taken.

Procedure: Baseline assessment was taken one week before the initiation of training period which includes age, height, weight, back endurance and balance. Before starting the training session subjects of both groups were given a training practice for both tests.

The exercise group participated in a steadily progressing supervised core strengthening program three times a week for six weeks. The control group refrained from any form of core strengthening for a six week period. After the six weeks, both groups underwent post-testing identical to the pre-testing.

Subjects have undergone training in following sequence:

- Warm up (10 minutes)
- Core strengthening program for 45 minutes which includes active rest periods in between (Bridge with Leg Lift, Static Abdomen Crunch, Lower trunk rotation, Prone and side Planks, Core – Bicycles, Full Vertical Crunch, Marching bridge, Long Arm Crunch)
- Cool down (10 minutes)

Outcome Measures

Sorensen Back Endurance Test done with the subject prone and the upper body beyond the anterior superior iliac spine (ASIS) suspended out over the edge of the couch with the pelvis, knees, and hips secured till the ASIS. The upper limbs are held across the chest with the hands resting on the opposite shoulders. Failure occurs when the upper body drops below the horizontal position.



Sorensen test



Star Excursion Balance Test

Star Excursion Balance Test: The participants stand at the centre of the grid with 8 lines extending from the centre at 45° increments. Each of the 8 lines extending represent the individual directions which each subject are required to reach out with the most distal part of the foot. The eight directions consist of antero-lateral (AL), anterior (A), antero-medial (AM), medial (M), postero-medial (PM), posterior (P), postero-lateral (PL) and lateral (L). A standard tape measure (cm) was used to quantify the distance, the subject has to reach from the centre of the grid to the point that the subject managed to reach along each diagonal line. The maximum distances reached were recorded for each test.

Trials were discarded if subject lift the stance foot from the centre of the grid, lost his balance or did not touch the line with the reach foot while continuing to fully weight bear on the stance leg.

Recent investigation has suggested there is redundancy among the 8 reaching directions and that the test can be paired down to fewer reaching directions^{11,13}.

The Anteromedial, Medial and Posteromedial directions were selected for this investigation¹¹.

Data Analysis

In this study the changes in core endurance and balance were analyzed by paired student 't' test. Unpaired t-test used to compare both the groups by using the values of mean difference.

Arithmetic mean was calculated for all the outcome measures at pre and post training in both the groups, Standard deviation was taken to see the variation from means. Mean difference was calculated to see variation within the group.

Results

The results showed significant improvements in both Sorenson and Star excursion balance tests for the group undertaking the core training program ($p < 0.05$). Among the two tests Star excursion balance test improved more compared to core endurance after 6 weeks of training

Table1: Pre and post performance of Sorensen back endurance test of both groups

variables	Control group(n=20)	Experimental group (n=20)	t-value	p-value
Sorensen test	Pre 99.1 + 14.13	Pre 110.8 + 15.63	2.493	0.017
	Post 106.7 +15.48	Post 143.1+ 15.69	7.384	0.001

* Significance difference between Pre and Post of both groups ($p < 0.05$)

Table 2: Pre and post performance of Star Excursion Balance Test of both groups

variables		Control Group	Experimental Group
Star Excursion Balance Test		Mean + Std. Deviation	Mean + Std. Deviation
ANTEROMEDIAL	Pre-Test	92.1420 + 7.08159	99.0095 + 6.14270
	Post-Test	93.7865 + 7.13785	107.0585 + 7.48310
MEDIAL	Pre-Test	92.4630 + 6.79605	98.9015 + 6.00192
	Post-Test	94.7815 + 7.50894	107.2975 + 6.40886
POSTEROMEDIAL	Pre-Test	92.7430 + 7.44949	99.1385 + 6.20077
	Post-Test	95.0265 + 7.83643	107.2655 + 6.43320

* Significance difference between Control group and experimental group, t-value (5.7, 5.6 and 5.3) with p-value < 0.05.

Discussion

The purpose of the study is to evaluate the effectiveness of core stabilization training program on endurance and balance in cricketers. Star excursion distances increased significantly from pre to post test for the exercise group. This improvement in reach distance verifies that core strengthening does have an effect on balance testing. Core can play an integral role in movement and dynamic balance. Thus, the results are in line with other study, which has emphasized the effect of core stability on the dynamic balance⁵. The core is comprised of the lumbo-pelvic-hip complex and is activated first prior to gross body movements. Hip and trunk weakness reduces the ability which was noted by Leetun¹⁹. Core stability can improve strength of hip and trunk muscle which is important to increase dynamic balance. Lack of sufficient coordination in core muscular can lead to decrease efficiency of movement and injury^{6, 8}. The body uses core muscles to generate the necessary rotational torques around the body and produce extremity motion¹⁵.

Dynamic balance was influence by core exercise and was measured with SEBT, which is proposed as a dynamic balance measurement tool^{7, 14}. Based upon this suggestion, we theorized that in SEBT subject stands on the stance leg and uses the opposite limb to reach, the

rectus abdominus muscles and obliques would fire before the movement occurs to perform trunk motion allowing the subject to maintain balance. Also the multifidus and transverse abdominus muscles would help to maintain dynamic balance during lower extremity movement by providing support to the lumbar spine.

The ultimate goal of core stability training in a rehabilitation setting is to prevent injuries, while in a sports performance setting the goal is to generate and transfer force to the upper and lower extremities

The subjects showed significant improvements in both Sorenson and SEB tests for the group undertaking the core training program.

Conclusion

This study was done to evaluate the effectiveness of core stabilization training program on endurance and dynamic balance in cricketers. Both groups demonstrated significant improvements for both criterion measures ($p < 0.05$).

Dynamic postural control as measured by the SEBT maximum distances, demonstrates a significant increase across the reach directions- Anteromedial, Medial, and Posteromedial for the core strengthening group. Core endurance measured using Sorensen

also showed increase in trunk holding time after 6 weeks of core exercise training, among the two tests SEBT improved more compared to core endurance after 6 weeks of training. Our results suggest that core strengthening training could be beneficial for improving dynamic balance, endurance, preventing risk of injuries. Future research should be including core stability and biomechanical aspect of hip, knee, and ankle during the performance.

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Conflict of Interest - Nil

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Physiotherapy in Telerehabilitation Mode Improves Health-Related Quality of Life and Functional Muscle Strength in COVID 19 Survivors: A Case Series

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Abstract

Introduction: Pulmonary rehab is effective for various chronic lung conditions. COVID-19 leads to conditions like ARDS, SARI wherein pulmonary rehab has been shown to be effective. Under the current pandemic situation, wherein access to transport and healthcare facilities have been difficult, ReLiva Physiotherapy & Rehab initiated tele-pulmonary rehab for COVID patients, known as "Respirehab". This article is to present findings of the patients who have completed the 1-month Respirehab program.

Objective: To determine whether respirehab delivered to COVID-19 patients has beneficial effects pre and post

1. Functional outcome measures
2. Clinical outcome measures.

Materials & Method: Respirehab is a 1-month program delivered online through real time video calls and exercise prescription through pre-recorded videos. Key components are breathing exercises and progressive physical exercises. This program starts with a detailed assessment on a video call with a physiotherapist, subsequent to which a plan of care is prepared online. Weekly reviews conducted and accordingly treatment protocols were modified, whenever required. It was ensured that at least 2 live video sessions per week were held with the patient for motivation and program safety. The patients' outcomes were measured on SGRQ, MMRC, 1 RM – 10 RM, and SPO2 data. We collected these data in the beginning of the program and at a weekly interval.

Results: Patients showed improvement on each of the scales and which was significant. The pre and post data was analysed using following outcome measures SGRQ, MMRC, 1RM-10RM, SPO2 MONITORING. The average improvement seen in the outcomes is 70%.

Conclusion: Respirehab holds a lot of assurances for patients recovering from COVID-19. In the current sample size, all patients showed improvement in clinical and functional outcomes. Findings from a larger sample will validate the benefits more conclusively.

Keywords: COVID rehabilitation, COPD, ARDS, COVID-19, SGRQ, MMRC, TELEREHABILITATION, Respirehab.

Introduction

Corona virus has been spreading rapidly in India and many of the COVID survivors would require rehabilitation in order to overcome respiratory and physical impairment

caused by the disease. A rehabilitation protocol which is scalable, accessible, convenient and effective is the need of the hour. The most recent study on pulmonary rehabilitation and its impact on COVID-19 patients come from Hainan General Hospital, China. This

randomized controlled study investigates the effect of a respiratory rehabilitation program on respiratory function, QOL, mobility and psychological function in elderly patients with COVID-19⁽⁴⁾. COVID-19 impacts patients primarily through deterioration of lung function and breathing capabilities, usually manifesting as pneumonia, SARI (Severe Acute Respiratory Illness) and ARDS (Acute Respiratory Distress Syndrome).

A large number of these patients would benefit from pulmonary rehabilitation to improve breathing and lung function. Many of us are aware about the role of physiotherapy in treating cardiovascular and pulmonary conditions but little has been found about its pivoting role in treating the symptoms of SARS-COV-2(COVID19). In more severe cases patients require aggressive respiratory care where medical specialists such as pulmonologist, intensivists, infection control, along with physiotherapist have shown better results in treating SARS-COV2 (covid-19).⁽¹⁾ There have been also set of preventive advisories issued by different bodies all over the world for non covid or asymptomatic patients.

Pulmonary Rehabilitation has always played a very important role in management and health maintenance of patients with acute and chronic respiratory diseases showing prolonged symptoms by improving their Quality of Life. According to recent studies fever, cough, breathlessness, fatigue and body ache are the cardinal symptoms of COVID-19 which usually last for 7-14 days. But in some cases, it is reported that breathlessness, cough and fatigue may exceed longer duration. These patients are termed as “Long Haulers”.

Pulmonary rehab being a graded exercise plan , which plays an important role in countering various aspects; such as to prevent its contagious nature of the virus; home isolation is advised on a larger scale; which results in physical degeneration at muscular level as well

as it leads to negative impact on metabolic levels of an individual (most vividly seen in elderly)^(6,7). Immobility triggers underlying conditions such as type 2 diabetes, hypertension, postural defects etc. which worsens the clinical condition of patients. In Indian scenarios, we are used to staying in a joint or nuclear family through most of the phases of our life; but when it comes for isolation it has been observed that a lot of patients irrespective of their age group undergo depressive or emotional instability. As a known fact, physical activity releases hormones such as dopamine and endorphins which helps to generate positivity at psychological levels and has beneficial effects at muscular level also. Earlier implementation of breathing exercises and conditioning of large muscle groups achieves reduction in hospital stay with underlying infection and admissions of the patients with mild symptoms of Covid-19. ⁽⁶⁾

Our study aims to validate the efficacy of a telerehabilitation program, through therapeutic exercises given for respiratory symptoms, in patients affected by COVID-19. In a patient’s perspective, telerehabilitation treatment has positive experiences and better outcomes; also, additional benefit of reduction in healthcare incurred cost ⁽¹³⁾. In this scenario, the implementation of telerehabilitation is required because of general home quarantine of covid population formed to avoid. Being from an economic perspective one of the reasons for implementing telerehabilitation in covid population are its advantages i.e. accessibility, convenience as it saves travel time and travel costs. Also, for patients it reduces exposure to other pathogens and pollution which could be present while visiting a clinic or hospital. Team of physiotherapists from ReLiva Physiotherapy & Rehab have designed Respirehab, (a telerehabilitation program); it is the personalised program delivered through online sessions (one to one) and the session lasts for approximately an hour. The flow of activities involved from admission to telerehabilitation is elaborated below in flowchart.



Materials and Methodology

Study design-

It is an analytical study design for case series to determine the pre-post intervention of functional and clinical outcome measures in population infected with COVID-19

Source of data-

Patients undergoing Respirehab program have consented for use of data for such purposes

Sample selection-

This sample is of the six patients who have undergone the Respirehab program. Patients were informed through a text message transmitted on social network (WhatsApp); they will be contacted with a general message informing of the possibility of participating in a physiotherapy study; all those interested were informed later in more detail. The consent for treatment and participation had been taken for the same. Patients with other co morbidities have more deteriorating outcomes compared with patients without. Patients with a history of uncontrolled hypertension, chronic lung disease, diabetes and other cardiovascular disease have the worst prognosis and most often end up with deteriorating outcomes such as ARDS and Pneumonia; and also there are no such physiotherapy guidelines for these patients.

Inclusion criteria-

- 1) Age 20 - 60 years
- 2) Patients having positive reports of Covid -19 and are in hospital/ home confinement.

Exclusion criteria-

- 1) Patients with chronic lung diseases
- 2) Patients with chronic kidney diseases
- 3) Patients affected with chronic neurological disorders
- 4) Patients suffering from cardiovascular conditions without medical treatment.
- 5) Patients who have had respiratory conditions in the last 12 months.
- 6) Patients who have recent musculoskeletal disorders who are not fully recovered from their injury.
- 7) Patients affected with chronic mental or psychological disturbances.
- 8) Patient classified as moderate or severe cases based on the following criteria:
 - Respiratory rate ≥ 30 BRPM
 - SPO₂ < 90%
 - O₂ dependency more than 8 litres

- Cardiac Rate > 125BPM
- Uncontrolled Hypo/Hypertension
- Severe dyspnoea (MMRC grade 4)
- Altered sensorium / Electrolyte imbalance

Intervention –

Protocol: Respirehab is a four weeks program and consists of therapeutic exercises like breathing technique (diaphragmatic/segmental/breath stacking), dyspnoea relieving techniques, relaxation techniques, mucus clearance techniques along with exercise regime of thoracic expansion exercises, aerobic exercises, strengthening and conditioning exercises. Before initiating the program, patients were explained about

the benefits of the program and were also guided about the dos and don'ts during the program according to the infection control guidelines. In the session's patients were shared with the educational content and exercise videos copyrighted by Reliva. The outcome measures used to deliver functional and clinical outcomes were Spo2 (saturation) monitoring, 1RM-10RM, MMRC (dyspnoea scale), SGRQ (to measure functional outcome). Saturation partial oxygen (SPO2) levels have been measured i.e. pre and post on pulse oximeters just to avoid any adverse effects during the session. 1RM-10RM (RM-repetition maximum) is used to measure the strength of major muscle groups with weights/resistance. Saint George Respiratory Questionnaire (SGRQ) is used to measure the impact score, activity score, and symptom score of underlying respiratory condition in terms of activities of daily living.



Figure 1

Figure 1

Process: Initially a patient is consented and a detailed assessment is taken during the first session with all the above-mentioned outcome measures (SGRQ/MMRC/1RM-10RM/SPO2). Patients can combine the medical treatment with the prescription of customized therapeutic exercise programs. Exercise monitoring will be developed through telerehabilitation tools i.e. emerging technology (Microsoft teams/Zoom/WhatsApp etc.) through which telerehabilitation care can be provided through a stay home and stay safe guidelines published by WHO. Patients are encouraged to carry out

the treatment and follow up has been taken completely through video conferencing that will encourage them to improve their functional independence and quality of life. Encouragement and their personal efforts will reduce the rate of loss to follow up and drop out during the course of the entire program which extends till 4 weeks. Patients will be asked in the follow up (daily contacts) if they have carried out any other activity, if any interference in the treatment revealed will be grounds for exclusion. Similarly, all the outcome measures are re analysed on a weekly basis to mark the progress of the patient.

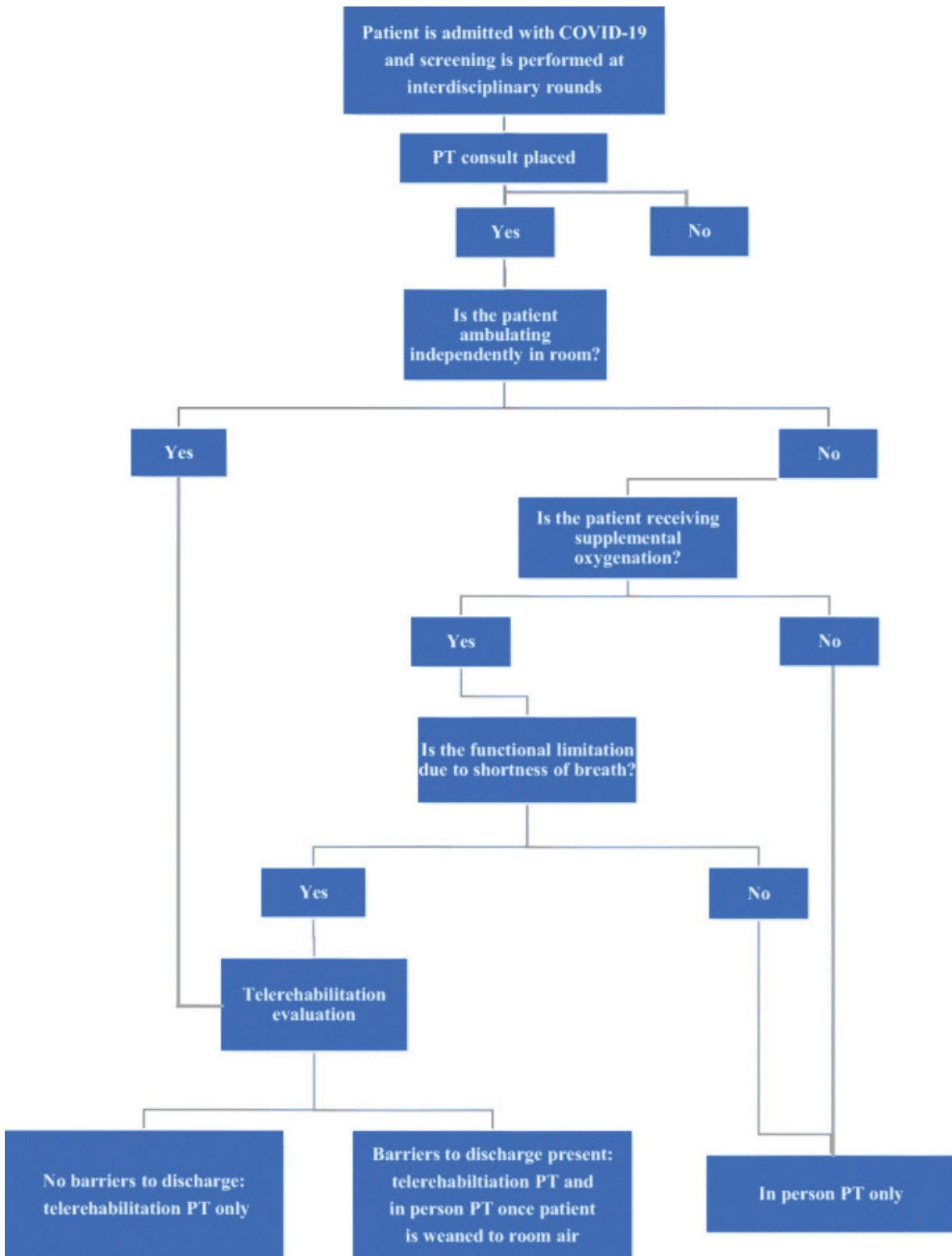
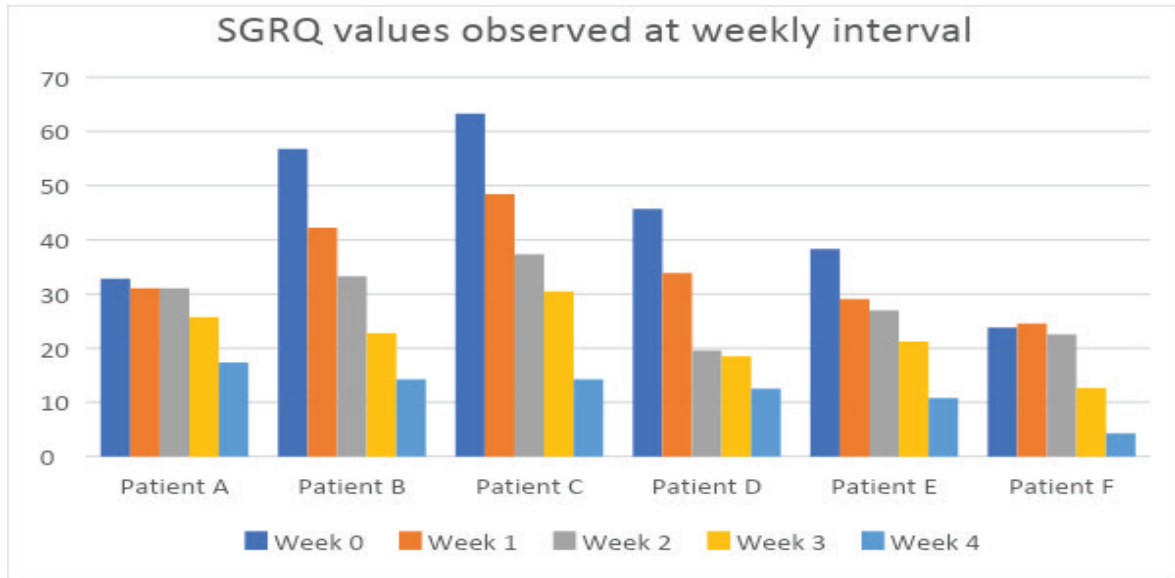


Figure 2



Findings: Fig 3: SGRQ measurements: Patients SGRQ scores which were calculated weekly can be observed in figure 3. All the patients showed consistent and progressive improvement in their SGRQ scores. The normal value of SGRQ scores are around 5 – 7.

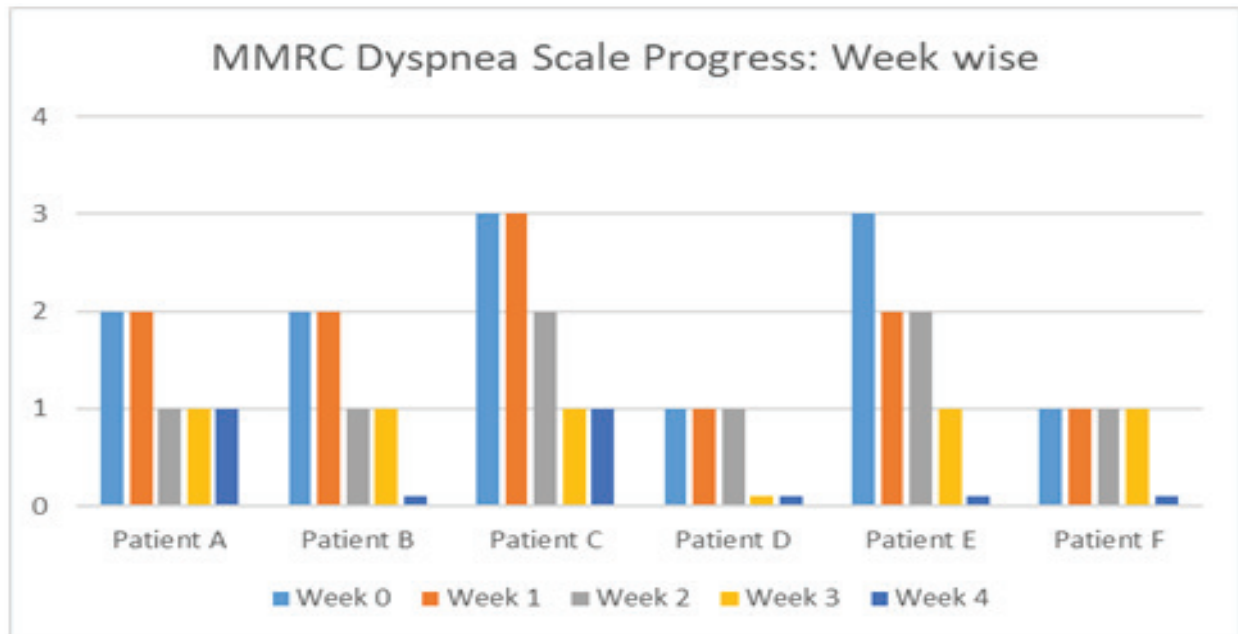


Fig.: 4 MMRC Scale: MMRC Dyspnoea scale was measured weekly. We observed improvement in MMRC Dyspnoea score of minimum 2 grades amongst all patients which is clinically significant as reflected in figure 4 below. MMRC Grade 4 dyspnoea is “too breathless to leave the house” and while Grade 0 would be “no breathlessness except on strenuous activity”.

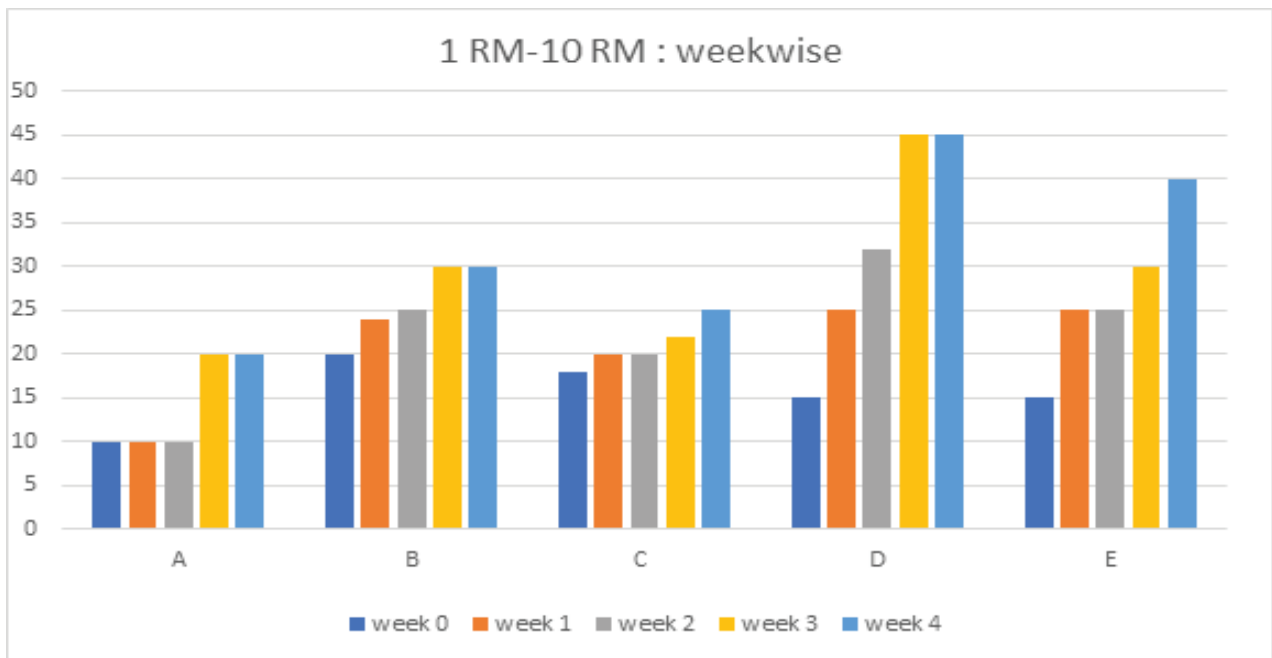


Figure 5: 1 RM – 10 RM Test: In figure 5, the graph shows an increased number of repetitions that maximum a patient could perform with 1 kg weight on a weekly basis. Whereas, the maximum repetitions are considered to be the improving strength of the patients. (Major muscle groups e.g. flexors, extensors).

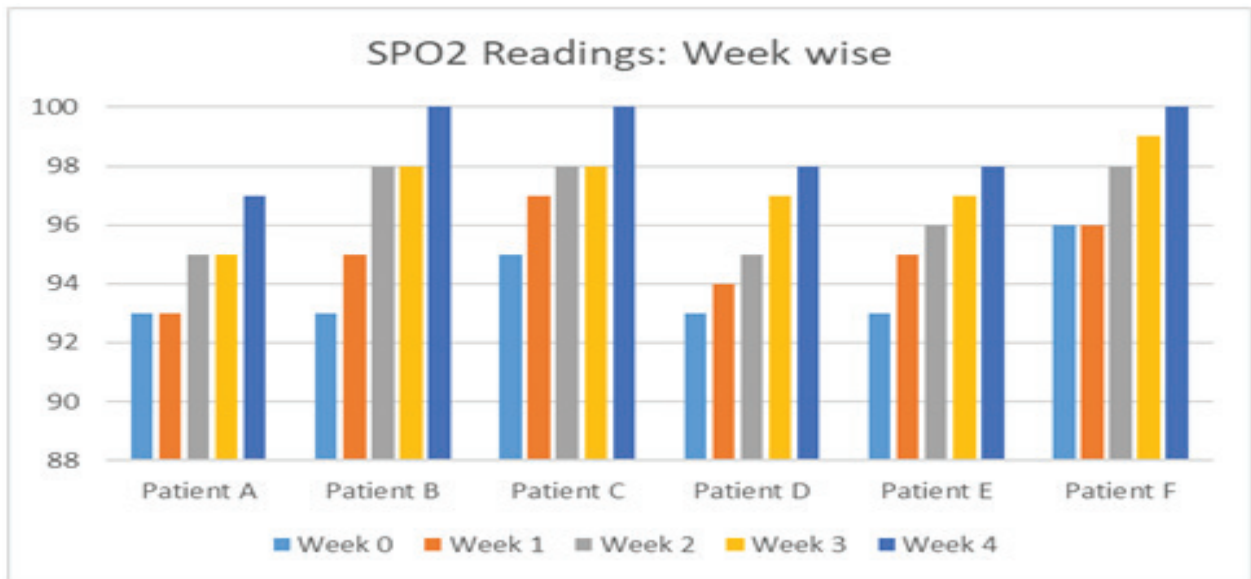


Figure 6 : SPO₂: The saturated partial oxygen levels monitored without oxygen support was measured on weekly basis, and the results are depicted in figure 6 and shows levels approaching towards normal ranges i.e. 98-100%

Results

The data indicates that patients have benefited from the Respirehab telerehabilitation program delivered extending 4 weeks; as it is an easily accessible and convenient option. Different outcome measures had different levels of achievement but most significant improvements were observed in SGRQ scores. The following results are elaborated in terms of outcome measures used and their scoring of the patients on a weekly basis.

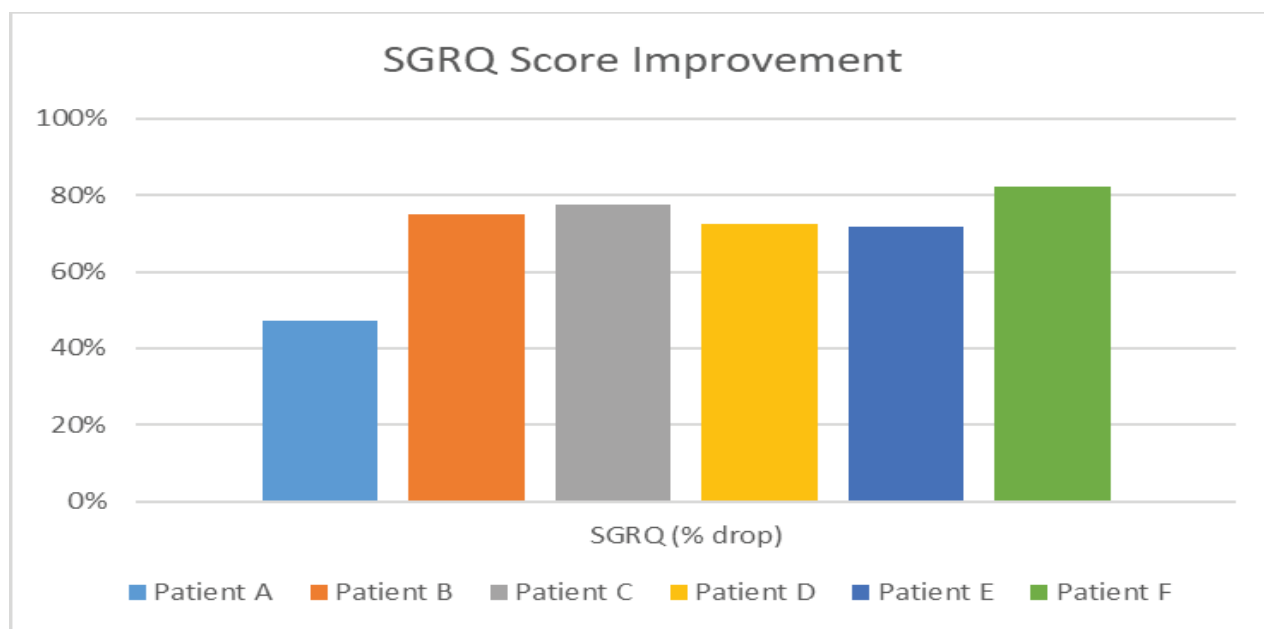


Figure 7: 1.) SGRQ- The average improvement percentage in scores of SGRQ is 71% amongst the patients

2.) MMRC- The average MMRC grade in week 0 was grade 2-3 which markedly improved with two levels down to grade 0-1 in week 4. This difference in scoring had shown reduced fatigue level and work of breathing in day to day activities of the patient.

3.) 1RM-10RM- This outcome measure was used to measure the strength of major muscle groups of upper as well as lower limbs. The ideal weight that was used for the patients was 1kg(to maintain the uniformity). Apart from patient no. 1 (who did not cross 20 reps) rest all had crossed an average of maximum repetition of 38 reps with 1kg by the end of 4th week.

4.) SPO₂- saturation levels were monitored pre and post every session. Whereas, average saturation for patients in week 0 was 93-94% without O₂ support; which had shown significant improvement in week 4 i.e. the average saturation of 98-100% without O₂ support.

Discussion

This article presents the detailed description of the Respirahab Telerehabilitation program designed to analyse the results in terms of functional outcome (SGRQ impact score and activity score and 1RM-10RM) and clinical outcome (SGRQ symptom score, MMRC grading and saturation monitoring). The data collection is done on a weekly basis i.e. week 0 to week

4 to analyse the outcome measures. On the contrary to our expectation, we found relative changes in functional independence of activity and symptom scores in SGRQ scoring. These results suggest that Covid patients do respond uniformly to a rehab program, or to different parts of a rehab program. Patients who had slow progress in improvement of their exercise capacity during the 4-weeks of rehabilitation, may still have made significant progress pertaining to how they think and feel about their health status, daily functioning or satisfaction with life. It seems reasonable to consider both subjective and objective improvements as important outcomes; according to their SGRQ scores that are achieved are closer to the normal values than they were initially. The MMRC scores are also reduced which shows the clinical improvement linked to their independence for activities of daily living. The overall oxygen saturation (Spo₂) was improved during the rehabilitation program. As observed in the entire 1RM-10RM protocol; the strength of major muscle groups (flexors, extensors) was increased.

The designed Respirahab Program which includes physical exercises, breathing techniques, dyspnoea relieving techniques, mucus relieving techniques, techniques to improve psycho-social well being is given to all patients in the same manner and delivered through telerehabilitation. The Patients were further advised

to enrol or continue the same program to achieve the normal values in the near future.

Conclusion

The current study demonstrates that along with other therapies the Respi- Care Telerehabilitation program can be given as an adjuvant therapy for the patients recovering from Covid 19. This data provides evidence that the Respirehab program helps to reduce the recovery time by reducing symptoms and improving their quality of life. Moreover, for patients this program can help them improve their lung functions and physical strength remotely; with additional benefit of reducing travel cost and time hence it is an accessible option for patients who are home quarantined, admitted in acute setup or discharged post covid recovery . It also helps respiratory therapists to treat patients without coming in direct contact with them in the current scenario of Covid 19. Findings from a larger sample will validate the benefits more conclusively.

