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Efficacy of Mobilization versus Strength Training in Patients with Chronic Cervicogenic Headache

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ABSTRACT

Background: Head pain which is referred to head from bony structure or soft tissues is commonly termed as cervicogenic headache. Cervicogenic headaches are unilateral, starting from one side of the posterior head and neck, migrating to the front, and sometimes are associated with ipsilateral arm discomfort. Many authors have reported effectiveness of mobilization in reducing headache but few controlled clinical studies of mobilization has been reported. However little is known about effectiveness of mobilization and strength training in cervicogenic headache.

Objective: To determine whether mobilization and strength training reduce pain and improve functional ability of patients with chronic cervicogenic headache.

Study Design: experimental study design

Method: 30 subjects were included in the study to fulfill the inclusion and exclusion criteria which was randomly assigned into mobilization group and strength training group. Group 1 included 15 subjects (n=15) and group 2 included 15 subjects (n=15). Both the group was given conservative treatment by TENS and Ice packs at the start of the treatment

Results: The result of post test inter group comparison of pain measured by VAS shows that Both the groups showed significant reduction in pain. The result of post test inter group comparison of neck functional activity measured by NDI shows that Both the groups showed significant improvement in functional activity.

Conclusion: The study concluded that both mobilization and strength training are effective in management of cervicogenic headache but strength training was more effective than Maitland mobilization which is statistically significant.

Keywords: Cervicogenic headache, mobilization, neck strengthening exercise

INTRODUCTION

Acute and chronic headaches are a significant medical, industrial and socioeconomic problem. The term cervicogenic headache has been first introduced by Sjaastad et al in 1983. The classic cervicogenic headache has been classified as recurrent, long lasting, severe unilateral headache arising from neck. The headache is dominant on one side, but may also be present on the contralateral side to a lesser degree. The dominant pain does not alternate from one side to the other. The typical headache location is in the low occipital and temporal region and can radiate periorbitally. The cervical spine has reduced range of

motion and the headache can often be precipitated by the patient with certain neck postures.¹

International headache society and international headache study group have both developed different classification system for the diagnosis of CEH. According to the international classification of headache disorders the diagnostic criteria of CEH are as follows.

- a. Pain referred from source in the neck and perceived in 1 or more regions of the head and face.
- b. Clinical, laboratory or imaging evidence of a disorder within the cervical spine and soft tissues of

the neck known to be or generally accepted as a valid cause of headache.

c. Evidence that the pain can be attributed to the neck disorder or lesion based on atleast one of the following:

1. Demonstration of clinical signs that implicate a source of pain in the neck.

2. Abolition of headache following diagnostic blockade of a cervical structure or its nerve supply using placebo or other adequate controls.

d. Pain resolves after three months after successful treatment of the causative disorder or lesion.²

The prevalence rate of cervicogenic headache is 0.4% to 2.5% of the general population to 15% to 20% of patients with all chronic and recurrent headaches. Individuals with chronic cervicogenic headache experience considerable restriction of daily function, limitation of social participation, and emotional distress. In addition, these individuals report a lower quality of life than healthy individuals.⁷ The etiology of cervicogenic headache has been related to articular dysfunction of first 3 cervical vertebrae and their surrounding structure⁸

Many treatments are advocated for cervicogenic headache including medical, surgical and physiotherapy management.

Mobilization is a passive movement performed in such a manner that it is at all times within the abilities of patient to prevent the movement if he so chooses. The two types of mobilization are: a) passive movements performed for the purpose of relieving pain and restoring pain-free functional movements. These are of two kinds. 1) passive oscillatory movements performed slowly or quickly smoothly or staccato, with small or large amplitude and applied to any part of total range of movement. These movements may be performed while the joint surfaces are distracted or compressed. Distraction is separation of opposing joint surface and compression is squeezing together or approximation of opposing joint surfaces. 2) sustained stretching: passive movements may be performed with or without tiny amplitude oscillations at the limit of the range. b) passive movements performed for the purpose of maintaining a functional range of joint movement of

patients who are unconscious or who have an active joint disease such as rheumatoid arthritis.¹⁰

Isometric strength and dynamic endurance training of neck muscles may relieve or even completely eliminate pain and restore function in patients with chronic neck pain. Therapeutic exercise intervention should start by addressing and teaching postural awareness. Strengthening exercises for all the muscles of the neck can be done by pushing the theraband in all the directions. . Dynamic exercises for shoulder and arm is also done. Exercises like dumbbell shrugs, presses, curls, bent-over rows, flyes and pullovers are done for increasing the strength of shoulder muscles

METHODOLOGY

All the subjects were assessed and patients fulfilling inclusion and exclusion criteria were explained about the study and a written consent was taken. Ethical clearance for the study was granted by Institutional ethical committee of Laxmi Memorial College of Physiotherapy, Mangalore. Participants were divided into 2 groups as Group A, Group B. after dividing the groups VAS scale and Neck Disability Index were taken and the score was noted before treatment. Both the groups will be given conventional therapy treatment like TENS. Portable TENS instrument called as -Transcutaneous Electrical Nerve Stimulator System 2000-two channeled was used. It has 2-200 Hz frequency range, 10-250 msec wave duration range and 0-100 mA power range was given for 10- 20 minutes and Cryotherapy using icepacks are given for 5 -10 minutes was given before the start of mobilization and strength training.

Group A is mobilization group. Patients in this group were given passive mobilization of C1-C3 segments by the therapist. PA glide of spinous process and facets were given. Extremely gentle pressure is used and oscillatory movements are given over the spinous process i.e. unilateral posterior anterior glides of C1-C3 spinal segments and facet joints were given. Oscillatory pressure produce a feeling of movement. When mobilizing the first cervical vertebrae the therapist should direct the lines of her thumb towards the patient's eye. In the lower cervical vertebrae the lines is directed more caudally. The same treatment was given for 3 times per week for 6 weeks¹⁰.

Group B is strength training group. Patients in this group were given strengthening exercises using a theraband. Here the patient will be in sitting position. Patient holds the theraband anteriorly over the forehead and the therapist asked the patient to push the theraband in sitting position 1 series of 15 repetitions forwards, backwards and obliquely to left and right and chin tucks. The progression of this exercise was done by increasing the resistance of the theraband. The patient is also asked to do Dynamic exercises for the shoulders and upper extremities like shoulder shrugs, bent over rows, biceps curl, dumbbell flies, dumbbell pull overs were also given to this group.

STATISTICAL ANALYSIS

Pain score data collected using VAS will be analyzed using non parametric test as data are ordinal in nature. The intra group pre and post test data will be analyzed using Wilcoxon sign rank-test. While post test inter group data will be analyzed with Mann Whitney U Test.

NDI data will be analyzed using parametric test as the data are interval in nature. The intragroup pre

and post test data will be analyzed using student t test. While the post test inter group data will be analyzed with paired t test.

RESULTS

At the time of initial evaluation (time 0) statistical analysis did not reveal any significant difference(p<0.001). For any of the variables between group 1 (mobilization) and group 2 (neck strengthening exercises).

The intra group comparison of pain was measured by VAS shows that there was a gradual reduction in pain.

The mean score of pre-test VAS for group 1 was 7.667±1.175 which has reduced to 4.267±0.884 at the end of 6 weeks duration. These results show that there is a significant reduction in pain which is statistically significant (p< 0.001).

The mean score of pre-test VAS for group 2 was 7.600±0.632 which has reduced to 3.600±0.507 at the end of 6 weeks duration. This result shows that there is a significant reduction in pain which is statistically significant (p< 0.001).

VAS SCALE

Table 1.1: pre- post test comparison of VAS in group 1 and group 2

VAS SCALE					
	GROUP	N	Mean	Std. Deviatc	Z
Pre	Group I	15	7.667	1.175	.193
	Group II	15	7.600	.632	p=0.848 ns
Post	Group I	15	4.267	.884	2.534
	Group II	15	3.600	.507	p=0.017 sig

The result of post test inter group comparison of pain measured by VAS are presented in table 1.2. Both the groups showed significant reduction in pain. Group 1 the mean difference are 3.400±0.986 with a Z value of 5.360. these results showed significant reduction in pain which is statistically significant(p<0.001)

Group 2 the mean difference are 4.000±0.845 with a Z value of 6.330. these results showed significant reduction in pain which is statistically significant (p<0.001)

Table 1.2: post test comparison of VAS between groups

VAS SCALE					
GROUP		Paired Differences		Z	p
		Mean	Std. Deviation		
Group I	Pre - Post	3.400	.986	5.360	<.001 vhs
Group II	Pre - Post	4.000	.845	6.330	<.001 vhs

Neck Disability Index

Table 1.3: pre test comparison of Neck Disability Index

NECK DISABILITY INDEX Pre					
	GROUP	N	Mean	Std. Deviation	t
Pre	Group I	15	25.667	1.496	2.893 p=0.007h sig
	Group II	15	26.933	.799	
Post	Group I	15	16.867	1.642	8.286 p<.001 vhs
	Group II	15	13.000	.756	

The intra group comparison of neck functional activities using NDI for both the groups are presented in table 1.3.

The mean score of pre-test NDI for group 1 was 25.667±1.496 which has improved to 16.867±1,642 at the end of 6 weeks duration. These results shows that there was a significant improvement in functional activity which is statistically significant(p< 0.001).

The mean score of pre-test NDI for group 2 was 26.933±0.799 which has improved to 13.000±0.756 at the end of 6 weeks duration. These results shows that there was a significant improvement in functional activity which is statistically significant(p< 0.001).

The result of post test inter group comparison of neck functional activity measured by NDI is presented in table 1.4. Both the groups showed significant improvement in functional activity. group 1 the mean difference are 8.800±1.897 with a t value of 17.963. these results showed significant improvement in functional activity which was statistically significant(p<0.001)

Group 2 the mean difference are 13.933±0.961 with a t value of 56.145. these results showed significant improvement in functional activity which was statistically significant(p<0.001)

Table 1.4: Post test comparison of neck disability index

NECK DISABILITY INDEX					
GROUP		Paired Differences		t	p
		Mean	Std. Deviation		
Group I	Pre - Post	8.800	1.897	17.963	<.001 vhs
Group II	Pre - Post	13.933	.961	56.145	<.001 vhs

DISCUSSION

30 subjects were included in the study to fulfill the inclusion and exclusion criteria which was randomly assigned into mobilization group and strength training group. Group 1 included 15 subjects (n=15) and group 2 included 15 subjects (n=15). For the group 1 and group 2 the age difference ranged between 18-66 years which included 15 subjects(n= 15) with a gender distribution of 7 males and 8 females. Group 2 consisted of 15 subjects(n=15) with

a gender distribution of 3 males and 12 females. Both the group was given conservative treatment by TENS and Ice packs at the start of the treatment.

In the present study pain and functional ability was determined before treatment and after 6 weeks of treatment. Maitland mobilization was advocated in group I, where the physiotherapist will palpate the neck to find the three most dysfunctional joints and then perform passive joint mobilizations to the involved joints where the therapist uses their thumbs

to rhythmically apply pressure to the spinous process of the vertebra usually in a posterior to anterior direction. It is usually applied three times for 30 seconds to dysfunctional joints or determined by the clinical judgement of the physiotherapist.

While in group II strength training was given by using a theraband for cervical flexors, extensors, and lateral flexors including upper cervical flexors by using a theraband. Along with that shoulder exercises were also given. The exercise was done as 3 series of 20 repetitions three times a week for 6 weeks.

William C. Meeker concluded that mobilization has a short term benefit for patients with neck pain. Manipulation is comparatively more effective than mobilization in subacute or chronic neck pain patients³¹.

Ylinen J.et al concluded that at the 12 month follow-up headache had decreased in strength group compared to endurance group and control group compared with base line. Neck pain diminished most in the strength group with the most severe headache. It was concluded that both strength and endurance group decreased cervicogenic headache¹⁴.

Sydney KS concluded that mobilization improves joint mobility and therefore activate type I and type II receptors which inhibit pain and contribute to relief of headache caused by cervical joint dysfunction. This study revealed that mobilization of upper cervical segments decreases the frequency, duration and intensity of headache³².

Zito G concluded that conservative treatment of manipulative therapy and specific low load exercise program are effective for management of cervicogenic headache³³.

The objective of present study was to evaluate the effect of maitland mobilization and strength training for reducing pain and improving functional ability in patients with chronic cervicogenic headache and to compare the effect of both the technique. It was found that both the groups had significant reduction in pain and improvement of functional activity. But group 1(mobilization group) had only short term relief of symptoms compared to group 2. The inter group comparison for VAS, in group 1 the mean difference were 3.400 ± 0.986 with a Z value of 5.360 and group 2

the mean difference are 4.000 ± 0.845 with a Z value of 6.330 ($p < 0.001$). The inter group comparison for NDI, Group 1 the mean difference was 8.800 ± 1.897 with a t value of 17.963 and group 2 the mean difference are 13.933 ± 0.961 with a t value of 56.145 ($p < 0.001$). The result shows that strength training group has slightly significant reduction in pain and improvement in functional ability compared to mobilization group.

CONCLUSION

The study was to evaluate the efficacy of mobilization versus strength training for reducing pain and increasing functional ability in chronic cervicogenic headache.

The study included 30 subjects 15 in each group. The age group taken was 18-66 years and duration of symptom was taken as more than three months. Conventional therapy given was TENS of 2-200 Hz frequency range, 10-250 msec wave duration range and 0-100 mA power range was given for 10- 20 minutes and Cryotherapy for 5 -10 minutes was given before the start of the treatment. It was evident from the results that 6 weeks of mobilization combined with conventional therapy and strength training combined with conventional therapy found statistically and clinically significant effect on reducing pain and improving functional ability but when comparing between groups there was slightly significant difference in strength training compared to Maitland mobilization.