Conflict of Interest: The authors declare that they have no financial or non-financial conflict of interest.

Source of Funding: No funding was provided to this research study.

Ethical Clearance: Participants gave informed consent before taking part

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Effect of Deep Transverse Friction Massage and Ischemic Compression in Trapezititis: A Randomized Controlled Trial

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Abstract

Background: Trapezitis is a commonly seen condition due to overuse and faulty posture. It leads to myofascial trigger points and muscle spasm. It causes range of motion restriction of cervical spine, tenderness and neck pain.

Aim: To evaluate the long term effect on pain and restricted range of motion following three days of treatment involving deep transverse friction massage, ischemic compression and sham conventional group in upper trapezititis.

Methodology: A Randomized controlled trial with 66 subjects (F = 61, M = 5) complaining of upper trapezius pain since 15 days were randomly allocated for the study into three different groups with 22 subjects in each group (Group A= Deep Transverse Friction Massage, group B = Ischemic Compression and group C = Conventional Therapy). Pre and post treatment visual analogue scale and lateral flexion of the cervical spine to the opposite side were taken.

Result and Conclusion: The results showed statistically significant improvement ($p=0.0001$) pre and post treatment within the groups. But there was no statistically significant difference between the groups ($p > 0.05$). Hence all the three groups were equally effective in reducing tenderness of upper trapezius.

Key words: - Deep transverse friction massage, Trapezitis, Ischemic compression, Trigger point

Introduction

The upper trapezius muscle is designated as a postural muscle of neck and it is highly susceptible to overuse. ^{1,2} The upper trapezius is often placed in a shortened position by poor ergonomics which creates shortness in the muscle. Neck pain is very common in the region of upper trapezius muscle. In middle age prevalence is highest and women are more affected than men. Neck pain prevalence varies widely in different studies, with a mean point prevalence of 13 % (range 5.9% – 38.7 %) and mean lifetime prevalence of 50 % (range 14.2% – 71.0 %).³

Muscle spasm occurs early after injury. This feels like tightness in the muscles and is sometimes painful. When basic injury is not treated, spasm causes formation

of muscle knots, called trigger points. The knots form because the spasm keeps the muscle continuously “on.”

⁴ A trigger point is a sensitive spot in a taut band of a skeletal muscle that is painful on compression and/or stretch and that can give rise to a typical referred pain pattern. ⁵ As muscles are not designed for this continuous work, over a period the muscle gets overloaded and forms these knots. As a result treatment of the spasm is necessary to reduce this problem. This happens most often with injuries to the neck and back. The myofascial trigger point in the trapezius is most commonly found at the midpoint of the upper border of the muscle.⁴

Trigger point are typically located by palpation. Simons described criteria for identification of taut band - a tender spot on the taut band, referred pain or altered sensation at least 2 cm beyond the spot, elicited by

needle penetration or pressure held for 10 seconds; and restricted ROM in the joint, the muscle crosses. ⁶

There are various studies comparing the effectiveness of different manual and non manual therapy techniques. Amongst that there is only one pilot study comparing the immediate effect of deep transverse friction massage and ischemic compression. ⁵ Hence the long term effects of these two techniques need to be checked. More over the pilot study was done only on two groups where group A was given deep transverse friction massage and group B was given ischemic compression. Hence the third group undergoing sham control intervention should be included which can demonstrate that both treatments were better than sham intervention and either of the treatments was more effective.

Aims and Objectives: To find out the effect of deep transverse friction massage, ischemic compression and sham conventional group and compare the effect of all groups following three days of treatment.

Methodology

Study Design: A Randomized Controlled Trial

Sample Size: The sample size was calculated using the formulae:

$$n = \frac{2\delta^2 (Z\alpha/2 + Z\beta)^2}{d^2}$$

$$d^2$$

Where, Z_{α} = value at a specified significance level = 95% = 1.96

Z_{β} = value at specified type II power = 1.28 (at 90% power)

$$S = \text{Pooled SD} = 0.4$$

$$D = \text{clinical significance difference} = 2$$

The total number of samples is 66. Thus total number of sample is $n=22$ in each group.

Sampling Method: Convenient sampling

Inclusion Criteria

- Age (18-45) years.
- Both male and female.
- Pain from at least last 15 days.

- Palpable tender spot in the upper trapezius muscle.

- Limitation of neck movements due to pain.

- Willingness to participate.

Exclusion Criteria

- Cervical injury.
- History of referred pain due to cervical pathology.

- Degenerative cervical spine.

- Wound over neck region.

- Shoulder pathology.

Procedure

In this study, total of 66 subjects were included. The subjects were recruited from OPD of S. S. Agrawal Institute of Physiotherapy and Medical Care Education presenting complaints of trapezititis and were screened by therapist 1 and who fulfilled inclusion and exclusion criteria were selected for the study.

The subjects who were screened were randomly allocated in three groups in sequence (Figure 1), where group A (DTFM) -Deep transverse friction massage and conventional therapy, group B (IC) -Ischemic compression and conventional therapy, group C (Sham) - only conventional therapy. Thus all three groups A, B and C had 22 subject samples each. Informed consent was obtained from all subjects. All the subjects were explained about the procedure in detail. The patients were asked to mark Visual analogue scale with the average pain intensity for their pain over 24 hours. Then opposite side lateral flexion range was measured using Universal Goniometer according to the protocol by Norkin.⁷ All the groups received intervention for three consecutive days. Deep Transverse Friction Massage was applied with forefinger which was reinforced by the middle finger. This technique was executed with the muscle in relaxed position, as recommended by Cyriax and Cyriax (1992) and was applied for 3 minutes. Frictions were applied slowly with a pressure slightly painful, approximately at the pressure pain threshold (PPT) level of each patient. ⁸ Ischemic Compression

was given with sustained deep pressure with the thumb to upper trapezius TrP for 30s-1 minute. Pressure was released when there was decreased tension in the TrP or when TrP was no longer tender or one min had elapsed, whichever occurred first.^{9,10} The conventional exercises such as scapular protraction, retraction, elevation and

depression and active neck exercises including cervical flexion, extension, right and left rotation and side flexion were given for 10 repetitions and 5 seconds hold for Group A, B and C daily for 3 days.¹¹ (Figure 2) Cold pack was given over upper trapezius region in sitting position for 20 minutes for all groups.¹²

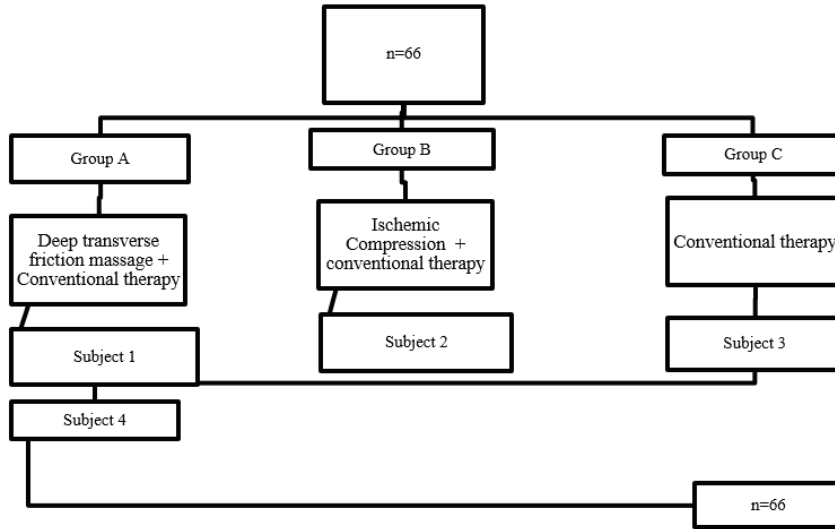


Figure 1: Flowchart showing random allocation of subjects in Group A, B and C.



Figure 2: Top left: Measurement of lateral flexion, Top right: Ischemic compression Bottom left: Deep transverse friction massage. Bottom right: Conventional exercise

Results and Discussion

Descriptive analysis was used to calculate mean and standard deviation. Paired t test was used to find the difference within groups. One way ANOVA was used to check the difference between groups. Normality of

data was checked using the method of Kolmogorov and Smirnov. All the groups were normally distributed. The level of significance was set at $p \leq 0.05$. Data analysis was done using SPSS software (version 20.0). Table 1 shows the descriptive statistics for age of all three groups.

Table 1: Descriptive statistics for age

Characteristics	Group A	Group B	Group C
Age	20.40 ± 2.59	20.59 ± 3.00	26.68 ± 12.60

Table 2 and Table 3 show the p and F value of all three groups for both outcome measures. All the three groups were statistically significant within groups which showed that there was difference in the outcome measure of VAS and lateral flexion on opposite side with pre and post treatment (p value= 0.0001). There was no difference between groups which states that all the three groups were equally effective in reducing tenderness of trapezitis (p value> 0.05).

Table 2: Baseline (pre) and post outcome measure of VAS with F value and p value.

VAS in centimeters. NS= not significant

Variables	Deep transverse friction massage group(A)	Ischemic compression group(B)	Sham group (C)	F value	Significance (p value)
Vas pre	5.91(1.69)	5.16(1.49)	5.14(1.48)	1.734	0.185(NS)
Vas post	3.70(2.35)	2.85(1.94)	2.69(1.54)	0.495	0.612(NS)
p value	0.0001	0.0001	0.0001		

Table 3: Baseline (pre) and post outcome measure of lateral flexion with F value and p value. LF in degrees.

NS= not significant

Variables	Deep transverse friction massage	Ischemic compression	Sham group	F value	Significance (p value)
LF pre	17.81(2.93)	18.54(3.99)	17.63(2.49)	1.657	0.199(NS)
LF post	21.63(3.98)	23.45(3.96)	21.45(3.11)	1.958	0.150(NS)
p value	0.0001	0.0001	0.0001		

Using a reduction of pain of at least 2 centimeters on the VAS to signify clinical improvement, 14 subjects improved in DTFM and sham group and 13 subjects were improved in IC group (table 4)

Table 4: No of Subjects Improved With Treatment

	Group A	Group B	Group C
No of subjects improved	14	13	14
Total number of subjects	22	22	22
% improved	63	59	63

Discussion

The purpose of the study was to evaluate long term effect within and between deep transverse friction, ischemic compression and sham conventional group in trapezitis following three days of treatment. All the three groups obtained the similar improvement in the range of motion and similar decrease in pain sensitivity of visual analogue scale ($p = 0.0001$).

The study done by Penas et al⁵ had demonstrated that immediate effect of ischemic compression and deep transverse friction massage was equally effective in reducing tenderness of myofascial trigger point. This study is in accordance with the study that tender point sensitivity had decreased in response to deep transverse friction massage, Ischemic compression and Conventional therapy within the group ($p = 0.001$). But there was no significant difference between the groups ($p > 0.05$). Hence, it cannot be said that any of the treatment was more superior to another and all the three groups were equally effective in reducing tenderness of trapezitis.

Cyriax et al¹³ suggested that the purpose of deep transverse friction massage is to maintain the mobility within the soft tissue structures of ligament, tendon, and muscles to prevent adherent scars from forming. The massage is deep and must be applied transversely to the specific tissue involved which enhances circulation and return of fluids. This helps in reducing the pain and improves lateral flexion range of motion.

The reduction in pain can be due to local pain diminishing effect and results in better alignment of connective tissue fibrils or may be the result of modulation of the nociceptive impulses at the spinal cord level: gate control. Cyriax et al¹³ suggested that

it leads to increased destruction of pain provoking metabolite, such as Lewis's substances. This metabolite, if present in too high a concentration, provokes ischemia and pain. Cyriax et al,¹³ Goats et al,¹⁴ suggested that prolonged deep friction of localized area may give rise to a lasting peripheral disturbance of nerve tissue, with local anesthetic effect. Walker et al,¹⁵ Chamberlain et al,¹⁶ suggested that deep friction softens the scar tissue and mobilizes the crosslink between the collagen fibers and adhesions between healing connective tissue and surrounding tissues, which improves neck mobility. Cyriax et al¹³ have said that DTFM is either effective quickly i.e. after 6-10 sessions or not at all. In the present study change in lateral flexion range was observed after 3 days of treatment within the group but less significant change in lateral flexion range. So the study focusing on longer duration of intervention needs to be done.

Ischemic compression is used on the trigger points for relieving pain and improving lateral flexion range of motion. The possible mechanism can be, as suggested by Jagad et al¹⁷ that the local chemistry changes due to blanching of the nodules followed by hyperemia when compression is released. This flushes out the muscle inflammatory exudates and pain metabolites, breaks down the scar tissue, desensitizes the nerve ending and reduces the muscle tone. The ischemic compression technique is usually applied with the targeted muscle in the lengthened position. Simons et al¹⁰ suggested that it equalizes the length of sarcomeres in the involved Trigger point which is effective in increase in the range of motion and reducing muscle tension relieving the muscle spasm and consequently decreases the palpable knot and pain.

The systemic review done by Penas CF et al¹⁸ has said that there is also no agreement as to the amount of

pressure that it is necessary to apply during a pressure technique. In the present study, amount of pressure was not measured so the future study is required to define the amount of pressure that is necessary to apply to trigger point to obtain difference between the groups.

Pain and improved lateral flexion range in the sham group can be due to following mechanism as suggested by Haldeman et al ¹⁹ that conventional exercises neurologically inhibit pain or involuntary muscle contraction long enough to allow the movement past the barrier and with neck exercise, there is stimulation of muscle proprioceptors which may produce pain relief according to pain gate theory where in the mechanoreceptor afferents carried by the large diameter axon inhibits nociceptors afferents at the dorsal horn of spinal cord.

Nadler et al ²⁰ suggested the use of ice pack which decreases tissue blood flow causing vasoconstriction reduces tissue metabolism, oxygen utilization, and inflammation and muscle spasm. Nadler et al ²¹ suggested that the use of ice pack reduces temperature to a depth of 2 to 4 cm, which reduces activation of nociceptors and painful nerve conduction velocity. The study done by Penas et al ⁵ have suggested of inclusion of sham group which was included in the study. Kienle et al ²² suggested that sham group also received hands on intervention which strengthens the evidence of clinical effectiveness because the placebo effect should not be underestimated.

The study by Gemell H et al ²³ have used a reduction of pain of at least 2 centimeters on the VAS to signify clinical improvement, so in this study using the same significant change for clinical improvement, 14 subjects improved in DTFM and sham group and 13 subjects had improved in IC group out of 22 patients. The number needed to treat patient to improve with ischemic compression as compared to deep transverse friction massage was 25, which is not significant. Hence both groups were equally effective.

The study demonstrated that the results proven may be applied to a population with a clinical diagnosis of insidious onset of upper trapezitis. The predominance of women (Female-61; Male-5), with middle age range participants in this study reflects the characteristics of population that is likely to experience upper trapezitis. Because of the three days of treatment and observation

periods, one cannot infer that the positive effects of ischemic compression and deep transverse frictional massage seen after three days of treatment within the group will lead to prolonged improvements. This study has demonstrated that all the three groups were equally effective. So effect of Ischemic compression and deep transverse friction massage were not considered superior than sham group. This can be because of undefined pressure for ischemic compression or might be due to shorter duration of intervention of three days.

Limitations

- Pressure of ischemic compression was not defined.
- Duration of intervention was limited to 3 days.
- Long term follow up was not taken.
- Study was done on subjects with atleast 15 days of pain. Therefore the results cannot be specified to particular stage of trapezitis.

Conclusion

Thus from this study, it can be concluded that all the three groups showed significant difference within the group, but there was no statistical significant difference between the group. Hence all the three groups were equally effective in reducing tenderness of upper trapezius.

Future Recommendation: Study should be done taking longer duration of intervention and defined pressure of ischemic compression with long term follow up. Study should be done taking subjects with particular stage of trapezitis.

Ethical Clearance: Taken from institutional advisory board.

Conflict of Interest: None

Source of Funding: Self

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Manuscript Type - Original article

Prevalence of Occupational Health Disorders in Auto Rikshaw Drivers -Meerut City - A Cross Sectional Study

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Abstract

Purpose : To find out the prevalence of occupational disorder in auto -rickshaw drivers.

Participants and Methods: A total number of 150 Participants (auto rickshaw drivers) were included in the study. The questionnaire was explained to them in their native language. All the components of questionnaire were explained to the participants. A consent form was been filled by all the participants. All the information like name, age, gender, and the sort of problems they were suffering were noted.

In this questionnaire the following questions are: Have you at any time had numbness, tingling or dullness in the fingers, palms or feet?

(1) Yes (2) No

Have you at any time had pain in any part of your body?

(1) Yes (2) No

How long does the pain continue?

(1) A long time (2) about one week

(2) about one day (4) about half a day

Result: We use Nordic questionnaire there are total 8 questions which has been use to represent the prevalence of Musculoskeletal disorder in various body parts. We have seen the maximum problem in their Eyes (32%) followed by Lower back pain (15.33%).

Conclusion: In conclusion, we found in this present study the most common problem was Eyes problems than followed by Back pain problems. The longer the years of driving experience the greater the chances of developing musculoskeletal pain. A large number of Auto Rickshaw drivers with musculoskeletal pain are using alternative therapies and self prescribe drugs.

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Keywords : Musculoskeletal Pain; physical activity;
Eye pain

Introduction

Auto rickshaw driving involve prolonged sitting in a fixed posture also exposes the drivers to a number of harmful element such as vibration, noise, glare and which over the period of time may lead to one or more

of occupational disorder .1

Driving as a task involves prolonged sitting, a fixed posture and vibration, any of which could directly lead to musculoskeletal trouble. Drivers sit while driving, but more importantly have to sit for long hours while waiting for fares. Sitting in the driving position exerts considerable forces on the spine and can cause a number of problems with the musculoskeletal system especially, backaches, neck problems, pulled muscles, and general stiffness².

It is also observed that transport related sitting is one of the domain of sedentary behavior that has been linked to increased risk of chronic disease³ .

Further harmful lifestyle is practiced like irregularity of meals, no proper restrooms, bad posture while driving and stressful occupational conditions are found to be associated with many gastrointestinal, respiratory, musculoskeletal, cardiovascular and increase probability of disability or illness like hearing impairment and lowering efficacy of ocular system⁴.

Sitting in driving position exerts considerable force on spine and can cause number of problems with skeletal system, in particular, back pain, headache, stress and general stiffness. The incidence of smoking, drinking is also higher among auto rickshaw drivers which poses risk to non-communicable diseases⁵.

Physical risk factors such as high forces, high repetition ,working with arms overhead long term static posture , local contact forces and vibration have been commonly identified⁶ .

Work- related Musculoskeletal disorders can affect almost all parts of the body especially the back, neck, and upper limbs, depending upon the physical movement characteristics and the ergonomics and mechanical design of work task.⁷

The factor that contribute to the pain may include prolonged sitting, poor postures, exposure to whole-body vibration, long driving time, heavy lifting, manual materials handlings, poor diet.⁸

Drivers are exposed ergonomic and mechanical design of work tasks.⁹The prevalence of Musculoskeletal pain may has also been reported to be high among

occupational drivers in developing countries such as India.¹⁰

It has been suggested that the people have varying perceptions about their Musculoskeletal problem and perceptions about illness may influence health outcomes such as pain and disability directly or indirectly by their effect on coping.¹¹

If a person consider that Musculoskeletal problem is a serious disease that medical care or the health services can do little about this belief may have an impact on the level of interference in daily life from that disease that the person report on their decision to consult or seek treatment.¹²

Work related musculo- skeletal disorders affect workers in many occupations including drivers of large vehicles.¹³

Professional drivers have been found to be at high risk of developing Low back pain due to prolong sitting and vehicle vibration.¹⁴ Psychosocial stress can cause muscle tension mechanical strain of spinal cord and fatigue all of which could lead to traumatic injury.¹⁵

It is also observed that transport related sitting is one domain of sedentary behavior that has been linked to increased risk of chronic disease.¹⁶

Material and Methods

Design of study-survey questionnaire

Sample size- There were total 150 Male participants were included in the study.

Source of Data- Begumpul Auto Stand, Cantt Station,

-Daurala Auto Stand.

The research work has been approved by the research committee of college of applied education and health sciences. A total number of 150 auto rickshaw drivers were included .The questionnaire was explained to them in their native language. All the components of questionnaire were explained to the participants. A consent form was been filled by all the participants.

1.All the information like name, age, gender , and the sort of problems they were suffering were noted.

2. In this questionnaire the following questions are :
 Have you at any time had numbness, tingling or dullness in the fingers, palms or feet?

(2) Yes (2) No

3. Have you at any time had pain in any part of your body?

(1) Yes (2) No

4. How long does the pain continue?

1) A long time (2) about one week

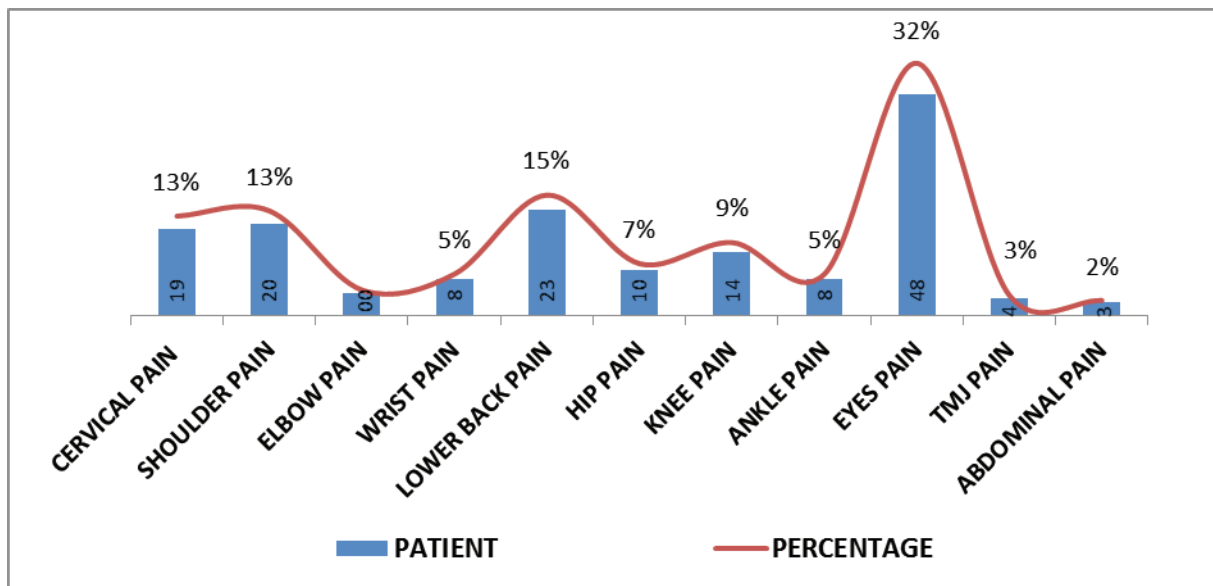
(3) about one day (4) about half a day

Result:

In this study we use Nordic questionnaire there are 8 question which has been use to

represent the prevalence of Musculoskeletal disorder in various body parts.

In this (Bar graph-1) we have seen the maximum problem in their Eyes - 32% followed by 65 Musculoskeletal problem is Lower back pain i.e 15.33%.



Graph 1: Depicts site of injury and percentage

Discussion

The study was aimed at determining the prevalence of occupational disorders among Auto

Rickshaw drivers in Meerut city. In this study, Eye pain was the most common site of musculoskeletal problem, occurring in . 32% of the driver followed by low back pain occurring in 14%.

The condition of the vehicles and roads on which the auto rickshaw drivers in the present study normally drive are probably worse than those in previous studies.

Generally, roads and vehicles in Meerut city are poorly maintained and road worthiness test for vehicles are generally not enforced.

The focus of this study was not to estimate the level of education of drivers, the drivers in this study had low level of education and might explained their health seeking behavior.

Those drivers who did not take medical treatment and felt discomforts in their Eyes, back, hands, fingers, knees, ankles.

Most of the drivers believed that their pain was caused by driving and prolong sitting.

On the basis of the obtained data, this observation calls for health education or enlightenment 80 programme among Auto Rickshaw drivers so that they can be better informed about the cause and prevention of musculoskeletal pain and there by prevent the prevalence and the consequent disabilities.

Conclusion

In conclusion, we found in our present study the most common problem was Eyes problems 84 than followed by Back pain problems.

The longer the years of driving experience the greater the chances of developing musculoskeletal pain.

A large number of Auto Rickshaw drivers with musculoskeletal pain are using alternative therapies and self prescribe drugs. There is need to organize enlightenment programmes for drivers on how to avoid or probably reduce the risk factors of musculoskeletal pain Hence there is need for creating awareness regarding Health promotion, balance diet ,stress 91 management and counseling and regular medical checkup.

Health insurance for all the Auto-Rickshaw drivers need to be looked into and implemented 93 by regional transport office. The health of drivers is an important issue in public health,

Occupational health, and transport policy and employment conditions. There has not been a

Concerted assault on those factors that cause poor health and this is an area of neglect that needs urgent attention.

6. Disclosure -

- **Ethical approval** - The research work is approved by ethical committee of College of Applied Education and Health Sciences, Meerut.

- **Source of Funding** - There is no source of funding

- **Conflict of Interest** – There is no conflict of interest

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Awareness of the Role of Physiotherapy in Temporomandibular Disorders amongst Dentists

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Abstract

Purpose: Temporomandibular joint disorder (TMD) is a complex disorder usually characterized by pain, crepitus and reduced movement which may be caused due to unbalanced activity, muscular spasm, or overuse of the jaw muscles. Awareness among dentists in and around Mumbai and Navi-Mumbai about PT's role for TMD treatment was found to be unknown. Therefore, the study aimed at finding out the awareness of physiotherapy management of TMD amongst dentists.

Method: This was a cross-sectional study including 100 dentists done over a period of 6 months. The data was collected from various private setups and hospitals in and around Mumbai and Navi-Mumbai. A consent form and a self-prepared validated questionnaire was used. The data was statistically analysed and descriptive analysis was done with the help of pie charts and bar diagrams.

Results: In our study 89% of the dentists considered physiotherapy as a treatment option for TMD. However, 49% of the dentists refer people with TMD to physiotherapists. Fewer dentists were aware that physiotherapy helps in improving strength and coordination of jaw muscles while greater number of dentists were aware that physiotherapy also helps in pain relief, relaxation, minimization of stiffness and restoration of normal mobility and function.

Conclusions: Although a large percentage of dentists that completed the survey were aware of the role of PT in treating people with TMD, the rate of referral was low. Therefore, there is a need to educate the dentists about the role of physiotherapy in treating people with TMD, to encourage them to refer people with TMD and thereby promote multidisciplinary rehabilitation of this complex disorder.

Keywords: Temporomandibular joint disorders, Dentists, Physiotherapy, Awareness.

Introduction

Temporomandibular (TM) joint is one of the most frequently used and mobile joints in the body.^[1] It is engaged in mastication, swallowing and speaking. Mastication requires tremendous power, while speaking requires intricate fine motor control. The musculature is designed to accomplish both these tasks.^[2] Temporomandibular joint disorder (TMD) is a complex disorder usually characterized by pain, crepitus and reduced movement. It may be due to various causes i.e. unbalanced activity, muscular spasm, or overuse of the jaw muscles.^[3] Other causes include

occlusal abnormalities, orthodontic treatment, bruxism and orthopaedic instability, macro-trauma and micro-trauma, factors like poor health and nutrition, joint laxity and exogenous oestrogen.^[4] Psychosocial factors like stress, tension, anxiety and depression may lead to temporomandibular joint disorders.^[5]

There are various ways to classify TMD one of which is ICD-9 classification. An extensive sub-classification for arthrogenous and myogenous disorders exists.^[6] Common temporomandibular disorders with corresponding International Classification of Diseases, Ninth Revision (ICD-9) codes classify

TMD as, arthrogenous TMD involving inflammation, hypermobility, fibrous adhesions, disc displacements, disc displacement with reduction, disc displacement without reduction, chronic disc displacement without reduction and myogenous TMD involving masticatory muscle pain. Also, the most common types of TMD include pain-related disorders (e.g., myalgia, headache attributed to TMD and arthralgia) and disorders associated with the TMJ (primarily disc displacements and degenerative diseases).^[7]

Signs and symptoms of TMD may include local pain in the TMJ and/or masticatory muscles, limited mouth movements, TMJ sounds, and headaches.^[7,8] Also, limited ability to open the mouth wide, difficulty chewing, neck aches, swelling either on one or both sides of face, difficulty eating and talking, catching and locking of jaw, forward head posture, tender jaw, muscle spasms in jaw, facial muscle pain, lump in temple area, tinnitus, hearing problems and toothaches etc. Cervical spine disorders were shown to be associated with TMD pain 70% of the time.^[7,9] Several studies have examined the presence of signs and symptoms in the cervical region of people suffering with TMD and that the presence of tender points in the cervical area of these patients is very common.^[10-15] De Laat et al found that, on palpation, 23–67% of the patients with TMD had neck muscle tenderness in the sternocleidomastoid and upper trapezius as well as other cervical and shoulder muscles, which was only rarely present in the control group.^[13]

TMD can occur at any age, but it most commonly presents in young to middle-aged adults and more frequently in women than in men.^[16] A study aimed at determining the prevalence of temporomandibular disorders (TMDs) in Chennai city population where a total of 3039 individuals participated found that more than half of the study sample (53.7%) in the study had one or more clinical signs and symptoms of TMD. Deviation of mandible on mouth opening (42.1%) and clicking sound (38.6%) made up the highest percentage. Females aged 18 years and older reported higher prevalence of TMD signs and symptoms than men.^[17]

A multidisciplinary approach is particularly important for successful treatment of chronic TMD cases.^[18] Health care professionals who are aware of the

TMJ dysfunctions are involved in its management which includes chiropractors, speech pathologists, physicians, psychologists, oral and maxillofacial specialist, an otolaryngologist (also called an ear, nose, and throat doctor or ENT specialist) and physiotherapists. Dentists specializing in jaw disorders (prosthodontist, also called a prosthetic dentist) refer people with TMD to physical therapists. Management of temporomandibular joint disorders includes conservative and surgical treatment options where physical therapy (PT) is one of the most effective conservative treatment option for temporomandibular joint pain.^[19] A conservative treatment approach is recommended for the initial management which includes self-care such as relaxation techniques and stress management, devices such as mouth-guards and splints, medications such as NSAIDs and muscle relaxants, therapies such as acupuncture and physical therapy with the aim of restoring normal mobility and function, reducing pain and causing relaxation, minimizing stiffness, improving range of motion, improving strength and coordination.^[20]

Based on systematic reviews^[21,22] manual therapy, jaw exercises, and postural re-education were shown to be effective to reduce pain and improve mobility/function in TMD patients. Physiotherapeutic techniques and modalities used to treat people with TMJ disorders involves jaw exercises (to strengthen muscles and improve flexibility and range of motion), heat therapy (to improve blood circulation in the jaw), ice therapy (to reduce swelling and relieve pain), massage (to relieve overall muscle tension), training to improve posture and correct jaw alignment, transcutaneous electrical nerve stimulation (TENS) is the application of a mild electrical current to the skin over the jaw joint. This electrical current is thought to interfere with the body's pain signals. TENS relaxes muscles, improves blood circulation, and relieves pain. The effectiveness of TENS varies, but it seems to work for some people. Movement of the temporomandibular joint helps to release scar tissue that restricts muscle movement and to improve range of motion. Ultrasound therapy uses high-frequency sound waves directed to the TM joint, to reduce pain and swelling and improve circulation.^[23] The pain control mechanism by low level laser therapy is not well known; reports suggest that this may occur due to increased release of endogenous opioids, improvement of area microcirculation, or an increase in lymphatic flow which

reduces oedema, increases the production of ATP, and reduces the permeability of nerve cells membranes. [24-26] Surgical treatment is recommended to the people with TMD when the conservative methods do not help. This includes arthrocentesis, injections, TMJ arthroscopy, open joint surgery, modified condylectomy, etc. [27]

A study done in southern India on attitude and awareness of TMJ disorders among general dental practitioners found that while clinicians were well versed with the etiologic factors responsible for TMD and their diagnosis, the domain of management of TMD was an area that needed improvement. The study concluded that general dental practitioners could benefit from education programs aimed at highlighting the management aspect of TMD. [28]

Another study done in Lahore found that 65% dentists did not consider physiotherapy as a treatment option for TMD, while 27% considered that it may be a treatment option and only 8% considered it as a treatment option. Treatment choice of most dentists was using a combination of medications and precautions (64%) while only 7% of dentists referred people with TMD for physiotherapy. The study concluded that physiotherapy is an effective means of symptoms' relief, yet awareness level is found to be significantly low in dentists regarding its effectiveness. [29]

Awareness among dentists in and around Mumbai and Navi-Mumbai about PT's role for TMD treatment was found to be unknown. Therefore, the study aimed to evaluate the awareness of TMJ disorders and their physiotherapy management in this population. The primary objective of the study was to identify the areas where the awareness could be raised regarding the importance of PT for better patient management and the benefits of the collaboration between dentists and PTs in TMD treatment.

Methods

The study was approved by institutional ethical committee of our institution. This was a cross-sectional study including 100 dentists done over a period of 6 months. The data was collected from various private setups and hospitals in and around Mumbai and Navi-Mumbai.

Inclusion and exclusion criteria: Both male and female dentists willing to participate in the study from in and around Mumbai and Navi-Mumbai were included while, subjects not willing to participate were excluded from the study.

All the subjects willingly gave the consent for participation in the study. A self-prepared validated questionnaire was given to assess the awareness. The data was statistically analysed and descriptive analysis was done with the help of pie charts and bar diagrams using data analysis add-ons in MS Excel.

Results

The study consisted of a convenient base sample of 100 full-time practising dentists with a minimum one year of practice in which 37 were females and 63 were males. The mean age was found to be 35.62. (63%) of the subjects were graduates (B.D.S), while (37%) of the subjects were postgraduates (M.D.S) where (54%) of the subjects were general dentists and the remaining (46%) of the subjects were oral surgeons, periodontists, prosthodontists, orthodontists, endodontists and implantologists.

As seen in figure 6, the four most common complaints of people with TMD to the dentists were local pain in TMJ or masticatory muscles and clicking sounds (93%) followed by limited mouth movements (80%) and catching/locking of jaw (79%). (68%) of the dentists estimated that 0% to 25% of the people suffer from TMD symptoms and (32%) estimated 25% to 50% of people suffer from TMD.

Treatment choice of most dentists were medications (88%) and bite splints/ mouth-guard (84%) followed by advising rest (43%) and braces (22%), while (12%) of the dentists preferred other treatment methods such as occlusion equilibration, deprogrammer, warm water gargles, jaw exercises, warm fermentation, injections, lasers, surgery and combined therapy. Also, (84%) of the dentists consider patient education and self-management as an effective conservative treatment strategy for TMD. The other treatment approaches considered to be effective were physiotherapy (82%), use of dental appliances (64%), medications (63%), patient reassurance (53%), cognitive-behavioural therapy (28%), deprogrammer, topical application, and surgery (3%).

According to the dentists in the study, the physiotherapeutic modalities used in the treatment of TMD were heat therapy (69.5%), TENS (65.3%), ultrasound (43.2%), laser therapy (26.3%), cryo-therapy (18.9%) and EMG biofeedback (16.8%). While the four most common physiotherapeutic techniques used in the treatment of TMD were jaw exercises (95.8%), manual therapy (69.8%), therapeutic massage (51%) and postural correction (41.7%). The dentists in the study considered pain relief (79.2%), minimization of stiffness (78.1%) and restoration of normal mobility and function (71.9%) as the major benefits of physiotherapy treatment in people with TMD followed by relaxation (62.5%) and improvement in strength and coordination (55.2%).