Hence present study suggests that strength training is more effective than Maitland mobilization in management of Cervicogenic headache.

Further research is necessary to quantify the results.

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Effectiveness of Pelvic Floor (PF) Rehabilitation by Recruiting Abdominals (global) vs Kegels in the Management of Stress Urinary Incontinence in Women

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ABSTRACT

Background: Stress Urinary Incontinence (SUI) is a common problem among women. Kegels is a older method of conservative management of SUI while recruitment of abdominals during PFM contractions is a newer concept. Both have different philosophies.

Outcome measures used: Modified Oxford Grading Scheme (MOS) and Patient Incontinence Impact Questionnaire (PIIQ)

Method: Place of the study-Health care Unit community centre of South Delhi. No. of subjects-17 women with complaint of SUI. Age -30-40 years. Randomly divided in two groups. Group one (nine subjects) were given PF rehabilitation by recruiting abdominals. Group two (eight subjects) were given kegels. Duration of study -Six weeks. All subjects attended the clinic for first three days daily. Group one were taught diaphragmatic breathing, abdominal and PFM contraction technique during activities of daily living (ADL). Group two was taught PFM contractions for slow twitch and fast twitch fibers and bracing of PF muscle during stressful activities. Once they learnt these techniques, they were advised to practice at home. They were asked to visit researcher once a week for six weeks thereafter. Pretest and posttest data was analysed.

Result: Mean age of subjects were 36.2 years. Pretest and posttest mean and sd of Gp I and Gr II of PIIQ are 20.33 and +_ 0.5175, 17.33 and 17.33 and +_ 0.744 (for Gp I) and 20.75 and +_ 0.462, 18.62 and +_ 0.484 respectively.

Conclusion: Both groups showed good results but posttest means of Gp I showed better results.

Keywords: Pelvic floor, rehabilitation, abdominals, SUI, ADL.

INTRODUCTION

Urinary incontinence is defined as involuntary loss of urine that is a social or hygienic problem and that is objectively demonstrable.⁽¹⁾

Urinary incontinence can leave a patient feeling ashamed, socially isolated, and depressed. According to latest survey in Asia, 53.7% population is bothered to certain degree due to urinary incontinence.⁽²⁾

Physiology of incontinence: Continence and micturition involve a balance between urethral closure and detrusor muscle activity. Urethral pressure

normally exceeds bladder pressure, resulting in urine remaining in the bladder. Increased intra-abdominal pressure (from coughing and sneezing) is transmitted to both urethra and bladder equally, leaving the pressure differential unchanged, resulting in continence. Normal voiding is the result of changes in both of these pressure factor, urethral pressure falls and bladder pressure rises. SUI occurs during periods of increased intra abdominal pressure (e.g sneezing, coughing, or exercise) when the intravesical pressure rises higher than the pressure that the urethral closure mechanism can withstand and urine loss occurs.⁽¹⁾

According to first approach, ten years ago incontinence therapists used to discourage contracting abdominals while rehabilitation of pelvic floor muscles for incontinence management in women. But these beliefs are now changing. Research has proved that there is synergy between abdominals and Pelvic Floor Muscle (PFM) and infact all the muscle groups surrounding abdominal capsule. It is now understood that there are two functions of the abdominal muscles, one is providing trunk stability and the other is contributing to continence and elimination of bladder and bowel. ^(3,4,5)

Recent studies have focussed on the relationship of PFM and abdominals (Neuman and Gill, 2002; Madill and sMclean, 2006). Researchers (Sapaford et al, 2001) have found that the cocontraction of PFM and abdominals occurred during both PFM voluntary contraction and abdominal maneuvers. Infact one cannot contract the PFM even moderately without also contracting the deep abdominal muscles (Neuman and Gill, 2002). Madill and Mclean (2006) found that intravaginal pressure rises when deep abdominal muscles are contracted. Moreover Thompson et al (2006) stated that while teaching PFM contractions in symptomatic women, abdominal muscles were more active than PM. Together, these results suggests that a coordinated approach of PFM and deep abdominals may be useful for management of SUI. ^(6,7)

Sapsford (2001) proposed a treatment approach by motor relearning of diaphragmatic, deep abdominals and PFM. This new approach emphasizes the coordination of diaphragm, deep abdominals and PFM rather than muscle strengthening independently. This exercise can be taught by observation and chest and abdominal palpation, obviating the need for vaginal palpation. ⁽⁸⁾

According to another approach, studies have shown that pelvic floor muscles training resolve urinary incontinence in women. Arthur Kegel (1948), a professor of Gyne. and Obs. in USA described tensing and relaxing the pelvic floor muscle as a preventive and treatment option for urinary stress incontinence. Ancient Indian text also described Ashwin mudra or Horse pose. Mool Bond or Root pose of Yoga is also similar to pelvic floor muscle contraction. Datillo et al, (2001), Largo Janeseen et al (1991) and Brown C (1998) have done several researches and showed that

clinically supervised PFM rehabilitation is effective in improving SUI in women. ^(9,10,11,12). Benvenuti F (1987) also stated that Kegels improved pubococcygeus contractibility. ⁽¹³⁾

In this study reseaecher has attempted to find out about the effectiveness of both approaches, which have different philosophies, in the management of SUI in women.

AIMS AND OBJECTIVES

To study the effectiveness of pelvic floor rehabilitation using Abdominals (global) vs Kegels in the management of SUI in women.

METHODOLOGY

Seventeen (17) subjects with complaints of Stress Urinary Incontinence (SUI) were taken for the study. They ware randomly allotted to two groups. Group 1 (N=09) and Group 2 (N = 08)

Study design: Single center, pretest posttest , prospective, experimental

Inclusion criteria

1. Women between age group of 30-40 years with at least three episopdes of urine leakage / week

Exclusion criteria

1. Having urinary tract infection
2. Medical or surgical treatment for incontinence
3. Pregnancy

Outcome measures used :

1. Patient Incontinence Impact Questionnaire (PIIQ) : This scale has seven components (house hold chores, physical recreation, entertainment activities, travel, participation in social activities, emotional health and frustration). Patient's response is noted on four scales ("not at all" to "greatly"). ⁽¹⁴⁾

2. Modified Oxford Scale (MOS) : The strength of PFM is evaluated by digital palpation during a maximal voluntary contraction (MVC) . Grading of muscle strength is done as 0 (no muscle contraction) to 5 (strong resistance) ⁽¹⁵⁾

Group 1 was given rehabilitation program using abdominal ms (global).

REHABILITATION PROGRAM for Group I

1. Stand erect. Firmly palpate the lower abdomen. Slowly and gently draw in the lower abdomen, without breathing or moving the spine until slight abdominal tension is detected. Hold, now breathe quietly without moving the abdomen, gradually increase the hold time to 5, 10, 15, 20 and more seconds. Repeat five times. Do five sessions a DAY. Check for subjective awareness of the periurethral and perivaginal tension.

2. When 15 seconds Tr A holds are achieved with ease, incorporate the gentle long holds into many daily activities in upright standing, eg on phone, in shower, ironing, in queues and walking.

3. Keep pulling abdominals to build to a strong isometric hold for 6 seconds. Breathe while holding. Repeat six times, 2-3 times a day.

4. Strong voluntary PF holds, with a neutral spine, can be incorporated now, but should not replace the abdominal holds.

5. Maintain abdominal and PF strength and power by incorporating abdominal PF holds into daily lifting and working activities

Rehabilitation program for group 2

Every subject was made to identify the pelvic floor muscle (PFM) by digital palpation by the therapist by taking aseptic measures. Once subject identified the PFM the bracing of PFM during stressful activities like coughing, jumping, clearing throat, getting up from the chair etc. was taught

Also they were asked to do :

1. Eight contractions three times a day (for fast twitch fibers)

2. Eight contractions with a gap 5 sec during each contraction, three times a day (for slow twitch fibers).

They were asked to attend Health Care Unit three days consecutively to learn correct techniques, in a week. Then they were asked to do it at home as per advice. All subjects visited researcher once a week for 5 weeks. At the end of sixth week post test MOS and UIIQ were filled again. Pretest and posttest data for both groups was analysed.

STATISTICAL ANALYSIS

Statistical analysis of Patient Incontinent Impact Questionnaire (PIIQ) and Modified Oxford Scale (MOS) of both groups was done by using SPSS software. Pretest and posttest scores were analysed using paired t-test for within group analysis and unpaired t-test for between group analysis.

TABLE 1. For Group 1 . PIIQ (within group)

Mean	20.33 (Pre Test)	17.33 (Post Test)
S D	.500	.463
Test Value	18.00	
p Value	<.001(significant)	

Interpretation : The pretest mean of Group 1 decreased from 20.33 to 17.33, which means the impact of incontinence has decreased on daily life.

TABLE 2. for Group 1 MOS (within group)

Mean	1.89 (Pre Test)	3.78 (Post Test)
S D	.333	.441
Test Value	-9.4	
p Value	<.001(significant)	

Interpretation: The pretest mean of Group 1 increased from 1.89 to 3.78, which means the muscle strength of PFM is increased.

TABLE 3. Group 2 (PIIQ. within group)

Mean	20.75 (pretest)	18.62 (posttest)
S D	.463	.518
Test Value	7.20	
p Value	<.001(significant)	

Interpretation: The pretest mean of Group 1 decreased from 20.75 to 18.62, which means the impact of incontinence has decreased on life.

TABLE 4. Group 2 (MOS. within group)

Mean	1.88 (pretest)	3.12 (posttest)
S D	.354	.354
Test Value	-7.63	
p Value	<.001(significant)	

Interpretation: The pretest mean of Group 2 increased from 1.88 to 3.12, which means the muscle strength (PFM) is increased.

TABLE 5. PIIQ between groups

Mean	17.33 (grp 1)	18.62 (grp 2)
S D	.463	.518
Test Value	-4.424	
p Value	=.001(significant)	

Interpretation : The pretest means of both the groups were not statistically significant ($p > 0.05$). However, the posttest means were statistically significant and PIIQ of Group 1 was lower than the group 2 (17.33 vs 18.62). This means that the impact of incontinence has decreased on life more in group 1 than the group 2.

TABLE 6. MOS between groups

Mean	3.78 (grp 1)	3.12 (grp 1)
S D	.441	.354
Tets value	3.37	
p Value	=.005 (significant)	

Interpretation :

The pretest means of both the groups were not statistically significant ($p > 0.05$). However, the posttest means were statistically significant and MOS of Group 1 was lower than the group 2 (3.78 vs 3.12). This means that the muscle strength (PFM) increased more in group 1 than the group 2.

DISCUSSION

All subjects were educated upto atleast 12 standard and belong to urban background.

When the mean scores of Group 1 (PFM rehabilitation using abdominals) were analysed p value (within group) was found to be significant ($p < .001$), for both PIIQ and MOS (Table 1 & 2). measures. In the similar way the p value for Group 2 (Kegels) was significant for both measures (Table 3 & 4).

When the (between group) mean posttest scores were analysed the p value was = .001 (significant) for PIIQ (GROUP 1 and 2) (Table 5). Also for MOS

measure the p value was =.005 (significant) (Table 6).

At the baseline level no significant difference was found (mean 20.33 and 20.75) for PIIQ and (1.89 and 1.88) as the scores were almost homogenous.

But the posttest mean of group 1 was better for both the measures (17.33 fr PIIQ and 3.12 for MOS).

The reason for significant results in both groups may be that they were motivated and educated enough to learn the techniques. This also helped them to learn to identify PFM.

Limitations of the study :

1. Sample size was small
2. Objective measures like ultrasound can be used for post void residual volume measurement.

Future recommendations:

1. Study can be done on disable women.

CONCLUSION

Both the approaches are good for the management of SUI in women but the PFM rehabilitation using abdominals is better approach relatively.

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Conflict of Interest : Nil

Funding : Self

Ethical Clearance : This study was done in the community. Informed written consent was taken from all subjects.

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Comparison between Myofascial Release Technique and Cyriax Manual Therapy on Pain and Disability in Subjects with Lateral Epicondylitis

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ABSTRACT

Study Design: Quasi experimental study design (Comparative in nature).

Objective: To compare the effectiveness of myofascial release technique and cyriax manual therapy in reducing pain and improving function in patients with lateral epicondylitis.

Methodology - 30 subjects were included in the study. The subjects were alternately assigned into two groups i.e. group A and group B by using convenient sampling technique. Group A received myofascial release technique in conjunction with ultrasound and group B received Cyriax manual therapy in conjunction with ultrasound. Treatment was given for 12 sessions over a period of four weeks. Data was collected on 1st (pre-treatment), 6th (post-treatment) and 12th (post-treatment) session.

Results: In within group analysis, both the groups i.e. Group A and Group B showed significant ($p < 0.05$) improvement in VAS and PRTEE scores after 12 treatment sessions but on comparing the two groups, both groups showed statistically non-significant difference in pain (p -value > 0.05) and disability (p -value > 0.05).

Conclusions: The finding suggests that in 12 treatment sessions, both the techniques equally effective in reducing pain and disability.

Keywords: Tennis elbow, Myofascial release technique, Cyriax manual therapy, Ultrasounds.

INTRODUCTION

Lateral epicondylitis (LE) is an extremely common injury that originally got its name after it appeared in a high proportion of tennis players.¹ This is a degenerative or failed healing tendon response characterised by the increased presence of fibroblasts, vascular hyperplasia, and disorganized collagen in the origin of the extensor carpi radialis brevis, is the most commonly affected structure.² It is a tendinopathy of the common extensor-supinator tendon of the elbow characterized by lateral peri epicondylar pain exacerbated by gripping.³ About seven patients per 1000 per year attending general medical practices, and as high as 15% of workers in highly repetitive hand task industries.^{4,5} The incidence of lateral epicondylitis varies from approximately 1% to 3% in general population to more than 50% among amateur

tennis players.⁶ The dominant arm is commonly affected, with a prevalence of 1–3% in the general population.⁷ The proportion of those afflicted by LET is not influenced by the sex of the patient, but the disorder appears to be of longer duration and severity in females.^{8,9} Lateral epicondylalgia appears to be a chronic overuse injury with degenerative changes to the common extensor tendon with the extensor carpi radialis brevis cited as the most commonly involved structure.¹⁰

It has been seen that cyriax and M.F.R both of them have been useful in treating a tennis elbow. Hence in my study, I wanted to see and compare the effectiveness of M.F.R and Cyriax in treating tennis elbow which according to the best of my knowledge has not been done before.^{11,12,13}

Purpose of study

This study will allow us to compare the effectiveness of Myofascial release technique and Cyriax Manual Therapy on lateral epicondylitis (Tennis Elbow).

OBJECTIVES

- To find the effect of myofascial release technique in reducing pain and improving function in patients with lateral epicondylitis.
- To find the effect of cyriax manual therapy in reducing pain and improving function in patients with lateral epicondylitis.
- To compare the effectiveness of myofascial release technique and cyriax manual therapy in reducing pain and improving function in patients with lateral epicondylitis.

MATERIALS & METHOD

The subjects were collected from the O.P.D of DAV institute of physiotherapy and rehabilitation, Jalandhar. Quasi experimental study design was used with convenience sampling of 30 subjects into 2 groups. Total duration of the study was one and half year.

Outcome measures used in the study are VAS and PRTEE.

INCLUSION CRITERIA

1. Age group 20-50 years of both genders.
2. From sub-acute to chronic more than 2 months.
3. Local tenderness on palpation over lateral epicondyle of the humerus.
4. Any of following signs positive
 - Positive Cozen's test.
 - Pain with passive wrist flexion with elbow extension (Mill's Test).
 - Resisted Extension of the third digit of the hand distal to the proximal interphalangeal joint.

EXCLUSION CRITERIA

1. Any previous trauma, fracture, subluxation, dislocation, surgery or bony abnormalities around elbow.
2. Symptomatic Arthritis of elbow joint.
3. Soft tissue injuries other than lateral epicondylitis.
4. Cervical radiculopathy.
5. Absence of clinical signs of tennis elbow.
6. Any other neurological abnormalities.
7. Corticosteroid injection within 3 months.

PROCEDURE

A written consent was obtained from all the subjects. All subjects who met the inclusion criteria were included in the study and the required assessment was done for functional disability on Patient-Rated Tennis Elbow Evaluation Scale (PRTEE).

PROTOCOL

GROUP A

• MYOFASCIAL RELEASE TECHNIQUE AND ULTRASOUND

Myofascial release technique after 5 minutes of ultrasound treatment with the output of 1W/cm² using a pulsed mode 1:4 ratio with frequency of 1MHz.¹⁴ Myofascial release technique is given for 10 minutes. For giving myofascial release technique the patient will be in supine lying. The shoulder is internally rotated; the elbow pronated and flexed to around 15°. The palm is resting flat on the table. For the delivery of myofascial release technique therapist is standing to the side of the table at the level of client's shoulder and facing ipsilateral hand. Begin on the humerus, just proximal to the lateral epicondyle Therapist used elbow, fingertips or soft fist to engage the periosteum. Therapist will carry this contact inferior to the common extensor tendon and then down to the extensor retinaculum of wrist. This technique will be given for 12 sessions over a period of three weeks.^{15,16}

GROUP B**• CYRIAX MANUAL THERAPY AND ULTRASOUND**

Cyriax deep transverse friction massage after 5 minutes of ultrasound treatment. Technique consist of 10 minutes of deep transverse friction massage followed by single application of Mill's Manipulation. For giving friction massage, patient positioned in 90 degrees of elbow flexion with forearm supination. The thumb of treating hand was used to apply friction and was positioned with distal interphalangeal joint in 90 degrees of flexion with tip of thumb resting against the lateral epicondyle. For the delivery of Mill's Manipulation patient was positioned in sitting with upper extremity in 90 degrees abduction with

internal rotation. The therapist stabilized patient's wrist in full flexion and pronation with one hand while other hand was placed over the olecranon and therapist applied high velocity low amplitude (HVLA) thrust at end range of elbow extension.¹⁷

Data analysis

Data analysis was performed using SPSS software version 16.0. Inter group and intra group comparisons were done.

Unpaired 't' test were used to determine the significance of difference between experimental group A and group B.

Level of significance selected for the study was $p < 0.05$

Table 1: Subject Description Table

GROUP	MEAN \pm SD	t-value	p-value
A	35.40 \pm 7.689	0.194	NS (0.8475)
B	34.80 \pm 9.182		

Table 2: Between group comparison for VAS

DAYS	Group A Mean \pm SD	Group B Mean \pm SD	t-value	p-value
DAY 1	86.87 \pm 10.690	83.87 \pm 15.385	0.620	0.5401 (NS)
DAY 6	50.80 \pm 11.900	47.20 \pm 12.007	0.825	0.4165 (NS)
DAY 12	22.20 \pm 16.284	18.07 \pm 6.227	0.918	0.3663 (NS)

Table 3: Between group comparison for PRTEE

DAYS	Group A Mean \pm SD	Group B Mean \pm SD	t-value	p-value
DAY 1	80.60 \pm 7.781	85.27 \pm 5.391	1.909	0.0665 (NS)
DAY 6	45.53 \pm 12.380	48.93 \pm 8.523	0.876	0.38884(NS)
DAY 12	28.53 \pm 13.700	24.13 \pm 5.604	1.151	0.2594 (NS)

DISCUSSION

There was significant decrease in pain in terms of VAS and disability for both the groups with the usage of therapeutic ultrasound, in addition to other treatment in the present study, a similar study was performed by Hana Hronkova in 2000, group which received therapeutic ultrasound showed significant reduction in pain.¹⁸

Pain relief may also occur due to the non thermal effects of pulsed ultrasound in the form of stimulation of histamine release from mast cells and factors released from macrophages that accelerate the normal resolution of inflammation as suggested by Young and Dyson.³²

Therapeutic ultrasound has the potential to accelerate normal resolution of inflammation

provided that the inflammatory stimulus is removed.³³ This acceleration may increase the rate of phagocytosis, movement of particles and the cells.³⁴

In group A, within group analysis showed statistically significant improvement in pain and disability. LE is thought to be a degenerative process resulting in vascular proliferation and hyaline degeneration of the ECRB and extensor digitorum communis (common extensor origin) at the lateral epicondyle.³⁶ Overuse leads to microscopic tears in the origin of the ECRB with subsequent lack of repair in the tendons and replacement with immature reparative tissue. Histopathologic examination shows a degenerative, non inflammatory process with tissue characterized by the presence of disorganized collagen with immature fibroblasts and neovascularization, a process described as angiofibroblastic tendinosis.^{36,37,38}

A recent study⁴⁰ has shown that treatment with MFR after repetitive strain injury resulted in normalization in apoptotic rate, cell morphology changes, and reorientation of fibroblasts.

According to Schleip,⁴¹ under normative conditions, fascia and connective tissues tend to move with minimal restrictions. As with any massotherapy techniques, the analgesics effect of MFR can also be attributable to the stimulation of afferent pathways and the excitation of afferent A delta fibers, which can cause segmental pain modulation¹⁹ as well as modulation through the activation of descending pain inhibiting systems.²⁰

According to M.F. Barnes myofascial release is a hands-on soft tissue technique that facilitates a stretch into the restricted fascia. A sustained pressure is applied into the restricted tissue barrier; after 90-120 seconds the tissue will undergo histological length changes allowing the first release to be felt.¹⁹

Application of DTF leads to immediate pain relief: the patient experiences a numbing effect during the session, and reassessment immediately after shows reduction in pain and increase in strength and mobility.²¹

Pain relief during and after DTF may be due to modulation of the nociceptive impulses at the level of the spinal cord: the "gate control theory."^{22,23}

According to Cyriax,²⁴ DTF also leads to increased destruction of pain provoking metabolites, such as Lewis's substances. It has also been suggested that a 10 minute DTF treatment of a localised area may give rise to lasting peripheral disturbance of nerve tissue, with local anaesthetic effect.²¹ Another mechanism by which reduction in pain may be achieved is through diffuse noxious inhibitory controls, a pain suppression mechanism that releases endogenous opiates.^{24,25}

In addition, the application of DTF can produce therapeutic movement by breaking down the strong cross links or adhesions that have been formed, softening the scar tissue and mobilising the cross links between the mutual collagen fibres and the adhesions between repairing connective tissue and surrounding tissues.^{26, 22, 23, 27}

Mill's manipulation is the most common manipulative technique used by physiotherapists.^{28,29,30} Cyriax and Cyriax²⁴ state that it should be performed immediately after the DTF.^{24,31} The aim of this technique is to elongate the scar tissue by rupturing adhesions within the teno-oseous junction, making the area mobile and pain free.^{24,28,29,30}

In between group analysis there was non significant difference in both the groups in terms of pain and disability, the reason for this could be that although myofascial release and cyriax manual therapy are different techniques and have different methods of administration but physiologically they work on the same principle of decreasing pain by stimulation of afferent pathways which cause segmental pain modulation as well as modulation through the activation of descending pain inhibiting systems.

Both the techniques produce vasodilatation and increased blood flow to the area this facilitates removal of chemical irritants and increase the transportation of endogenous opiates, resulting in a decrease in pain and facilitating healing process.

Also both the techniques bring about collagen reorganization, stimulate fiber orientation and help the fascial tissue to come to its normative length.

These techniques also help to elongate tight tissues by rupturing adhesions within the teno-oseous junction restoring alignment and mobility to

the joint

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Ethical Clearence: To take up this study and asses patients and consider them for the study permission was taken from the Ethical committee of the institute.

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Effectiveness of Kinesiotaping along with Conventional Physiotherapy for Patients with Tennis Elbow

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BACKGROUND

Among the upper limb conditions, tennis elbow is one of the most significantly occurred conditions. Painful elbow syndrome comprises lateral, medial and posterior elbow symptoms; among them the one significantly noticed is the lateral tennis elbow which results from repetitive stress. The successful conservative treatment of lateral epicondylitis generally aims to relieve pain, control inflammation, promote healing, improve local and general fitness, and control force loads. The application of tape is a means, aims to alleviate pain, improve muscle function, and restore functional movements. Taping facilitates the compliance to exercise rehabilitation programs by minimizing the aggravation of symptoms during performance of therapeutic exercise. The objective of taping is to support a weakened part of body without limiting its function, by preventing movements that would stress the weakened area. **Objective-** To compare pain intensity at rest, during forceful wrist extension, during strong grip, during cozen test, at resisted middle finger extension and during palpation before and after conventional physiotherapy with taping and conventional physiotherapy alone in patients with tennis elbow. **Method-** 12 patients with tennis elbow were selected and randomly assigned to taping with conventional physiotherapy group and 12 patients to the only conventional physiotherapy group for this randomize control trial study. The study was conducted at NDMVP college, hospital and research center. Visual analogue scale was used to measure pain intensity in different functional position. Unrelated "t" test was used to compare the result. **Results-** Following treatment the study found that the experimental group showed a significant improvement in case of rest 0.0002, forceful wrist extension 0.0001, strong grasp is 0.0035, cozen test is 0.0003, middle finger extension is 0.0020, palpation is 0.0003. **Conclusion-** This experimental study shows that taping with conventional physiotherapy is more effective than conventional physiotherapy alone for patients with tennis elbow.

Keywords- Tennis elbow, taping, conventional physiotherapy.

INTRODUCTION

Tennis elbow is the frequently occurring musculoskeletal condition¹, treated by many physical therapists in a variety of clinical settings and the successful conservative treatment of lateral epicondylitis generally aims to relieve pain, control inflammation, promote healing, improve local and general fitness, and control force loads².

This is a condition characterized by pain and tenderness at the lateral epicondyle of the humerus due to non-specific inflammation at the origin of the extensor muscles of the forearm. Although, it is sometimes seen in tennis players, other activities such as squeezing clothes, carrying a suitcase etc, are frequently responsible.³

The physiologic effects of cold application include immediate vasoconstriction with reflexive vasodilation decreases local metabolism decreases muscles spindle fiber activity slows nerve conduction velocity decreases spasticity and muscle guarding. Cryotherapy also helps to control edema and swelling and reduce pain⁴. Self stretching techniques helps to increase muscle flexibility and scar mobility⁴.

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Strengthening exercise helps to develop and improve muscle performance and functional control ⁴.

Ultrasound is often of use after soft-tissue injuries, as the mechanical effect helps to remove traumatic exudate and reduces the danger of adhesion formation ⁵.

It is proposed the application of tape is a means, aims to alleviate pain, improve muscle function, and restore functional movements. Taping facilitates the compliance to exercise rehabilitation programs by minimizing the aggravation of symptoms during performance of therapeutic exercise ⁶. The objective of taping is to support a weakened part of body without limiting its function, by preventing movements that would stress the weakened area and the primary purpose is to provide semi rigid or rigid splint around a joint or surrounding tissue ⁷.