The dentists in the study considered TENS (71%), therapeutic massage (58.1%), ultrasound (44.1%) and cryo-therapy (29%) as the four most common physiotherapeutic treatment options used for relieving pain in people with TMD. Also, active exercises of the jaw (79.6%), relaxation exercises (65.6%), manual therapy (53.8%) and ultrasound (26.9) as the four most common physiotherapeutic treatment options used for restoring the joint mobility and function. It was also found that the dentists considered therapeutic massage (71.7%) as the most effective treatment option in

training muscle relaxation in people with TMD. Range of motion exercises (76.6%), manual therapy (63.8%) and stretching (60.6%) were considered to be the four most common treatment options used for minimizing stiffness in people with TMD.

In figure 1 and 2, it is observed that (89%) of the dentists considered physiotherapy as a treatment option for TMD while (11%) did not. Also, (51%) of the dentists never referred people with TMD to physiotherapists. The reason for not referring the patient with TMD to physiotherapists can be seen in figure 3, where it was found that (55.6%) of the subjects do not know the benefits of what physiotherapy can offer, while (20.4%) think that other options are better, (11.1%) do not consider physiotherapy as effective for the treatment of TMD. (49%) of the dentists referred their people with TMD to physiotherapists. The reason for referring people with TMD to physiotherapists can be seen in figure 4, where it was found that (64.4%) of the dentists refer people with TMD to physiotherapists for limited mouth movements and masticatory muscle tenderness, (52.5%) for local pain at the joint, (33.9%) for postural alteration (forward head) and (3.4%) because of non-effective conservative treatment and referred pain.

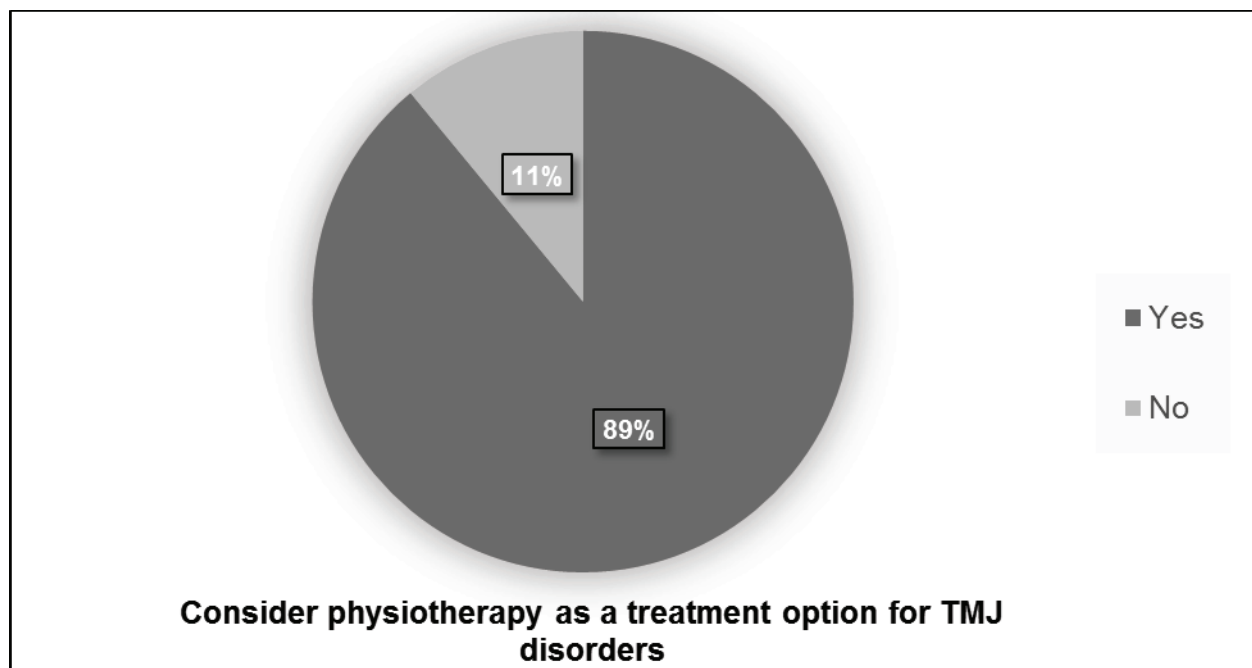


Fig-1: Consideration of physiotherapy as a treatment option for TMD.

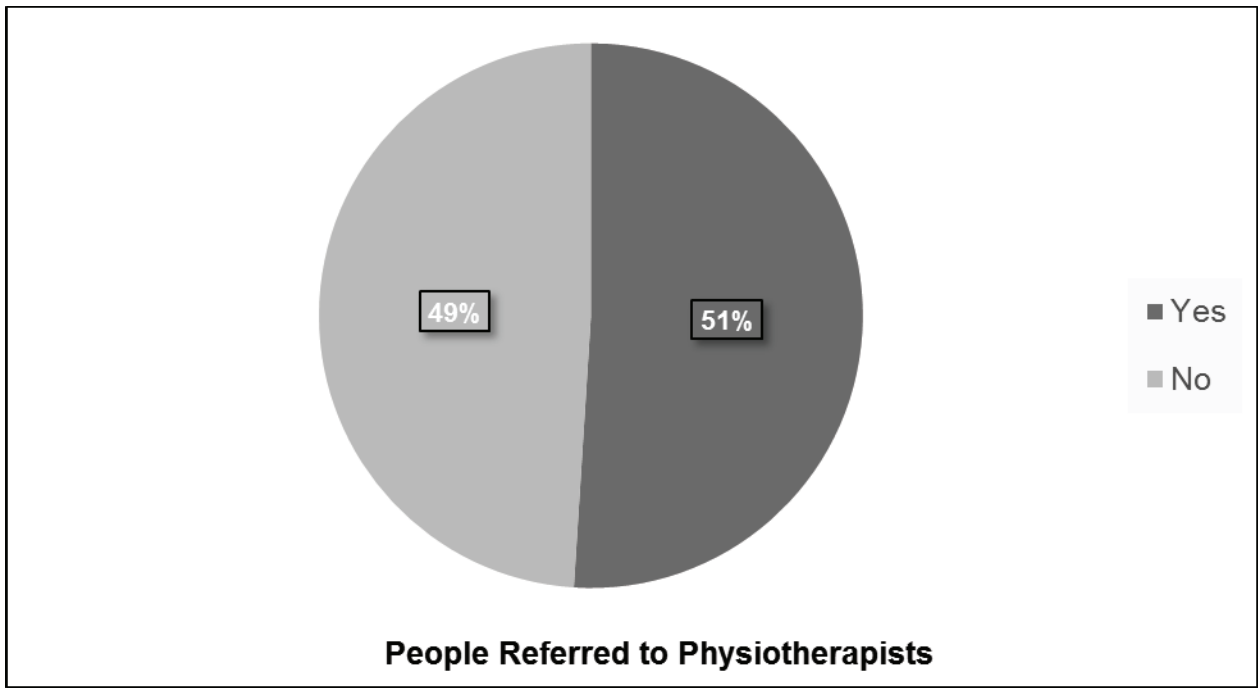


Fig-2: Percentage of people with TMD referred to physiotherapists.

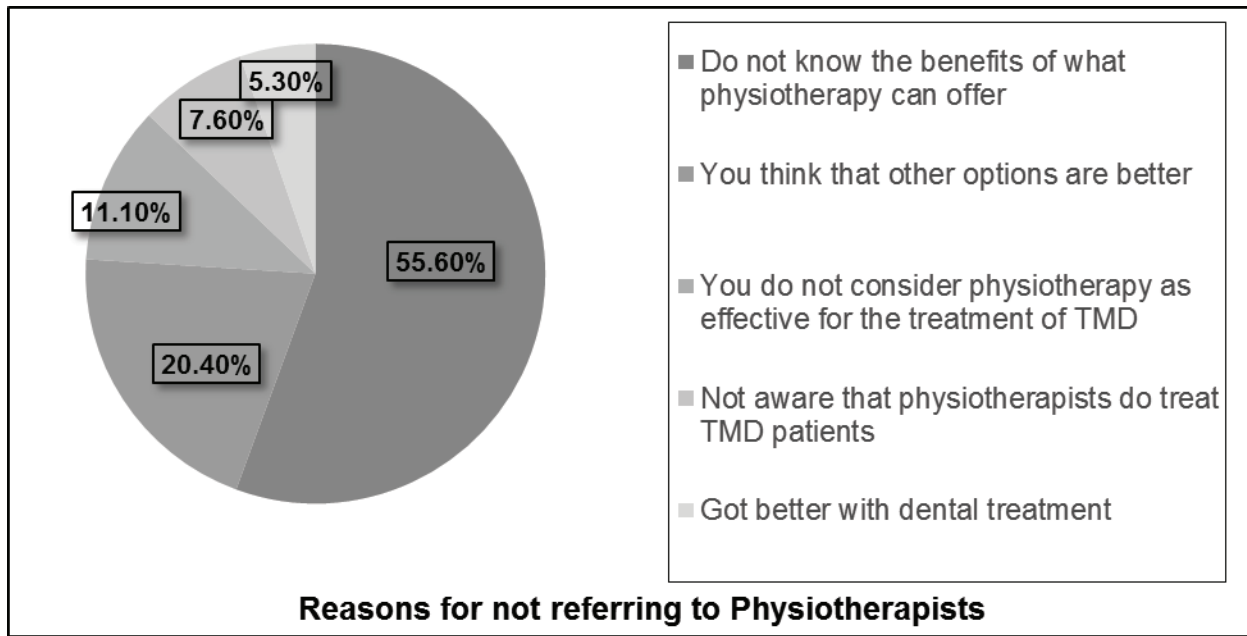


Fig-3: Reasons for not referring the people with TMD to physiotherapists.

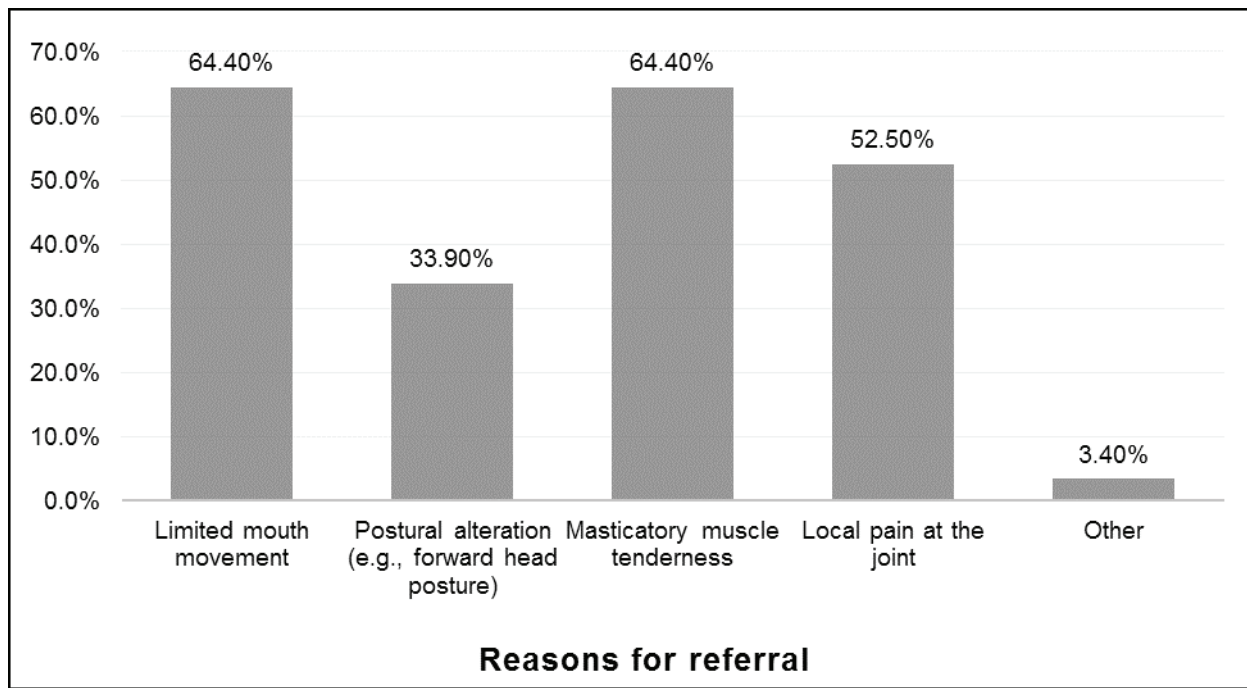


Fig-4: Reasons for referring the people with TMD to physiotherapists.

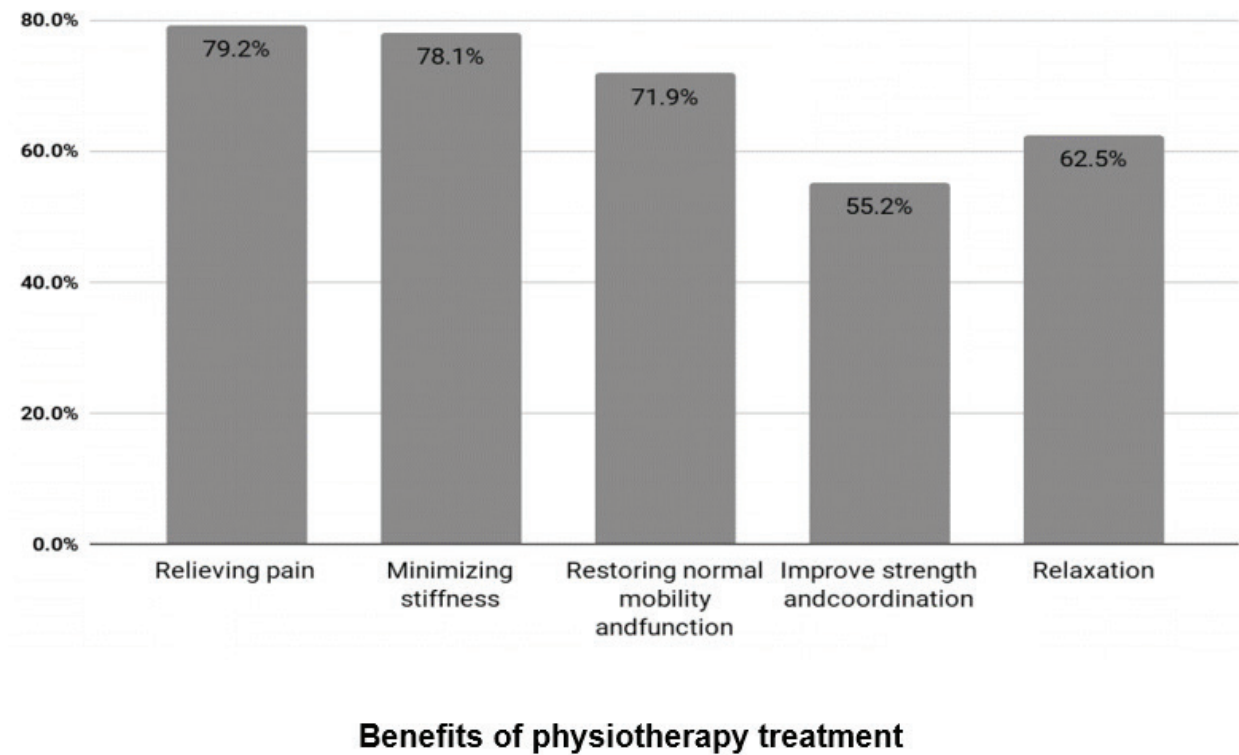
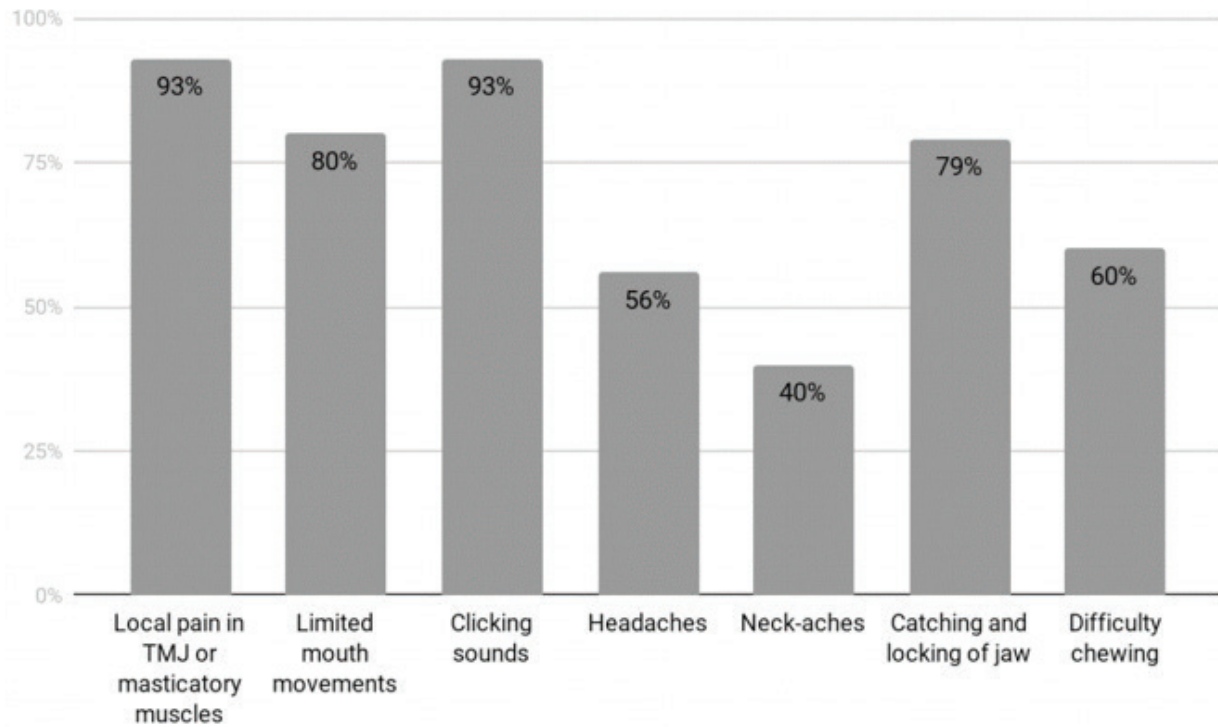


Fig-5: Benefits of physiotherapy treatment in people with TMD



Complaints to Dentists

Fig-6: Symptoms people with TMD complaints to dentists.

Discussion

The study aimed at finding out the awareness of physiotherapy management of TMD amongst dentists. As seen in figures 1 and 2; 89% dentists consider physiotherapy as a treatment option for TMJ disorders while only 49% out of the total sample referred people with TMD to physiotherapists. According to the study's results it was seen that the dentists were aware of the role of physiotherapy in TMJ disorders, but the main hurdle was patient referral towards physiotherapy. A lack of dentists' awareness about the benefits of PT for the treatment of people with TMD may contribute to less patient referral and collaboration with PT. In fact, the most common reason for not referring a patient PTs was the lack of awareness of the benefits a PT can offer. According to Inae. C. Gadotti et al one of the possible reasons for the low rate of referral of people with TMD to PTs was the lack of available PTs with expertise in treating TMD because not all PTs are trained and confident about providing care to people with TMD. [30]

As seen in figure 3; only 7.6% of the dentists were not aware that physiotherapists do treat people with TMD. A study done in Florida by Inae. C. Gadotti et al found that prior to the survey 41% of the dentists were not aware that physiotherapists can treat people with TMD [30] and another study done in Lahore by Fariha Shah et al it was found that 65% dentists did not consider physiotherapy as a treatment option for TMD, while 27% considered that it may be a treatment option. [29] This shows that the dentists in Mumbai and Navi Mumbai were comparatively more aware than the dentists in Florida and Lahore. This could be because, information on the role of PT in TMD treatment is a part of seminars and lectures in the curriculum of Dentistry Programs to inform them on the importance of interdisciplinary treatment of people with TMD and most of our sample (72%) have been practicing dentistry for 5+ years. The dentists in our study had greater years of practice and greater work experience hence leading to an increase in knowledge and awareness of the role of physiotherapy in

people with TMD.

The study also aimed at finding out the specific areas/aspects of physiotherapy management in which the awareness is lacking. As seen in figure 5; lesser number of dentists were aware that physiotherapy helps in improving strength and coordination as compared to other benefits of physiotherapy management like pain relief, relaxation, minimizing stiffness and restoration of normal mobility and function. A very low percentage of the dentists were aware of kinesio-taping, muscle energy technique and EMG biofeedback being used to treat people with TMJ disorders. A lack of awareness in these specific areas/ aspects of physiotherapy management would be the possible reason for the low rate of referral of people with TMD to physiotherapists.

As seen in figure 6; the most common complaints of people with TMD to dentists were pain at TMJ and masticatory muscles followed by crepitus/clicking as the second most common complaint. The results of our study were consistent with Fariha Shah et al a descriptive cross sectional survey (n=100) where they found that, pain was present during eating and yawning (52%) followed by crepitus/clicking (30.0%) as the second most common complaint.^[29]

A study done in Texas by Wright. E et al found that people with TMD and concurrent cervical pain exhibit a complex symptomatic behaviour that is more challenging than isolated TMD symptoms. Although routinely managed by medical and dental practitioners, TMD may be more effectively cared for when physical therapists are involved in the treatment process. Hence, a listing of situations when practitioners should consider referring TMD patients to a physical therapist can be provided to the practitioners in each physical therapist's region TMD patients will have better treatment outcomes if both dentists and PTs work together.^[31] In a randomized control trial, patients who received a combination of dental splint therapy with PT had greater gains in mouth range of motion than splint therapy alone^[32]. Thus, there is a need to create awareness regarding the role of physiotherapy in the treatment of TMD among dentists. Increased awareness will lead to an increase in collaboration. Better treatment outcomes can be expected if people with TMD are managed using a multidisciplinary approach.

Conclusion

Based on the results of our study it can be concluded that even when a large percentage of dentists that completed the survey were aware of the benefits of PT in treating people with TMD, the rate of referral was low. Therefore, there is a need to educate the dentists about the role of physiotherapy in treating people with TMD, to encourage them to refer their people with TMD to physiotherapists. On the other hand, PTs also need to collaborate with dentists while treating people with TMD.

Most of the dentists surveyed were interested to know more about the benefits of the collaboration with PTs to treat people with TMD. This is important as the increased awareness of dentists about the importance of physical therapy may lead to an increase in collaboration between the dentists and PTs and better treatment outcomes.

Recommendations

There is a need to increase the awareness of the role of physiotherapy in TMJ disorders and the benefits from the multidisciplinary approach with PT among dentists which can be increased with the help of educational programs aimed at highlighting the physiotherapy management aspects of TMD.

Ethical Approval: D.Y. Patil University, School of physiotherapy Ethical committee.

Source of Funding: None.

Conflict of Interest: Nil.

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Profile of Ear Nose Throat and Head Neck Inpatient Care Undergoing Shortwave Diathermy in a Tertiary Care Centre of Punjab -A 3.5 Year Study

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Abstract

Background: Short wave diathermy acts as magic potion in many Otorhinolaryngology and head neck pathologies where either conservative therapeutic modality or surgical intervention has been undertaken. The profile of subjects who underwent short wave diathermy in a 3.5 year period is included.

Materials and Methods: 101 subjects undergoing short wave diathermy in the Otorhinolaryngology and Physiotherapy services of a tertiary care centre of Punjab were analyzed during a period of 3.5 years. The subjects were analyzed for their demographic profile ,gender profile and seasonal variation over 3.5 years .

Results: Maximum patients 55.44%(56 patients) underwent shortwave diathermy were in the middle age group (21-60 years). Males 52.47% (53 patients) outnumbered the females 47.52% (48 patients) who underwent shortwave diathermy. In the age group 21-60 years, there were maximum females 57.14%(32 patients) where the male patients were comparatively less i.e. 42.85% (24 patients). Most significant difference was seen in above 60 age group where males 73.91%(17patients) outnumbered females 26.08%(6 patients).

Conclusion: Short wave diathermy is an effective pain therapy for inflammations of ear,nasal cavity and maxillofacial region , it reduces the dose and duration of adjuvant oral analgesics.

Keywords : Shortwave diathermy, Oto-rhino-laryngology, head neck, age, gender.

Introduction

Neuropeptide release resulting in nociceptive impulses following tissue injury cause pain and inflammation.¹ Diathermies, incorporate ultrasound, shortwave, and microwave. Short-wave diathermy (SWD) is an electrotherapeutic modality with high-frequency electromagnetic energy to generate heat used in the conservative treatment of various otorhinolaryngology and head and neck pathologies like otitis media, otitis externa , chronic wounds, pre and post surgical interventions in dental ,maxillofacial infections to reduce pain and edema.³

The use of non-ionizing radiation from the radio frequency portion of the electromagnetic spectrum to produce heat for pain relief started in 1890 .²Most frequently used radio frequency is 27.12 MHz with power of 44 watts for 20 minutes .⁴

Continuous shortwave diathermy helps to relieve pain and resolve inflammation by promoting vasodilation,altering vascular smooth muscle tone and the contractility of the endothelial cells and decreasing the nociceptive substances .⁵

Shortwave diathermy is known to increase pain thresholdby direct action of heat upon free nerve

endings or on the nerve trunk that supplies the affected area mostly during post incision and drainage masseteric space abscess, healing post extraction sockets, temporomandibular joint disorders, otitis externa, middle ear infections⁶.

Aim of Study

To study the demographic profile of ENTHNS subjects undergoing shortwave diathermy.

Material and Methods

101 subjects undergoing short wave diathermy in the Otorhinolaryngology and Physiotherapy services of a tertiary care centre of Punjab were analyzed during a period of five years (Jan 2017-July 2020).

The size and gender of the patients was recorded from the records.

The retrospective study included analysis of the age, gender of short wave diathermy.

Inclusion Criteria

1. Otitis Externa
 2. Benign Necrotizing Otitis Externa
 3. Pre and post surgical interventions
- Ludwig's angina

- Cervical abscesses

Exclusion Criteria

1. Malignancies of ENT and head neck region
2. Post radiotherapy patients

Statistical Analysis

All statistical calculations were done using Statistical Package of Social Sciences (SPSS) 17 version statistical program for Microsoft Windows (SPSS Inc. Released 2008. SPSS statistic for windows, version 17.0, Chicago). Ethical approval of the study was taken from the Institutional Ethics Committee.

Results/Observations

Total of 101 admitted patients over a period of 3.5 years (January 2017 to July 2020) underwent the short wave diathermy. Inpatient census of shortwave diathermy in ENTHNs patients of variou

Maximum admitted patients 55.44% (56 patients) who underwent shortwave diathermy were in the middle age group (21-60 years) and minimum 8.91% (9 patients) were below 14 years of age.

Males 52.47% (53 patients) outnumbered the females 47.52% (48 patients) who underwent shortwave diathermy.

Table 1 -Gender distribution according to age groups of patients undergoing diathermy

Gender/Age groups	<14	14-20	21-60	>60
Males	5	7	24	17
Females	4	6	32	6

Male outnumbered the females in all age groups except the 21-60 age group. In the age group 21-60 years, there were maximum females 57.14% (32 patients) where the male patients were comparatively less i.e. 42.85% (24 patients). Most significant difference was seen in above 60 age group where males 73.91% (17 patients) outnumbered females 26.08% (6 patients).

Table 2- seasonal variation among the Ipd patients of les than 14 years age

MONTH	2017		2018		2019		2020		TOTAL
	M	F	M	F	M	F	M	F	
JANUARY	1	0	0	0	0	0	0	0	1
FEBRUARY	0	0	0	0	0	1	1	0	2
MARCH	0	0	0	0	0	0	0	0	0
APRIL	0	0	1	0	0	0	0	0	1
MAY	0	0	0	0	0	0	0	0	0
JUNE	0	0	0	0	0	0	0	0	0
JULY	0	0	0	0	1	1	0	0	2
AUGUST	1	0	0	1	0	0	0	0	2
SEPTEMBER	0	0	0	0	0	1	0	0	1
OCTOBER	0	0	0	0	0	0	0	0	0
NOVEMBER	0	0	0	0	0	0	0	0	0
DECEMBER	0	0	0	0	0	0	0	0	0

Mostly the patients were seen during July and august among paediatric population .

Table 3- seasonal variation among adolescent 14-20 years

MONTH	2017		2018		2019		2020		TOTAL
	M	F	M	F	M	F	M	F	
JANUARY	0	0	0	0	0	0	0	0	0
FEBRUARY	0	0	0	1	0	0	1	0	2
MARCH	0	0	0	0	0	2	0	0	2
APRIL	0	0	1	0	0	1	0	0	2
MAY	0	0	0	0	1	0	0	0	1
JUNE	0	0	0	0	0	0	0	0	0
JULY	0	0	0	0	0	0	0	0	0
AUGUST	2	0	0	0	1	0	0	0	3
SEPTEMBER	0	0	0	1	1	0	0	0	2
OCTOBER	0	0	0	1	0	0	0	0	1
NOVEMBER	0	0	0	0	0	0	0	0	0
DECEMBER	0	0	0	0	0	0	0	0	0

The maximum admitted patients undergoing short wave diathermy were seen during the month of August followed by February march April September over a period of 3.5 years .

Table 4-seasonal variation among middle age 21-60 years Ent patients

MONTH	2017		2018		2019		2020		TOTAL
	M	F	M	F	M	F	M	F	
JANUARY	0	0	0	1	2	1	0	1	5
FEBRUARY	0	0	0	0	0	0	0	0	0
MARCH	0	0	0	0	1	1	0	2	4
APRIL	1	1	1	1	1	0	0	0	5
MAY	0	3	0	0	1	2	0	0	6
JUNE	0	1	0	1	0	2	0	0	4
JULY	0	1	2	0	3	1	0	2	9
AUGUST	0	1	1	2	3	1	0	0	8
SEPTEMBER	1	4	0	0	2	0	0	0	7
OCTOBER	0	0	1	0	0	0	0	0	1
NOVEMBER	1	0	0	1	2	0	0	0	4
DECEMBER	0	1	1	1	0	0	0	0	3

Maximum patients were seen in the month of July over a period of 3.5 years followed by August among middle aged population .

Table 5- seasonal variation among elderly >60 years population

MONTH	2017		2018		2019		2020		TOTAL
	M	F	M	F	M	F	M	F	
JANUARY	0	0	0	0	0	0	2	0	2
FEBRUARY	0	0	0	0	0	1	1	2	4
MARCH	0	0	0	0	0	0	0	0	0
APRIL	1	0	0	0	0	0	0	0	1
MAY	1	0	0	0	0	0	0	0	1
JUNE	0	0	1	1	2	0	0	0	4
JULY	1	1	0	0	1	0	0	0	3
AUGUST	0	0	0	0	0	0	0	0	0
SEPTEMBER	1	0	0	0	2	0	0	0	3
OCTOBER	0	0	0	0	0	0	0	0	0
NOVEMBER	1	0	1	0	2	0	0	0	4
DECEMBER	0	0	0	1	0	0	0	0	1

Among elderly admitted population most of the patients were seen during months of June ,november ,February followed by July ,august .

Discussion

Diathermy is an effective thermotherapeutic agent in inflammatory diseases of ear ,nose and throat .Hollinder described the short wave diathermy to be more effective

as compared with the then available methods of conveying external heat to the body .

Total of 101 patients admitted under otorhinolaryngology and head and neck surgery department over a period of 3.5 years (January 2017 to July 2020) underwent the short wave diathermy

Maximum admitted patients 55.44%(56 patients)

who underwent shortwave diathermy were in the middle age group (21-60 years) and minimum 8.91% (9 patients) were below 14 years of age.

Kalerkar S et al study on short wave diathermy reported mean age of patients to be 22.65 ± 1.85 years .

Male outnumbered the females in all age groups except the 21-60 age group. In the age group 21-60 years, there were maximum females 57.14%(32 patients) where the male patients were comparatively less i.e. 42.85% (24 patients).

30 subjects between 18- 50 years age were analyzed for the effect of short wave diathermy in the study by Anand B Heggannavar et al with female preponderance.

In our study Most significant difference was seen in above 60 age group where males 73.91%(17patients) outnumbered females 26.08%(6 patients).This is attributed to the fact that most the admitted elderly patients were diabetics having malignant otitis externa which shows male predilection.

The maximum admitted patients undergoing short wave diathermy were seen during the month of August followed by February march April September over a period of 3.5 years.

Among elderly admitted population most of the patients were seen throughout the year (i.e.during months of June ,november ,February followed by July ,august).

Conclusion

Short wave diathermy is an effective pain therapy for inflammations of ear,nasal cavity and maxillofacial region , it reduces the dose and duration of adjuvant oral analgesics.

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Conflict of Interest: None declared

Ethical Approval: The study was approved by the Institutional Ethics Committee.

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Neck and Upper Extremity Discomfort and Its Relationship with Extent of Computer Usage among University Students

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Abstract

Introduction: Technology has played a crucial role in transforming the lives of an individual. The use of technology has increased steeply among students. With an abrupt increase in the computer users in a period of two decades, the musculoskeletal discomfort has risen sharply.

Methods: The present study was observational one comprising 107 students in the age group of 20-35 years. After taking informed consent, a self structured questionnaire along with Neck disability index and the disabilities of arm, shoulder and hand scale were used to conduct the study. The data was analyzed using Microsoft excel 2007 percentile and coefficient of correlation with significant value $p < 0.05$.

Result: The prevalence of neck and upper extremity discomfort was 89.71% among the computer users. Out of this 88.78% subjects complained shoulder discomfort, 14.95% had elbow discomfort and 28.97% had hand/wrist discomfort. Statistically there was no significant relationship of neck disability with hours of working per day ($r = 0.01$, $p = 0.89$), hours of work last week on typical day ($r = -0.08$, $p = 0.35$) and break time ($r = 0.14$, $p = 0.13$). A statistically non significant relationship was observed for DASH with hours of working per day ($r = 0.03$, $p = 0.69$), hours of work last week on typical day ($r = -0.11$, $p = 0.25$) and break time ($r = -0.07$, $p = 0.42$).

Conclusion: Prevalence of shoulder discomfort was seen more than elbow and hand/wrist among students.

Key Words: Neck discomfort, upper extremity discomfort, computer, university students

Introduction

Musculoskeletal disorders related to computer usage are affecting million of computer workers^[1]. In the recent decades with the development of information technology the working life has changed rapidly, where more than half of Population is using their personal

computer for work. Additionally, over the years the spending time on computers has increased drastically^[2]. Occupation related musculoskeletal disorder causes muscles, tendons and nerves at the joints of the neck, shoulder, elbow, wrist, finger, back, legs etc. to be strained and traumatized due to extreme or recurring exertive force, uncomfortable body position, a lesser amount of resting time, wintry working environment, trembling so on. Symptoms comprises of tenderness, aches and pains, tingling, stiffness and swelling^[3].

The risk factors for musculoskeletal pains are usage of computer daily for a prolonged period of time, more workload, higher mental stress and lack of support on workplace. Remaining the head and neck in a crooked

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situation and keeping the head and neck in this position for prolonged hours are significantly correlated with neck pain^[4]. Elevated physical perceived exertion and less perceived ease should be regarded as self-determining risk factors for prospect neck and upper extremity symptoms^[5].