The taping technique for the tennis elbow is considered a useful adjunct to exercise and effective in reducing pain with improving forearm muscle activity ⁶.

METHOD

12 patients with tennis elbow were selected and randomly assigned to taping with conventional physiotherapy group and 12 patients to the only conventional physiotherapy group for this randomized control trial study. The study was conducted at NDMVP college, hospital and research center. Visual analogue scale was used to measure pain intensity in different functional position. Unrelated "t" test was used to compare the result.

INCLUSION CRITERIA

- 1: Patients diagnosed with tennis elbow.
- 2: The participants who had no deformity of the affected elbow and wrist.
- 3: Voluntary participants.
- 4: Age group: 20-60 years old of both sexes.

EXCLUSION CRITERIA

1: Patients with clinical disorder which may become worse with taping, such as skin disease, dermatitis, eczema.

2: Subjects who had any deformity in the affected sided elbow and wrist.

3: Subjects who were not willing to participate.

Distribution of subjects: The study procedure was conducted by assessing the patient, initial recording and final recording. The patients were chosen according to inclusion and exclusion criteria. All the patients were divided into two groups group A and group B. Group A received taping along with conventional therapy and group B received only conventional therapy.

PROCEDURE

The study procedure was conducted by assessing the patient, initial recording and final recording on pain questionnaire designed for tennis elbow patients. The patients were chosen according to inclusion and exclusion criteria. All the patients were divided into two groups group A and group B. Group A received taping along with conventional therapy and group B received only conventional therapy. Data was gathered through pre-test, intervention and post-test. Pre-test was performed before beginning treatment, intensity of pain was noted with VAS on questionnaire form. Same procedure was performed to take post-test at the end of 6 session of treatment. A common intervention program was executed for both group as conventional physiotherapy. Group A- taping, cryotherapy, stretching & strengthening exercise of wrist extensor group muscle, deep transverse friction massage and ultrasound. Frequency: 3 MHz, Mode: pulsed, pulsed ratio 1:4, Intensity: 0.1-0/3 W/cm², Duration of treatment: 5 minutes. Group B- cryotherapy, stretching & strengthening exercise of wrist extensor group muscle, deep transverse friction massage and ultrasound. Frequency: 3 MHz, Mode: pulsed, pulsed ratio 1:4, Intensity: 0.1-0/3 W/cm², Duration of treatment: 5 minutes. For application of tape place the elbow 90 degree bend, the first piece of tape should be placed at the point of pain with 80% stretch, and the second piece of tape should also be placed right over the point of pain but crossing the first piece of tape with 80% of stretch, the third piece of tape should be applied just above the previous tape go around the elbow with 25% stretch right over the site of pain down to the forearm.

RESULT

Table 1: Comparison Between Group A And Group B

Sr.No.		Mean		SD		P	t
		Group A	Group B	Group A	Group B		
1	REST	5.25	3.5	1.14	0.08	0.0002	4.3616
2	WE	5.25	3.75	1.22	0.62	0.0001	3.806
3	SG	5.33	3.75	1.44	0.87	0.0035	3.2716
4	CT	5.33	3.67	0.98	0.89	0.0003	4.3549
5	MFE	5.25	3.91	0.97	0.90	0.0020	3.4991
6	PALPATION	5.33	3.83	0.89	0.83	0.0003	4.2642

ABBREVIATION: RP- Resting pain, WE- wrist extension, SG- Strong grasp, CT- Cozen test, MFE- Middle finger extension.



DISCUSSION

The purpose of this study was to evaluate the effectiveness of taping with conventional physiotherapy compare to only conventional physiotherapy for tennis elbow. In this study 24 patients with tennis elbow were randomly assigned to the groupA and to the groupB. Among these 24 patients, 12 patients were included in the groupA who received taping with conventional physiotherapy and the rest of the 12 patients were included in the groupB, who received conventional physiotherapy only.

Each group attended for 6 sessions of treatment within three weeks in order to demonstrate the improvement. The outcome was measured by using

visual analogue scale for pain intensity in different functional position.

Conventional therapy included ultrasound, deep friction massage, icing, stretching and strengthening exercise of wrist extensors had improvement in reducing pain at rest, forceful wrist extension, strong grasp, cozen test, resisted middle finger extension and palpation.

In addition taping along with conventional therapy is more effective than conventional therapy alone because kinesio tape supports the muscles around elbow during movement which decreases the tension and consequently decreases the pain. Also application of kinesiotaping helps in unloading of ECRB which reduces biomechanical stresses over the elbow joint. In addition, kinesiotaping helps in giving appropriate proprioceptive feedback to the patient. Along with kinesiotaping, conventional physiotherapy (ultrasound) application has a effect on reduction of inflammation of soft tissues around elbow joint, particularly the musculotendinous unit thereby reducing pain.

The researcher found a statistical significant decrease of resting pain ($p < 0.0002$), pain on forceful wrist extension ($p < 0.0001$), pain on forceful grip ($p < 0.0035$), pain on cozen test ($p < 0.0003$), pain on forceful middle finger extension ($p < 0.002$), pain on palpation ($p < 0.0003$).

“Initial effect of taping technique on wrist extension and grip strength and pain of Individuals with lateral epicondylitis”, to find out the initial effect of taping technique on wrist extension and grip strength and pain on Individuals with tennis elbow¹.

They concluded that Taping technique has an impressive effect on wrist extension and grip strength and pain in individuals with tennis elbow. Therefore, it is recommended for functional rehabilitation.

An experimental study on sixteen participants with chronic lateral epicondylitis participated in a placebo control study of an elbow taping technique and outcome measures were pain-free grip strength and pressure pain threshold. Results showed that the taping technique significantly improved pain-free grip strength. Changes in pressure pain threshold, although positive, were not statistically significant.⁶

A study aimed to determine the combined effect of wrist manipulation and elbow taping in patients with tennis elbow. The measurement tools used were hand held dynamometer, visual analogue scale and 6-point scale of global improvement. Results showed mean improvement in dynamometer, significant improvement in VAS score after 3 weeks 6-point scale of global improvement showed significant improvement⁷.

CONCLUSION

The result of this study have identified the effectiveness of conventional physiotherapy with taping is better treatment than the conventional physiotherapy alone for reducing pain and disability in tennis elbow patient. Participants in the conventional physiotherapy with taping group showed a greater benefit than those in the only conventional physiotherapy group, which indicate that the conventional physiotherapy with taping can be an effective therapeutic approach for patient with tennis elbow. Hence there is rejection of null hypothesis "Taping with conventional physiotherapy and conventional physiotherapy are equally effective for treatment of patients with tennis elbow", in the favour of hypothesis "Taping with conventional physiotherapy is more effective than conventional physiotherapy alone for treatment of patients with tennis elbow".

Limitations: The main limitation of this study was its short duration.

Sample size was very small.

It is limited by the fact daily activities of the subjects were not monitored which could have

influenced.

Suggestions: Large sample size can be taken.

Study duration could be increased

Close monitoring of daily activities could be done.

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Conflict of Interest: None

Ethical Adherence: Yes

Disclaimers: None

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A Study to Find Out the Effect of Exercise Overflow on Electromyography Activity in Patients with Stroke - An Observational Study

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ABSTRACT

Introduction: Stroke or brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. It is associated with various neurological signs & symptoms. There are so many therapeutic approaches used for the treatment of stroke. Exercise overflow is sometimes used as a therapeutic technique by physical or occupational therapists concerned with the rehabilitation of patients with motor deficits resulting from a cerebrovascular accident (CVA). It can be measured with Electromyography (EMG) amplitude of homologous muscle to affected side.

Aim of the Study: To find out the effect of exercise overflow on EMG activity in patients with Stroke.

Method: This study was carried out in K.K. Sheth Physiotherapy College and patients were selected from physiotherapy centres in and around Rajkot. Total 10 subjects of stroke were selected according to inclusion & exclusion criteria and written consents were taken. Patients performed resisted elbow flexion exercise against maximal resistance on unaffected side and EMG amplitude of Biceps brachii muscle of affected extremity was recorded.

Data Analysis – Data were analysed using SPSS 14 software. Paired t test was used for analysis of difference of MUAP amplitude from baseline during exercise overflow.

Result – Paired t test showed significant effect of overflow to the involved nonexercised extremities in biceps brachii.

Outcome Measures – Motor unit action potential (MUAP) amplitude

Conclusion – Exercising the uninvolved extremities in patients with CVAs caused significant increase in EMG activity in the hemiparetic upper limb during the exercise condition.

Keywords- Stroke, exercise overflow, MUAP amplitude.

INTRODUCTION

Stroke or brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain.¹ Clinically It is divided into two types those are Ischemic stroke and Hemorrhagic stroke. Ischemic stroke is the most common type, affecting 80% of individual with stroke.¹ Hemorrhagic stroke occurs when blood vessels rupture, causing leakage of blood in and around the brain.¹ Stroke leads to various impairments which includes alteration in tone, loss of superficial and deep sensations, weakness, abnormal synergy patterns,

abnormal reflexes, altered coordination, impaired balance, speech and swallowing difficulty.¹ In India, the overall prevalence rate for stroke is lie between 84 – 262 per 100,000 in rural area and between 334 – 424 per 100,000 in urban areas.² Indian studies have shown that about 10-15 % of strokes occur in people below age of 40 years.³ There are so many therapeutic approaches used for the treatment of stroke like stretching, strengthening, PNF etc. Exercise overflow is generally defined as the effect of exercise in one area of the body on the muscle activity in another area of the body. Exercise overflow is sometimes used as

a therapeutic technique by physical or occupational therapists concerned with the rehabilitation of patients with motor deficits resulting from a cerebrovascular accident (CVA).⁴ It is generally believed that intricate transcallosal processes are crucial for bilateral activation during unilateral movement. A unilateral movement could bring about a very early transcallosal facilitation and subsequent transcallosal inhibition of the contralateral motor cortex. The facilitatory and inhibitory transcallosal effects normally reconcile to an optimal level; however, damages in supraspinal structures alter inter-cortical connectivity of the affected hemisphere and balance between the two transcallosal effects. The facilitation effect often prevails leading to increase in size of MO, and pathological overflow is commonly found in patients with neurological or psychiatric disorders and in patients with post-stroke hemiparesis.⁵ Manual resistance is the most powerful and effective to produce overflow increasing the muscle recruitment and conscience of movement and strength. Of the biomechanical point of view, the overflow would be resulted of a body persecution to stability, having as consequence a broad variability of motor behaviors, according to individual conditions.⁶ Surface electromyography (EMG) has been widely used to characterize MO. Studies involving EMG monitoring of all four extremities have shown that the effects of exercise overflow 1) vary directly with the intensity of the exercise 2) are widespread over the body 3) increase with muscle fatigue and 4) are most evident in muscles used to stabilize the body.⁴

NEED OF THE STUDY

Muscle weakness is main impairment in stroke patients and rehabilitation protocol also focuses on the improvement of muscle weakness.

But there are so many patients who cannot exercise with their affected extremity due to pain or any other reason.

So exercise overflow can help to strengthen affected limb with exercise on unaffected side if find effective.

AIM & OBJECTIVES

- To find out the effect of exercise overflow on EMG activity in patients with stroke.

HYPOTHESIS

- **Null Hypothesis :**
 - There is no significant effect of exercise overflow on EMG activity in patients with stroke.
- **Experimental Hypothesis :**
 - There is significant effect of exercise overflow on EMG activity in patients with stroke.

MATERIALS & METHOD

- **Source of data collection** - Physiotherapy centers in and around Rajkot.
- **Study design**– An observational study.
- **Study population:** Post stroke patients.
- **Sampling method:** Purposive sampling.
- **Sample size:** 10
- **Materials used:** Treatment Table, Pillow, EMG-NCV Instrument (RMS Ep Mk-II, Version 1.1), Spirit, Cotton, Electrode Gel, Adhesive tape, Measuring tape, Ground Electrode, Surface Electrodes, Record or data collection sheet , Consent form, pen, paper

Inclusion criteria:

- Age: Between 25-65 years
- Gender : Both male and female
- Subjects having unilateral hemi-paresis.
- Subject with acute, sub acute and chronic stroke.
- Ability to understand and follow instructions.

Exclusion criteria:

- Any musculoskeletal condition of upper limb or fixed contracture.
- Neurological conditions other than stroke.
- Cardio vascular disorder
- Non-consent.

METHOD

Total 10 patients were interviewed to collect demographic data including age, etiology; time elapsed from the onset of condition and affected side etc. Written consent was taken. Before testing commencement, all patients were asked to rest on the bed with shoes removed for 5 minutes and remain comfortable and relaxed. To provide a quite testing

environment, all tests were performed in a close quite room with natural light from windows.

Procedure: Patients were in supine position with arm resting on table, forearm in supination and elbow extended. The area of electrode placement was cleaned, shaved, and lightly abraded. Electrodes were applied to the paretic muscle (Biceps brachii) and located the muscle belly by palpation. Then patients were asked to do elbow flexion against maximal resistance (Manual resistance applied by therapist) with their unaffected extremity and EMG activity of affected extremity was recorded. Total ten repetitions were given and maximum EMG amplitude was selected for data analysis.

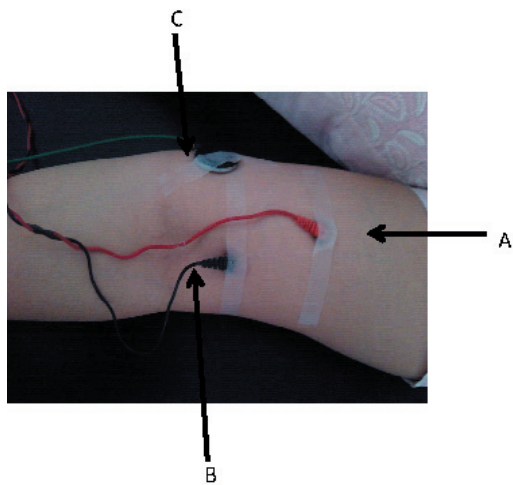


Figure 1: Electrode placement for EMG of Biceps brachii muscle

Electrode placement for EMG of Biceps brachii muscle:

(A) Recording active: Directly on muscle belly

(B) Recording reference: 3 cm distally from recording active electrode

(C) Ground electrode: anywhere between recording active and recording reference electrode

STATISTICAL ANALYSIS

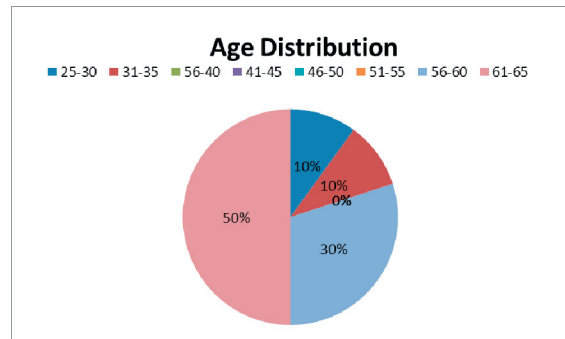
STUDY DESIGN: An observational study.

A SPSS version 14.0 windows statistical program was used for all data analysis. To determine if muscle activity significantly increased during the exercise condition, a comparison between the resting baseline EMG activity and the EMG activity during exercise using paired t tests. The EMG activity during exercise minus baseline EMG in biceps brachii

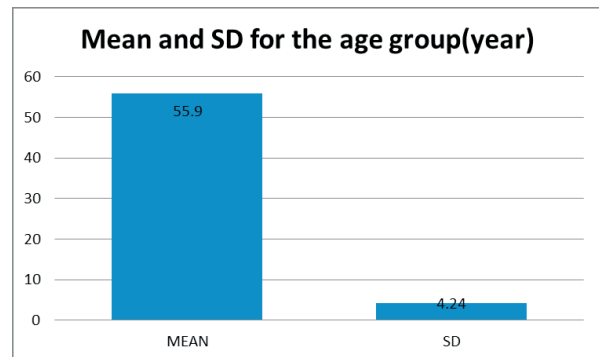
Muscle was used for data analysis. The level of significance was set at $p < .05$. The rationale for using this approach in analyzing the data is provided with an interpretation of the results.

RESULTS

The below graph shows number of patients and distribution of age in treatment group. The mean for the age group is 55.9 years and standard deviation is 4.24 years.

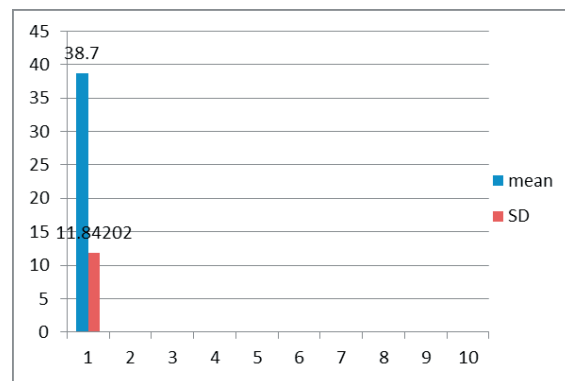


Graph 1 showing number of patients and distribution of age(year)

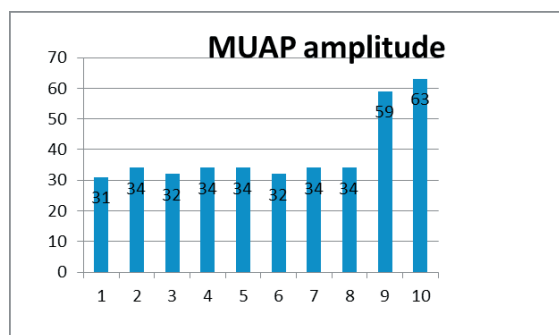


Graph 2 showing Mean and SD for the age group

The below graph 3 and Graph 4 shows mean and SD for the EMG amplitude during exercise overflow



Graph 3 showing mean and SD for the EMG amplitude during exercise overflow (mv).



Graph 4 showing MUAP amplitude during exercise overflow (mv)

DISCUSSION

This study was carried out to find out the effect of exercise overflow on EMG activity in post stroke patients. Result of this study showed that there is significant effect of exercise overflow on EMG activity. This is due to when patient perform resisted exercise with their unaffected upper extremity there is activation of homologous muscle on affected side. Exercising the upper contralateral to hemiparetic extremity in patients with CVAs increased the muscle activity in the paretic muscles. Increased activity in paretic muscles may help strengthen muscles or may cause an undesirable increase in muscle tone in patients with hemiparesis. Unresisted exercise and resisted exercise produced increased contralateral muscle activity. This finding is contrary to studies of healthy subjects that failed to find significant overflow effects with unresisted exercise. Therefore, encouraging patients with CVAs to perform all the activities they can for themselves with either their unaffected or affected extremities may cause increased muscle activity of their paretic muscles. This activity may have a beneficial or negative effect on the patient's function depending on his muscle tone.

This study is partly supported by the study done by Luciane A P Sande de Souza et al in 2014 they studied the Effect and length of the overflow principle in proprioceptive neuromuscular facilitation with electromyography results and they found that the irradiation effect is present to elicit muscle responses at distance, ipsilateral and contralateral to the stimulus.⁷ whereas another study done by Olle Lagerquist et al in 2006 stated that isometric training given to unaffected limb increase the strength of affected limb but there is no effect on spinal reflex

excitability on affected limb.⁸

Limitation of the study: Small sample size. Type and site of lesion was not considered. Duration of stroke was not taken into consideration.

Further recommendation: further study should Aim to find out the correlation of exercise overflow with stage of recovery.

Clinical implication: Exercise overflow can be used as a therapeutic technique in patients with stroke who cannot do exercise with their affected extremity due to any reason and to prevent fatigue in affected limb.

CONCLUSION

Exercising the uninvolved extremities in patients with CVAs caused significant increase in EMG activity in the hemiparetic extremities during the exercise. Increased muscle activity through a regular exercise program may increase strength of the paretic muscle or increase spasticity. Overflow techniques with hemiplegic patients should be selectively applied by therapists.

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Pattern and Risk Factors of Musculoskeletal Pain among Secondary School Teachers in Kano Metropolis

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ABSTRACT

Background and Aim: Musculoskeletal pain (MSP) is a painful disorder affecting muscles, tendons and nerves caused by activities which are frequent and repetitive or activities associated with awkward postures. Data on MSP among teachers in Nigeria are not available. The purpose of this study was to determine the pattern and risk factors of MSP among secondary school teachers in Kano metropolis.

Methodology: A total of 100 participants were recruited using cluster sampling technique in a cross sectional survey. The data was obtained using Modified Nordic Musculoskeletal Questionnaire, analyzed using descriptive statistics of frequency and percentages and inferential statistics of chi-square. Analyses were performed using SPSS version 16. Level of significance was set at $p < 0.05$.

Results: This study comprised of 61% males and 39% females between the ages of 18-60 years, 72% of them between 26-35 years (mean age=33±0.55). The findings showed that in the last 12 months, neck pain (51%) was the most common MSP and in the last 7 days, LBP and hips/thigh/buttocks had the largest percentages at 31% each. Also, LBP prevented (30%) from ADL. Factors associated with MSP include hours/day of working, years of experience and working posture with age having no association.

Conclusion and recommendation: Musculoskeletal pain is common among secondary school teachers in Kano metropolis. Neck, low back and shoulder pain were the commonest. Increasing years of service, working hours and working posture were all major risk factors.

Keywords: Musculoskeletal pain, Risk factors, Secondary School Teachers.

INTRODUCTION

Pain has been defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.¹ It is said to be musculoskeletal if it originates in the muscles, bones, ligaments, tendons and nerves.²

Musculoskeletal pain (MSP) represents one of the most common and important occupational health problems in working populations in both developing and developed countries, affecting the quality of life and causing economic burden.³ The burden of MSP is second only to that of cardiovascular disease.⁴

The common cause of MSP in most occupation is musculoskeletal disorders⁵ which are the most common cause of severe long term pain and physical

disability.⁶ MSP from overuse affects 33% of adults and accounts for 29% of lost workdays due to illness.⁷ In some occupations, it can be caused by many factors involving physical, psychological and social influences.⁸ Advanced ages, female gender⁹ working with improper position and physically strenuous works increases the risks of MSP significantly.⁸

School teachers from different populations have been seen relative to other occupations to report very higher risks of developing MSP.⁷ This is because sometimes teaching is carried out in a way that teachers are placed under unfavorable circumstances that stresses their physical, cognitive and effective capacity to reach teaching production objectives.¹⁰ The work tasks of school teachers often involves significant use of different varying positions, such as frequent reading, marking of assignments,

and writing on a blackboard which can make these teachers to assume improper postures.^{11, 12}

Nevertheless, a number of studies have determined the pattern of musculoskeletal pain among secondary school teachers and the frequently reported health complaints among them in a Chinese study are shoulder pain, neck pain, headache and lower back pain.^{9, 13} For countries like Saudi Arabia, Philippines and Brazil the commonest pattern of pain are back pain, shoulder pain and then neck pain.¹³ When MSP occurs, it tends to reduce the productivity of teachers and as such will reduce output and performance.¹⁴

Moreso, identifying the pattern and risk factors of MSP among secondary school teachers in Kano, the most populous state in the country with over 9 Million inhabitants in the 2006 census¹⁵ will be very important and may serve as basis for action and further studies.

METHODOLOGY

Study permission was obtained prior to the commencement of the study from Kano State Secondary Schools Board. The design is descriptive cross sectional survey. A cluster sampling was used to select participants. Kano metropolis comprised of eight (8) local governments, out of which four (4) were selected; six private secondary schools were randomly selected from the four LGA.

The consent of the teachers who met the inclusion criteria of working experience of at least 12 months, no congenital anomalies and or previous musculoskeletal surgeries was sought and obtained. All the participants had their demographic data documented and were administered Nordic musculoskeletal questionnaire for the assessment of musculoskeletal pain. It consists of 39 questions divided into 3 main sections: Section 1, socio-demographic data with 5 questions, Section 2, 27 questions with complaints about musculoskeletal pain in different body parts and Section 3 assessed risk factors with 7 questions. All the questionnaires were retrieved the same day/ following day with 100% response rate.

Data Analysis Procedure

Descriptive statistics of frequency and percentage

was used to describe the pattern of MSP. Inferential statistics of chi-square was used to determine the associations between the MSP at various body parts and risk factors such as age, length of working duration, working posture. Data obtained was analyzed using statistical package for the social sciences (SPSS) version 16.0 and level of statistical significant was set at $p < 0.05$.

RESULTS

One hundred (100) secondary school teachers participated in this study. The findings were described according to socio-demographic factors, symptoms distribution in relation to different body parts and risk factors. The participants were between the ages of 18-60 years, with 72% between ages 26-35 years. Most of them were males (61%) and single (56%) and a greater number of them possess Bachelors degree (54%), table 1.

Table 1.0: Socio-demographics of the participants

Variables	n (%)
AGE (YEARS)	
18-25	12(12)
26-35	72(72)
36-45	15(15)
Above 60 years	1(1)
GENDER	
Male	61(61)
Female	39(39)
MARITAL STATUS	
Single	56(56)
Married	43(43)
Divorced	1(1)
Widow	0(0)
QUALIFICATION	
Diploma	5(5)
NCE	26(26)
Bachelors Degree	54(54)
Masters	11(11)

NCE=National Certificate of Education

Symptoms reported at different body parts in the last 12 months and last 7 days are presented in table 2. In the last 12 Months, neck pain had the highest frequency (51%), then shoulder and lower back with

43%. While the elbow has the least frequency (26%). In the last 7 days lower back and hips/thigh/buttocks had the highest percentages at 31%, followed by neck and shoulder pain and the lowest regional symptom was at the knee (19%).

Table 2.0: Pattern of MSP in the last 12 months and last 7 days

Variables	No	Yes	n (%)	No	Yes	n (%)
	12 Months			Last 7days		
Neck	49	51	51(51)	70	30	30(30)
Shoulder	57	43	43(43)	70	30	30(30)
Elbow	74	26	26(26)	77	23	23(23)
Wrists/hands	60	40	40(40)	75	25	25(25)
Upper back	62	38	38(38)	75	25	25(25)
Lower back	57	43	43(43)	69	31	31(31)
Hips/thigh/buttocks	66	34	34(34)	69	31	31(31)
Knees	66	34	34(34)	81	19	19(19)
Ankles	60	40	40(40)	75	25	25(25)

Table 3.0 showed participants that were prevented from carrying out activities due to pain in the last 12 months. The highest ADL prevention was 30% at lower back, while shoulder pain had least effect with just 16%.

Table 3.0: Activities of Daily Living Prevention over last 12 months

Variables	No	Yes	(%)
Neck	78	22	22(22)
Shoulder	84	16	16(16)
Elbows	81	19	19(19)
Wrists/hands	81	19	19(19)
Upper back	79	21	21(21)
Lower back	70	30	30(30)
Hips/thighs/buttocks	72	28	28(28)
Knees	80	20	20(20)
Ankles	83	17	17(17)

Table 4.0 shows the work description, many of the participants worked 5-8 hours per day (49%) and 75% work for 5-6 days per week. Nature of work is repetitive and forceful (71%), while posture commonly adopted during work was standing (76%). Many have worked between 1-5 years (68%) and only 31% seek medical attention with 15 participants (15%) seen by a physiotherapist.