Worldwide, 15 - 25% is the prevalence of work related musculoskeletal symptoms among the all computer users. In India, 76% computer professionals reported about musculoskeletal pain and discomfort. In India, the prevalence rate of musculoskeletal complaints in Delhi is 76.5%, In Mumbai 63%, In Loni 73.3% and four metropolitan cities is 59%^[6].

It has become mandatory for the health professional to understand the factors related to it, such as extent of computer usage, posture, type computer of PC etc. so that the young people could be educated regarding its prevention. Therefore present study is designed to investigate the musculoskeletal discomfort among the young computer users and determine its relationship with the factor like extent of computer usage.

Materials and Methods:

Research design: observational study.

Sample size: The sample comprised of N=107 university students.

Inclusion criteria: Both males and females between age group of 20-35years were included, who were computer users.

Exclusion criteria:

1. Congenital deformities of spine and upper extremities.

2. Trauma of the neck and upper limb.

3. Recent surgery of spine and/or upper limb.

4. Any Neurological disorder.

Methodology

The study was conducted at Punjabi university over a period of 2 years from 2017 to 2019. The university students who were computer users were selected from the Punjabi university campus on the basis of inclusion and exclusion criteria. After explaining the purpose and nature of the study a written consent was obtained from the subjects. A total of 107 subjects were screened for the study using the convenient random sampling method. The participants were provided with three self administered questionnaire (self structured questionnaires, neck disability index, disabilities of arm, shoulder and hand scale). The participants were asked to fill out the information asked in the questionnaires and return it to the investigator. The Data was analyzed using Microsoft excel 2007. Percentile and coefficient of correlation analysis was done to analysis the results. The criteria of statistical significance were set at $p \leq 0.05$.

Results

Neck and upper extremity discomfort

The large proportion of the computer users in the studied population reported (89.71%) musculoskeletal discomfort. Out of this 88.78% participants complained discomfort in the shoulder/neck area, where as 14.95% reported elbow discomfort and 28.97% had a hand/wrist discomfort. In context to the type and frequency of discomfort 44.85% of the participants suffered from stiffness, 36.44% from pain, 17.75% from numbness and only 3.73% were suffered from soreness symptoms. The frequency of the symptoms was reported to be once or twice a day by 59.81% participants. However 6.54% participants the frequency of symptoms was constant.

Table 1. Neck and upper extremity discomfort

Feelings of discomfort/pain in your neck, shoulder, arm, and/or hand after working on computer	
Yes	96 (89.71%)
No	11 (10.28%)
Type of discomfort	
Stiffness	48 (44.85%)
Numbness	19 (17.75%)
Pain	39 (36.44%)
Soreness	4 (3.73%)
Frequency of symptoms	
Never	11(10.28%)
Once or twice a day	64 (59.81%)
3-4 times a day	22 (20.56%)
More than 4 times a day	3 (2.80%)
Constant	7 (6.54%)
Areas of discomfort	
Hand/wrist	
Yes	31 (28.97%)
No	76 (71.02%)
Elbow	
Yes	16 (14.95%)
No	91 (85.04%)
Shoulder/neck	
Yes	95 (88.78%)
No	12 (11.21%)

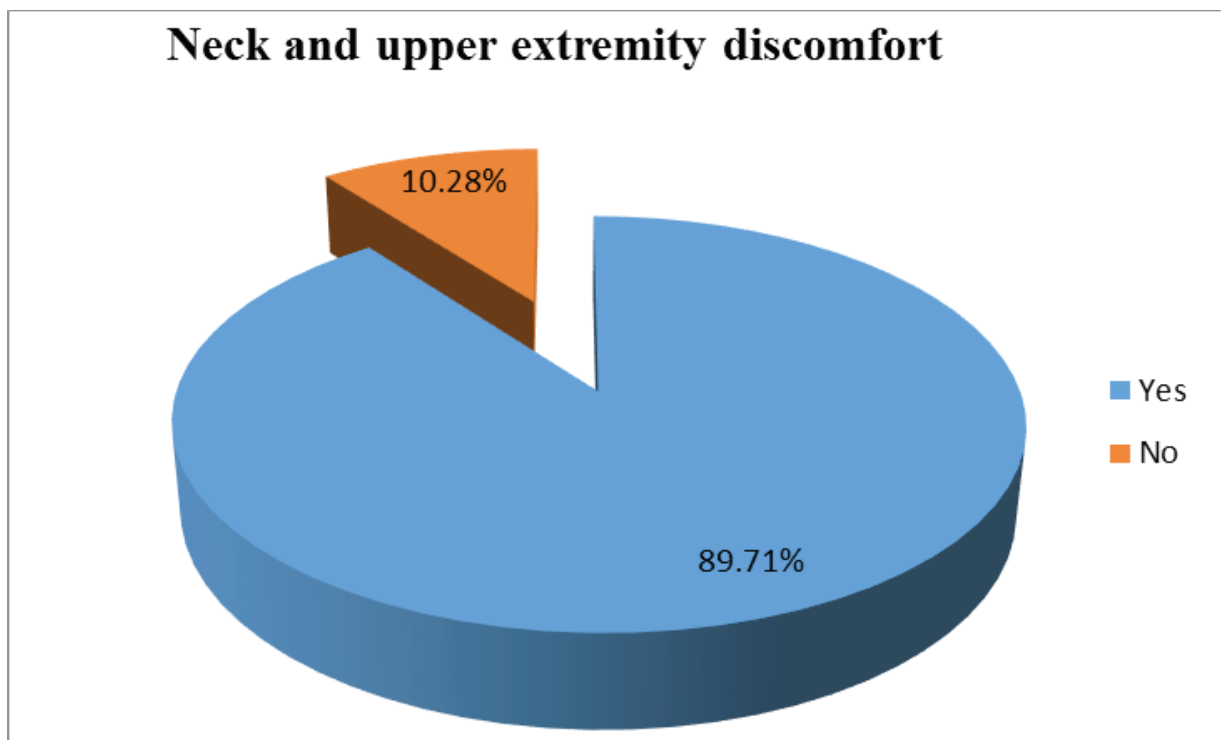


Figure 1: Percentage of Neck and upper extremity discomfort among university students

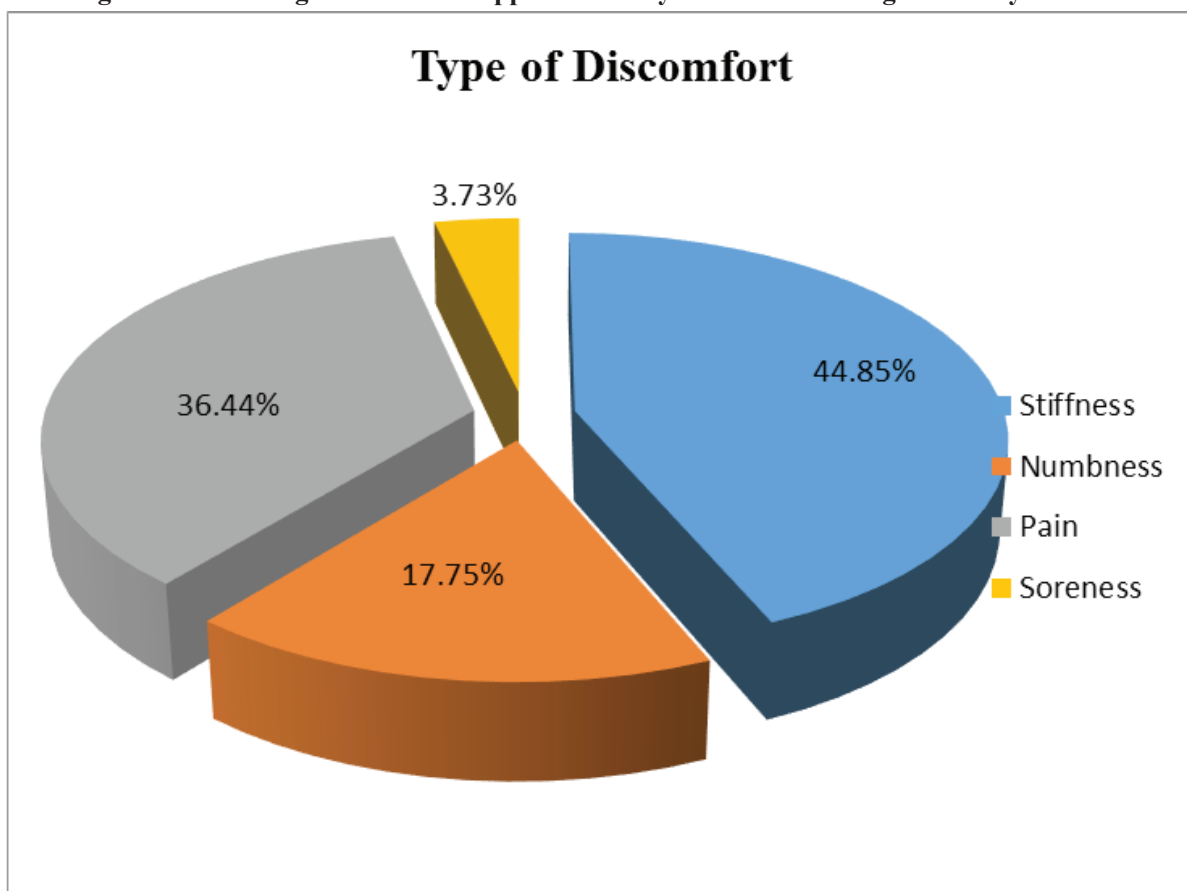


Figure 2: Percentage of type of discomfort among university students

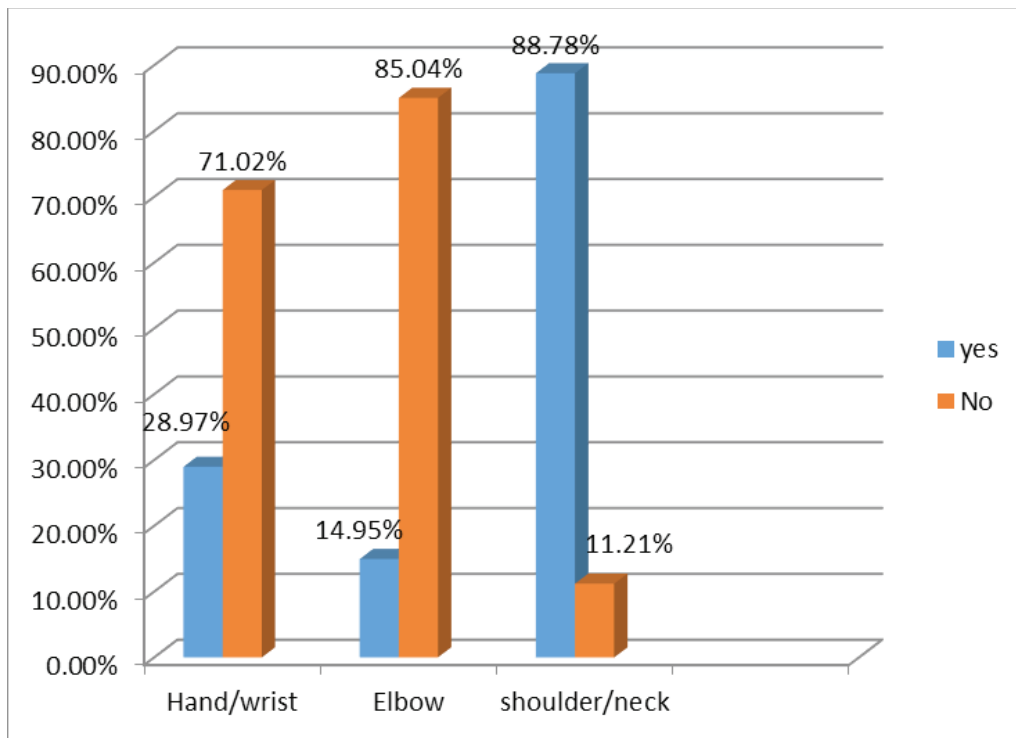


Figure 3: Percentage of areas of discomfort among university students

Extent of computer usage

31.77% participants used their computer for 2-4 hours per day, 26.16% for 4-6 hours per day, 24.29% for less than 2 hours per day, 13.08% for 6-8 hours per day and only 4.67% used their computer for more than 8 hours per day for work. On typical day in the last week 19.62% participants used their computer for 4-5 hours per day, 17.75% used for greater than 6 hours and

only 11.21% used their computer for less than 1 hour. 34.57% participants took break after more than 2 hours working on computer. 28.97% took break at least once an hour and 4.67% participants did not take break while working on computer. 15.88% participants spent more than 4 hours at computer without getting out of chair for a break more than 3 times each week, 19.62% spent 2-3 times each week and 30.84% never spent more than 4 hours at computer without getting out of chair for a break.

Table 2. Extent of computer usage

Extent of computer usage	Subjects (N%)
How many hours do you use computer per day for work	
Less than 2 hours/day	26 (24.29%)
2-4 hours/day	34 (31.77%)
4-6 hours/day	28 (26.16%)
6-8 hours/day	14 (13.08%)
More than 8 hours	5 (4.67%)

Cont... Table 2. Extent of computer usage

On typical day in the last week, how many hours have you used your computer	
Less than 1 hour	12 (11.21%)
1-2 hours	14 (13.08%)
2-3 hours	20 (18.69%)
3-4 hours	11 (10.28%)
4-5 hours	21 (19.62%)
5-6 hours	10 (9.34%)
Greater than 6 hours	19 (17.75)
How frequently do you take break during working on computer	
Never	5 (4.67%)
After more than 2 hours	37 (34.57%)
Once every 1-2 hours	27 (25.23%)
At least once an hours	31 (28.97%)
More than once an hour	7 (6.54%)
How regularly do you spend more than 4 hours at computer without getting out of chair for a break	
Never	33 (30.84%)
2-3 times each semester	11 (10.28%)
2-3 times each month	25 (23.36%)
2-3 times each week	21 (19.62%)
More than 3 times each week	17 (15.88%)

Neck disability index

In the current study 67.28% of the participant had mild to severe disability. Where nearly half (47.66%)

of the participants had mild neck disability, 16.82% had moderate neck disability and 2.80% had severe neck disability. Complete disability was not found in the neck.

Relationship of extent of computer usage with disability of neck and upper extremity

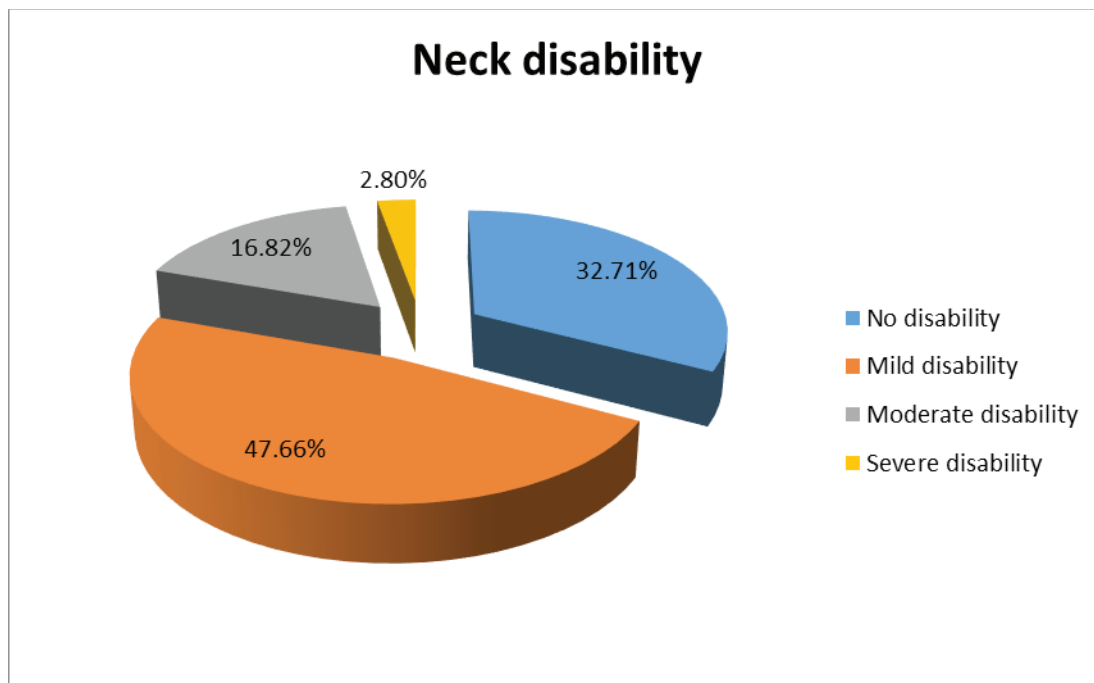


Figure 4: Percentage of neck disability among university students

Table 3. Relationship of neck disability with extent of computer usage

	r value	P value
Hours of working per day	0.012331	0.8997
Hours of work last week on typical day	-0.0899	0.3571
Break time	0.144615	0.1372

The relationship of neck disability with hours of working per day, hours of work last week and break time was studied. The observed values of r suggested a statistically there was no significant relationship of neck disability with hours of working per day ($r = 0.01, p = 0.89$), hours of work last week on typical day ($r = -0.08, p = 0.35$) and break time ($r = 0.14, p = 0.13$).

Table 4. Relationship of DASH with extent of computer usage

	r value	P value
Hours of working per day	0.038562	0.6933
Hours of work last week on typical day	-0.11005	0.2591
Break time	-0.07867	0.4206

The relationship of disabilities of arm, shoulder and hand with hours of working per day, hours of work last week and break time was studied. The observed values of r suggested a statistically there was no significant relationship of DASH with hours of working per day ($r = 0.03, p = 0.69$), hours of work last week on typical day ($r = -0.11, p = 0.25$) and break time ($r = -0.07, p = 0.42$).

Discussion: In this study the prevalence of musculoskeletal discomfort was similar to the other studies. Similar to the current study, Hough *et al.*^[7] concluded that 63.9% students were suffering from musculoskeletal symptoms (pain or numbness) in neck and wrist, 47.2% experienced stiffness in neck, 44.4% experienced neck muscle spasm and 12.7% female and 35.3% male experienced pain or numbness symptoms in the wrist.

Another study done by Mohanty *et al.*^[6] on risk factors responsible for musculoskeletal pain among computer operators suggested a prevalence rate of 76% for musculoskeletal pain among users.

Similarly a high prevalence of musculoskeletal disorders (83.5%) was reported in a study done by Moom *et al.*^[3] among bank office employees who were computer users in Punjab. Another study done by Eltayeb *et al.*^[8] reported that the 64% subjects suffered from neck symptoms, 32% from upper arm symptoms, 30% from hand symptoms, 29% from wrist symptoms, 29% from lower arm symptoms and 19% from elbow symptoms.

The study done by Schlossberg *et al.*^[9] concluded that the prevalence rate of neck or upper extremity pain was 60% among computer user students.

Similar to the current study, study done by Johnston *et al.*^[10] also investigated neck disability among the office workers using computer. They reported that 53% office workers were affected from mild neck disability, 14% from moderate neck disability, 1% from severe neck disability and 32% workers had nil disability.

Study done by Ijmker *et al.*^[11] investigated the relationship between the duration of computer usage and musculoskeletal symptoms. The study concluded that the arm-wrist-hand symptoms were positively associated with duration of computer usage those who use the computer for more than 4 hours per day and neck shoulder symptoms were seen among those who use mouse for more than 4 hours per day. But the outcomes of the study did not show a statistically relationship with the duration of computer usage.

Conclusion

A high proportion of university students/computer users reported musculoskeletal problems and disability in the study. The study concludes that a mass awareness regarding the proper ergonomics of computer usage is need of the hours. Therefore, mass awareness programs, seminars or educational camps are required to be carried out for the students so that they could be guided regarding the proper ergonomics and exercises.

Conflict of Interest – Nil

Source of Funding – Self

Ethical Clearance – Taken from Ethical committee, Punjabi University, Patiala

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Comparative Study to Find out the Effectiveness of Core Strengthening Training (Pilates) versus Plyometric training to Promote Dynamic Balance and Agility in Elite Indian Badminton Players

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Abstract

The ability to change direction and position of the body quickly and effectively while maintaining postural stability and orientation are important in badminton sports. There is also harmony related to skill and plan achievement during dynamic balance and agility. Purpose: The purpose of the study to ascertain the effects of core strengthening training (Pilates) versus Plyometric training in promoting dynamic balance and agility in elite Indian badminton players. Study design: Quasi experimental design. Methodology: 34 subjects who met the inclusion and exclusion criteria were allotted to the study. General Assessment Proforma like AGE, HEIGHT, WEIGHT, LEVEL OF COMPETITION, HOURS OF PRACTICE, MEDICAL AND SURGICAL HISTORY, AND LIMB LENGTH MEASUREMENTS (ASIS TO MEDIAL MALLEOLUS) are collected from each players. The subjects were divided into two equal groups. Group A was given CST (Pilates) and Group B Plyometric training. Outcome measures were taken before and after the program schedule of 2 sessions alternately in 1 week for 6 week. Outcome measures: Star Excursion Balance Test (SEBT), Core Muscle Endurance Test (CMET), Illinois Agility Test (IAT). Results:- In Group A (Pilates) and Group B (Plyometric), all data was expressed as mean \pm SD and was statistically analyzed by using paired t-test and unpaired t-test to determine the statistical difference among the parameters at 0.05% level of significance. Statistical data of SEBT, CMET, and IAT in badminton players shows that, there was no significant difference between the groups, but both were individually effective with $p < 0.05$ i.e 95% of significant. Conclusion:-In this study, we concluded that both the groups were equally effective in promoting dynamic balance, core endurance and agility in elite Indian badminton players, no, one treatment program is proved to be superior than the other statistically.

Keywords:- Badminton player, Elite, Core endurance, Pilates training, Plyometric training.

Introduction

Badminton is one of the most popular racquet sports in the world.¹ The game of badminton is characterized by repetitive actions of short during which high speed and intensity within an 80 m² court.^{1,2} Badminton requires quick changes in direction, jumps, forward lunges, rapid arm movements and a wide variety of postural positions.² Therefore, badminton players need good balance and agility during rapid postural actions around court.

It was found that agility was associated with performance ($r = 0.83$) during badminton games. Badminton has been considered to be a quite safe sport. Although badminton is a non- contact sport, previous studies have reported that badminton injuries constituted 1%-5% of all sports injuries.³ Repeated rapid forward lunges during a badminton match created high stress loads especially on Achilles and patellar tendons in the dominant leg.⁴ Report was made that the majority of the badminton injuries (63.1%) occurred in lower

extremities such as the knee (37.1%), ankle (28.3%), thigh (13.2%), heel (11.2%), toes (5.7%), and others (4.4%).⁵

Badminton requires a specific physical conditioning in terms of motor and action controls; coordinative variables such as reaction time, foot stepping and static or dynamic balance, which are essential motor demands in this sport. Therefore, badminton players need enough strength and a high level of dynamic balance during the rapid postural movements around the court.⁶

The core has been described as a muscular corset with the abdominals in the front, erector spinae and gluteus in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature in the bottom, broad benefits of core strength have been touted from improving athletic performance. The core is particularly important in sports because it provides “proximal stability for distal mobility”.⁷ The core muscles stabilize the spine and trunk during movements of lower and upper extremities such as jumping, running, and throwing. Previous studies revealed that trunk muscle fatigue led to decreased dynamic stability of the trunk and loss of balance control suggested that knee pain affected trunk and knee motions during forehand lunges, and training programs for badminton players with knee pain should include core strength exercises.⁸ The CST may help to enhance dynamic balance, flexibility and muscle coordination between lower and upper extremities, as well as lessen injury risk and muscle imbalances.

Joseph Pilates had evolve a unique system of hooking springs and straps in hospital beds to help disabled and immobilized patients regain strength and movement in order to counteract the deleterious effects of deconditioning after World War I, which was later going to be called Pilates.⁹ With his development of the “universal reformer” the importance of training the core abdominal and lower back muscles to stabilize the torso and allow the whole body to move freely was recognized.¹⁰ It focuses on improving strength, core stability, flexibility, muscle control, posture, and breathing.¹¹ Pilates aims to improve coordination and control of the core muscles of the trunk, which contribute to the optimal lumbar pelvic stabilization needed for daily activities and function.¹² A recent systematic review of 16 studies concluded that Pilates can improve

dynamic balance in healthy populations.¹³

Plyometric are used by athletes as a training techniques in all types of sports to increase strength and explosiveness.¹⁴ Plyometric consists of a rapid stretching of a muscle (eccentric action) immediately followed by a concentric or shortening action of the same muscle and connective tissue.¹⁵ The stored elastic energy within the muscle is used to produce more force than can be provided by a concentric action alone.¹⁶ Researchers have shown that plyometric training, when used with a periodized strength-training program, can contribute to improvements in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness, and overall proprioception.¹⁷ Plyometric drills usually involve stopping, starting, and changing directions in an explosive manner. These movements are components that can assist in developing agility.¹⁸

The power output during exercises is determined by the availability of Creatine phosphate (CP). Therefore during intermittent sport the ability to re-synthesis of the CP will affect an athlete’s ability to perform subsequent bouts of high intensity. So Plyometric and Pilates are the two forms of short duration and high intensity exercises which would train the muscles in the ability to re-synthesising the utilised CP and re-synthesising of ATP-CP system.¹⁹

Materials and Methods

34 subjects who fulfilled the inclusion and exclusion criteria signed as informed consent form approved by the institutional review board. Subjects i.e. 19-23 years of Elite Indian Badminton players both male and female were taken from Badminton Academies in and around Bengaluru. All subjects had at least 1 year of Badminton experience, no lower-extremity or lumbar spine pathology or surgery within 6 month earlier to the initial testing. Procedures: The study was approved by the ethical committee of The Oxford College of Physiotherapy. General Assessment Proforma are collected from each subject. Later the subjects were randomly allocated for Group A (Pilates) and Group B (Plyometric) with 17 in each group. Group A which received core strengthening training (Pilates) and Group B which received Plyometric training twice a week for 6 weeks in addition to their individual regularly scheduled training. All the subjects were tested to assess dynamic

balance with Star Excursion Balance Test (SEBT), agility with Illinois Agility Test (IAT) and core muscle endurance est

(CMET) before (pre-test) and after (post-test) the intervention of the exercise program.



Fig 1: Star Excursion Balance Test



Fig 2: Illinois Agility Test



Fig 3: Lft. Side Bridge Test (CMET)



Fig 4: Rt. Side Bridge Test (CMET)

Table 1:- Core strengthening training (Pilates) program.

Week	Exercises	Reps, hold time
1	Abdominal bracing, hollowing, Prone, supine, side bridge.	All the exercises will be held for 20 sec.
2	Quadruped alternate-arm leg raise, supine bridge exercise with alternate leg extension, seated marching on physioball, crossover crunch	20 reps.
3	Dead bug, Supine bridge on physioball, Prone bridge on physioball, Superman exercises.	20 reps Hold 20 sec Hold 20 sec Hold 2 sec/20 reps.

Cont... Table 1:- Core strengthening training (Pilates) program.

4	Medicine ball floor twist, Curl-up on physioball, Pelvic bridge alternating knee extension and shoulder flexion, Superman on physioball.	20 reps 20 reps 20 reps Hold 2 sec/20 reps.
5	Lunge with medicine ball twist, Abdominal rollout, Ball bridge with alternate knee extension.	20 reps 20 reps Hold 2 sec/20 reps.
6	Physioball lunge, Side bridge with shoulder abduction, Physioball alternate superman.	10 reps on each leg 15 reps on each side 20 reps.

Table 2:- Plyometric training program.

Week	Foot contacts	Plyometric drills	Sets, reps	Intensity
1	90	Side to side ankle hops, Standing jump and reach, Front cone hops Double leg and Lateral cone hops.	2/15	Low
2	120	Diagonal cone hops, Standing long jump with lateral sprint , Lateral jump single leg, Cone hops with 180° turn, Hexagon drill.	2/15	Low/Medium
3	120	Squat jump, Lateral squat jump, 90 squat jump, 180 squat jump, Split squat jump.	2/10	Medium
4	140	Single leg vertical jump, Single leg zig-zag hops, Jump over barrier Double leg zig- zag hops Lateral barrier hops.	2/10	Medium/Low
5	140	Linear hops , Lateral hops Kangaroo jumps, 90 rotation 180 rotation.	2/10	High
6	120	Single leg push off , Lateral push off, jump to box, Squat box jump Lateral box jump.	2/10	High

Findings

The data was carefully collected and calculated with alpha value was set as 0.05. In this study paired t-test, unpaired t-test were used as a statistical tool for detecting the significant difference within and between the GroupA (Pilates) and GroupB (Plyometric). Chi-square test was performed to find out the gender difference among both groups. Descriptive statistics (mean and standard deviation) were also calculated for all the measurements considered for the study.

34 samples were collected for the study, out of which 18% were female and 82% were male. Age of the subjects for groupA is found to be 20.8±1.18 and for groupB is found to be 21±1.14 within the age range of 19-23 years. The pre and post test outcomes in Group A (Pilates) is shown in table 3 and for Group B (Plyometric) is shown in table 4. The parametric test for comparison

of dependent outcomes, the paired t- test was carried out and it was found to be significant at $p < 0.0001$ ($p < 0.05$) in both the groups individually. Unpaired t- test was carried out between the group, resulting outcome measures were more or similar in the pre test in both groups. The post test scores of SEBT, CMET and IAT were comparably similar in both Group-A (Pilates) and Group-B Plyometric; there were no significant differences.

The current study suggests that effect of 6 week of core strengthening training (Pilates) and Plyometric training is statistically significant individually in promoting dynamic balance, core muscle endurance and agility with $p > 0.05$ in elite Indian badminton players; therefore no program is supercilious than the other indicating p value more than 0.05.

Table 3:- Results of outcome measure in Group- A (Pilates)

OUTCOME MEASURES		RESULT
SEBT	ANT	9.510*
	PL	8.305*
	PM	8.503*
CMET	RSBT	16.08*
	LSBT	12.59*
	AFT	13.47*
	BET	13.60*
IAT		9.905*

Note:* denote- significant ($p < 0.05$)

Table 4:- Result of outcome measure in Group B (Plyometric).

OUTCOME MEASURES		RESULT
SEBT	ANT	15.25*
	PL	14.68*
	PM	17.98*
CMET	RSBT	15.34*
	LSBT	11.77*
	AFT	14.49*
	BET	13.22*
IAT		10.94*

NOTE: * denote- significant ($p < 0.05$)

Discussion

The purpose of this study was to compare the effect of core strengthening training (Pilates) and Plyometric training in improving dynamic balance and agility in elite Indian badminton players. 34 subjects were divided into two groups, Group A (Pilates)= 17 and Group B (Plyometric)=17 subjects who underwent for 6 week of training program with 2 sessions per week to predict the outcome measure/variables i.e. dynamic balance (SEBT), core muscle endurance (CMET) and agility (IAT).

Tarik Ozmen et al. (2015)²⁰ investigated the effectiveness of core strength training on dynamic balance and agility in 20 adolescent badminton players. The results indicated that a six week of CST led to significant increase in CMET and SEBT (A, PL, PM) but less or no significant increase in agility. This study shows Core strengthening training (Pilates) is effective in increasing players dynamic balance and agility which is constant in the current study.

RCT study was done in athlete's to determine if six weeks of Plyometric training can improve agility in 24 students divided into 2 groups; control group

and Plyometric group. The result of this study shows Plyometric training was effective in improving an athlete's agility Michael G. Miller 1, et al (2006)²¹. Pilates method offers exercises in various starting positions with multidimensional movements in which skeletal muscles are activated in a manner conducive not only to development of their strength but also endurance, flexibility and neuromuscular coordination. Therefore, this system, with appropriate supervision and adjustment of the degree of difficulty of the exercises to be performed without losing the flow of movement and dynamic stabilization of the deep muscles system appears to be appropriate in the eradication of unwanted muscle imbalance.

Athletes use the Plyometric concept as part of functional movement patterns and skill when performing the sport. Plyometric training utilizes the "STRETCH-SHORTENING CYCLE" (SSC) by using a lengthening movement (eccentric) which quickly followed by a shortening movement (concentric).

Sandipkumar Parekh et al. (2014)²² conducted a study on the effect of Plyometric versus Pilates exercises on the muscular ability and components of jumping to 30 college level volleyball players dividing them in two

groups. The result shows that both Group (A and B) were effective. The result of the adjacent study is consistent with the previously discussed research.

Therefore, it evidenced that thought both the groups i.e. Group A (Pilates) and Group B (Plyometric) were individually effective in promoting dynamic balance, core muscle endurance and agility but no treatment program is superior than the other.

Conclusion

Objective of the study was to find out the efficacy of core strengthening training (Pilates) and Plyometric to advocate dynamic balance and agility in elite Indian badminton players. This study unveil that that thought both the groups i.e. Group A (Pilates) and Group B (Plyometric) were individually effective in promoting dynamic balance, core muscle endurance and agility but as a comparison no one treatment program is proven to be surpassing the other statistically. Hence, the null hypothesis is accepted and an alternate hypothesis is rejected. Future studies should investigate effects of both the programs on performance during the rehabilitation period after injury and to prevent injuries in athletes.

Conflicts of Interest: Nil

Funding: Self

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Effectiveness of Therapeutic protocol for Physiotherapy Management of Adhesive Capsulitis

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Abstract

Background: Adhesive Capsulitis idiopathic painful restriction of Shoulder movement results in global restriction of the glenohumeral joint. It is affecting 2% to 3% of the general population and affects many functional activities like combing, lifting, pushing and pulling. Although Physiotherapy is often the first line of management, there are various treatments has found its effectiveness but yet to date its protocol of treatment has not been established. So, it is necessary to find effectiveness of specific Physiotherapy treatment protocol for Adhesive Capsulitis. The aim of this study was to find effectiveness of Therapeutic Protocol for Physiotherapy management of Adhesive Capsulitis.

Materials and Method: Experimental trial of 30 patients, diagnosed with primary Adhesive Capsulitis selected and divided into two groups. One group was given a Therapeutic Protocol based on review of literature and the other group was treated with Conventional Physiotherapy treatment for 4 Weeks. Pre and post treatment measurement of ROM, and SPADI Index were taken and statistical analysis was done. The two treatment strategies were compared, Group A showed better improvement in Abduction, IR ROM and Functional Score (SPADI) as compare to Group B which was treated with Conventional regular Physiotherapy Treatment. Improvement in Flexion, Extension and ER ROM was relatively less.

Conclusion: Therapeutic Protocol proved effective for management of Adhesive Capsulitis.