Table 4.0: Work description among teachers

Variables	n	%
Working hours per day		
1-4	13	13
5-8	49	49
9-12	30	30
12 & above	8	8
Working days per week		
1-2	4	4
3-4	4	4
5-6	75	75
Daily	17	17
Nature of work		
Repetitive & forceful	71	71
Vibratory	25	25
Handling heavy loads	4	4
Posture mostly adopted		
Sitting	21	21
Kneeling	3	3
Standing	76	76
Number of years in the working environment		
Years of service		
1-5	6	68
6-10	20	20
11-15	1	11
16-20	1	1
Teachers who were seen for medical attention		
Yes	31	31
No	69	69
Teachers who were seen by a physiotherapist		
Yes	15	15
No	85	8
5		

Table 5 shows association between the various risk factors and MSP. Age does not have effect within the last 12 months (p value 0.06). There was significant association between low back pain and ankle/feet pain with respect to working hours per day (p value

0.00). Moreso, an association was established between years/experience in the working environment and hand, low back and hips/thigh pain (p value 0.00). Working posture was observed to be significant only on upper back.

Table 5.0: Risk factors and musculoskeletal pain in the last 12 months

Variable	Neck	Shoulder	Elbows	Hands	Upper back	Lower back	Hips/thigh	Knees	Ankles/feet
Age	X ² =7.59 P=0.06	X ² =10.06 P=0.35	X ² =4.78 P=0.85	X ² =6.12 P=0.73	X ² =7.36 P=0.29	X ² =5.82 P=0.12	X ² =5.25 P=0.15	X ² =4.64 P=0.20	X ² =2.71 P=0.45
Working hours/day	X ² =2.25 P=0.52	X ² =13.85 P=0.13	X ² =11.36 P=0.25	X ² =9.96 P=0.35	X ² =9.58 P=0.14	X ² =13.26 P=0.00	X ² =1.47 P=0.69	X ² =5.37 P=0.15	X ² =12.25 P=0.01
Year of experience	X ² =1.98 P=0.58	X ² =8.54 P=0.48	X ² =11.05 P=0.27	X ² =42.44 P=0.00	X ² =11.52 P=0.07	X ² =13.32 p=0.00	X ² =8.29 P=0.04	X ² =4.55 P=0.21	X ² =0.94 P=0.82
Working posture	X ² =0.93 P=0.63	X ² =5.22 P=0.52	X ² =1.71 P=0.94	X ² =2.20 P=0.90	X ² =33.49 P=0.00	X ² =0.12 P=0.94	X ² =0.36 P=0.84	X ² =0.01 P=1.00	X ² =0.14 P=0.93

DISCUSSION

The study aimed at identifying the pattern and risk factors of MSP among secondary school teachers in Kano Metropolis. 61% males and 39% females participated, with a response rate of 100%.

Pattern of MSPs showed that the highest prevalence was neck pain (51%) and low back pain/shoulder pain (43%), the least pain was at the elbow (26%) in the last 12 months. More so, low back pain (31%) and neck/shoulder pain (30%) was observed to be the highest reported in the last 7 days with the least being the knee joint (19%). Relationship between occupation and neck pain has been investigated, amongst those at risk include academic workers, factory workers and secretaries ¹¹ this study is not also different as highest prevalence was neck pain. In contrast to this, study conducted in Saudi-Arabia among female teachers showed that back pain (63.8%) was the most prevalent pain site followed by shoulder pain (45.4%) and neck pain (42.1%). ¹⁶ This difference could be ascribed to the study population of 240 and most of the female teachers wear high heel. In Philippines and Brazil studies, 53.3% of secondary school teachers reported back pain while shoulder pain and neck pain were 54.4% and 42.1%

respectively. ^{9,13} In Turkey, study reported lower back pain (43.8%), neck pain (42.5), upper-back (36.9%) as the commonest MSP while wrist(13.4%), hip(8.4%), elbow(8%) are least common among the teachers. ¹⁷ Age group 26-35 year, in this study was observed to have the highest musculoskeletal pain due to the fact that they represent the largest population. This might be due to the fact that younger teachers may tend to overwork themselves with activities like teaching for long while standing and accepting more demanding roles unlike elderly teachers that maybe less active.

LBP is reported to be the major cause of ADL prevention (30%), next is hip/thigh/buttocks (28%) and neck pain (22%). The nature of work is repetitive and forceful (71%), while the common posture adopted during work is standing position (76%). Only 31% seek medical attention and 15% seen by a physiotherapist. This is consistent with a study that reported 12-month prevalence of LBP as 55.7%, however only 67.1% of them reported minimal disability. ³ Also, LBP was reported to have high prevalence among Primary School Teachers ³ though the study did not check its effect on ADL.

The most common risk factors associated with MSP were hours/days of working, years of experience

and working posture. In this study, age is not a risk factor in the manifestation of MSP, making it different from a study conducted in Hong Kong which reported that age has been seen to be related to MSP. Although, they blamed their result on the ageing population in Hong Kong and Japan⁹ Contrasting our finding is another study¹⁸ which found significant connection between age (over 40 years) and MSP. The difference could be that the majority of our participants are relatively young between 26-35 years.

Working hour/days is associated to developing LBP and ankle/feet pain. This can be explained as the participants reported the work to be repetitive and forceful motions (71%), prolong standing was adopted by most and coupled to the fact that majority work 5-8 hours per day (49%) and working 5-6 days per week (75%). This study is similar to study conducted by³ which showed that repetitive overhead writing on board are risk factors for the development of LBP/upper limb pain.¹⁹

Years of teaching experience has an association on hand pain, lower back and hip/thigh pain respectively. This is in agreement with results of Chinese secondary school teachers¹¹ and Brazilian teachers.¹⁴ Prolonged sitting or standing and repetitive motions may contribute to the development of MSP²⁰ this might be due to the fact that higher number acknowledged that the work is repetitive and forceful in nature. Furthermore, 68% who have worked between 1-5 years have MSP. This is in accordance with other studies which stated that younger workers who have worked less than 10 years face greater work demands, being exposed to risk factors, as they take over more activities and tasks in the beginning of the career.¹¹

Poor posture, either sitting or standing was ranked as second and third major risk factor. This included twisting such as turning from the board to the class and back again.³ Working posture is associated with upper back pain in this study with most of the teachers adopting standing posture

CONCLUSION

Neck, low back and shoulder were the commonest MSP reported among secondary school teachers within Kano metropolis. Risk factors includes hours/day of working, years of experience and working

posture

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Prevalence of Neck Pain among School Teachers and its Association with Perceived Muscular Tension, Job Stress and Physical Exposure; An Observational Study

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ABSTRACT

Background and Objective: Chronic musculoskeletal pain is of concern to health professionals, and impacts quality of life. Neck pain is one of the prolific reasons for decreased productivity in the teaching profession in developing countries. Epidemiological data on neck pain in Indian teachers are limited. The aim of this study was to find the prevalence of neck pain among school teachers and its association with muscular tension, job stress and physical exposure.

Material and Method: A cross-sectional study was conducted among 300 school teachers in twenty randomly selected schools of Belagavi city. Data was collected using a self-administered questionnaire, which consisted of three parts, to gather information on demographic data, muscle tension and physical exposure. Teacher stress inventory - revised was used to check the level of stress in teachers. Age limit for study was 20 to 50 years. Teachers having neck pain other than musculoskeletal were excluded.

Results: Over 53.3% of respondent teachers had neck pain. The prevalence of Neck pain among female teachers was much higher than that for males. Job stress was found to be significant predictor on neck Pain then physical exposure and muscular tension respectively.

Conclusion: More emphasis should be given to prevent job stress among teachers as perceived muscular tension is associated with increasing level of stress and physical exposure in association with neck pain.

Keywords: Teachers; Neck pain; muscular tension; job stress; physical exposure

INTRODUCTION

Neck pain is common in the general population. It is believed to have multifactorial etiology, with physical, psychological and individual factor playing a role in the development of musculoskeletal disorder of neck^(1, 2, 3). Many studies have been done to show the relation between the above factors and musculoskeletal pain disorders^(4,5). There is no specific criteria used to classify neck pain but the umbrella term cervico-brachial disorder has been used to describe neck and shoulder musculoskeletal pain⁽⁶⁾.

In many theoretical studies it has proposed that both physical and psychological factors are associated with abnormal muscle activity, measured with electromyography (EMG)^(7,8). Similarly EMG also

has been used to check the associations of perceived muscular tension and muscle activity⁽⁹⁾.

In china, prolonged sitting and static posture and uncomfortable back support and prolonged standing have been associated with development of neck/shoulder pain among teachers⁽¹⁰⁾.

Aside from individual factors like age, gender social, psychosocial and physiological factors such as stress⁽¹¹⁾, tension⁽¹²⁾, depression and job satisfaction^(11, 13) have also been frequently observed in the occurrence of various neck disorders. Teaching leads to stress which affects school teaching performance⁽¹⁴⁾. Despite this, the impact of musculoskeletal pain specifically within the teaching profession has not been given sufficient attention in the literature. Not

much focused on the risk factors like perceived muscular tension, job stress and physical exposure associated with musculoskeletal neck pain among school teachers has also been done.

Hence aim of the present study was therefore, to report on the prevalence of musculoskeletal neck pain among school teachers and its association with perceived muscular tension, job stress and physical exposure in Belagavi city, Karnataka state.

METHOD

An observational quantitative cross-sectional study was conducted among school teachers. A self-administered questionnaire was personally distributed to 300 school teachers. Clearance was obtained from Institutional Ethical Committee. Permission to conduct the research in the selected schools was sought from school heads. The data was collected by the researcher by going to every selected school. All the teachers were asked to sign Informed consent prior to voluntary of the questionnaire.

Questionnaire design

Data on demographic characteristics, neck pain, muscular tension and physical exposures during work among teachers were collected using an anonymous self-administered questionnaire, which consisted of three parts. The subjects' demographic data was taken that included school name and subject teaching. The other important individual factor in demographic data was considered as the first part of the study and was:

- Health status (self-rated status of health; two categories: very good/rather good and average/rather poor/very poor).
- Time used for physical exercise (hours spent on average during work days; three categories: daily at fixed timing; alternate days or sometime and not at all).
- Time used for domestic activities, such as child/home care, cooking, gardening, household work (hours spent on average during work days; two categories: <1 hour and >1 hour).
- Pain assessment: Pain was measured using visual analog scale (VAS) by asking the patient to

mark a point indicating the severity of his/her pain on a 0 to 10 cm horizontal scale, where 0 signified no pain and 10 signified the worst pain.

The second section assessed the subject's muscular tension experienced during the past month. Questions were worded as "have u during the past month, experienced muscle tension (for example: wrinkled your forehead, ground your teeth, and raised your shoulders)?" The response scale comprised three categories: low tension (never /few times past month), medium tension (a few times a week) and high tension (ones or several time a day), which were used in statistical analysis. The third section was regarding physical exposure. Hear subjects was asked as "During the past month have you carried out precision work (for example: overhead activity/ writing on board, writing on and/or checking books, computer work/ or caring load e.g. books and other physical activities like office work which include walking, standing or bending)?" The response scale comprises of four categories that is continues for 30, 20, 15 or in between 10 to 5 minutes per day. Teachers were also asked how many lecture they take per day. Grading was done as; continues for 30 minutes was scored as 4, for continues 20 minutes 3, continues 15 minutes as 2 and between 10 to 5 minutes continually as 1. The score of 4 questions were added and multiplied by the number of lectures they take per day keeping the maximum lecture taken by a teacher per day was 4. The maximum score of the scale was 64 which was further divided into 3 categories as high physical exposure (high exposure to both precision and repetitive work) = 44 to 64, medium exposure (medium exposure to precision or repetitive work) = 22 to 43 and low physical exposure (low exposure to both precision and repetitive work) = 1 to 21. The fourth part of this study was to see the association of neck pain and job stress by Teachers Stress Inventory. The Revised Teacher Stress Inventory identified the types of stress situations teachers reported. The shortened version has 36 items that are rated on a 5-point Likert scale with seven sub divisions which include: role ambiguity, role stress, organizational management, job, life satisfaction, task stress, and supervisory support. A high score indicates a higher degree of stress experienced by the participant with the maximum score as 180⁽¹⁵⁾.

STATISTICAL ANALYSES

The results were reported as descriptive statistics. Prevalence Rate and Prevalence Rate Percentage (PRP) was calculated to examine the association of neck pain with risk factors like perceived muscular tension, job stress and physical exposure using binary logistic regression. P value less than 0.05 was said to be significant. All analyses were performed using SPSS version 19.0.

RESULTS

Study was a cross sectional one time observational study to report the prevalence of neck pain and its association with perceived muscle tension, job stress and physical exposure. The prevalence rate of neck pain was found to be 53.3 % in school teachers. Neck pain Prevalence Rate Percentage (PRP) was calculated in three age groups: 20 -30, 31 – 40 and 40 above. The Prevalence Rate Percentage (PRP) for the above age group was 47.4%, 57.1% and 75% respectively. PRP for females was 55.6% compared to male with 33.3% (Table 1 and Fig 1) and Health status in Table 2.