Keywords: *physiotherapy, adhesive capsulitis, treatment protocol, conventional treatment*

Introduction

The current definition of Adhesive Capsulitis is given by American Shoulder and Elbow Surgeons in 1995. A condition of uncertain etiology characterized by significant restriction of both active and passive shoulder motion that occurs in the absence of a known intrinsic shoulder disorder¹

In Adhesive Capsulitis, capsular extensibility is decreased, the axillary recess becomes adherent, and the flexibility of the biceps tendon in its sheath is reduced. As a result, the external rotation of the humeral head to pass under the acromion during abduction is severely restricted. Restoring this mechanism is the primary goal of various treatment strategies for Adhesive Capsulitis.² The incidence is 2% to 5%. It mainly affects the age of

40 to 70 years.^{3,4}

Adhesive Capsulitis is usually classified as primary or secondary. Patients are classified as having primary or idiopathic Adhesive Capsulitis if no findings on history or examination explain the onset of disease. These cases may be related to immunologic, biochemical, or hormonal imbalances. Adhesive Capsulitis develops from known causes of stiffness and immobility, such as previous shoulder trauma or surgery, and may represent an entirely different condition is known as secondary.⁵

Codman originally described a self-limited course of Adhesive Capsulitis, and many patients are treated with supervised neglect with analgesia, supervised physical therapy, and/or steroid injection.⁶ Oral corticosteroids can also be prescribed and have been shown to improve

pain, especially night pain.⁷ It is widely accepted that physical therapy and stretching should be used in the conservative management of Adhesive Capsulitis. Simple home exercise programs with analgesia have been shown to be effective, whereas other clinicians suggest more intensive supervised physical therapy.⁸ While many treatments have been employed in the management of Shoulder disorders, few have been proven to be effective in randomised controlled trials. Non-steroidal anti-inflammatory drugs, local anaesthetic and corticosteroid injections into the glenohumeral joint, calcitonin and antidepressants, distension arthrography, closed manipulation, physical therapy modalities and stretching exercises can be listed among the most common non-surgical approaches to treatment in Adhesive Capsulitis.⁹

Currently, no standard medical, surgical, or Physiotherapy regimen is universally accepted as the most efficacious treatment for restoring motion in patients with Shoulder Adhesive Capsulitis.^{10,11}

Recent evidence is not able to conclude which physical therapy treatment technique, heat or Ice applications, Ultrasound, Interferential therapy, Transcutaneous Electrical Nerve Stimulation, Active and Passive Range of Motion (ROM) exercises, Proprioceptive Neuromuscular Facilitation (PNF) techniques, and Mobilization techniques is most effective.¹²

It is necessary to find specific and effective physiotherapy treatment for Adhesive capsulitis.

Materials and Methods

Experimental clinical trial was conducted at four physiotherapy centres in Rajkot and Junagath.

Total 30 participants were included in studies who fulfils inclusion and exclusion criteria. Inclusion criteria unilateral primary adhesive capsulitis diagnosed from orthopaedic department, age 40-70 years, first treatment of physiotherapy for the condition. Exclusion criteria were secondary adhesive capsulitis, previous manipulation under anaesthesia, corticosteroid injection.

Ethical Clearance was obtained from School of Physiotherapy, RK University. The patients of Adhesive Capsulitis, diagnosed and referred by specialists were included in the study. After written concern the patients were included in study. The details assessment was done and outcome measures ROM and SPADI were recorded. The patients were randomly assigned by simple random method to either Group A or Group B.

The subjects were asked to schedule therapy sessions 4 to 5 times per week for 4 weeks. Group A was given a specific Therapeutic Protocol (Table I) while Group B was treated with conventional physiotherapy treatment.

Table I : Physiotherapy Treatment protocol

Phase I	
Patient education	<ul style="list-style-type: none"> · Emphasize full ROM may never be recovered · Spontaneous resolution & reduction of stiffness · Instructions for HEP · Avoid painful activity/activity modification
Upper body cycle ergometer	50 r.p.m, 8 minute warm - up
Modalities	10 - 15 minutes, before, during, or after exercise, Hot pack/Cold Pack
ROM exercise/stretch	low intensity, short duration, 1-5 seconds, 2-3 times per day, pain-free, passive, AAROM like pendulums (1 min clockwise, 1 min counter-clockwise), internal rotation in standing, horizontal adduction in standing, pulley for elevation in sitting or standing, forward flexion in supine using own hand, external rotation using pipe/ stick in supine, extension in standing using pipe/stick in supine

Cont... Table I : Physiotherapy Treatment protocol

Manual Techniques	Low - grade mobilization (Grade I or II), Capsular stretching, PNF, Positional stretching: 5 minutes-> progress to 15 minutes
Strengthening	Isometric in all planes, 5 second holds, 1 set of 10 each direction against wall
Phase II	
Patient education	<ul style="list-style-type: none"> · Moderate irritability · Activity modifications/basic functional activities
Upper body cycle ergometer	50 r.p.m, 8 minute - warm up
Modalities	10 - 15 minutes, before, during, or after exercise Moist heat / SWD
ROM exercise/stretches	5 - 15 seconds, passive AAROM to AROM, low load, prolonged Same as in Phase I, but increase duration and length of stretch
Manual Techniques	<ul style="list-style-type: none"> · Same as Phase I for abduction and flexion, instead End-Range in varying degrees of elevation and rotation, 10 - 15 repetitions · End range mobilization · Mobilization with Movement 3 sets of 10 repetitions with 1-minute rest in between · Last 3 minutes, passive PNF if needed to increase ROM · Low - to - High Grade Mobilizations
Strengthening	TheraBand: 5 directions, 3 sets of 12 reps, progress with colours of band
Phase III	
Patient education	<ul style="list-style-type: none"> · Increase activities/high demand activities · Pain decreased
ROM exercises/stretchches	<ul style="list-style-type: none"> · Same as phase II, but increase duration, past end range end range/lower pressure, increased duration, cyclic loading · Can use stick or cane in standing over table for prolonged elevation & external rotation
Manual Techniques	<ul style="list-style-type: none"> · High Grade Mobilization/Sustained (HGMT) - Grades III & IV · Distraction, posterior glides > anterior glides (perform before HGMT) 3 sets of 30 seconds (End-range posterior mobilizations hold 1-minute x 15 times) · Abduction & External rotation · Last 3 minutes passive PNF, if needed to increase ROM
Strengthening	<ul style="list-style-type: none"> · Low - to - high resistance end range dumbbell in sitting: flexion, abduction, extension 1 - 2 lbs to begin with, 2 - 3 sets of 10 · Sidelying dumbbells IR, ER 3 sets of 10 - 12 (1 - 2 lbs)

Table II : Treatment for Group A

	Phase 1	Phase 2	Phase 3
Duration	1-12 weeks	12-24 weeks	> 24 weeks
Modality	Moist heat	SWD	SWD
Stretching	Low intensity , short duration (1-5s), Painfree	Low intensity, long duration (5-15s)	End range/ overpressure, increased-duration
Strengthening	Isometric (Manual)	Isotonic (Thera band, Thera tube, Manual)	Isotonic (Dumbells, Manual)
Mobilization	Low grade (Maitland &II)	Low to high grade	High grade (Sustain Hold)
Other	Positional stretching	MWM PNF Capsule stretch	Distraction, Capsule stretch

Table III: Treatment for Group B

No.	Conventional Physiotherapy Treatment
1	SWD
2	Strengthening (Manual)
3	Anterior and Posterior joint Mobilization (middle range)
4	Passive, AAROM, AROM exercises
5	Stretching (Prolong)
6	Capsule stretch
7	Free active exercises (Wound, Pulley, Pendular)
8	Home exercises

The outcomes were recorded on day pre-treatment and after treatment session 4 weeks. While patients were on treatment were assessed for all follow up treatment.

Results and Discussion

The collected data was recorded and data was analysed using SPSS version 10.

Data were presented as mean±standard deviation (SD) and percentage (P). Comparison of Pre and post measurement of ROM and SPADI in each group was done by Paired t-test. Comparison of Group A and Group B with respect to ROM and SPADI was done using Unpaired t-test. P value< 0.05 was considered as statistically significant. Initial 44 patients that were evaluated, 15 subjects were

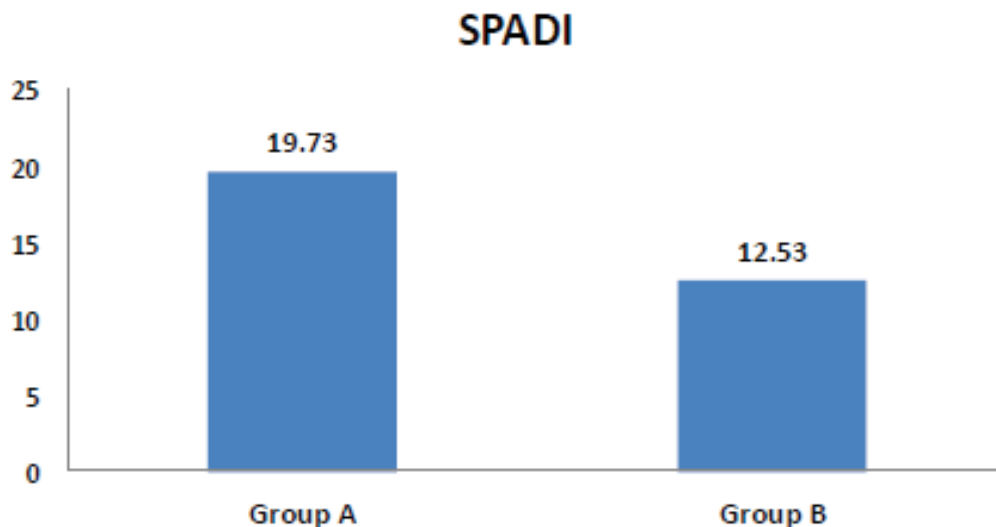
excluded as not fitting inclusion criteria. Thirty subjects were included into the study. All the subjects completed the study for duration of 4 weeks. Demographic data of 30 subjects who completed all treatment sessions.

Table IV: Range of Motion Means ± Standard Deviations at Baseline (Pre intervention), at 4 Weeks (Post intervention)

Measures	Pre intervention	Post intervention
Group A (Therapeutic Protocol)		
Flexion	131.0 ± 23.01	161.7 ± 12.77
Extension	38.00 ± 7.97	51.33 ± 5.49
Abduction	118.3 ± 18.58	151.0 ± 13.78
IR	42.00 ± 10.14	64.00 ± 10.72
ER	45.00 ± 8.01	62.33 ± 11.63
Group B (Conventional Physiotherapy)		
Flexion	133.7 ± 18.94	157.3 ± 16.46
Extension	37.00 ± 10.49	48.33 ± 7.48
Abduction	123.0 ± 22.26	146.0 ± 17.24
IR	42.33 ± 15.57	55.33 ± 14.45
ER	39.67 ± 15.98	53.00 ± 15.90

Table V: Comparison of Mean Difference of Shoulder ROM and SPADI Between Two Groups

	Flexion	Extension	Abduction	IR	ER	SPADI
Group A	30.67	13.33	32.67	22	19.33	19.73
Group B	23.67	12	23	13	13.33	12.53



(Figure-1 SPADI score)

All shoulder ROM showed significant improvement in both groups when compared with paired t- test for within group analysis. The largest improvement in ROM for the subjects in Group A were 65° (Flex), 25° (Ext), 55° (Abd), 30° (IR), 35° (ER) and for Group B were 40° (Flex), 30° (Ext), 40° (Abd), 20° (IR), 25° (ER). There were no significant differences in shoulder Flexion, Extension and External rotation ROM in between group comparison. Shoulder Abduction and IR ROM and SPADI score were found statistically significant.

Group A had a significant decrease of SPADI score as compared to Group B by the end of treatment. Group A reduced by 19.73 and for Group B reduction was 12.53

Conclusion and Acknowledgement

Results of this study indicate that given therapeutic protocol for management of Adhesive capsulitis was effective in treating Abduction and IR ROM. In experimental group Flexion and External Rotation ROM were not significantly improved as Abduction and Internal Rotation. However, Improvement in Flexion and External Rotation ROM was relatively small in experimental group, functional outcome score (SPADI) was found better in this group. There was observed marked improvement in shoulder function in patients with Adhesive capsulitis in long term follow up after end range mobilization.

Ethical Clearance- Taken from School of Physiotherapy, RK University Institutional Ethical

committee

Source of Funding- Self

Conflict of Interest -NIL

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Effect of Pronated and Supinated Foot Postures on Static and Dynamic Balance in Dancers

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Abstract

Aim: Foot being the most distal segment represents a relatively small Base of Support (BOS) on which the entire body maintains balance. Postural control is not a fully automatic process, requires a certain level of attention to maintain balance. A minor biomechanical alteration can disrupt the process. Hence the current study aims to assess the static and dynamic balance of contemporary dancers with altered foot posture.

Methodology: Altered foot posture was assessed using the Navicular drop test following that the static balance (using the flamingo balance test) and dynamic balance (using star excursion balance test (SEBT)) were assessed in 30 contemporary dancers.

Results: Out of 30 dancers (21 had pronated foot, 8 had neutral and 1 with supinated foot). Strong correlation was found between the foot posture and the static balance ($r=0.753$; right foot and $r=0.702$; left foot). SEBT showed that balance was affected in certain directions which were different for the dancers with different foot alterations. Supinated foot showed affection in anterior and antero-medial directions and pronated foot showed alterations in posterior, postero-lateral and lateral directions.

Conclusion: Overall the study showed that contemporary dancers are affected most with the pronated foot proposing higher risk of injuries in future and the overall reach distance was affected in supinated foot compared to neutral foot and pronated foot.

Keywords: Foot postures, Supinated, Pronated, Navicular drop test, balance, Flamingo balance test, Star excursion balance test

Introduction

Foot is the most distal segment in the lower extremity chain and represents a relatively small BOS on which the body maintains balance. Although it seems reasonable that even minor biomechanical alterations in the support surface may influence postural-control strategies, the implications of a hypermobile or hypomobile foot on balance.¹

Dance has physical restrictions as muscle mass, joint structure, size, weight, flexibility and place. Being the most aesthetic and rhythmic way of movement, dance is a technical and complex activity that contains

exercises that strengthen the skeleton-muscle system as well as improves coordination by enabling the body to move freely in space/time.² Contemporary dance tends to combine the strong but controlled legwork of ballet with modern that stresses on torso. It also employs contract-release, floor work, fall and recovery, and improvisation characteristics of modern dance. Unpredictable changes in rhythm, speed, and direction are often used, as well.

Dance injuries are generally classified into 2 types, acute traumatic and overuse injuries resulting from repetitive trauma. An excessively supinated foot, characterized by a high arch and hypomobile

mid-foot, may not adequately adapt to the underlying surface, increasing the demand on the surrounding musculoskeletal structures to maintain postural stability and balance.³ Conversely, excessive pronation is characterized by a flattening of the medial arch and a hypermobile mid-foot but may also place greater demands on the neuromuscular system to stabilize the foot and maintain upright stance.⁴

Balance has often been used as a measure of lower extremity function and is defined as the process of maintaining the Center of Gravity (COG) within the body's BOS.⁵ To maintain upright stance, the central and peripheral components of the nervous system are constantly interacting to control body alignment.^{6, 7} Because balance is maintained in the closed kinetic chain and relies on the integrated feedback and movement strategies among the hip, knee and ankle, balance can be disturbed by diminished afferent feedback or deficiencies in the muscular strength and mechanical instability of any joint or structure.^{8, 9}

Minor biomechanical alterations in the support surface may influence postural-control strategies. Specifically, excessively supinated or pronated foot postures may influence peripheral input via changes in joint mobility or surface contact area or, secondarily, through changes in muscular strategies to maintain a stable BOS. Dynamic balance can be characterized as maintaining one's centre of mass within the base of support during a movement task. Such tasks require simultaneous stabilizing movements from the entire lower extremity throughout the exercise. A contemporary dancer requires an excellence in both static and dynamic postures. Hence the aim of the study was to assess altered foot postures among contemporary dancers and to correlate the same with static balance and to assess the change in reach distance with dynamic balance.

Materials and Methodology

The study was approved by the Institutional Ethics and Research Committee at D .Y. Patil University. A cross-sectional study was conducted on 30 contemporary

dancers involved from more than a year. The participants were assured that the information regarding their identification obtained during the study would be kept strictly confidential. Each subject was explained about the procedure in detail and written informed consent was attained from all the participants. The demographic details including age, gender, height, weight and Body Mass Index (BMI) were obtained. Limb length was also measured. Contemporary dancers were screened for altered foot posture using a Navicular drop test. Once the dancers were screened for a supinated or pronated foot, following that balance was assessed for the same. Static balance was assessed using the flamingo test and the dynamic balance was assessed using star excursion balance test. The obtained data was statistically analyzed and results were obtained.

Data Analysis

Data was analysed using statistical package for the social sciences (SPSS version 16). Test for normality was done. Descriptive statistics were performed. Data was represented as mean and standard deviation. Data was not normally distributed hence Spearman's rho correlation tests were used to find out the correlation between static balance and foot posture and the reach distance for dynamic balance testing was calculated and mentioned as mean and standard deviation. The level of significance was kept at $p \leq 0.05$.

Results and Discussion

TABLE 1: Assessment of foot postures using Navicular drop test

Category	Frequency
Neutral	8
Pronated	21
Supinated	1

As mentioned in the table, out of 30 dancers the navicular drop test ruled 21 dancers to have a pronated foot and just one dancer with supinated foot.

Table 2: Correlation between static balance and foot posture

Variables	Foot posture	
	R	p
Measures		
Static balance (right)	0.753	0.00
Static balance (left)	0.702	0.00

As mentioned in the table, correlation between foot posture and static balance was assessed in the dancers using flamingo balance test where in, strong correlation was found between the foot posture and the static balance suggesting that altered foot postures can lead to affection in the static balance.

Table 3: Dynamic balance assessment using star excursion balance test (right)

Group	Reach distance							
	Anterior	Antero medial	Medial	Postero medial	Posterior	Postero lateral	Lateral	Antero lateral
Neutral	61.75± 11.29	58.68± 11.94	56.84± 10.13	54.01± 7.86	54.94 ±7.13	52.65± 6.82	57.23 ±4.99	58.31± 7.31
Pronated	74.06± 12.30	72.33± 111.55	69.12± 11.40	63.42± 9.96	58.80 ±9.50	53.25± 5.67	59.83 ±5.85	63.76± 7.56
Supinated	55.03	49.50	50.20	50.20	55.50	56.50	55.20	56.50

As mentioned in the table, pronated foot showed least affection in posterior, postero-lateral and lateral directions while supinated foot showed least affection in the antero-medial direction.

Table4: Dynamic balance assessment using star excursion balance test LEFT

Group	Reach distance							
	Anterior	Antero medial	Medial	Postero medial	Posterior	Postero lateral	Lateral	Antero lateral
Neutral	60.85±	54.83±	54.87	56.84±	50.75	50.08±	55.98	56.34±
	10.88	11.02	±9.12	10.13	±8.53	8.95	±5.60	7.13
Pronated	71.45±	70.11±	64.84	69.12±	57.07	54.70±	59.11	62.56±
	11.76	11.51	±9.20	11.40	±9.10	7.19	±5.58	6.06
Supinated	54.20	44	47.83	50.20	56.53	54.50	54.43	56.50

As mentioned in the table, pronated foot showed least affection in posterior, postero-lateral and lateral directions while supinated foot showed least affection in the antero-medial and medial direction.

Table 5: Calculation of reach distance (Right)

Group	Reach distance							
	Anterior	Antero	Medial	Postero	Posterior	Postero	Lateral	Antero
	(%)	Medial (%)	(%)	Medial (%)	(%)	Lateral (%)	(%)	Lateral (%)
Neutral	84.94	82.2	78.26	73.31	72.31	68.46	74.43	74.07
Pronated	96.40	92.92	89.15	82.09	76.53	70.38	74.14	80.93
Supinated	54.20	44	47.83	50.20	56.53	54.50	54.43	56.50

Table 6: Calculation of reach distance(Left)

				Reach distance				
	Anterior	Antero	Medial	Postero	Posterior	Postero	Lateral	Antero
	(%)	Medial (%)	(%)	Medial (%)	(%)	Lateral (%)	(%)	Lateral (%)
Neutral	93.31	76.47	74.4	71.23	67.07	67.52	73.57	75.41
Pronated	95.38	94.11	86.83	82.72	76.51	78.98	74.81	79.31
Supinated	54.20	44	47.85	50.20	56.53	54.50	54.43	56.50

As mentioned in the table 5 and 6, overall reach distance was affected in individuals with supinated foot compared with neutral and pronated foot

Discussion

The study included 30 contemporary dancers where in 13 males and 17 females with a mean age of 21.40±4.22 and the BMI of 22.09±2.07 kg/m² were included. Foot postures were assessed using FBT wherein we found out that 21 subjects had pronated foot and 1 subject suffered from supinated foot. Our findings even suggest a strong correlation between the foot type and the static balance which was assessed using the FBT and even showed significant results suggesting that some aspects of postural stability are affected by foot type, but we believe structural stability, rather than altered proprioception, is likely the basis for our results but proprioceptive feedback during joint motion depends not only on sensory information from joint receptors (i.e., ligament and capsule) but also includes divergent information from skin, articular, and muscle mechanoreceptors¹⁰.

The study even suggests greater number of falls from the participants having supinated feet which is similar to the findings of the study conducted by Karen P et al., which concluded pronators had greater mean deviations

in sway around the base of support (i.e., increased stability index) than supinators. Whether the increased stability index in pronators was due to differences in the mechanical stability of the foot versus proprioceptive and neuromuscular alterations is difficult to confirm.

Most activities including dancing which an individual participates in, are functional, or dynamic, as opposed to static balance¹¹ Thus, in addition to well accepted standard static-balance tests, we choose to also measure an index of dynamic balance to assess the dynamic stability in contemporary dancers. The SEBT is a relatively new assessment tool, described as a functional test that emphasizes dynamic postural control,¹² which has been defined as the extent to which a person can reach or lean without moving the foot and still maintain upright posture¹³. Hence, this test requires a combination of foot, ankle, knee, and hip motion and imposes greater demands on strength and joint range of motion, in addition to proprioception and neuromuscular control within the stance leg to maintain balance while reaching with the opposite leg¹².

Our results relative to this test revealed that only certain reach directions were affected by foot type. Supinated feet had affection in the anterior directions but supinators were able to reach farther than pronators in the Lateral and Postero-lateral directions. Considering that an individual with a supinated foot places more pressure on the lateral aspect of the foot, it seems reasonable that the limits of stability may be greater in the lateral direction and pronated feet had affection in posterior, lateral and postero-lateral direction. We had one participant with supinated feet so it is inconclusive about the postural deviations. Our study correlated well with the study done by Karen P et al, which showed similar results in relation to the affection of certain reach directions is affected by foot type. This would suggest that different foot structures may affect range of joint motion when reaching in certain directions and represent specific mechanical and neuromuscular advantages or disadvantages affecting the ultimate reach limits in those directions.

Recent studies performed on collegiate American football players has shown that athletes with a composite score of less than 90% are 3.5 times more likely to sustain an injury. Findings from our study suggested that overall score from the SEBT was less than 90% especially in the direction of posterior, postero-lateral and postero-medial, suggesting a high risk of injury in near future.

Conclusion

Overall the study showed that the contemporary dancers are affected with pronated foot and shows a strong correlation with static balance proposing that a foot alteration affects the balance. The dynamic balance was altered in dancers with supinated foot compared to the pronated foot but this cannot be conclusive as the subjects were limited. Overall the study concludes that the foot alterations affects balance and proposes a higher risk of injuries in future.

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Effect of Body Weight Support Treadmill Training on Gait Speed in Acute Stroke Rehabilitation -A Quasi Experimental Study

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Abstract

Background: Stroke is a global health problem. The most common manifestation of stroke are gait abnormalities along with other neuromuscular impairments. Around 60% of stroke survivors will be limited in community ambulation, walking after stroke is characterized by altered gait parameters and reduction in the gait speed, it changes the quality and adaptability of walking pattern, for the optimal ambulation need to restore the gait speed along with other gait parameter, Through the elimination of deterrents like body weight and other neuromuscular impairments will effectively helps to restore the gait parameters along with its speed. So, use of body weight support treadmill in gait training is effective in restoration of gait speed in acute stroke rehabilitation, in addition it is feasible and safe. **Objective:** To evaluate the effect of body weight supported treadmill training by using 10 meter walk test on gait speed in acute stroke subjects.

Methodology: A Quasi experimental study, A total of 25 stroke patients were screened and only 20 were recruited who are willing to be in the study and they were randomly allocated into two groups. In Group A (n=10) subjects were received body weight supported treadmill training along with routine individual physiotherapy, where in Group B (n=10) subjects were received routine individual physiotherapy only, 10 meter walk test measured as outcome. **Analysis:** Statistical analysis was performed using the JASP version 0.12.2, Paired t test for within group and Unpaired t test for between groups comparison. **Results:** Statistically significant difference was found between pre and post measures of gait speed in the control and study groups with greater improvement in the study group. **Conclusion:** adding body weight support treadmill training in acute stroke rehabilitation is effective in improvement of gait speed in acute stroke rehabilitation, in addition it is feasible and safe.

Key words: body weight support treadmill training, gait speed, acute stroke rehabilitation.

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Introduction

Stroke or Brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. According to World Health Organization 'stroke is defined as rapidly developed clinical sign of a focal disturbance of cerebral function of presumed vascular origin and of more than 24 hours

duration' and every year 15 million people worldwide suffer from stroke, nearly 6 million die and 5 million left disabled¹. It is a major health problem in India and is the third leading cause of disability and second leading cause of death. About 1.2% of deaths in India are due to stroke, the incidence is 105 per 1 lakh population in urban community and 262 per lakh in rural community². One Among the non communicable diseases stroke contributes for 41% of deaths and 72% of disability as estimated by Indian council of medical research. Hemiplegia is one of the most common impairments after stroke and contributes neuromuscular impairments and significantly to reduce gait performance. Although the majority of stroke patients achieve an independent gait, many do not reach a walking level that enable them to perform all their daily activities^{3,4}. Finch et al. (1991) and Barbeau and Rossignol (1991) proposed the idea of suspending an individual from an overhead lift and assisting the legs to step following stroke or spinal cord injury. Evidence is building for body weight supported treadmill training as more effective than approaches based on Neuro facilitation, which were used by physical therapists in the 1980s and 1990s. This has led to the development of specialized treadmills, support systems, and rehabilitation approaches⁵. BWSTT secures and assists the patient in a harness that provides body-weight support (BWS) while walking on a treadmill, enabling the patient to walk at selected speeds for a selected length of time^{6,7}. As a result, safe and massed practice of an activity that is similar to overground walking can be started relatively early post-stroke. Many Studies suggest that retraining gait with body weight support leads to a more successful recovery of ambulation by ground walking speed and reduces the amount of physical assistance required to walk^{8,9}. Body weight supported treadmill training works through central pattern generator (CPG) theory of gait control and recovery. The theory proposes that gait is largely controlled by a set of neurons located primarily at the spinal level, and the CPG's can be activated through passive or assisted limb movement, weight shift, and postural alignment¹⁰. Providing suspension during walking on treadmill results in elimination of deterrents like body weight and other neuromuscular impairments will effectively helps to restore the gait parameters along with its speed. So, use of body weight support treadmill in gait training is effective in restoration of gait speed in

acute stroke rehabilitation^{11,12}.

Design and Methods

This study involves post stroke subjects to evaluate the effectiveness of body weight support treadmill in gait training in improving gait speed, Ethical committee clearance was obtained from GSL Medical College, Ethics committee for the student's proposal. Study design was: Quasi- Experimental study and follow up of 4weeks. Subjects were recruited from GSL General Hospital, Rajamahendravaram.

Procedure: Patients with Moderate to severe hemiparesis from a single stroke, free from any serious medical conditions and able to understand instructions, were included in the study after obtaining informed consent and Patients with Atrial fibrillation and previous strokes or heart attacks, psychiatric disorders, uncontrolled BP, active cancer, lower extremity contractures, and rheumatoid arthritis were excluded.

25 stroke subjects were taken from which 20 met the inclusion criteria. All of them were randomly allocated into 2 groups with 10 subjects in each group. Initially all of them were screened for gait speed using 10 meter walk test and not blinded. After that they were given a 4 week protocol. The control group received only the usual conventional therapy of passive and active exercises. Subjects also performed upper limb strengthening exercises, walking re-education, as well as standing and balance retraining carried out between parallel bars. Subjects performed walking re-education by starting between parallel bars and progressing to free overground walking with aids. A total of 10 stroke subjects received a routine individual physiotherapy for 30 – 45 minutes, 3 times a week for 4 weeks. Gait parameters were collected using a 10 m walking test. Intervention group, received body weight supported treadmill training 30 minutes a day and 3 days a week for 4 weeks. Along with conventional physiotherapy

Protocol for Body weight support treadmill training: During BWSTT, the patient will be secured into harness and positioned on the treadmill. The patient body weight will be supported in erect position to allow full knee extension during midstance and full hip extension during terminal stance of gait. Therapist will stand behind the participant to facilitate gait pattern by stimulating full

range hip extension and equal stance time on each limb, preventing knee hyperextension during mid-stance. The one person was positioned at the hemiparetic lower limb and provided assistance with stepping and limb control during stance and swing. This person also monitored

stride characteristics and cadence. The training strategy focused on the following key components that were normalized for each subject as much as possible: upright trunk alignment, weight shift, and weight bearing.

Results

Table 1 Demographic characteristics of sample:

Gender	Control group (n=10)	Study group (n=10)
Male	6(60)	5 (50)
Female	4 (40)	5 (50)
Age	51.50 (5.50)	51.30(4.83)

SD= Standard Deviation, n= number.

The table 1 shows that the male participation is grater then the female in control group and the male and female ratio was equally distributed in study group. The mean age group of participated subjects in the both groups were equally distributed.

Table 2 Paired t test with in the groups:

	Control group (n=10) Mean (SD)	Study group (n=10) Mean (SD)	p-value
VELOCITY (Pre -training)	4.8 (0.91)	5.62 (0.63)	.167
VELOCITY (Post-training)	2.5 (0.52)	1.06 (0.10)	.034

SD= Standard Deviation, n =number, $p \leq 0.05$.

Table 2 shows that there was a statistically significance in the post measures of gait speed in the study groups then measures of both groups

Table 3 Unpaired t test between the groups:

	Control group (n=10) Mean(SD)	Study group (n=10) Mean (SD)	t-value	p-value
VELOCITY (Post-training)	4.8 (0.91)	5.62 (0.63)	8.465	.0001
VELOCITY (Post-training)	2.5 (0.52)	1.06 (0.10)		

SD= Standard Deviation, n =number, $p \leq 0.05$.

Table 3 shows that there was a statistically significance in the post measures of gait speed in the study groups then control group.

Discussion

Aim of the study is to evaluate the effectiveness body weight supported treadmill training on gait speed in ambulatory stroke subjects. Results of this study showed that, All 20 subjects completed the entire study protocol as defined by 4 weeks in the training session. To observe the treatment impact before and after the treatment in the 20 subjects, analysis is carried out by using paired t- test, the outcome measure – 10 meter walk test. To compare the body weight supported treadmill training and regular conventional physiotherapy, the t-test for paired sample observations has been utilized. It is observed that the values of body weight supported treadmill training have significant improvement than regular conventional physiotherapy. Some recent studies on paretic lower extremity had shown that body weight supported treadmill training promote motor recovery, muscle strength and functionality after stroke and The CPG theory indicates that the gait is to a large extent limited by a bunch of neurons found essentially at the spinal level, and theCPG's can be triggered by normal gait pattern, and postural alignment, So in this study I wanted to compare body weight support treadmill training and regular conventional physiotherapy in subjects. Body weight support treadmill training is effective for gait training following stroke through controlled reduction of weight bearing during ambulation, postural support and promotes coordination of the lower extremities, which improves gait speed^{13,14,15}.

Conclusion

The quasi- Experimental study had shown that who received 30 minutes of body weight supported treadmill training has shown beneficial improvement along with regular conventional physiotherapy over 4 weeks was feasible, safe and effective to improve gait speed in acute stroke rehabilitation.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: The ethical clearance of this study protocol was approved by

the Ethical Committee of GSL Medical College; the participants were requested to provide their consent to participation in the study.

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An Investigation Into Health Related Physical Fitness among Physiotherapists

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Abstract

Background: Physical fitness is the ability to carry out daily tasks with vigor and alertness without undue fatigue and ample energy to enjoy leisure time pursuits and meet unforeseen emergencies.¹A number of measurable components contributes to physical fitness. The most frequently cited components are health and skills related that pertain to athletic ability. The health-related components of physical fitness are (a) cardio-respiratory endurance, (b) muscular endurance, (c) muscular strength, (d) body composition, and (e) flexibility.²

Physiotherapists work with people of all ages to bring about improvements in their health and independence. Physiotherapists provide exercise prescriptions to help people keep fit and achieve/maintain a healthy weight. Literature has indeed suggested that Physiotherapists are particularly susceptible to WRMDs (Work Related Musculoskeletal Disorders) because of the nature of their profession which is often repetitive, labor intensive and involving direct contact with patients. Physiotherapist helps people to be physically fit but are they themselves physically fit? Through this research we are trying to investigate level of physical fitness in physiotherapists using various health related physical fitness tests.

Method: 44 Physiotherapists participated in the study. The data was gathered at MGM School of Physiotherapy, MGM College of Physiotherapy and includes post graduate students, academicians and clinical therapist ranging between the age group of 22-40years. The subjects with any higher function deficits, musculoskeletal impairment, traumatic injuries, vascular impairments, and systemic inflammatory disorders were excluded from the study.

The participants were provided oral and written overview of study. Each participant signed an informed consent form prior to participation in study. The total time taken to complete tests by the subject was maximum 15 minutes.

Conclusion: This study reported reduced level of health related physical fitness among Physiotherapists.

Key words: Physical fitness, Work Related Musculoskeletal Disorders.

Introduction

Physical fitness is the ability to carry out daily tasks with vigor and alertness without undue fatigue and ample energy to enjoy leisure time pursuits and meet unforeseen emergencies.¹A number of measurable components contributes to physical fitness. The most frequently cited components are health and skills related that pertain

to athletic ability. The health-related components of physical fitness are (a) cardio-respiratory endurance, (b) muscular endurance, (c) muscular strength, (d) body composition, and (e) flexibility.²

Cardio-respiratory (CR) endurance is the efficiency with which the body delivers oxygen and nutrients needed for muscular activity and transports waste

products from the cells. Muscular strength is the greatest amount of force a muscle or muscle group can exert in a single effort. Muscular endurance is the ability of a muscle or muscle group to perform repeated movements with a sub-maximal force for extended periods of times. Flexibility is the ability to move the joints or any group of joints through an entire, normal range of motion. Body composition is the percentage of body fat a person has in comparison to his or her total body mass.¹

Regular physical activity and/or exercise improve cardiovascular and respiratory function reduces coronary artery disease & decreases mortality and morbidity. Higher activity and/or fitness levels are associated with lower incidence rates of combined cardiovascular diseases, coronary artery disease, cancer of the colon, and type 2 diabetes. It also decreases anxiety & depression, enhances feelings of well-being, performance of work, recreational, and sport activities.¹

In case of coronary heart disease, there is unanimity that protection is gained from both regular aerobic activity and from a high level of aerobic fitness. Regular physical activity also reduces symptoms, improves function and mortality and subsequent to myocardial infarction.^{15,1}

Prospective studies have suggested that a 6-month period of endurance training can correct much of the accumulated morbidity in the patient with end-stage renal disease, including hypertension, an adverse lipid profile, a poor glucose tolerance and muscle weakness. There is good cross-sectional and prospective evidence that a sedentary lifestyle increases the risk of developing Type II diabetes mellitus, and an increase of physical activity can improve insulin sensitivity. Degenerative diseases, heart disease, hypertension, diabetes, and cancer have become the major causes of death if inactivity stays for long time. Overuse or repetitive trauma injuries are on the rise as the population becomes less active.¹⁶

There are many risk factors which contribute to low level of physical fitness. Heredity was seen as having a potential to influence habitual physical activity, health-related fitness, and health directly. Smoking, diet and alcohol consumption has weak influences on fitness and health status. Combination of socio cultural, economic factors also attribute to individuals participation in physical activity. Factors like air temperature, humidity,

air pollutants not only contribute to person's willingness to physical activity but also the person's response to physical activity.¹⁵

Various tests are used to assess the components of fitness. Cardio respiratory endurance can be assessed by step test, 1.5mile walk test, 1mile run test, 6min walk test etc. Muscular strength is assessed by hand grip strength, one RM etc. Muscular endurance is assessed by sit ups, curl ups, push ups, YMCA bench press test. Flexibility is assessed using sit and reach test, modified sit and reach test. Body composition is calculated using the height, weight, waist hip ratio and skin fold measurement.^{1,9}

Physiotherapists work with people of all ages to bring about improvements in their health and independence. Physiotherapists provide exercise prescriptions to help people keep fit and achieve/maintain a healthy weight. Studies have indicated that Physiotherapy treatments have a major impact on conditions such as back and neck pain. Physical activity provided under the guidance and supervision of a Physiotherapist reduces the risk of heart attack, stroke, type 2 diabetes, colon cancer and breast cancer. Despite limited numbers of Physiotherapists in some countries around the world, they have proved their effectiveness at getting and keeping people healthy³.

Literature has indeed suggested that Physiotherapists are particularly susceptible to WRMDs (Work Related Musculoskeletal Disorders) because of the nature of their profession which is often repetitive, labor intensive and involving direct contact with patients. Younger therapists reported a higher prevalence of WMSDs in most body areas. Use of mobilization and manipulation techniques was related to increased prevalence of thumb symptoms. Risk factors pertaining to workload were related to a higher prevalence of neck and upper-back symptoms, and postural risk factors were related to a higher prevalence of spinal symptoms.^{4,5}

Physiotherapists have great potential for physical activity promotion. They prescribe exercises for a wide range of conditions (mostly musculoskeletal) requiring rehabilitation. Currently, physiotherapy is mainly a tertiary prevention discipline, but equipped with the ideal skills and

potential to act in a primary prevention role.¹⁷ Physiotherapist helps people to be physically fit but are

they themselves physically fit? Through this research we are trying to investigate level of physical fitness in physiotherapists using various health related physical fitness tests.

Materials and Methods

1. Study design: Descriptive. Study
2. Population: Physiotherapist
3. Target population: post graduate students, academicians and clinical therapist between the age group of 22-40years.
4. Sample size: 44 physiotherapists

5. Sampling technique: Convenience sampling

6. Materials used: Step test- 12inch stepper, metronome and stop watch, Hand held dynamometer Sit and reach box, Chair, Weighing machine & measure tape.

Result

The data collected from all subjects were coded and entered into Microsoft excel 2007 and statistically analyzed with SPSS version 16 statistical package. Demographic variables were analyzed for each group. Mean values were determined. Graphical representation of mean values and standard deviation was done

1. Table on Cardio respiratory endurance: The cardio respiratory endurance of male and female physiotherapist was poor when compared with the normal standards.

VO2 max	Present study			ACSM guidelines				
	Age 22-40	Mean	SD	Superior	Excellent	Good	Fair	Poor
Males (n=13)	38.1	5.6	56 +	51-55	46-50	42 -45	< 41	
Females (n=31)	35.5	4.9	50 +	44-49	40-43	36 -39	< 35	

2. Table on Muscular strength & endurance: Muscular strength and endurance in physical therapist needed improvement.

2.1 Table on Upper limb Muscle strength

Grip strength	Present study			ACSM Guidelines				
	Age22-40	Mean	SD	Excellent	Very good	Good	Fair	Needs Improvement
Males (n=13)	56.6	15.3	> 115	104 -114	95-103	84-94	< 83	
Females (n=31)	40.6	12.0	> 70	63 -69	58-62	52-59	< 51	

2.2 Table on Lower Limb Muscle Strength & endurance.

Sit to stand	Present study (Age22-40)			Normal adults		
	Mean		SD	Mean		SD
	Males (n=13)	14.9	3.3	Males (n=22)	17.7	2.4
	Females (n=31)	14.4	2.0	Females (n=17)	14.1	1.7

3. Table on Flexibility: Flexibility of male PTs was fair where else that of female PTs needs improvement.

Sit and reach	Present study			ACSM Guidelines				
	Age 22-40	Mean	SD	Excellent	Very good	Good	Fair	Needs improvement
	Males (n=13)	29.7	8.1	≥ 40	34-39	30-33	25-29	≤ 24
	Females (n=31)	27.3	8.2	≥ 41	37-40	33-36	28-32	≤ 27

4. Table on Body composition Body composition study reported that the subjects fall into the range of normal BMI

BMI	Present study			WHO classification (Asian)					
	Age 22-40	Mean	SD	Under weight	Normal range	Over weight	At risk	Obese class 1	Obese class 2
	Males (n=13)	22.1	3.1	≤ 18.5	18.5-22.9	≥ 23	23.0-24.9	25.0-29.9	≥ 30
	Females (n=31)	22.3	3.4						

Discussion

The present study was conducted to investigate the level of physical fitness in Physiotherapists. . Sample size of 44 subjects was recruited for the study.

Physical fitness is a dynamic construct which has growing importance to everyday life and health.¹ Physical fitness is divided into two health related physical fitness and skill related physical fitness. Health related fitness has five components namely cardio respiratory fitness, body composition, muscular strength, muscular endurance and flexibility. From the perspective of public health, the health-related components are more important than those related to athletic ability (or are skill-related or performance-related components).^{1, 2} All health-related fitness components contribute equally, or are in balance, to the whole of health-related physical fitness.

Physiotherapist work with people of all ages to bring about improvement in their health and independence. They provide exercise prescriptions to help people keep fit and achieve/maintain a healthy lifestyle. Adults need 30 minutes of moderate physical activity five days a week, or 20 minutes of vigorous physical activity three days a week along with muscle strengthening exercises at least twice a week to maintain health. Exercise, particularly aerobic conditioning and strength training, is one of the key interventions that can prevent death and disability from cardiovascular disease. Physiotherapists are experts in prescribing these as part of a structured, safe and effective program. Physiotherapists help people achieve and return to work, education, community participation and fulfilled lives.³

The work of Physiotherapist is physically demanding and often involves considerable amount of bending, reaching, twisting, and awkward positioning. Such activities increase loads on the lumbar spine.⁸ Time constraints, lack of assistance from staff members, and sudden maximal efforts while moving or supporting patients may further increase the risk of incurring LBP¹². Thumb problems are a common occupational hazard apart from back or neck pain for physiotherapists indulged in manual therapy due to work activities and techniques that repeatedly compress the thumb joints.^{4,}

5, 13

Sedentary lifestyle has a major impact on health related physical fitness. Sedentary behavior is associated with deleterious health outcomes, which differ from those that can be attributed to a lack of moderate to vigorous physical activity¹⁴.

1. Table on Cardio respiratory endurance shows that the Cardio respiratory endurance of male and female physiotherapist was poor when compared with the normal standards. Change in body composition, imbalance in lipoprotein lipase (LPL) activity can also cause decrease in cardio respiratory endurance¹⁴ Factors other than body composition and maximal heart rate (namely age related changes in maximal stroke volume and arteriovenous oxygen difference) were responsible for the greater rate of decline in VO₂max¹⁹

2. Table on Muscular strength & endurance showed that Muscular strength and endurance in physical therapist needed improvement, the effect of sedentary lifestyle causes a decrease in muscular strength and endurance due to decline in tension generating capacity of the muscle Decrease in energy stores , built up of H⁺ ions , insufficient oxygen reaching the muscle causing it to fatigue more fast , Decrease in conduction of impulses at the myoneural junction , particularly in fast twitch fibers can all contributed to decreased muscular endurance of the therapists ¹⁸.

3. Table on Flexibility shows that Flexibility of male PTs was fair where else that of female PTs needs improvement. Physical inactivity causes the hamstrings and the lower back muscles to tighten, which leads to decreased flexibility. Decreased performance of activities of daily living causes the compliance of the capsule to decrease leading to decreased flexibility in the population.

4. Table on Body Composition shows that the subjects fall into the range of normal BMI. However continues reduced physical activity can leads to excessive adipose tissue deposition and less energy expenditure which can cause further lead to overweight and obesity which can further increase the risk of cardiovascular diseases in the long run.

This study definitely points out the need to perform exercises to maintain physical fitness even among Physiotherapists. Further studies can be extended by

implementing fitness programs in different set ups and assessment of fitness levels.

Conclusion: This study reported reduced level of health related physical fitness among Physiotherapists.

Conflict of Interest: NIL

Source of Funding: Self divided amongst us .

Ethical clearance: Institutional Ethical Committee Approval Taken for the Study.

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Relationship between Hand Grip Strength, Cognition, and Hand Dexterity in Older Adults: A Pilot Study

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Abstract

Background and Objective: In older adults most important two factor is cognition and hand motor functions, most noticeable in requiring much skill in fine motor activities. The normal process of aging involves declines in cognitive and sensorimotor functions that affect performance of activities of daily living. Dexterity measures help to detects early decline of hand function and it is necessary to quantify manual dexterity of older adults not only design for work but also for the product and system daily activities by older adults. Force control is necessary for grip because most daily object required acquired force for movement not maximum force. While using large grip forces can lead to changes in the aging neuromotor system other than impaired tactile afferent functioning. Some older adults may produce less stable isometric forces with hand and arm muscles because of peripheral reorganization of their muscles. There is greater connection between hand grip strength and cognition, the deterioration of cognitive function is a high risk of AD. Therefore, handgrip strength considers as an early marker of cognitive decline and incident dementia. Objective is to find relationship between hand grip strength, cognition, and hand dexterity in older adults.

Methodology: 16 subjects were recruited on the basis of selection criteria. Subjects evaluated cognition, grip strength, and hand dexterity using outcome measures are MoCA, hand held dynamometer, and 9-hole peg test respectively.

Results: Karl Pearson correlation were used for the statistical analysis. The result showed that moderate correlation between cognition and grip strength for right and left side with p value 0.031 and r value 0.540, and p = 0.40 and r = 0.517 respectively and weak correlation between cognition and hand dexterity for both right and left with p value 0.162 and r = -.367 and p = .180, r= -.353 respectively.

Conclusion: the study shows moderate association between cognition and grip strength and weak correlation between cognition and hand dexterity for both right and left side.

Keywords: *older adults, grip strength, cognition and hand dexterity*

Background

While aging there will be reduction in motor activities especially fine motor skill. In elderly people movement become slow, decrease in coordination

and balance. These changes are occurred because of alterations of underlying brain network¹. Above 60-year-old people, shows that some changes in hand dexterity have been demonstrated in gripping, pinching, grasping, lifting, and manipulation of objects. Especially reducing grip strength are appropriate for dexterity in older adults as there is a loss of muscle mass from the fifth decade that can affect activation and recruitment of muscles supporting rapid and precise coordinated movements.

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Aging

According to WHO ageing defined “as the process of developing and maintaining the functional ability that enables wellbeing in older age”³. While aging there will be decline in cognition because of that it affects their memory, judgement, communication and physical function these can lead to reduction in quality of life (QOL). World Health Organization defined QOL as “the individual’s perceptions of their position in life in the context of the culture and value system in which they live, and in relationship to their goals, expectations, and standards”⁴.

The normal process of aging involves declines in cognitive and sensorimotor functions that affect performance of activities of daily living². Difficulties with manual ability experienced by elderly adults handling small objects such as coins or buttons, telephoning, and preparing meals. There are studies have found that reducing of hand/finger strength, precision, and manual speed are the principal declines observed in subjects in older adults.

Hand dexterity

Dexterity defined as “the coordination of voluntary movement to accomplish an actual or simulated functional goal/task accurately, quickly, resourcefully and adapting to environment or change”. It is used to manipulative movement to complete task and there are many outcome measures to examine hand function test⁷.

There are many factors affecting fine dexterity. Gender, age, hand length, grip strength, hand skin temperature, room temperature, and room humidity. Hand skin temperature is one of the reasons to which affect the hand dexterity, the oxygen supply to the muscle tissue reduce while reducing temperature and then lead to reducing muscle activity. In younger age the dexterity is better and when getting older its gradually reduce. Females have better hand dexterity than male⁸. pegboard test is among that and it is very easy and simple

Hand grip strength

During ageing process, the neuromuscular function decline and it affect daily performance task. losing muscle strength in older adults have poor force control. Force control includes scaling and calibrating

force while picking up, transporting, and unloading objects. They will be having difficult to handle object and manipulating. Force control is necessary for grip because most daily object required acquired force for movement not maximum force. In additional while increasing age it shows decline in steadiness with older adults have less force control. Steadiness is defined as the ability to exert a constant submaximal force, and it is more strongly associated with fine motor coordination and precision than is grip strength⁹. In elderly people who having low socioeconomic status, advanced age, more joint impairment, and lower grip strength tend to have poor hand function.

Relation between grip strength and cognition

There is greater connection between hand grip strength and cognition, the deterioration of cognitive function is a high risk of AD. Therefore, handgrip strength considers as an early marker of cognitive decline and incident dementia. Early detection of cognitive dysfunction can prevent functional impairment and implement further intervention¹⁴ cognitive and physical functions play crucial role for maintaining independent daily activities of life in older adults¹⁴. In elderly people with low physical activity show decline in cognitive function. Physical function test commonly uses hand grip strength, gait speed, single leg standing showed that physical performance of older adults. There are study supporting that while increasing age with poor physical activity has declined cognitive function.

Relationship between cognition and hand dexterity

advanced age, there is a decline in tactile sensitivity (Tremblay, Wong, Sanderson, &Coté, 2003), as well as reduction in muscle mass and in the number of motor units in the hand (Carmeli, Patish, & Coleman, 2003). These peripheral changes can decline in pinch and grip strength (Ranganathan, Siemionow, Sahgal, &Guang, 2001). In turn, lower grip strength is associated with poorer hand functionThe interaction effects of both decreased grip strength and hand dexterity on cognitive performance is still unclear; therefore, future studies will need to consider the interaction of the three variables cross-sectionally and longitudinally.⁷

Hence, handgrip strength and hand dexterity, representing hand motor function in this study, seem to be crucial components of functional independence and cognitive maintenance in older adults.

Materials and Method

The cross-sectional comparative study was conducted in healthy older adults with age ≥ 60 years to find the relationship between hand grip strength, cognition and hand dexterity in older adults. 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. The subjects were enrolled according to the inclusion and exclusion criteria.

Inclusion Criteria

- Older adults ($65 \geq$ age)
- Both gender
- People who are willing to participate

Exclusion Criteria

- Recent fracture or surgery.
- Muscular skeletal problem like arthritis
- Neurological disease such as stroke, Parkinson's disease.
- Subjects with hearing problem, vision problem and mentally unstable

Procedure

subjects were selected from in and around Mangalore as per the inclusion and exclusion criteria. The initial assessment of medical history, physical therapy assessment, medical record screening was done. A brief

introduction about the procedure will be explained to all the subjects. A written consent was also obtained from the subjects following the assessment. All data collected one day with a given interval.

Outcome Measure

• **9 HOLE PEG TEST:** The Nine Hole Peg Test should be conducted with the dominant arm first. One practice trial (per arm) should be provided prior to timing the test. Timing will be recorded with a stopwatch in seconds. The stop watch will be started when the patient touches the first peg. The stop watch will be stopped when the patient places the last peg in the container.¹⁸

• **MONTREAL COGNITIVE ASSESSMENT:** Montreal Cognitive Assessment (MOCA) is a widely used screening assessment for detecting cognitive impairment. It was created in 1996 by Ziad Nasreddine in Montreal, Quebec. It is a 30 maximum score test assesses 8 domains of cognitive functioning: attention and concentration, executive functions, memory, language, visuo-constructional skills, conceptual thinking, and orientation¹¹. MOCA scores range between 0 and 30. A score of 26 or over is considered to be normal. In a study, people without cognitive impairment scored an average of 27.4; people with mild cognitive impairment (MCI) scored an average of 22.1; people with Alzheimer's disease scored an average of 16.2. Compared with MMSE, the MOCA provides better psychometric properties in the detection of mild cognitive impairment. The utility of MOCA is optimal in mild to moderate cognitive dysfunction with internal consistency (coefficient a ranging from 0.86- 1.00) and a sensitivity of 92% and specificity of 78%. (chia-fen et al 2011)

• **HAND HELD DYNAMOMETER:** Hand held dynamometer is used to measure hand grip strength.

Result

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	16	60.00	68.00	63.3750	2.52653
MoCA	16	18.00	26.00	21.7500	2.62043
Grip strength (R)	16	10.00	38.00	23.8750	6.94622
Grip strength (L)	16	12.00	34.00	23.3750	6.17387
Hand dexterity (R)	16	15.00	22.00	17.6250	1.62788
Hand dexterity (L)	16	15.00	22.00	18.1250	2.12525
Valid N (listwise)	16				

Table 1. shows the descriptive statistics of finger nose test, finger opposition test, mass grasp, supination pronation, heel shin, preferred walking speed and maximum walking speed.

		Grip strength (R)	Grip strength (L)
MoCA	Pearson Correlation	.540*	.517*
	Sig. (2-tailed)	.031	.040
	N	16	16

Table 2 shows the Pearson correlation between cognition and grip strength

	Hand dexterity (R)	Hand dexterity (L)
Pearson correlation	-.367	-.353
MoCA sig (2-tailed)	.162	.180
N	16	16

Table 3 shows the Pearson correlation between cognition and hand dexterity

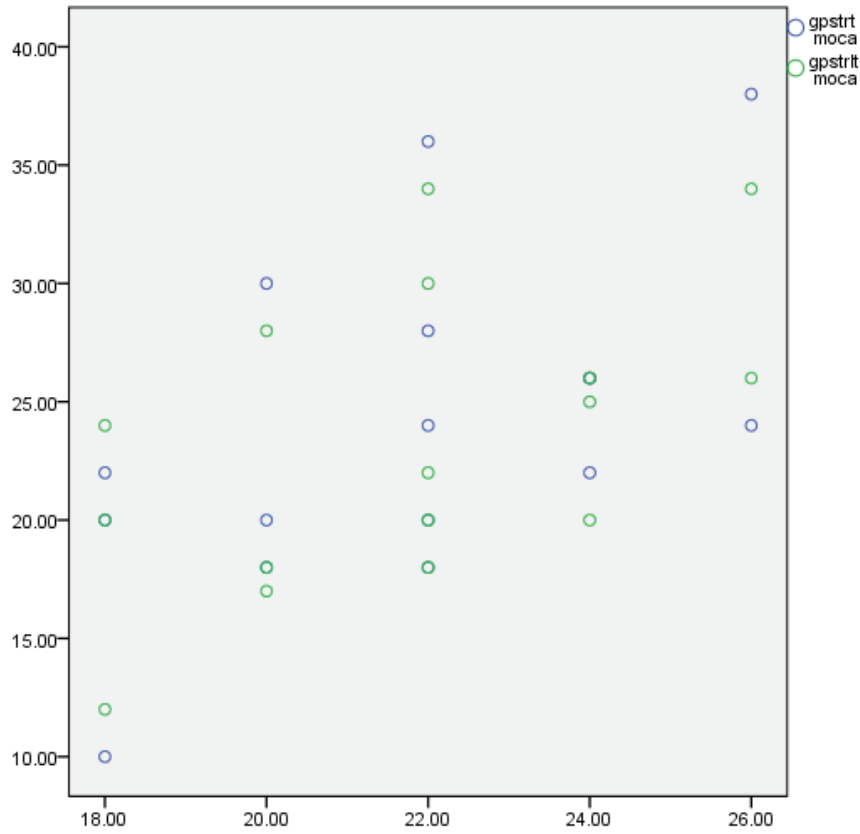


FIGURE 1: THE SCATTER DIAGRAM SHOWS COGNITION AND GRIP STRENGTH

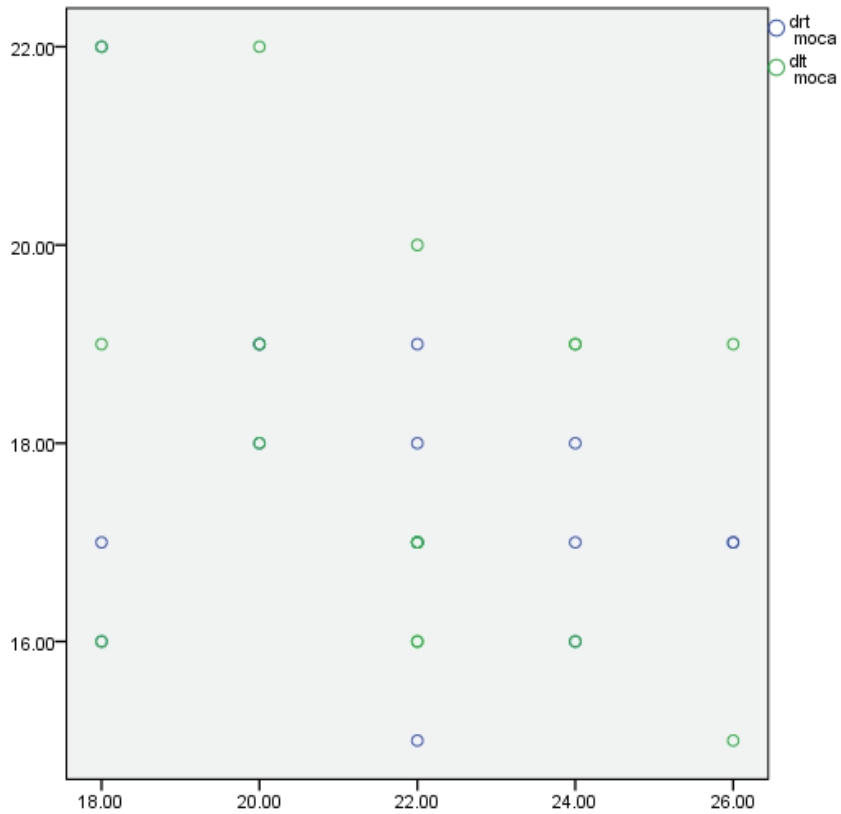


FIGURE 2: THE SCATTER DIAGRAM SHOWS COGNITION AND HAND DEXTERITY

Karl Pearson correlation coefficient was calculated between the parameters. It shows that there is a moderate correlation present between cognition and grip strength for right and left ($p = .031$, $r = .540$ and $p = .040$, $r = .517$) respectively, there is weak correlation between cognition and hand dexterity ($p = .162$, $r = -.367$ and $p = .180$, $r = -.353$) for right and left respectively.

Discussion

A cross-sectional study design was used in the present study to find the relationship between grip strength, cognition and hand dexterity in older adults. Over a period of one year (total study duration), a total number of 16 subjects were enrolled for the study according to selection criteria.

The present study suggests that moderate correlation present between cognition and grip strength for right and left, there is weak correlation between cognition and hand dexterity for right and left. A study conducted on grip strength and cognitive abilities associations in old age by O Stenang et al the starting period (around 65 years of age) of the rather stable connection between changes in grip strength and cognitive performance indicates that something crucial for these abilities is happening around that part of the lifespan. Earlier studies indicate that loss of hand/finger strength, precision, and manual speed are the principal declines observed in subjects over 65 years of age (Ranganathan, Siemionow, Sahgal, & Yue, 2001; Carmeli, Patish, & Coleman, 2003).

There is study G. Taekema et al baseline cognitive performance was associated with decline in handgrip strength, whereas baseline handgrip strength was not associated with cognitive decline. Results suggest that cognitive decline precedes the onset of muscle weakness in oldest old people. The normal process of aging involves declines in cognitive and sensorimotor functions (Ketcham & Stelmach, 2001) that affect performance of activities of daily living early finding of these deteriorations can prevent and maintain good health.

LIMITATIONS

Sample size of the present study was limited; future studies with larger sample size may be necessary to confirm these findings. Most of the subjects were

illiterate so they can't follow the commands.

Conclusion

There is moderate association between cognition and grip strength and weak association between cognition and hand dexterity. Grip strength significantly influenced with cognition and not significantly associate between cognition and hand dexterity.

List of Abbreviations

9 HPT – 9-hole peg test

MoCA – Montreal Cognitive Assessment

AD – Alzheimer's disease

Conflicts of Interest: None

Source of Funding: None

Ethical Clearance: Ethical clearance has been obtained from institutional ethical committee.

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Rehabilitation outcomes in Acute Necrotizing Encephalopathy of Childhood – A Retrospective Study

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Abstract

Aims & Objectives: To assess the outcome of early physiotherapy and rehabilitation in children with Acute Necrotizing Encephalopathy of Childhood (ANEC).

Methods: Retrospective review of 10 infants & children with ANEC at Department of Paediatrics, S.N.Medical College & HSK Hospital, Bagalkot from January 2013 to December 2019. ANEC was suspected based on clinical and radiological characteristics and diagnosis was made based on diagnostic criteria proposed by Mizuguchi et al. Clinical and radiological (MRI brain characteristics) findings and response to standard therapy, early physiotherapy and rehabilitation were assessed in all cases. All cases were followed for evaluation of neurodevelopmental outcome.

Results: The age ranged from 6 months to 11 years (7 female, 3 male). All cases had precedent viral illnesses and had fever, coryza, diarrhoea. The initial neurological symptoms included altered sensorium (n=3), seizures and status epilepticus (n=7), focal neurological signs, gait disturbances (n=2) and diplopia (n=1). MRI brain revealed characteristic thalamus involvement with varied involvement of midbrain, pons, medulla (n=10). 9 out of 10 cases survived, responded to standard medical therapy, early physiotherapy and rehabilitation. 6 children had complete recovery with minimal disability in 3 cases.

Conclusions: Early detection and appropriate treatment improves outcome in ANEC. Physiotherapy helps in remarkable improvement in the regain of tone, reflexes and movements of limbs

Keywords: ANEC, Encephalitis, Rehabilitation, Rankin Scale

Introduction

Ever since first description by Mizuguchi et al, ANEC is being recognized as an acute encephalopathy with a characteristic rapidly deteriorating neurological course

with poor neurodevelopmental outcomes with high mortality and morbidity rates¹⁻³. ANEC has occasionally been reported in both Asian and Western countries and is being recognized as reason for longer stay in ICU and hospitalization. The etiology and pathogenesis of this disease remain unknown. Although influenza A virus, mycoplasma, herpes simplex virus, and human herpes virus-6 have been reported as common causative agents⁴, it is now believed that this disease is most likely immune-mediated or metabolic⁵.

Patients with ANEC have neither specified symptoms nor typical neurological signs. In addition to

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prodromal symptoms due to different viral infections, which include fever, signs of upper respiratory tract infections, gastroenteritis, and erythema, patients with ANEC often have signs of Systemic Inflammatory Response Syndrome, shock, multiple organ failure, and disseminated intravascular coagulation⁶. With the development of ANEC, brain dysfunctions may present as seizures, disturbance of consciousness and focal neurological deficits^{1-3,6}. Most of the manifestations of ANEC are non-specific and lead to failure of diagnosis of ANEC. Apart from clinical features, laboratory and radiological investigations will be useful in diagnosis.

The clinical course of ANEC is fulminant and diverse, from a mild form with completely recovery or mild sequelae to a severe form with a high mortality^{7,8}. Children of ANEC go through three phases during the clinical course including prodromal stage, period of acute encephalopathy, and recovery stage. In the prodromal stage, the common symptoms include cough, vomiting, diarrhea, skin erythema mainly due to various viral infections. Soon after, the dysfunction of the brain gradually appeared during the acute encephalopathy stage, for example, disturbance of consciousness, seizures, and focal deficits. If survived, patients of ANEC would go through the third phase, so-called recovery stage and most patients left with different neurological sequelae while a few could recover completely⁵⁻⁸.

Diagnosis is made mainly by the characteristic findings of computed tomography or magnetic resonance imaging (MRI), which typically shows symmetric lesions in the thalami, with variable involvement of the white matter, basal ganglia, brainstem, and cerebellum¹⁻³. With the widespread use of MRI, this unique condition is becoming more familiar. However, the etiology, pathogenesis, guidelines of treatments, or prognostic factors still remain unclear.

Indian data on ANEC is still primitive and lacking. In this study, we have described 10 children with ANEC to elucidate, the clinical/neuroradiological characteristics, the response to early physiotherapy and rehabilitation.

Material and Methods :

This is retrospective analysis of 10 infant and children with ANEC admitted at Department of Pediatrics, S.N.Medical College & HSK hospital,

Bagalkot from January 2013 to December 2019. ANEC was suspected based on clinical and radiological characteristics and diagnosis was made based on diagnostic criteria proposed by Mizuguchi et al³[Table 1]. Routine blood tests and CSF analysis and Brain MRIs were taken in all patients at the time of initial presentation. MRI imaging characteristics like number of lesions, symmetry, hemorrhage, locations were noted. All patients were managed with standard protocol and other supportive treatment. After stabilization, these children were initiated on early physiotherapy and rehabilitation. Initially at ICU, breathing exercises, postural drainage and suctioning (as required), passive exercises, limb elevation, positioning, facilitation techniques like stroking, joint compression, quick stretching were given for all cases. Ankle Foot Orthosis was used to maintain Tendo Achilles length. All the recovered patients were followed-up at our department of Pediatrics OPD and child rehabilitation centre. These cases underwent therapeutic exercises, strength training, stretching, electrical stimulation (for lower limbs and trunk) 5 days a week for 30 minutes. Functional activities in sitting position were given. Each session lasted for 60 minutes and was carried for 6 days a week. All cases were followed for evaluation of neurodevelopmental outcome and response to physiotherapy. Modified Rankin scale [RS] (total 0-6 scale : score 0 - no symptoms, score 6 - death) was used to assess the response to rehabilitation. The disability (as graded by modified Rankin Scale) in the patient was reduced over time with physiotherapy. Follow up MRI brain scan was done in all surviving cases between 9- 12 months after the discharge to assess radiological outcome.

Results

A total of ten children were enrolled in the study. All cases had normal developmental milestones without any significant past medical and family history. No patients were exposed to any drugs or chemical substances known to cause toxic encephalopathies. The age ranged from 6 months to 11 years (7 female, 3 male). Clinical features, laboratory and neurological outcome are summarized in table 2.

Clinical features of the subjects

All cases had precedent viral illnesses and had fever, coryza, diarrhea. The initial neurological

symptoms included altered sensorium (n=3), seizures and status epilepticus (n=7), focal neurological signs, gait disturbances (n=2) and diplopia (n=1).

Laboratory findings

All cases had mildly elevated hepatic transaminases (less than 3 times the normal level) may indicate hepatic dysfunction, but their levels varied highly from case to case. In addition, serum ammonia levels were normal in all cases. CSF analysis was within normal limits in 7 cases. Isolated mildly elevated protein level was seen in 3 cases. ABG lactate and CSF lactate was also normal in all cases. Serological test of one showed positive IgG for dengue virus, viral panel for neurotropic virus was done in only two cases, which was negative.

Radiological findings

Brain MRI revealed increased signal density on T2-weighted imaging in the bilateral thalami and brain stem

in all patients. The findings in all cases were consistent with a unique pattern of ANEC.

Treatment and Outcome: All cases were admitted at PICU and received treatment as per standard ICU protocol. Children with seizures and altered sensorium received antiepileptic therapy and raised ICP management respectively. Standard protocols for medical management of ANEC were used in all cases. One child (case no 9) died 6 days after admission due to raised ICP with septicemia and Multiorgan dysfunction syndrome. Remaining cases stabilized and were started on early physiotherapy and rehabilitation. 6 cases showed excellent outcomes without any neurological deficits at 6 months after the illness. The other three patients showed a relatively good to fair outcome. Even though they had initial weakness, spasticity on extremities or memory disturbance, their symptoms improved remarkably with regular physiotherapy.

Table 1 : Diagnostic criteria of ANEC proposed by Mizuguchi

1. Acute Encephalopathy following viral disease, with seizures and deterioration of consciousness
2. Absence of CSF pleocytosis, CSF protein is commonly increased.
3. Neuroimaging findings of symmetric, multifocal brain lesions involving the bilateral thalami, upper brain stem tegmentum, periventricular white matter, internal capsule, putamen and cerebellum.
4. Elevation of serum aminotransferase level to a variable degree. No increase in blood ammonia.
5. Exclusion of any resembling disease.
 - A. Clinical differential diagnosis; toxic shock syndrome, haemolytic uremic syndrome, Reye syndrome, hemorrhagic shock and encephalopathy syndrome, and heat stroke.
 - B. Radiological (or pathological) differential diagnosis; Leigh encephalopathy, glutaric acidemia, methyl malonic aciduria, infantile bilateral strial necrosis, Wernicke encephalopathy, carbon monoxide poisoning, acute disseminated encephalomyelitis, acute hemorrhagic leukoencephalitis, arterial or venous infarct, severer hypoxic or traumatic injury.

Table 2: Summary of clinical, and neurological outcome**Table 2: Summary of clinical, and neurological outcome**

	Age/sex	Presenting illness	CNS presentation	GCS at admission	GCS at discharge	Modified Rankin Scale score at discharge	Modified Rankin Scale score at 3months Follow-up	Modified Rankin Scale score at 9month Follow-up	Outcome
1	5yr 6mon, F	Non specific Febrile illness	Altered sensorium	6	10	4	3	1	Fully recovered
2	6month, F	URTI	Seizures, irritability	8	12	5	3	2	Spasticity
3	2yr, F	Non specific Febrile illness	Status Epilepticus	6	11	5	3	2	Spasticity & Speech disorder
4	5yr 10 month, M	URTI	Status Epilepticus	5	13	5	3	1	Fully recovered
5	4yr, F	Non specific febrile illness	diplopia, gait disturbance, altered sensorium	6	12	5	3	2	Fully recovered
6	2yr 10mon, F	URTI & AGE	Gait disturbance, Altered sensorium	6	13	5	5	5	Spastic quadriparesis, Speech disorder
7	3yr 6mon, M	AGE	Status Epilepticus	7	13	5	2	1	Fully recovered
8	11months, F	AGE	Altered sensorium	7	14	4	2	1	Fully recovered
9	1yr 4 month, M	URTI & AGE	Status Epilepticus	6	-	-	-	-	Expired
10	9yrs, F	Non Specific febrile illness	Status Epilepticus	7	14	5	2	1	Fully recovered

Discussion

ANEC was proposed as a novel disease entity by Mizuguchi et al², extensively affecting infants and young children worldwide including sporadic cases in

Indian scenario. Most of the patients in India remain unreported and there is lack of comprehensive data in Indian children. However, we were able to recognize and manage 10 cases of ANEC over period of 5 years

at our institution. Here with we present data of cases of ANEC with respect to clinical, radiological features, response to physiotherapy and neuro-rehabilitation.

Patients with ANEC manifest fulminating neurologic deterioration with preceding non-specific febrile illness and frequently undergo intractable convulsions. In our study, all cases met diagnostic criteria for ANEC [table 1] proposed by Mizuguchi^{2,3} and had varied presentation at the time of admission. Cases were worked up and the diagnosis of ANEC was reached. Despite proposed the diagnostic criteria of ANEC, atypical and milder cases have been reported⁹. None of our cases had atypical presentations. All our cases were previously healthy, in whom diseases initiated with fever and other viral like prodrome, seizures and neurologic disturbances.