Table 1: Prevalence of Neck pain in School Teachers

	Age group			Gender	
	21-30	31-40	≥41	Male	Female
PR*	91/190	43/70	33/40	152/270	9/30
PRP**	47.4	57.1	75	55.6	33.3

*Prevalence Rate **Prevalence Rate Percentage

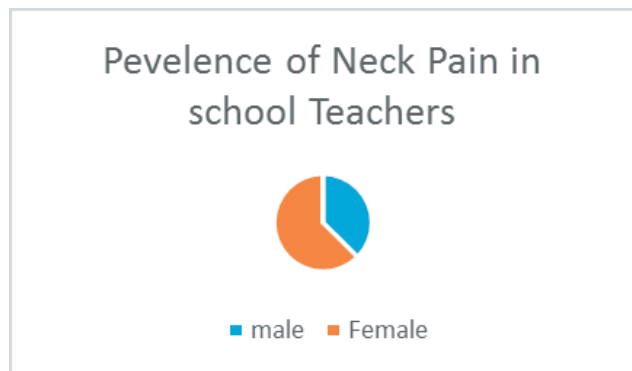


Fig 1: Prevalence of Neck Pain in School Teachers

Table 2: Prevalence of Neck Pain and Health Status

	Age (y)		
	Average	Good	V.Good
PR*	31/50	71/15	62/160
PRP**	60	46.7	60

*Prevalence Rate **Prevalence Rate Percentage

Job stress was highly associated with neck pain in school teachers (Table 3). P value was 0.011 which was highly significant with DF= 2. Perceived muscular tension was associated with neck pain with P value 0.041 which is significant. Physical exposure association with Neck pain showed p = 0.693 for 95% CI, that is not significant. Also Effect (odds ratio) of Teachers Stress Inventory on neck pain at different level was seen (Table 4).

Table 3: Distributions of the subjects in the different categories of neck pain in association with the risk factors

Neck pain (n=300)			
	PR*	PRP**	
Work related variables			
Muscle Tension			
Low	20/70	22.2	
Medium	107/180	61.01	
High	33/30	100	P = 0.036
Physical Exposure			
Medium	128/26	50	
High	32/40	75	P = 0.693
Job Stress			
Low	21/70	28.6	
Average	29/100	30	
Medium	110/130	84.6	P = 0.011

*Prevalence Rate **Prevalence Rate Percentage

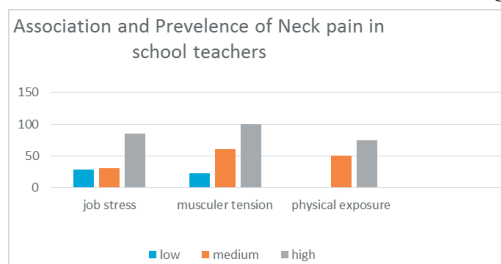


Fig 2: Neck pain association with perceived muscular tension, job stress and physical exposure in school Teachers.

Table 4: Effect (odds ratio) of Teachers Stress Inventory on neck pain at different level

Level	OR	95 CI%	P Value
Low	1.0		
Average	1.07	0.08-14.49	0.633
Medium	13.75	1.48-127.44	0.021 ⁺

DISCUSSION

Sick leave and absenteeism decreases productivity at work due to musculoskeletal pain and are costly in terms of treatment and individual suffering ⁽⁹⁾. School teachers represent an occupational group among which there appears to be a high prevalence of neck pain and/or low back pain ⁽¹⁰⁾. The prevalence rate of musculoskeletal disorders among teacher’s ranges between 40% to 95% ^(16, 17) and self-reported musculoskeletal disorders rate to be 39% to 95% ⁽¹⁸⁾. Present study gave 53.3% prevalence of self-reported neck pain in Indian teachers. The difference between other studies and this study could be due to different population studied or criteria used to defining pain definition.

In the present study females had more prevalence of neck pain than men. One of the reasons may be that women experienced a higher prevalence of musculoskeletal symptoms than men in all body regions due to physiological and psychological stress ^(19, 20) (Philips 1977, Fordyce 1982).

This study also analyzed the association between physical exercise and neck pain. The results suggested that those who practiced physical exercise daily had less prevalence of neck pain than those who do some times in a week. This could be the result of physical exercise exercises can expand or preserve the range of motion and elasticity in affected cervical (neck) joints, and thus relieve the stiffness that leads to pain ⁽²¹⁾.

Parnilla and colleagues had stated in their study that high work demand were related to high perceived stress, which in turn was related to a high perceived muscle tension in neck and shoulder region ⁽²²⁾. But in the present study it was found that job stress was more significant than muscular tension and environmental exposure. A possible reason for our findings may be related to stress-response hyper-stimulation ⁽²³⁾. Being stressed and/or anxious under high work load every

day cause the body to produce the stress response which secretes stress hormones into the blood stream where they travel to targeted spots in the body to bring about specific physiological, psychological and emotional changes. One of the physiological changes that stress response brings about is that it causes the muscle in the body to contract (tighten). When stress response occurs too dramatically and/or frequently, stress response becomes hyper-stimulated, since stress hormones are stimulants and causes muscle to remain tense and tight for most of its time which may lead into muscular neck and back pain in most cases. Moreover a recent study has found that psychological factors can negatively affect the pain modulation that causes stronger pain than normal muscular pain ⁽²⁴⁾.

In spite of extensive research on muscular tension with neck pain among school teachers there is still a dearth of literature available on the same. In this study muscular tension was also quite significant. Ecological study done by Sauter and Swanson ⁽²⁵⁾ also supports the present study report as that state that psychological strain produces muscular tension and moderates the relation between biomechanical strain and musculoskeletal symptoms hence muscular tension could be used as an effective method to evaluate early signs of neck pain.

A possible association of physical exposure was also found in our study as an individual risk factor of neck pain. There is limited investigation done on this topic for teachers with neck pain. Though study done by Devereux and co-workers ⁽²⁶⁾ observed a potential interaction between high psychological and high physical exposure, in a cross sectional study done on both white-collar and blue-collar workers which may support our result. In addition another study of Chinese secondary teachers ⁽²⁷⁾ found a positive association between high workload, low colleague support, high job stress, low job satisfaction and neck pain. Neck pain may also cause teachers to suffer adverse mental and physical health issues due to variety of job functions ⁽²⁸⁾. Hence more emphasis should be given on teacher’s environment and on reducing the load of job.

CONCLUSION

Neck pain is a considerable issue in job like teachers and may interfere in their quality of life. More emphasis should be given to prevent job stress

among teachers. Perceived muscular tension was also associated with increasing level of stress and physical exposure in association with neck pain.

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To Study the Efficacy of Muscle Energy Technique on Muscle Strength and Flexibility in Patients with Knee Osteoarthritis

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ABSTRACT

Background: Osteoarthritis (OA) also called as Osteoarthrosis or degenerative joint diseases; it represents a major cause of morbidity and disability. Muscle Energy Technique (MET) claimed to be effective for improvement in flexibility and strength. **Objective:** To study the efficacy of MET on quadriceps strength and hamstring flexibility in knee osteoarthritis patients. **Methodology:** According to inclusion and exclusion criteria, 120 unilateral involvement of OA knee patients were randomly assigned into 2 groups, Pre and post-test evaluation of hamstring flexibility with Active knee extension test (AKE) and quadriceps strength by Delorme boot were done. Group A had given MET with conventional treatment. **Results:** Statistical analysis indicated more significant improvement in MET group for hamstring flexibility ($t = 15.66, p < 0.05$) and in quadriceps strength ($t = 7.60, p < 0.05$) compared to conventional treatment. **Conclusion:** Both MET and conventional treatment improves hamstring flexibility and quadriceps strength but MET was more effective for the improvement of hamstring flexibility and strength in OA knee patients.

Keyword: AKE, Delorme boot, hamstring flexibility, knee osteoarthritis, MET.

INTRODUCTION

Osteoarthritis (OA) also called as an Osteoarthrosis or degenerative joint disease, it is the most common form of chronic disorder of synovial joints.¹ OA is more common after 40 years in women than men but the prevalence increases dramatically with age. Global Burden of Disease in the year 2000 suggested that OA is the 4th leading cause of Years living with disability (YLD) at global level.² OA is marked mainly by two localized pathological features: the progressive destruction of articular cartilage and the formation of bone at the margin of the joint.³ The exact aetiology is still unknown but multiple factors like age, sex, obesity, genetic, bone density, cigarette smoking, local factors and joint location having a major effect on Osteoarthritis.⁴

In patients with OA knee, pain would be the earliest symptom, and weakness in the quadriceps muscle compared to healthy persons.⁵ quadriceps muscle weakness may contribute to the substantial functional deficits that occur with disease progression.

Some researcher stated that quadriceps weakness may result from the pain of osteoarthritis, however, some have suggested that quadriceps weakness preceded the onset of knee osteoarthritis and considered to be the risk factor for the development of knee osteoarthritis particular in women.⁶ Individuals with OA knee joint commonly display marked weakness of the quadriceps muscles, with strength deficits of 20 to 45% compared with age and gender-matched controls.⁷ Muscle tissue Flexibility defined as the ability to move a single joint or series of joints smoothly and easily through an unrestricted pain free ROM.³ but in people with osteoarthritis of the knee joint, the flexion and extension range of motion is particularly reduced. This can be due to damaged articular cartilage, pain avoidance, loss of extensibility of the capsule surrounding the joint and loss of extensibility of the muscles acting over the joint, here in OA knee hamstrings having a major role in developing arthrogenic changes and it leads to the development of contracture, which gradually falls into the loss of hamstring flexibility.⁸

The physiotherapist plays an important role in the health care process of the patients with hip and knee osteoarthritis.⁵ Quadriceps strengthening has traditionally been an important component of exercise programs for knee Osteoarthritis.⁹ Despite of the benefits of exercise and the various modalities' limitations, have necessitated the pursuit of advanced techniques like Muscle energy technique. Muscle energy technique (MET) is a manual technique developed by osteopaths that is now used in many different manual therapy professions like in physiotherapy, massage therapy and athletic training centers. MET is claimed to be effective for variety of purposes, including lengthening a shortened or contracted muscle, strengthening of muscles, as a lymphatic or venous pump to aid the drainage of fluid or blood, and increasing the range of motion (ROM) of a restricted joint.¹⁰ MET may produce increase in muscle length by a combination of creep and plastic change in the connective tissue an increase in the flexibility after muscle energy technique occurred due to biomechanical or neurophysiological changes or due to an increase in tolerance to stretching.¹¹ Osteopathic physician Sandra Yale have stated that MET can be used in older patients who may have severely restricted motion from arthritis or who have brittle osteoporotic bones.¹² So, the purpose of the study is to find out efficacy of muscle energy technique on muscle strength and flexibility in knee osteoarthritis patients.

METHODOLOGY

Study design: Experimental study.

Study setting: Various physiotherapy centres.

Sampling technique: Simple Random sampling.

Study duration: 3 weeks protocol, 5 days/week

Study sample: 120 OA knee patients were randomly and equally divided in two groups.

- **Group A (MET):** 60 – OA knee patients
- **Group B (Control):** 60 – OA knee patients
- **Inclusion criteria:**

1. OA knee patients with unilateral involvement.
2. OA knee patients with X-ray findings showing grade I to III.
3. Both the genders will be included.
4. Age group between 40 to 60 years.

• **Exclusion criteria:**

1. History of any known cardio respiratory or neurological conditions.
2. Fractures or any other orthopaedic condition in treatment limb.
3. Tumours in the area of treatment.
4. Recent under gone surgery or any acute inflammatory problem.
5. Any hearing or visual defects.
6. The patients who are not co-operative during the study.

METHOD

- The proposed title and procedure was being approved by ethical committee members and written consent was taken from patients, who fulfilled the inclusion and exclusion criteria, and all patients were explained briefly about the aims and objectives of the study, health benefits of the exercises and about the procedure of measuring knee extension ROM and quadriceps muscle strength was explained.

- After that patients were randomly assigned into 2 groups so that each group consisted 60 patients. Each subject's knee extension ROM and quadriceps strength were recorded before starting the study.

- Group A were given MET for hamstring flexibility and muscle strength, where Group B were kept as control group.

MEASUREMENT PROCEDURE

1. Active knee extension test:¹³

- i. The subject was in supine position with the hip flexed at 90° and the knee flexed. A wooden cross bar was used to maintain the proper position of the hip and the thigh. The testing was done on the affected extremity and subsequently, the other extremity was strapped down to the table.

- ii. The fulcrum of the goniometer was cantered over the lateral condyle of the femur with the proximal arm secured along the femur using the greater trochanter as a reference. The distal arm was aligned with the lower leg using the lateral malleolus as a reference.

iii. The hip and knee of the extremity being tested were placed into 90° flexion with the anterior aspect of the thigh in contact with the horizontal cross bar frame at all times to maintain the hip in 90° flexion.

iv. The subject was then asked to extend the right lower extremity as far as possible until a mild stretch sensation was felt. A universal goniometer was then used to measure the angle of knee extension.



Figure 1: Measurement of active range of knee extension: starting position



Figure 2: Measurement of active range of knee extension: end

Quadriceps strength test:^{14, 15}

- i. The patients were in a high sitting position.
- ii. A Delorme boot was strapped to the affected foot of the leg to be tested and random metal weight were attached to boot.
- iii. Than patient were asked to extend the knee with weight without any difficulty. After each successful performance, the weight increased until a failed attempt occurred. So previous weight of failed

attempt were noted as 1 RM (Repetition Maximum) of that patient.

TRAINING INTERVENTION

1. Group A:

* Muscle Energy Technique (MET) for hamstring flexibility and quadriceps strength.

- Isometric contraction was held for 10 seconds and then slight stretch for 30 seconds was maintained.