The outcome of ANEC is generally grave, although the prognosis has improved recently. Serious neurological signs such as decorticate, decerebrate posturing or long tract signs may appear. Its mortality is considered to reach as high as 30%^{1,2,6-9}. In our study, 9 out of 10 cases survived and out of 9 cases who survived, 8 cases (88.9%) showed complete recovery or left with minimal deficits. 1 out of 10 children died (mortality rate of 10%) due to raised ICP with septicemia and multiorgan dysfunction syndrome. One surviving child left with severe sequelae (table 2). Kim JH et al reviewed 14 Korean cases over 10 year study period and suggested no mortality. 57% patients completely recovered or left with mild deficits¹⁰. This study showed better outcome, compared to previous published data of around 65% of patients with death or were left with severe neurological sequelae. Our study suggested better outcomes similar to several other reported cases with good outcomes in literatures¹¹⁻¹⁵. Patients less than 24 months age, those with high serum transaminases level, high level of proteins in CSF and those with brain stem lesions had poorer outcome in terms of disability etc. Similar factors have been described in literature as poor prognostic factors in ANEC^{9,15-19}. Radiological findings were specific and consistent with the diagnostic criteria of ANEC. In our study children with MRI brain findings like extensive involvement of lesions, presence of hemorrhage and cavitation had incomplete neurological recovery and disability and poor outcome. Wong AM et al in a retrospective analysis of MRI brain in 12 cases of ANEC reported a significant and positive co-relation

between clinical outcome and MRI brain findings like presence of hemorrhage, cavitation and extensive location of lesions¹⁹.

In so far published cases of ANEC, there is limited data on role of physiotherapy and rehabilitation. Importance of physiotherapy is brought out in our study. We were able to assess only short term and intermediate term outcome of neuro-rehabilitation these children with ANEC and comparative studies are lacking in this aspect.

Limitations of the study:

This study is a relatively small number of the patients and a retrospective design with only short term outcome. Prospective trials with a large number of the patients with long-term outcome are desirable.

Conclusion

Early detection and appropriate treatment may lead to better outcome. Physiotherapy helps in remarkable improvement in the regain of tone, reflexes and functional activities in cases with ANEC.

Ethical Clearance: taken from S.N.Medical College Institutional Ethics Committee on Human Subject Research, Bagalkot (Approval reference number – SNMC/IECHSR/2017-2018/A-53/1.0)

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Consequences of Washing Hands To Protect Against Coronavirus (COVID- 19)

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Abstract

Background: Respiratory viruses like coronavirus disease (COVID-19) spread when mucus or droplets containing the virus get into your body through your eyes, nose or throat. Most often, this happens through your hands. Hands also are one among the foremost common ways in which the virus spreads from one person to subsequent. During a worldwide pandemic, one among the most cost-effective, easiest, and most vital ways to stop the spread of an epidemic is to scrub your hands frequently with soap and water¹. But there may be mild to moderate skin reactions related to hand hygiene.

Objective: To find out the consequences of repeated washing of hands to protect against coronavirus (COVID-19).

Methods: 106 candidates were asked by questionnaire to fill 20 different questions related to time, duration, frequency and consequences of hand wash they are feeling.

Result: The result of this study supports that 56% of people who are washing their hands at least 25-100 times a day are suffering from skin dryness.

Conclusion: study suggests that repeated or frequent washing of hands can cause dryness and crack skin of hands even in individuals with no history of skin diseases

Keywords: Novel Corona Virus 2019, repetitive, handwashing, COVID 19, skin reaction,hygiene, Stress Exposure, Social Isolation and Quarantine.

Introduction

Respiratory viruses like coronavirus disease (COVID-19) spread when droplets containing the virus get into your body through your eyes, nose or throat. Most often, this happens through your hands. Hands also are one among the foremost common ways in which the virus spreads from one person to subsequent. During a worldwide pandemic, one among the most cost-

effective, easiest, and most vital ways to stop the spread of an epidemic is to scrub your hands frequently with soap and water.¹

There are two major sorts of skin reactions related to hand hygiene. The first and commonest type includes symptoms which will vary from quite mild to debilitating, including dryness, irritation, itching, and even cracking and bleeding. This array of symptoms is mentioned as irritant dermatitis. The second kind of skin reaction, allergic dermatitis, is rare and represents an allergy to some ingredient during a hand hygiene product. Symptoms of allergic dermatitis also can range from mild and localized to severe and generalized. In

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its most serious form, allergic dermatitis could also be related to respiratory distress and other symptoms of anaphylaxis. Therefore, it is sometimes difficult to differentiate between the two conditions.²

Hand hygiene products damage the skin by causing denaturation of corneum proteins, changes in intercellular lipids (either depletion or reorganization of lipid moieties), decreased corneocyte cohesion and decreased stratum corneum water-binding capacity^{3,4}. Among these, the main concern is the depletion of the lipid barrier that may be consequent to contact with lipid-emulsifying detergents and lipid-dissolving alcohols⁵. Frequent handwashing results in the progressive depletion of surface lipids with occurring deeper action of detergents into the superficial skin layers. During dry seasons and in individuals with dry skin, this lipid depletion occurs more quickly⁵. Damage to the skin also changes skin flora, resulting in more frequent colonization by staphylococci and Gram-negative bacilli^{6,7}.

Although alcohols are safer than detergents⁸, they can cause dryness and skin irritation^{9,10}. The lipid-dissolving effect of alcohols is intended relevant to their concentration⁵, and ethanol tends to be less irritating than n-propanol or isopropanol¹⁰. Numerous reports confirm that alcohol-based formulations are well tolerated and often associated with better acceptability and tolerance

than other hand hygiene products^{11,12}, that's why it is advisable to use alcohol-based hand rubs only during this pandemic by a coronavirus.

Method

In this study, the form was sent randomly to 106 people and was asked to fill answers of 20 items.

The questionnaire covered demographic data and questions regarding awareness of preventive measures of coronavirus, mode of transmission of coronavirus, regular washing of hands, frequency of hand wash, steps of hand wash, awareness of when to wash hands, feeling of tightness, itching, cracking and dryness after washing, sensitive skin type, application of moisturizer after washing etc.

Then forms were reviewed carefully. Data processing and analysis were done with Microsoft Excel 2007. Pie chart analyses were used to test for statistical correlation.

Result

The result of this study supports reveals that people who are washing their hands at least 25-100 times a day, 56% are suffering from hand dryness. At last, we also found that 99% of the population were awarded and take serious covid 19.

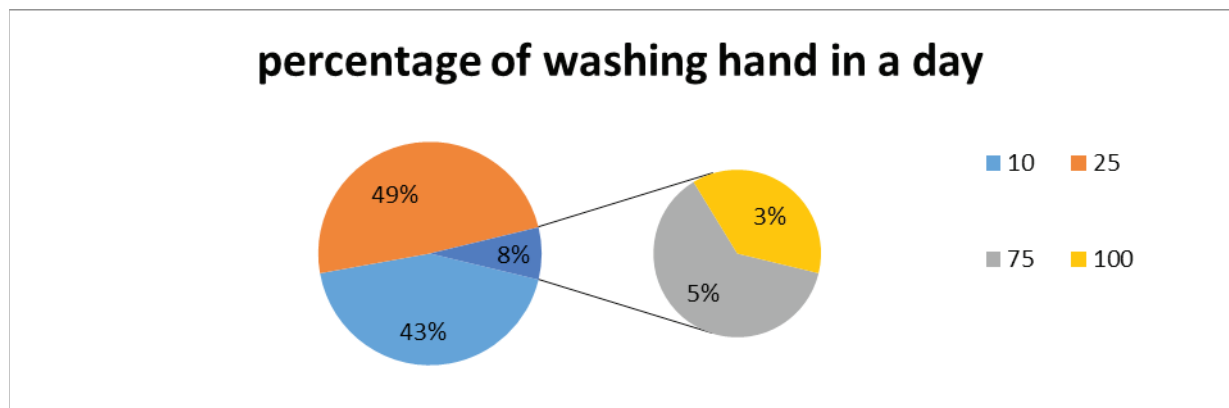


Figure 1:- It shows the percentage of people how many times washing their hand in day 43% people washing their hand 5-10 times a day 49% people washing their hand 25 times/day, 5% people washing their hand 75 times/day 3% washing their hand 100/day.

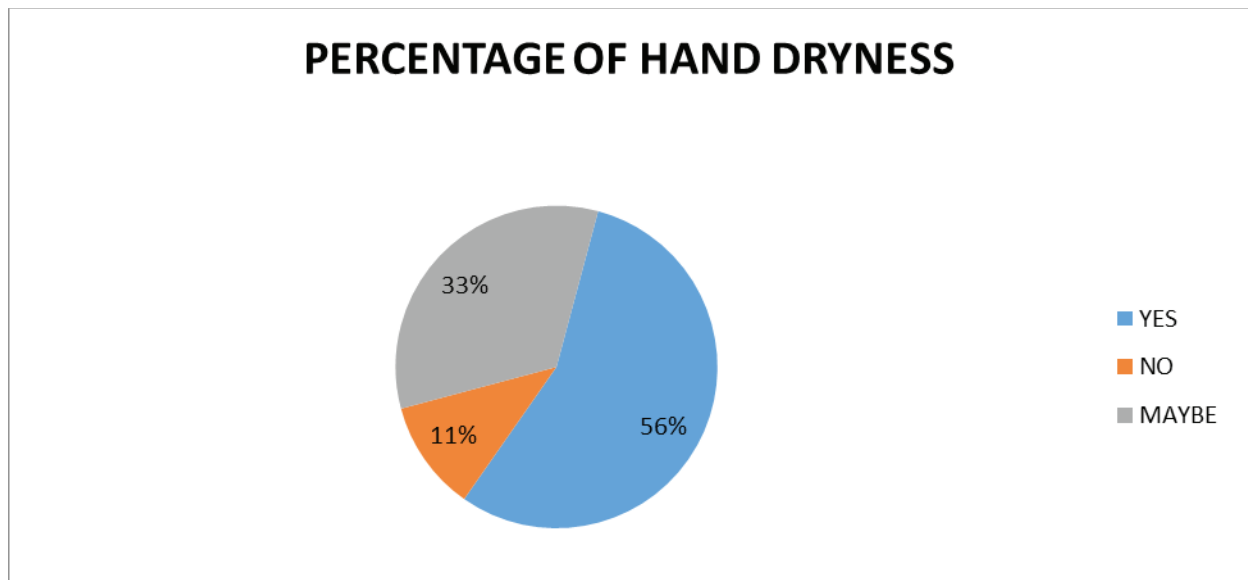


Figure 2:-It shows the result of dryness due to excessive hand-washing number of people who are washing their hand 25 -100 times a day.

Treatment : to avoid dryness night is the best sign to resting your hand apply moisturizer before going to sleep is the best way to avoid dryness.

Conflict of interest: There were no conflicts of interest in this study.

Ethical Clearance: Patient consent was taken.

Source of Funding: Self.

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Role of Early Rehabilitation in An Infant with Arthrogryposis Multiplex Congenita: A Case Report with 11 Months of Follow up

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Abstract

Background: Arthrogryposis multiplex congenital (AMC) is etiopathogenetically a heterogeneous disorder which is considered to be a neuromuscular syndrome present at birth. It is characterized by presence of contractures in more than two body areas at the prevalence rate of 1 in every 3000 to 5000 live births.

Purpose: There are no reports in the literature which provides clear guidelines regarding physical therapy interventions for children with AMC. The purpose of this case report is to document the infant's recovery based on the frequency and duration of physical therapy interventions during first 11 months of life.

Key points of case: An infant with arthrogryposis multiplex congenital was followed from day 15 to 11 months of early developmental period. Following continuous and integrated physical therapy, infant achieved normal developmental sequence with visible improvement in joint contractures. Without intervening surgically, there is improvement in club foot of the baby. This article enlightens physiotherapeutic treatment strategies for child with AMC.

Conclusion: Physical therapy of a child with AMC should be multi-centred, holistic and continuous. Early approach to physical therapist minimise the complications following AMC. Early physical therapy interventions can help in prolonging the early need of surgical interventions during developmental age.

Keywords: *Physical therapy, Infant, Early Rehabilitation, Arthrogryposis*

Introduction

Arthrogryposis multiplex congenital (AMC) is etiopathogenetically a heterogeneous disorder which is considered to be a neuromuscular syndrome present at birth. It is characterized by presence of contractures in more than two body areas at the prevalence rate of 1 in every 3000 to 5000 live births. The primary insult

is expected to be present during the first trimester of pregnancy. The severity tapers down if the insult occurs later in the pregnancy.¹⁻⁶

The etiology of AMC is multifactorial & sporadic. The most possible cause could be reduced foetal movements. This foetal akinesia can be the outcome of neuromuscular conditions or uterine abnormalities due to presence of maternal diseases. Twin pregnancy, bicomuate uterus and oligohydroamnios are possible examples of causes reducing the foetal movements.^{1,4,7,8}

Arthrogryposis can be in the form of Amyoplasia with characteristic features of shoulders being internally rotated and adducted with elbows extended and wrist flexed with ulnar deviation. Along with it the hips may be

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dislocated with extended knees and feet in equinovarus. This type of AMC children can have normal intelligence. Other forms of AMCs can be related to central nervous system or can be of heterogeneous aetiologies including congenital, chromosomal abnormalities, skeletal dysplasia, and contracture syndromes.^{1,9}

The presentation of symptoms can be different in each patient with AMC which includes difference in severity of contractures in different body regions along with involvement of other systems of the body. Despite of being non progressive condition, the joint contractures can be recurrent.¹⁰⁻¹³

In a growing foetus it is essential to have movements in order to achieve milestones. Restricted movements can become a causative factor for excessive development of the peri articular connective tissues. To achieve this, early and continue physical therapy is a must. This case report enlightens on early intervention for a child with arthrogryposis multiplex congenital. The purpose of this case report is to document the child's recovery based on the frequency and duration of treatment.

Case description:

History and examination: The girl infant was born after second pregnancy to healthy, non consanguineous parents. She was born out of full term pregnancy without any prenatal or natal history. Her birth weight was 2.9 kilograms. She was referred to physical therapy department on day 15 of life with the complaints of joint contractures and the child being less active. No signs of deformations were marked during routine ultrasound examinations. Post-natally during the routine visit the infant was referred to physical therapist.

Systems review:

Musculoskeletal: The infant preferred to keep her head turned to left most of the time with no head control.

Postural observations-

Plagiocephaly (Flat head) is seen on the posterior aspect of the head.

In bilateral upper extremities; shoulders were flexed and internally rotated, forearm pronated with wrist and fingers in flexion. Hands were fistled, ulnarly deviated with thumb in attitude. Bilateral lower extremities were

flexed from hip and knee along with severe club feet seen in feet along with overriding of toes.

Initial examination revealed presence of micrognathia & retrognathia with flattened head. Multiple joint contractures were noticed at shoulder, elbow, wrist, hip, knee and ankle along with tightness developing on the left side of neck.

Club feet were marked on dimeglio scale at the grade of III.

Developmental dysplasia of hip was ruled out using x- ray hip.

Neuromuscular: Possible active movements were slight elbow flexion with more of shoulder internal rotation and bilateral kicking in lower extremities with right more than left. Muscle tone, assessed by resistance during passive movement was found to be normal in the available range of motion. Tendon reflexes were found to be normal.

Developmental milestones & reflexes:

Social smile: Present

Sucking: Poor

Rooting: Poor

Reaction to external stimuli: Poor

Palmar grasp: Present

Plantar grasp: Present

Flexor withdrawal: Present

Cognition/ response to pain: Baby had social smile and recognition to mother's touch. Baby used to cry while entering the department and while exposing to new people. Movement in joints stimulated cry in baby.

Integumentary: Issues related to skin irritation, marks or breakdown of skin were absent.

Cardiopulmonary: The baby did not show any positive signs related to cardiopulmonary system. No comments regarding cardiopulmonary status were made by paediatrician of the baby.

Baby was reacting to touch, pain, sound and light.

Description of outcomes:

Passive ROM: For all the joints passive ROM was measured using Goniometer. Goniometry is good tool with excellent reliability and validity.^{14, 15} ROMs were restricted in bilateral UEs, LEs and cervical spine.

Prone tolerance was measured by keeping the baby in prone position. Initially the time was 10 seconds. Crying was a limiting factor.

Evaluation using ICF model:

Body structure & function impairments: Reduced ROMs in bilateral UEs, LEs and spine, asymmetry at neck

Activity limitations: Decreased movements of all four limbs, Discomfort in prone lying, unable to extend both upper and lower extremities

Participation restriction: Baby had difficulty in exploring the environment in a manner typical of age matched infant.

Description of Intervention:

Therapeutic measures began at the age of 15 days when the infant was referred by orthopaedist to paediatric physical therapy department.

Aims of physical therapy:

To mobilise the foot towards corrective position

To increase the ROMs of joints

To prevent muscle tightness

To enhance neuro sensory motor development

Techniques used:

To increase the mobility of joints

- Gentle massage by using stroking, kneading, picking up and rolling

- Stretching of the muscles of neck, pectorals, elbow flexors, wrist and finger flexors

(30 seconds hold for each stretching position

repeated for 3 times)

- Gentle mobilization of foot towards the stretching of ligaments, capsules and tendons

- Passive ROM exercises for each joint (10 repetitions for each joint)

- End range stretch maintained for 30 seconds each time

- Gradual training towards attaining active ROMs with the use of age appropriate toys such as squeaky toys (Minimum 10 repetitions of each movements)

To facilitate neuro sensory motor development:

- Stimulation of sucking and rooting reflexes

- Graded sensory stimulation with the use of different texture and toys in order to overcome thumb-in attitude of hands

(Stimuli- Response- Stimuli sequence)

- Visual tracking of musical and lightening toys

- Different auditory and verbal cues to improve the awareness of external environment

- Prone positioning was advised for most of the time of the day except one hour after each meal. (To promote head holding and avoid flattening of head)

- Positional therapy with the use of bolster, wedges and physioball

- Facilitatory rolling was incorporated on both sides

- Sitting on a bolster roll

- Proprioceptive stimuli for hand opening and foot placement

- Facilitating prone extension while on physioball

- Kinesio taping for correction of scapular position (performed two times in entire therapy duration)

- Counselling to the parents was an important aspect of therapy session. Parents were advised to swaddle the baby with knees and elbows in extended position, carrying the baby on each side simultaneously

in order to avoid fixed position of baby’s neck while carrying the baby and repeating the ROM exercises at home.

Frequency of therapy sessions: Initially the infant was seen on everyday basis for a session of 1 hour with small breaks during the sessions. From the age of 3 months the child is been called up thrice a week. Now the child is of 11 months of age and still continuing therapy.

Short term goals of physical therapy sessions were achieved during the first 4 months of therapy and then the baby started achieving different developmental milestones in order to achieve optimal long term goal. The baby is currently able to access the environment by crawling and independent sitting. She is able to stand with support along with the persisting minimal contractures at knees and elbows. No casting is done by the orthopaedist so far but regular consultation is done.

Table 1: Difference in Passive Range of motions at different joints

Joints of the body	Movement	Day 1 rehabilitation		11 months post rehabilitation		Difference in range of motion	
		Right	Left	Right	Left	Right	Left
Cervical	Lateral flexion	25°	35°	35 °	40 °	10 °	5 °
	Rotation	60 °	80 °	70 °	80 °	10 °	0 °
Shoulder	Flexion	100 °	100 °	170 °	170 °	70 °	70 °
	Extension	20 °	20 °	80 °	80 °	60 °	60 °
	Abduction	110 °	110 °	160 °	160 °	50 °	50 °
	Internal rotation	90 °	90 °	90 °	90 °	0 °	0 °
	External rotation	60 °	60 °	80 °	80 °	20 °	20 °
Elbow	Flexion	50 ° -140 °	50 ° -140 °	20 ° -140 °	30 ° -140°	-	-
Wrist	Flexion	70 °	70 °	70 °	70 °	0 °	0 °
	Extension	60 °	60 °	70 °	70 °	10 °	10 °
Finger	Flexion	Not assessed	Not assessed	FULL	FULL	-	-
	Extension	Not assessed	Not assessed	FULL	FULL	-	-
Hip	Flexion	FULL	FULL	FULL	FULL	-	-
	Extension	50 °	40 °	70 °	70 °	20 °	30 °

Cont... Table 1: Difference in Passive Range of motions at different joints

	Abduction	30 °	30 °	40 °	40 °	10 °	10 °
Knee	Flexion	40 ° -120 °	40 ° -120 °	20 ° -120 °	20 ° -120 °	20 °	20 °
	Extension	-40 °	-40 °	-20 °	-20 °	20 °	20 °
Ankle	Dimeglio scale grade 3 for club foot (Present Bilaterally)						

Table 2: Summary of Outcome data

	At the age of day 15	At the age of 11 months
Prone positioning time	3s	Able to stay in prone position, crawls nicely
Developmental milestones achieved	Social smile	Head control Rolling bilaterally Prone positioning Crawling Sitting independently Standing with support
Passive ROMs	Restricted	Almost full
ICF model	Participation restricted in environment	Participation improved at environmental, social and functional level

Discussion

Arthrogryposis multiplex congenital is a rare and heterogeneous in nature. Children with AMC should be dealt with interdisciplinary problem solving approach. It is been found that there is very less literature on rehabilitation strategies for treating children with AMC which makes rehabilitation professionals less prepared while treating children with AMC. This case report provides information on rehabilitation sessions and specific treatment strategies for a growing infant with AMC.^{16, 17}

For the children with AMC physical therapy play an important role in making these children independent. Recent review of studies on AMC suggests that detailed description of specific therapy session is not clearly mentioned in any literature. Through this report, we tried to convey duration, frequency and therapeutic modalities which were used in treating the girl infant with AMC.¹⁸

During 11 months of physical therapy there was improvement in joint contractures, limb axis alignment, developmental milestones, postural deviations and environmental participation. The child has become more playful and active. Child has achieved milestones of sitting and crawling independently. Child is able to

stand with support. There were no episodes of joint dislocations or any other unanticipated events during the period. Her casting was delayed as there is noticeable improvement in feet alignment with regular physical therapy. Intensive and continued rehabilitation since the early age helped in prevention of further complications of AMC.

In cases with arthrogryposis surgical correction is required for feet (76% cases), knees (39%) and hips (18%). For the case described no corrections are done surgically instead joints are maintained with physical therapy interventions. This could be possible because of early physical therapy interventions. The possible outcome is supported with the literature stating initial corrective therapy improves the result during first months of life.¹⁹

As in this infant with AMC neonatal reflexes were found to be poor during initial assessment, specific attention was given in providing sensory stimuli to facilitate sucking and rooting in order to prevent malnutrition. The available literature emphasises that movement restrictions can hamper the ability to explore the world in children with AMC which may affect their cognitive and motor development. Here in this infant the neuro-developmental sequence was equally focused upon.^{20, 21}

Along with physical therapy sessions, parents' active participation was commendable during this entire process. Generally parents of children with long term illness experience frustration, depression and disappointments. Their everyday life will change to some extent. Parents of this child were lively, supportive and educated enough to cope up with the ongoing therapy sessions without missing any session except on emergencies.²²

The goals will change once the child ages. The improvements of ROMs and developmental milestones will help in forming further goals of ambulation and daily life activities.

Conclusion

Physical therapy of an infant with AMC should be multi-centred, holistic and continuous. Early physical therapy interventions can help in prolonging the early

need of surgical interventions during developmental age.

Consent: Written informed consent was taken from the parents' for utilisation of informations and images of their child for the publication purpose.

Grant support: This study was not supported by any grants or funding.

Ethical Clearance: It was taken by the Institutional ethical committee.

Conflicts of Interest: Nil

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Patterns of Pain in Spinal Cord Injured Individuals

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Abstract

Objective: The objective of this study was to find out the Pattern of Pain in Spinal Cord Injury individuals.

Methods: Total 100 subjects were included in the study. The informed consent was filled by the subjects. Then, the questionnaire was used by asking questions to the subjects regarding their pain. Some were filled by telephonic conversations and some by person.

Result: Out of 100, 90 subjects suffered from pain with the Neuropathic type being the most prevalent. Most of the subjects suffered pain in the upper limb followed by the lower limb and the back.

Conclusion : The research work showed that 90 out of 100 suffered from pain. Out of 90, 23 had pain above the injury level while 67 had pain below the injury level. 35 were Quadriplegic and 65 were Paraplegic. The types of pain showed the following prevalence: Neuropathic pain > Mixed > Burning sensation > Dull Aching. The common sites of pain were: Upper limb > Lower limb > Back > Urinary tract > Various. The most common aggravating factor of pain was found to be transfers, exercise, recreation, sport and fatigue. This was followed by prolonged sitting and Stress and anxiety. Most of the subjects relieved from pain when at rest followed by posture or position change. 12 out of 90 subjects got no relief in their pain while 10 subjects got relieved from other non specific factors.

Keywords : SCI; Pain; Level of injury

Introduction

A spinal cord injury (SCI) is an injury to the spinal cord that leads to varying degrees of motor and/or sensory deficits and paralysis.¹ Although injury of the cauda equina is included, the definition excludes isolated injuries to other nerve roots.² Pain is common

in patients with SCI.³⁻⁵ The pain may be of nociceptive or neuropathic type or a combination of the two. Neuropathic pain following SCI is caused by damage to or dysfunction of the nervous system, while nociceptive pain is caused by damage to non-neural tissue either musculoskeletal due to bone, joint, muscle trauma or inflammation, mechanical instability or muscle spasm. Pain of visceral origin may develop for instance due to renal calculus, bowel, sphincter dysfunction, headache related to autonomic dysreflexia and secondary overuse syndromes.⁶⁻⁷ The pain may be localized above, at or below the level of the SCI and may persist for many years after the acute injury.⁸⁻¹⁰

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The different classifications are based on a combination of pain characteristics (e.g., pain locations and pain descriptors) and other injury characteristics (e.g., level of injury). For example, “burning” pain

below the level of injury is usually classified as neuropathic pain, while “aching” pain above the level of injury is usually classified as nociceptive pain.¹¹⁻¹² Widerström-Noga et al. used an exploratory factor analysis (EFA) to analyze clinical features of pain after SCI.¹³ Three factors (patterns) emerged from the EFA:

1. Neuropathic pain below the level of injury (widespread pain; burning quality; and pain in thighs, legs, and feet).
2. Upper-limb pain in tetraplegia (aching quality; pain in neck and shoulders; and cervical level of injury).
3. Severe, persistent pain (constant pain; early onset pain; and high-intensity pain)

The first pattern corresponded to neuropathic pain below the level of injury and the second to musculoskeletal shoulder pain in tetraplegia. Both types of pain commonly follow SCI.^{11,14} The third pattern included heterogeneous types of pains that were unrelated to the level of injury but were perceived as constant and severe with an onset at or shortly after the SCI. Recent evidence suggests that the vast majority of patients with SCI report chronic painful sensations and that as many as 26 percent of these report the pain as severe.¹⁵⁻¹⁶ Research also indicates that pain associated with SCI tends to worsen, rather than improve, over time¹⁷⁻¹⁸ and that most treatments for SCI-related pain are rated as only “somewhat” helpful by those who have tried them¹⁹ Biopsychosocial models of pain consider the biological, psychological, and social variables that contribute to pain and the inherent feedback that occurs among those variables over time.²⁰

CLINICAL PRESENTATION OF SCI-RELATED PAIN

Musculoskeletal Pain

Several types of pain are commonly observed following SCI. If the injury is traumatic, acute pain may arise from damage to surrounding musculoskeletal structures including bones, ligaments, muscles, intervertebral discs, and facet joints. Nociceptors are activated in these regions and the pain is therefore generally located in the region of preserved sensation close to the site of the SCI, although it may radiate to other regions. Chronic musculoskeletal pain may also occur with overuse or abnormal use of structures such as the arm and shoulder and in association with muscle spasms.²¹⁻²²

Visceral Pain

Visceral pain may arise from pathology in visceral structures, such as urinary tract infection, bowel impaction, and renal calculi. Although the level of SCI influences the type of neurogenic bowel dysfunction, the level of injury does not seem to predict the presence of abdominal pain.²³ Activation of nociceptors by constipation may be an underlying mechanism of abdominal pain in some patients and appears to be more common in patients with long-term SCI.²⁴

Neuropathic Pain

Neuropathic pain following SCI is sometimes regarded as a single entity and referred to as central pain or SCI related pain. However, two distinctly different types of neuropathic pain appear to be specifically related to SCI.²⁴ The first type is present in a segmental distribution anywhere within the dermatome of the level of neurological injury and three dermatomes below this level.²⁵ For this reason, this type of pain is often referred to as segmental, transitional zone, border zone, end zone, girdle zone, or at-level neuropathic pain. The second type of pain occurs diffusely below the neurological level of SCI and is present in the region more than three dermatomes below the neurological level of injury.²⁵ This type of pain may develop many months, and even years, following injury.²⁶ This pain is also referred to as central dysesthesia syndrome, central pain, SCI phantom pain, differentiation pain, or below-level neuropathic pain. This type of pain is typically constant, varies with mood or attention, and is usually unrelated to position or movement..”

However, descriptors alone are often poor indicators of pain type. Although words such as “tingling” and “burning” are more common in people with neuropathic pain and “aching” in musculoskeletal pain, a great deal of overlap exists.²⁷

MECHANISMS UNDERLYING SCI PAIN

Musculoskeletal Pain

The underlying pathophysiological mechanisms of musculoskeletal pain in a person with SCI are similar to those found in the general population. However, this type of pain may be initiated by the physical impairment associated with the SCI. For example, musculoskeletal

pain involving the neck, shoulders, and upper limbs may be related to overuse, extreme joint postures, high mechanical stresses, and repetitive movements associated with transfers and use of wheelchairs..

Neuropathic Pain

The two types of neuropathic pain described earlier are specific to SCI, and a fairly large body of research now characterizes the possible contributing mechanisms.²⁸⁻²⁹ While below-level neuropathic pain is a consequence of the damage to the spinal cord, at-level neuropathic pain may arise from damage to spinal nerve roots or the spinal cord itself.

Trauma to the spinal cord, by various causes, may result in compression, demyelination, inflammation, and ischemia.²⁸ This damage triggers secondary pathological changes in the spinal cord. For example, loss of inhibitory interneurons and lesions of descending inhibitory tracts, along with increased neuronal excitability, leads to abnormal firing of neurons close to the level of SCI, which then contributes to the generation of nociceptive signals and the experience of pain.²⁹

Brain mechanisms are also important in pain perception following SCI. Neuroimaging studies indicate that pain perception depends on a network of cortical and subcortical structures such as the thalamus.³⁰ For example, SCI related pain has been shown to be associated with alterations in thalamic neuronal firing,³¹ expression of sodium channels,³² biochemical changes,³³ and changes in thalamic perfusion or activity.³⁴

Materials and Methods

Study Design: Survey Study

Total 100 subjects were included in the study. The informed consent was filled by the subjects. Then, the questionnaire was used by asking questions to the subjects regarding their pain. Some were filled by telephonic conversations and some by person. Leaving the question blank, if the question does not describe their pain or the individual performing the task.

Result

There were 100 subjects included in the study. Out of 100, 90 subjects suffered from Neuropathic type being the most prevalent. Most of the subjects suffered

pain in the upper limb followed by the lower limb and the back. The pain was present more below the level of injury. The most common aggravating factor of pain was found to be the transfers, exercise and sport activities and fatigue. While 15 out of 90 subjects suffered from continuous pain.

Table no. 1 shows TYPE OF PAIN

TYPE	
Dull aching	17
Neuropathic	33
Burning	18
Mixed	22
No pain	10

Table no.2: Showed SITE OF PAIN

Site of Pain	
Upper limb	27
Lower limb	23
Back	18
Urinary Tract	14
Various	8

Table No 3: Showed LEVEL OF PAIN

Above	23
Below	67

Table no. 4 Shows AGGRAVATING FACTORS OF PAIN

Aggravating Factors of Pain	
Prolong sitting	15
Transfers	25
Stress, Anxiety	10
Exercise, sport, fatigue	25
Continuous	15

Table no. 5: DEPICTS RELIEVING FACTORS OF PAIN

Relieving Factors	
Rest	54
Posture change	16
Exercise	8
No relief	12
Others	10

Discussion

The present study was done to see the patterns of pain in spinal cord injured individuals using “The Spinal Cord Injury Pain Questionnaire”. The questionnaire comprised of Health Screening Questions and questions that relate with pain of the individual. A total of 100 subjects participated in the study and they according to their pain filled the questionnaire. In favour we have, M Dalyan, DD Cardenas1 and B Gerard concluded that UE pain is a common problem in individuals with SCI and has impact on daily activities. UE pain prevention and management programs are needed for SCI patients. Sevgi Ikbali Afsar, Sacide Nur Saracgil Cosar, Oya Umit Yemisci and Nuri Cetin concluded that neuropathic pain is an important factor that affects daily living activities, SCI patients should be evaluated

in detail to determine the characteristic of any pain, and the medical treatment prescribed to the patient should be closely monitored. Güldal F Nakipoglu-Yüzer, Nermin Atçı, and Nese Ozgirgin found that neuropathic pain due to SCI to be mostly below the lesion level with a burning or aching character and we did not find a significant relationship between the demographic and SCI-related characteristics of the patient and the pain characteristics. Persons with SCI tend to experience high pain intensity over multiple body locations. Lower body pain was as common as upper extremity pain, but tended to be more intense. (Spinal Cord (2008) 46, 451–455; doi:10.1038/sc.2008.5). The quality of central pain-burning, stabbing, pins and needles, or numbness-but seldom aching (Davis and Martin, 1947; Pollock et al., 1951; Weinstein, 1962; Melzack and Loeser, 1978; Nepomuceno et al., 1979) -was similar to that of other nervous system trauma. Examples are the radiculopathies, the compression neuropathies as in carpal tunnel syndrome, ulnar palsy, meralgia paraesthetica (Adams and Victor, 1985; Schaumburg, 1988) or the gunshot wounds to the peripheral nerves resulting in causalgia (Mitchell, 1872). The location of central pain at or below the level of paralysis has also been well described (Davis and Martin, 1947; Melzack and Loeser, 1978; Nepomuceno et al., 1979).

Conclusions

This study showed that 90 out of 100 suffered from pain. Out of 90, 23 had pain above the injury level while 67 had pain below the injury level. 35 were Quadriplegic and 65 were Paraplegic. The types of pain showed the following prevalence: Neuropathic pain > Mixed > Burning sensation > Dull Aching. The common sites of pain were: Upper limb > Lower limb > Back > Urinary tract > Various. The most common aggravating factor of pain was found to be transfers, exercise, recreation, sport and fatigue. This was followed by prolonged sitting and Stress and anxiety. Most of the subjects relieved from pain when at rest followed by posture or position change. 12 out of 90 subjects got no relief in their pain while 10 subjects got relieved from other non specific factors.

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Effects of 90/90 Bridge with Ball and Balloon Exercise on Lung Volumes and Quality of Life in Patients with Chronic Obstructive Pulmonary Disease

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Abstract

Background: Chronic obstructive pulmonary disease is the 4th leading cause of death in the world and it is estimated to be the 3rd leading cause of death by 2020. Diaphragmatic dysfunction is one of the major clinical finding in chronic obstructive pulmonary disease patients which alters the respiratory function and quality of life. Therefore, the objective is to investigate the impact of 90/90 bridge with ball and balloon exercise on lung volumes and quality of life in patients with chronic obstructive pulmonary disease.

Method: A total 38 patients were taken, 30 of them met criteria and were divided into two groups using randomized sampling technique, 15 in experimental group i.e., 90/90 bridge with ball and balloon exercise and 15 in control group i.e., diaphragmatic breathing. There was a single dropout in experimental group. The intervention given for 6 weeks, 5 days in a week, one session for a day i.e., 30 minutes. Both outcomes i.e., Forced expiratory volume in 1 second and St. George Respiratory Questionnaire values were taken before and after intervention in this study.

Results: The findings suggest that both experimental and control group showed statistically significant improvement in both outcome measures. Statistically experimental group showed more significant than control group.

Conclusion: The study showed that 90/90 bridge with ball and balloon exercise is effective in improving the lung volumes in patients with chronic obstructive pulmonary disease, which leads to improvement in quality of life.

Key Words: Chronic obstructive pulmonary disease, diaphragm dysfunction, lung volumes, quality of life, bridge exercise, balloon.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is one of the leading respiratory diseases that affects quality of life around the world. It is defined as a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway abnormalities caused by exposure to noxious particles.^[1] At present COPD is the 4th leading cause of death in the world and it is estimated to be the

3rd leading cause of death by 2020.^[2] In 2012, over 3 million deaths reported because of COPD considering for 6% of all deaths globally. According to sources, on 2016 out of 5, three leading causes of mortality constitute non-communicable diseases although COPD is the 2nd biggest cause of death in India today.^[3] It is predicted that by 2030, 4.5 million COPD related deaths may occur.^[1] In India, the prevalence varied between 2 to 22% among the men and 1.2 to 19% among women.^[4]

In India, north-eastern states, COPD ranked seventh and in remaining states it ranked fourth.^[5]

The main clinical finding in COPD patients are inspiratory muscle weakness.^[6] Diaphragm is the primary muscle responsible for inspiration and it is dome shaped, muscular and membranous structure that separates the thoracic and abdominal cavities. The weakness of diaphragm leads to decreased diaphragmatic mobility. In general, there are several reasons which leads to diaphragm weakness, where as in COPD, the central causes are hyperinflation and shortening of Zone of Apposition (ZOA).

Hyperinflation is due to obstruction of expiratory flow which is caused by decreased lung elastic recoil and increased airway resistance^[7]. It leads to reduced flow and pressure-generating capacity of diaphragm.^[8] It also shows negative impact on respiratory muscles, mainly diaphragm which effects the diaphragmatic length. It is the main mechanism by which force-generating capacity of the diaphragm is affected.^[7,9] The shape of the chest wall is altered in hyperinflation leading to reduction of the ZOA.^[10]

The ZOA is the area of the diaphragm surrounding the dome shaped muscle (cylindrical portion) which corresponds to the portion directly apposed to the inner aspect of the lower rib cage.^[11] Due to absence of piston-like movement of diaphragm, the ZOA gets shortened.^[12] This leads to reduced ability to carry air into thorax due to less caudal movement upon contraction and less sufficient tangential tension of diaphragm on the ribs and consequently lesser transdiaphragmatic pressure^[13] and also results in diminished activation of transverse abdominis, which is responsible for both respiration and spinal stabilization.^[14,15] The decreased ZOA is accompanied by reduced expansion of ribcage and increase in abdominal expansion.^[16] If the body maintains this position for respiration for a prolonged period, the diaphragm gets attentively shorten and lungs become hyperinflated^[17,18,19] and the usage of accessory muscles gets increased for efficient breathing.^[20]

As, the diaphragm gets shortened, the expansion of thoracic cavity decreases, which leads to increase in lung volumes. Increased lung volumes causes increased lung capacities, leading to breathlessness and limitation of activities of daily living which ultimately shows effect

on quality of life. This is the major cause of chronic morbidity and mortality around the world.^[21]

Various treatments for respiratory diseases have been developed, in which respiratory muscle strengthening exercises showed more therapeutic effects comparing to other techniques.^[22] These treatments have shown impact on respiratory function, muscle strength, exercise performance and to prevent complications.^[23] But in many of the studies, the researchers had neglected the concept of “zone of apposition”.

One of the demanding factors, which has to be remembered by physiotherapists is maintaining an optimal ZOA of diaphragm.^[24,16,25,14] If the ZOA is improved, the respiratory role of the diaphragm has maximal efficiency.^[17]

Whereas, 90/90 Bridge with Ball and Balloon technique developed by the Postural Restoration Institute helps in repairing of ZOA and spine to a proper position which allows the diaphragm the optimal ability to perform both its respiratory and Postural roles.^[26]

The purpose of this study is to find out the effectiveness of 90/90 bridge with ball and balloon exercise on lung volumes and quality of life in COPD.

Materials and Methods

This study was an experimental study conducted in Department of Physiotherapy, GEMS Medical College, Srikakulam. After obtaining ethical clearance from GEMS medical college, all the patients of COPD were examined and screened according to the inclusion criteria (patients with age group 55-65 years of 2nd & 3rd stages of COPD based on GOLD classification with BMI less than 30 kg/m²) and exclusion criteria (patients having associated pulmonary, cardiovascular, musculoskeletal or any neurological disorders, under oxygen supplementation, having participated in training programs in the 6 months prior to study, being unable to perform any of the required tests or being uncooperative). 30 patients who met the criteria were randomly allocated into two groups i.e., 15 patients in each experimental and control group after taking an informed consent. Patients in experimental group were given 90/90 bridge with ball and balloon exercise whereas in control group they were given diaphragmatic breathing exercise. The

pre and post treatment values were measured by using Forced Expiratory Volume in 1 sec through Spirometry and St. George Respiratory Questionnaire (SGRQ) for quality of life.

Intervention

EXPERIMENTAL GROUP (90/90 BRIDGE WITH BALL AND BALLOON EXERCISE)

The treatment was given for 1 session i.e. 30 minutes per day for 5 days in a week for a period of 6 weeks.

For 90/90 bridge with ball and balloon exercise, the patients were asked to lie on their back with feet on a wall, knees and hip flexed at 90° angle. Place a 4-6" ball between knees and place the right arm above head and a balloon in left hand. Maintaining this posture, ask the patients to inhale through the nose for 3-4 seconds in duration, and complete exhalation through mouth into the balloon for 5-8 seconds in duration, followed by a pause. While performing exercise ask the patients to keep his/her low back flat on the mat. The patients were instructed not to grab the opening of the balloon too tightly to allow air in the balloon to enter the mouth cavity nor to use the cheek muscles to blow into the balloon and also not to press the feet flat on the wall while performing exercise. As the balloon gets bigger, pinch the balloon neck and remove it from mouth, let the air come out of the balloon.

CONTROL GROUP (DIAPHRAGMATIC BREATHING EXERCISE)

The treatment was given for 1 session i.e., 30 minutes per day for 5 days in a week for a period 6 weeks.

For diaphragmatic exercise, the patients were asked to sit in a upright position and then ask them to inhale through nose for 3-4 seconds in duration, and complete exhalation through mouth for 5-8 seconds, followed by a

pause. The patients were instructed to keep his/her hands on upper abdomen to verify that the abdomen ascends during inhalation and descends during exhalation.

Results

The statistical tools used are SPSS software 20.0 and the data was entered into Microsoft excel spreadsheet, tabulated and subjected into statistical analysis.

All the descriptive statistical data were presented in the form of mean and standard deviation was calculated and graphically represented. Paired t-test is used to compare the means of pre and post intervention of the dependent variable for parametric data. Independent student t-test (unpaired t-test) is used to compare the means of two pre and post interventions of two groups of the variables for parametric data. For all statistical analysis, $p < 0.05$ considered significant.

Patients in both groups were at same base line of FEV_1 values and SGRQ scores prior to the treatment. The values of FEV_1 is $p=0.8179$, whereas SGRQ is $p=0.9615$.

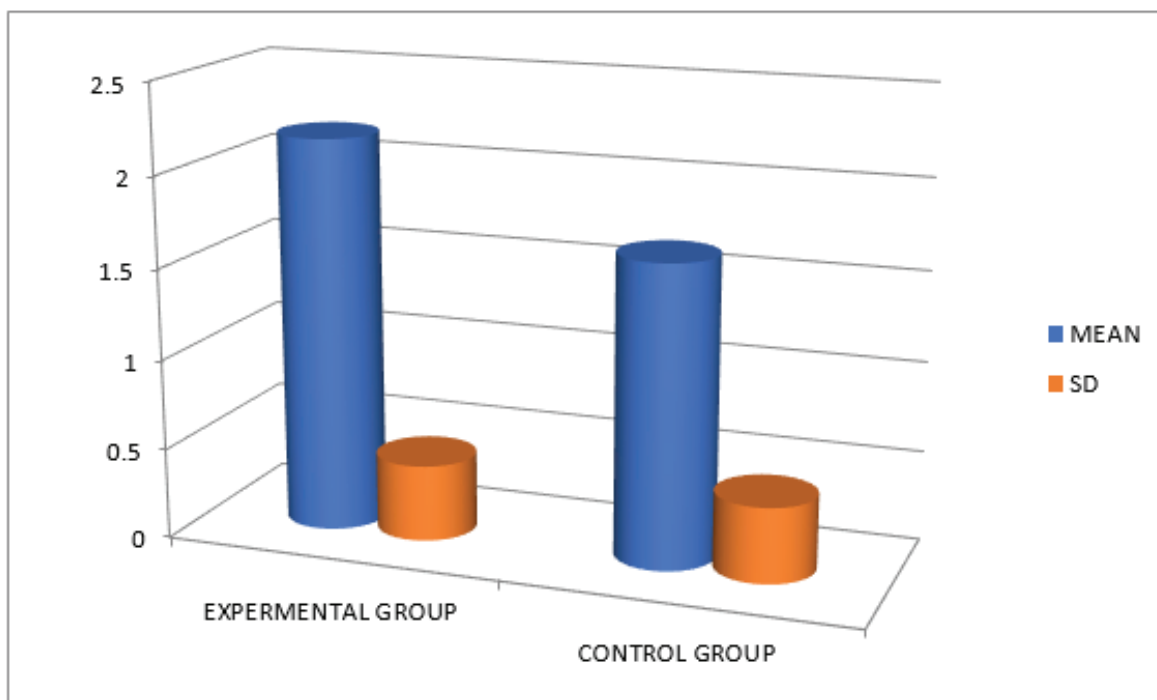
The spirometric values for FEV_1 of both groups before and after treatment are, mean difference and t value of experimental group is 0.557149 and 10.390 with a p value of <0.0001 considered extremely significant, whereas for control group is 0.08 and 3.595 with a p value of 0.0029 considered very significant. The SGRQ values of both groups, mean difference and t value of experimental group is -9.07143 and 26.428 with a p value of <0.0001 considered extremely significant, whereas for control group is -4.6 and 21.515 with a p value of <0.0001 considered extremely significant.

The post intervention values in between two groups is of FEV_1 is $p=0.0025$, considered very significant, whereas SGRQ is $p=0.0342$, considered significant.

Comparison between groups (Post test means)

TABLE – 1 : POST test data analysis of FEV₁ values in both groups.

GROUP	MEAN	SD	MEAN DIFFERENCE	T VALUE	p VALUE
EXPERIMENTAL	2.171429	0.4214	0.5181	3.332 with 27 degrees of freedom	0.0025
CONTROL	1.653333	0.4155			

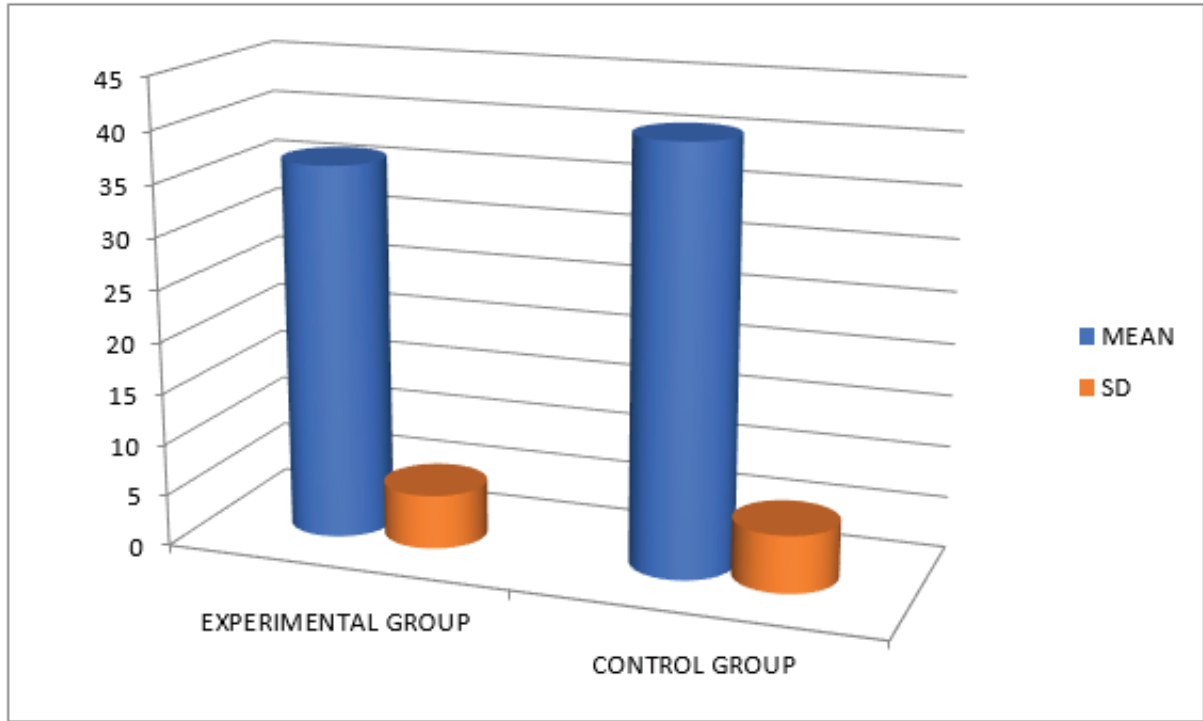


GRAPH – 1 : Comparison of POST test means and SD of FEV₁ values in both the groups.

RESULT : There is a significant difference in post test means of FEV₁ values in both the groups. Experimental group showed more significant than control group.

TABLE – 2:POST test data analysis of SGRQ score in both groups.

GROUP	MEAN	SD	MEAN DIFFERENCE	T VALUE	p VALUE
EXPERIMENTAL	36.28571	4.999	4.381	2.231 with 27 degrees of freedom.	0.0342
CONTROL	40.6667	5.538			



GRAPH – 2: Comparison of POST test means and SD of SGRQ score in both groups..

RESULT : There is a significant difference in post test means of SGRQ score in both the groups. Experimental group showed more significant than control group.





Figure 1 :- Patient performing 90/90 bridge with ball and balloon exercise.



Figure 2 :- Patient performing diaphragmatic breathing exercise

Discussion

The purpose of this study was to find out the effectiveness of 90/90 bridge with ball and balloon exercise on lung volumes i.e., FEV₁ and quality of life in

patients with COPD.

In this study, over all, 30 patients who met the inclusion criteria were randomly allocated into two groups. The patients with age groups 55-65 years of both genders i.e., 14 females and 16 males who were diagnosed with COPD were selected. 15 patients from experimental group were treated with 90/90 bridge with ball and balloon exercise while 15 patients from control group were treated with diaphragmatic exercise. The patients were treated for a period of 6 weeks. There was a single drop out from the experimental group i.e. due to personal reason The pre and post values of treatment were measured. The results has showed statistically significant changes in FEV₁ and SGRQ values in both experimental and control groups i.e., before and after the intervention. But a statistically significant changes has been observed between the two groups.

This study supported by Sumi Rose and Aakriti Dakal et al. showed that the position 90/90 is effective and improved the lung volumes in individuals with reduced lung volumes. Individuals who were taught exercise showed significant improvement in FEV₁, FEV₁/FVC and no significant improvement in FVC where as in control group no significant improvement were seen in FVC, FEV₁ and FEV₁/FVC.

In a study conducted by KyoChulSeo, Misuk Co et al., investigated the pulmonary function before and after the experiment were compared, results found that the lung capacity of the experimental group showed significant increase in FVC and FEV₁ when compared to control group. Although, MVC has increased but doesn't have significance.

This study shows similarities with previous studies by working on ZOA in improving lung volumes, it differentiates by focusing on higher age groups i.e., 50 to 60 years along with improving quality of life.

This study used 90/90 bridge position with ball and balloon exercises to increase the length of ZOA which is a root cause for change in diaphragmatic length, results in alteration of lung volumes and quality of life. The blowing of balloon used while exhalation causes activation of both internal and external intercostal muscles. The bridge position in the exercise enhances activation of abdominal muscles and expansion of

chest wall. The statistical significance in outcomes of experimental group was due to the activation of abdominal muscles and expansion of chest wall which is enhanced by the bridged position. So 90/90 bridge with ball and balloon exercise i.e., experimental group is shown to be more effective when compared with control group.

Conclusion

This study has concluded that Effectiveness of 90/90 Bridge with Ball and Balloon Exercise has shown improvement in pulmonary function and quality of life in patients with COPD.

Source of Funding - Self

Conflict of Interest - Nil

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Effect of Pilates Vs.yoga on Balance, Cognition and Core Strength in Elderly

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Abstract

Background: In older people, falls have become a major health issue. People aged 65 and above are more prone for most frequent accidents which can lead to injury related hospitalisation. Elderly people have many serious health issues and they have several disorders affecting their body at the same time. Pilates is kind of exercise that uses a combination of muscle that increases power, stretches muscle and also concentrate on breathing to develop strength of the trunk muscles and restore muscle balance for physical fitness. Yoga is the active engagement between the mind and body. Yoga focuses specifically on what is exactly happening in the body and where the body is actually moving in space which increases both awareness and proprioception. **Objective:** To study the effect of Pilates on balance, cognition and core strength. To study the effect of Yoga on balance, cognition and core strength. To compare the effect of Pilates Vs. Yoga on balance, cognition and core strength in elderly. **Method:** There were two groups Pilates and Yoga. 30 subjects were sequentially divided in both groups. The treatment was given for 3 days a week for 4 weeks. The outcome measures were taken at the beginning and at the end of 4th week. **Result:** The Pilates group is having statistically significant improvement in balance. The Yoga group is having statistically significant improvement in cognition. The core strength is clinically significant in Pilates group. **Conclusion:** This study concluded that Pilates and Yoga both are equally effective in improving cognition, balance and core strength at the end of 4 weeks protocol, yoga group showed marked increase in cognition whereas Pilates group showed marked increase in balance and core strength.

Key Words: Pilates, Yoga, Cognition, Balance, Core strength, Elderly

Introduction

Today people live longer worldwide and now can expect to live beyond their sixties. There is a dramatic increase in the frequency of population ageing in the world.^[1] There are two inseparable concepts called demographic transition and population ageing. The process of demographic transition have a resultant product called population ageing.^[2]

The ageing results are having mark impact by the gathering of vivid variety of cell level and molecular level changes over the period of time. Progressive decline in physical and mental capability, progressive risk of disease and progressively death are all carried out because of the process of ageing. Characteristics of

older age is development of plenty of difficult level of health issue which are supposed to appear only in later stage of life and also those does not come into separate categories. Those are known as old age syndromes commonly.^[3]

Changes in Skeletal Muscle:

Reduction in performance of skeletal muscle is the significant factor of responsible factor of physical inability and progressive age. The reduced level of work done by skeletal muscle is in the form of sarcopenia.^[4] Regulating factors of elderly skeletal muscle performance are nervous, muscular and skeletal systems.^[5] Grossly, physiological and/ or anatomical degeneration will lead to decrease performance of skeletal muscle which

are carried over by the way of living, biological and psychological elements.^[6]

Nervous system along with skeletal system controls more than 500 skeletal muscles.^[7] The smallest functional unit of skeletal muscle fibre which goes under constant pumping which leads to movement of body like fast and powerful or small and time motions. Loss of sarcomere, difference in muscle fibre type and muscle atrophy, decreased level of activation of junction of nerve and muscle could affect the kinematics of muscle like velocity, force, strength of movement that ultimately leads to functional disability and hospitalization. Importance of maintaining muscle health throughout life truly depends on the metabolic functions and role of myokines.^[8]

NEUROLOGICAL CONTROL OF MUSCLES AND MOTION:

Nervous system controls the largest movement and forces of human body skeletal muscle.

The neural control of skeletal muscle goes as follows – Sensory information > Motor areas of brain and spinal cord > Generates neurological signals > Produces co-ordination, targeted movements^[9]

NEUROLOGICAL FACTORS RESPONSIBLE FOR MUSCULAR DECLINE IN ELDERLY:

Motor neurons and muscle fibres are recruited more and more as the voluntary contraction force of muscle increases. Major factors of timing and strength of voluntary contractions comes from descending tract from motor cortex.^[10] According to the previous studies, functionally healthy older adults usually will not lead difficulty in voluntary muscle activation and visa versa for the weaker older people.^{[11],[12]}

According to the prediction, amongst the total mass of people 22% are having old age than 60 years and 5 % will be counted of having old age till 2050.^[13] in India due to improved quality of life and life expectancy the population ageing is showing an upward going and rising sharp graph.^[14] As the age progresses, the population will have increased incidence of physical performance limitations. Those limitations leads to the risk of falls. So in today's world prevention of limitations and treatment of physical performance improvement are very much

important for public health benefits.^[15]

AGEING MUSCLE MORPHOLOGY AND NEUROPHYSIOLOGICAL MANIFESTATION –

According to the figure showed below,^[16]

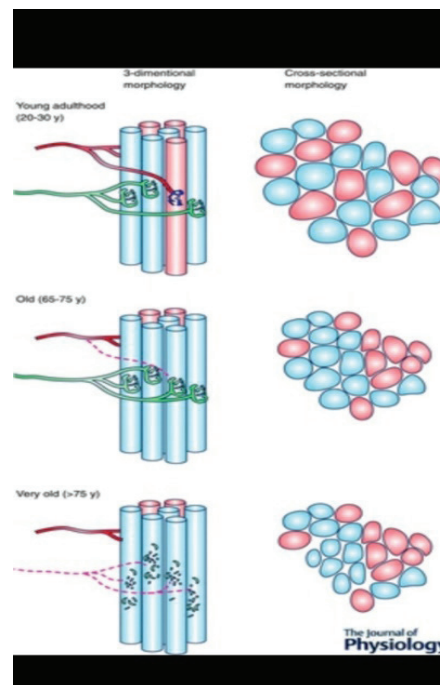


Figure : 2 motor unit alteration in ageing muscle by morphological view

- Young adulthood shows the interconnected threads of muscle which are part for varied motor units.
- Starting from adult life to elderly shows cycle of denervation – re innervation.
- Elderly is showing increased number of axonal ageing which eventually leads to grouped fibre atrophy.^[17]

Sensory and motor inputs contribute to declines in balance with age. Progressive decline in spinal motor neurons causes reduced in muscle fibre number and size i.e. sarcopenia, these results in reduced mechanical muscle performance, decreased muscle strength, power and force that eventually reduces functional capacity during everyday tasks due to the effects of ageing. Along with balance, strength, cerebellar integrity, Vestibulo – cochlear function, hearing and vision & proprioception all contributes for the falls in elderly.^[18]

Changes of ageing includes repeating cycles of denervation and re innervation which leads to grouping

of fibre and extension of living MUs, neuronal loss, instable neuromuscular junction. Along with strength and power ageing also leads to impaired co – ordination that collectively cause falls and physical imperfection in performance.^[19]

All our systems, organs and tissues are all affected by the fundamental process of ageing. Total body decline is inevitable with ageing but it depends on person to person that at which rate and magnitude it makes changes in each system.^[20]

In older people, falls have become a major health issue. People aged 65 and above are more prone for most frequent accidents which can lead to injury related hospitalisation. Disability, loss of independence and increased mortality are all associated with fall injuries.^[21] A restricted activities related to daily life are the eventual results of falls in elderly are defined as a feeling of fear of fall. Fear of falling is multi factorial and multidimensional, which is widely accepted. Decreased functional capacity, impaired cognitive capacity and depression those all are responsible for feeling of fear of falling in both gender having old age.^[22]

Prevention of fall and assessment of balance training is helpful in counteracting the age related decline in function and aids in prolonging independence in elderly individuals.^[23] Depending on the risk factors identifying and treating the reasons prevents the consequences of falls.^[24]

The complex interaction of neuromuscular, proprioceptive, vestibular and visual system is required for the ability to maintain balance in humans. And with ageing performance of many of these system declines gradually which results in impaired equilibrium and eventually progresses to risk of falling in elderly. Maintenance of balance and functional mobility in elderly is very important.^[25]

Many years ago an exercise was developed relayed on the eastern philosophical principle and motion technologies such as Yoga and western method of body conditioning such as P.H.ling's medical gymnastics by JOSEPH PILATES(1880 – 1967). This method was developed for the core muscle which had more than 500 techniques of improving muscle flexibility and muscle strengthening exercise which are divided into

two different categories: Mat pilates and pilates using Apparatus.^[26]

Pilates is kind of exercise that uses a combination of muscle that increases power, stretches muscle and also concentrate on breathing to develop strength of the trunk muscles and restore muscle balance for physical fitness. In Pilates one will have to activate several group of muscles at the same time. Which works on the co – activation and co - ordination of the muscles. Recent studies suggested that now a days Pilates exercise is used by many people of different age group, people having different body type and poeple having different level of physical ability because of flexibility of changes.^[27]

We can assume that Pilates is a different kind of physical movement that engages mind to focus on what the boding is doing. Which helps in increasing the cognitive functions. Researchers have found that when one has to think about how their body is moving, their brain cells grow at a faster rate and their nervous system creates better connections throughout the body.

EFFECT OF PILATES ON COGNITIVE FUNCTION:

- It helps in improving circulation and oxygenation in the brain
- Brain derived neutrophin supports neuronal survival in developing brain
- It provides mood enhancement
- Generates new neurons
- Increases neurotransmitters^[28]

Yoga is considered as one of the complementary and alternative therapies which is more theorized as therapeutics than traditional exercise as it involves mind and body component. Yoga is active coordination of body and mind. Yoga focuses particularly on what is exactly happening in the body and how the body is actually being moved in the space which increases proprioception and consciousness. As yoga have gentle movements is can be addressed to prevent the risk of falls in persons having reduced balance, difficulty in mobility, decreased muscle strength and flexibility and it also focuses that how one can increase the awareness and proprioceptive function which can decrease the fear

of fall and improve balance in elderly.^[29]

Need For Study: Aging is associated with the common problem of cognitive impairment with occurrence rate of approximately 21.5 – 71.3 per 1000 person/ year in old age population. Mild cognitive functions can range from 3% to as high as 42% in population and 6% to 85% in clinical setting. Maintenance of balance and functional mobility in elderly is the result of very important strengthening of core muscles. Activation and co – ordination of several muscle groups at the same time is the classical feature of Pilates exercise. This exercise suits to people having different age, different body type and different level of physical ability due to flexibility in changes in movement. Active engagement of mind and body simultaneously is the classical characteristic of yoga therapy. Mind is stimulated to engage the focus on what is happening in the body and how the body moves in the space. That increases both proprioception and consciousness. There are few studies which have given the combined treatment of Pilates and yoga on balance and there are also few studies which individually saw the effect of Pilates on balance or cognition or core strengthening, but not a single studies have compared the effect of Pilates and yoga on balance, cognition and core strengthening in elderly. So this study is needed to compare the effect of Pilates and yoga on balance, cognition and core strengthening in elderly

Aims: To study the effect of Pilates Vs. yoga on balance, cognition and core strength in elderly.

Objectives: To study the effect of Pilates on balance, cognition and core strength. To study the effect of yoga on balance, cognition and core strength. to compare the effect of Pilates Vs. yoga on balance, cognition and core strength in elderly.

Methodology: participants recruited were elderly individuals coming regularly at konkane chowk public garden pimple saudagar are. Selected were of age 65-75 year. Demographic data was collected from all the individuals. Which includes name, age, gender and occupation, address and contact details. Participants were asked about their past medical history that is about hypertension and recent surgical history in past year. This was documented for all the patients. A questionnaire form was filled by all patients through interview method for measuring fear of fall efficacy scale – international

(FES – I).

A total number of 30 individual selected for the study according to inclusion and exclusion criteria was elderly people with the age of 65 – 75 years. Not participating in any sports or any physiotherapy sessions. Willingness to do physical exercise thrice a week with regular attendance. Fall efficacy scale score more than 16. Montreal assessment scale score less than 23 are included.

Exclusion Criteria: Any neurological disease and cardiovascular disease. Any psychiatric conditions. Malignancy. Medications known to effect muscle strength .Recent fractures. Any recent soft tissue injury.

Now they were divided into two groups, Pilates group and yoga group through sequential allocation. Participants were informed about the benefits and possible risk which mainly includes muscular soreness. Thus written consent was taken from all the subjects. Ethical approval was taken from institutional ethical; committee.

Baseline parameters for balance, cognition and core strength were assessed for all individuals by using berg balance scale, Montreal cognition scale and pressure biofeedback. Public garden at konkane chowk pimple saudagar area was use as a study setting where exercise were given to both the groups.

Participants of both the groups were called for exercise sessions for 4 weeks, 3 times a week for 45 min each session. Pilates and yoga both were practised using Mat. After completing the 4 week protocol the outcome measures were assessed again.

Outcome Measures: Balance was measures using the berg balance scale. Cognition was measured using the Montreal cognition scale and the core strength was measured using the pressure biofeedback.

Statistical Analysis: The outcome measures were assessed and the values obtained were documented and tabulated for statistical analysis. Pre post assessment within group was done by paired t – test or wilcoxon test respective to the normality of the data. Pre post assessment between groups was done by using t – test or Man Whitney Rank sum test respective to the normality of data.

The outcome measure were assessed for both group A (Pilates) and group B (Yoga) all subjects were taken that is n = 15 each.

Data Analysis And Interpretation:

TABLE 1: Characteristics of subjects of both the groups

Age group	Pilates	Yoga
N	15	15
Gender	Male = 10	Male = 7
	Female = 5	Female= 8
Mean age	69	68.67
SD	3.703	3.478
P value and t value	P= 0.801	
	t = 0.254	

Table 1 shows mean age of participants of both the groups. Graph 1b shows male and female ratio in Pilates and yoga groups. After applying t – test on mean age between groups (p = 0.801) were not found significant. Hence both the groups were comparable as the participants were of same age group.

TABLE 2: Comparison of difference in Pilates and Yoga group for Montreal Cognition Assessment Scale score (between)

Montreal cognition scale	Pilates	Yoga
Mean + SD	1.533+0.7432	3.867+1.125
p value	0.000	

Table 2 shows that in comparison between the groups for the Montreal Cognition Assessment Scale score there is marked increase in cognition score in yoga group. While in Pilates group there is slight increase observed in cognition.

TABLE 3: Comparison of difference in Pilates and yoga group for berg balance scale score (Between)

Berg balance scale	Pilates	Yoga
Mean + SD	6.067+2.12	3.067+0.9612
P value	0.000	

Table 3 shows that in comparison between the groups for the berg balance scale score there is marked increase in balance score in Pilates group. While in yoga group slight increase was observed in cognition.

TABLE 4: Comparison of difference between Pilates and yoga for pressure biofeedback (Between)

Pressure biofeedback	Pilates	Yoga
Mean + SD	-4.8+1.971	-3.8+3.668
P value	0.097	

Table 4 show that in comparison between the groups for the pressure biofeedback score there is marked improvement in the Pilates group. While in yoga group slight improvement was observed in core strength. Here the minus data indicates the improvement.

Results

Data obtained was analysed using paired t – test and Wilcoxon test for within group and t – test and Man Whitney test for between group comparison for pre post values of both groups and following results were found. **TABLE 1** shows the demographic characteristics of subject of both the groups. **TABLE 2** shows that comparison between Pilates and yoga for Montreal Cognition Assessment scale score was highly significant statistically with p value of 0.000. This result also co – relates with the clinically significant effect of yoga over Pilates. Improvement is seen in both the groups but clinically yoga group shows more improvement. **TABLE 3** shows that comparison between Pilates and yoga for berg balance scale score was highly significant statistically with p value of 0.000. This result also co – relates with the clinically significant effect of Pilates over yoga. Improvement in balance is seen in both the groups but Pilates group shows more improvement. **TABLE 4** shows that comparison between Pilates and yoga for pressure biofeedback score was not statistically significant with p value of 0.000 But this result contradicts the clinically significant effect of Pilates over yoga. Clinically improvement is seen in both the groups but Pilates group shows more improvement. The result of the study found that cognition was highly statistically and clinically significant for yoga group with p value of 0.000. Balance measured through berg balance scale was highly statistically and clinically significant for Pilates group. This study also shows that core strength measure with pressure biofeedback was not significant statistically with the p value of 0.097 but it is definitely clinically significant for the Pilates group.

Discussion

Our study is comparing the effect of pilates and yoga programs on cognition, balance and core muscle strength in elderly with age of 65 – 75 years. The subjective assessment of participants was done and outcome measures were analysed like cognition, balance and core strength through Montreal cognition scale, berg balance scale and pressure biofeedback respectively .Group A received Pilates intervention and Group B received yoga intervention.

According to study of Gonul Babayigit et al, improvement in dynamic balance, muscle flexibility, reaction time and muscular strength could be done by Pilates exercise for reducing the number of falls in older age women and they concluded that improvement in dynamic balance, muscle flexibility, reaction time and muscle strength can be done by Pilates as well as it can reduce the tendency of fall in older women.^[33]

Here we can find out the reason that why the Pilates will have marked improvement in the balance and core strength components, that is because as in a multi-storeyed building the base is the important element similarly the core muscles are the base of our body. As Pilates directly work on the core muscle according to its principles, we could connect the strings that once the base i.e. the core muscles are strengthened the body will have its equilibrium and balance in space and eventually balance shows improvements.

In one recently study done by Nozomi Hishikawa et al., in 2019 on the effect of yoga and exercise together promotes cognitive, affective and physical functions in old age people he concluded that Cognitive, affective,

ADL, and physical functions in a local older age people. Populations was improved by yoga plus exercise which indicates the benefits in preventing dementia among elderly individual.^[37] In our study also the yoga group is showing marked improvement than Pilates group so this study findings supports our study.

The ultimate reason behind the improvement in cognition in yoga is because whenever the yoga postures are being held or assumed the muscles are engaged and focused and it goes in a state of attention and the similar happens during the meditation. In the meditative process there is increased level of oxyhemoglobin in the pre frontal cortex due to the increased blood flow to that area of brain. This eventually improves the cognition but this process takes a longer duration studies to be followed.^[38]In this current study it was found that participants in the yoga group showed improvement significantly in the cognition and while Pilates group showed improvement significantly in balance and core strength.

Conclusion

This study concluded that Pilates and yoga both are equally effective in improving cognition, balance and core strength at the end of 4 weeks protocol, but there was marked increase in cognition in yoga group whereas the Pilates group showed marked increase in balance and core strength.

Ethical committee clearance received from faculty at Dr. D.Y.Patil college of Physiotherapy.

Research and Recognition committee clearance received from faculty at Allied medical science at its meeting held on 22nd april,2019.

Conflict of Interest: Nil

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