- 4 contractions per treatment with 3 seconds rest between each contraction.

- 5 days/week

- 3 weeks protocol

* Conventional Treatment.

- Static quadriceps exercise

- Vastus Medialis obliques exercise

- Straight leg raising

2. Group B:

* Conventional Treatment.

- Static quadriceps exercise

- Vastus Medialis obliques exercise

- Straight leg raising

- 5 days/week

- 3 weeks protocol

Muscle energy technique:¹²

- i. Agonist contract and relax which is one of the MET technique was used in this study. For that the supine patient fully flexes the hip on the affected side. The flexed knee was extended by the practitioner to the point of resistance (identifying the barrier).

- ii. The calf of the treated leg was placed on the shoulder of the practitioner, who stands facing the head of the table on the side of the treated leg. The practitioner's one hand holds the treated leg's thigh to maintain stability when the barrier is being assessed. The other leg was stabilized with the stabilizing belt.

iii. The patient then asked to attempt to straighten the lower leg (i.e. extend the knee) utilizing the antagonists to the hamstrings (quadriceps), employing 20% of the strength in the quadriceps. This was resisted by the practitioner for 7-10 seconds.

iv. Appropriate breathing instructions had given. The leg was then extended at the knee to its new hamstring limit, after that passive stretch should be hold for 30 sec, followed by relaxation the procedure is then repeated.



Figure 3: MET application:

RESULTS

Means and Standard Deviation (SD) were calculated as a measure of central tendency and measure of dispersion respectively. Comparison of active knee extension ROM and quadriceps strength for within group comparison done by paired t test. Between group comparison for active knee extension ROM and quadriceps strength was analysed by unpaired t test.

Table 1: Age, Height, Weight distribution of Group A and B:

	AGE (years)	HEIGHT(cm)	WEIGHT (kgs)
MEAN(A)	53.03	156.72	69.92
MEAN(B)	50.96	156.61	69.05

Table 2: Gender distribution of all participants.

Gender	Group A	Group B	TOTAL
Male	24	22	46 (38.33%)
Female	36	38	74 (61.67%)

Table 3: Pre-post difference in ROM after treatment for Group A and B:

Variant	Group A (mean ± SD)		t value	P value	Result
	Pre	Post			
ROM(in degrees)(A)	117.33 ±8.61	147.50 ±15.03	17.60	<0.05	HS
ROM(in degrees)(B)	113.83 ± 9.22	116.16 ± 8.94	4.99	<0.05	S

Table 4: Pre-post difference in strength after treatment for Group A:

Variant	Group A (mean ± SD)		t value	P value	Result
	Pre	Post			
Strength(kgs)(A)	1.89 ± 0.64	2.68 ± 0.65	11.90	<0.05	HS
Strength(kgs)(B)	1.82 ± 0.64	2.00 ± 0.66	4.12	<0.05	S

Table 5: Shows inter group comparison of ROM between Group A and Group B:

	Group A difference of ROM(in degrees)	Group B difference of ROM(in degrees)	t value	P value	Result
Mean±SD	30.16±13.27	2.33±3.62	15.66	<0.05	HS

Table 6: Shows inter group comparison of Strength between Group A and Group B:

	Group A difference of strength(Kgs)	Group B difference of strength(Kgs)	t value	P value	Result
Mean±SD	0.79±0.51	0.18±0.34	7.60	<0.05	HS

DISCUSSION

The review of the existing literature regarding the role of MET in improving hamstrings flexibility and quadriceps strength reveals significant improvement compare to conventional treatment(control group). The current study was undertaken to see the efficacy of MET on the hamstring flexibility and quadriceps strength in patients with OA knee.

However, in comparison of the pre and the post-test value of AKE and quadriceps strength shows a significant improvement in both the groups but among them MET group showed highly significant technique to improve AKE as well as quadriceps strength. And there were no any drop out ratio all the patients have completed study duration. **S Trudel and Uthoff** commented that arthrogenic changes occur in the knee as period of immobility increases which leads to the development of a contracture and loss of knee extension, the hamstring muscles in particular may play a role in this limitation.¹⁶ where as **Duncan A reid et al and Lisa C White et al.**, also supported that OA knee patients having short length of hamstring muscle.¹⁷ where **Tibor et al and Adegoke et al.**, also have found that isometric peak torque of both quadriceps and hamstring is increased with knee OA than those of the age matched controls.¹⁸

Conventional treatments are available to deal with complications of OA patient and in the present study's result conventional treatment showed significant improvement but when it was compared with MET's result that changed the whole picture as it showed highly significant result in 3 weeks protocol. MET researchers like **Wassim M. et al.**, stated after investigation and comparison of the influence of Muscle Energy Technique (MET) and Eccentric Training (ECC) on hamstring flexibility and indicated that there were more significant improvement in hamstring flexibility in MET than ECC in normal collegiate students.¹³ where **Ballantine et al.**, also observed that Muscle energy technique produced an immediate increase in passive knee extension.¹⁹

Handel et al., identified significant increases in hamstring flexibility along with an increase in passive torque (increase in force used to stretch the hamstring) after a contract-relax exercise program.²⁰ and **Wallin et al.**, also claimed that contract-relax techniques were more effective than ballistic stretching for improving muscle flexibility²¹

Magnusson et al., and **Halbertsma et al.**, demonstrated that increased muscle extensibility was attributed to use of increased torque. A visco-elastic change would have been evident if increased muscle length was achieved using a constant torque (force of stretch).²⁰

Some authors have speculated on the neurological mechanisms that may produce increased range of motion of a joint after MET. **Kuchera** attributed the effectiveness of MET to the inhibitory Golgi tendon reflex. This reflex is believed to be activated during isometric contraction of muscles, which is claimed to produce a stretch on the Golgi tendon organs and a reflex relaxation of the muscle.²² **Handel et al.**, suggest that an increased stretch tolerance is a possible mechanism behind the increased ROM seen in their study after the contract-relax exercise program.²¹

Chaggar rupinder singh et al., claimed that application of post isometric relaxation muscle energy technique provides strengthening effect on the quadriceps muscle in college student.²³ where in present study result also showed that quadriceps strength increase after the isometric contraction. So here, in agonist contract and relax technique, isometric contraction of quadriceps muscle leads to its strengthening, Increased hamstring flexibility **will improve patient's quality of life** in patients with knee osteoarthritis.

CONCLUSION

The result of the present study showed that subjects belonging to MET group were able to increase the hamstring flexibility and quadriceps strength compared to the control group. So, it can

be further recommended to include in OA treatment regime.

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Improved Extubation Outcome with Breathing Exercises during Spontaneous Breathing Trials with T-Tube/ Pressure Support Ventilation, Decreased Pulmonary Complications in Thoracic Cancers: A Clinical Trial

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ABSTRACT

Objective: Extubation outcomes during spontaneous breathing trial is better with T-Tube+Deep breathing exercises OR with Pressure support ventilation+Deep Breathing exercises and do breathing exercises help in preventing pulmonary complications? **Methodology:** a randomized, prospective clinical trial. Participants: 40 mechanically ventilated patients with thoracic cancers in an adult intensive care unit. Intervention: Randomly the patients were assigned to undergo a trial of 2 hours of spontaneous breathing in one of two ways i.e. with a T-tube circuit+ breathing exercises and with pressure support ventilation + breathing exercises. Outcome Measures: Successful extubation was considered if extubation was performed after the spontaneous breathing trial of 2 hours, and reintubation was not required within 48 hours of extubation. PaO₂, FiO₂, Positive end expiratory pressure, Glasgow coma scale, Hemoglobin, Temperature were recorded before starting the trial. Respiratory rate, Heart rate, Blood pressure, Tidal volume, PH, PaCo₂, PiMax, Oxygen saturation was noted during the trial. Chest expansion, Peak expiratory flow rate, Single breath count were also recorded. **Results:** One: the percentage of patients successfully extubated after spontaneous breathing trials was 15% higher with pressure support + Breathing Exercises. Two: Reintubation in the T-tube group was associated with a dramatic increase in mortality. Three: No patient developed any kind of pulmonary complications when extubated with pressure support. **Conclusion/Recommendations:** Pressure support method can be preferred for extubation than T-tube method. The chances of pulmonary complications is significantly low when pressure support + deep breathing exercises is used

Keywords: Pressure Support Ventilation, T-Tube, Extubation Outcome, Spontaneous Breathing Trials.

INTRODUCTION

Once a mechanically ventilated patient recovers from illness, attempts should be made for discontinuation and extubation. We should be able to differentiate the patients who could tolerate immediate spontaneous ventilation

from those who needed a gradual transition from mechanical ventilation to spontaneous breathing. Predictive criteria for weaning are a helpful method to evaluate the suit-ability of disconnecting a patient from the ventilator^{10,14,21,25}. Because of the simplicity and reliability, rapid shallow breathing ratio (i.e. breathing frequency to tidal volume f/V_T), seems to be the most useful parameter for measuring this suitability²⁵. 2 hour T-tube trial of spontaneous breathing is an important test for selecting the patients who were ready for extubation, but sometimes there are chances of extubation failures, (i.e., the percentage of patients who must be reintubated)

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because during intubation, pulmonary complications often occur in thoracic cancer patients, Pulmonary complications cause problems during intubation period. Patients with chronic obstructive pulmonary diseases, obesity, advanced age, heavy smokers, and cardiovascular diseases are highly predisposed to develop such complications & often severe morphological & functional alterations of the lungs were also observed¹⁷.

Post extubation, the pulmonary complications are being prevented till now by early use of antibiotics, early ambulation, prophylactic treatment by heparin, intermittent positive pressure breathing, blow bottles, continuous positive airway pressure, etc. Chest physiotherapy, deep breathing exercises and incentive spirometry along with other treatments also play an important role in preventing these post extubation pulmonary complications. Many studies in the past have proven the efficacy of chest physiotherapy¹⁷.

Despite many studies, some doubt still remains as to which is the appropriate method of extubation and what is the role of deep breathing exercises in the prevention of pulmonary complications in thoracic cancer patients. Presence of an endotracheal tube causes an increased work of breathing and may put an extra load for some patients breathing through the T-tube circuit and this may result in poor tolerance of the trial. Pressure support ventilation counteracts this extra work imposed by breathing through an endotracheal tube. The level of pressure support required to decrease the work of breathing is 7 to 8 cm H₂O^{3,9,19}.

Successful extubation rates after trials of spontaneous breathing depend on the percentage of patients failing the trial and on the percentage of patients who needs reintubation. The added stress imposed by T-tube trials could increase trial failure rates. On the other hand, the reduced work of breathing due to pressure support can lead to extubation of those patients who are only marginally able to sustain spontaneous breathing and therefore a higher reintubation rate would be expected². If the above hypothesis is true, the rate of successful extubation after trials of spontaneous breathing with T-tube or pressure support remains the same.

The aim of the study was, which group showed better extubation outcome during spontaneous breathing trials with T-Tube+Deep breathing exercises/ Pressure support ventilation+Deep Breathing exercises and do deep breathing exercises help in preventing pulmonary complications?

MATERIALS & METHOD

Design

The study was conducted between January 2011 and September 2011 in medical-surgical intensive care units in Rajiv Gandhi Cancer Institute and Research Center Rohini New Delhi 85 India. The study population consisted of 40 patients suffering from different types of cancers post chemotherapy and post radiotherapy, who received mechanical ventilation for more than 48 hours before the spontaneous breathing trial was performed. Patients were randomly assigned using a random-number table to undergo the trial of spontaneous breathing in one of two ways: with a T-tube circuit+ Deep Breathing Exercises or with pressure support ventilation of 7 cm H₂O + Deep Breathing Exercises. The patients were allocated to the two groups in a blinded fashion using opaque, sealed, numbered envelopes, which were opened only after the patient fulfilled all of the inclusion criteria. Randomization was performed by permuted blocks according to the study centre.

Participants

For enrollment in the trial, the patients had to have an improvement or resolution of the underlying cause of acute respiratory failure: adequate gas exchange, as indicated by a partial pressure of arterial oxygen (PaO₂) higher than 60 mmHg, breathing a fraction of inspired oxygen (FIO₂) 0.40 with a positive end-expiratory pressure of 5 cm H₂O, a Glasgow Coma Score higher than 13, temperature below 38° C, a hemoglobin level above 10 g/dl with no further need for sedative agents. The attending physician consent that the patient is in stable condition and can be weaned from the ventilator is necessary. Patients with a tracheostomy were excluded from the study. Total 40 patients participated, 30 were male and 10 were female. In the male group, 18 were extubated using Pressure support and 12 were extubated

using T-Tube. In the female group, 04 patients were extubated using Pressure support and 06 were extubated using T – Tube. Patients between the age group 18 to 70 years were included in the study. The study was approved by the Ethics Committees of the Rajiv Gandhi Cancer Institute & Research Centre Rohini New Delhi.

Intervention

After enrollment in the study, each patient breathed spontaneously for 3 min through a T-tube circuit, with the $F_{I}O_2$ set at the same level as that used during mechanical ventilation. Tidal volume and respiratory frequency were measured with a spirometer during this period. Maximal inspiratory pressure was measured, and the most negative value of three efforts was selected. Patients underwent a trial of spontaneous breathing for 2 hours when they met at least two of the following criteria: maximal inspiratory pressure less than $20\text{ cmH}_2\text{O}$, tidal volume greater than 5 ml/kg body weight, and a respiratory frequency of less than 35 breaths/min. If a patient did not meet these criteria, he or she was evaluated daily until the criteria were fulfilled. Prior to the trial the patient is taught how to do these exercises. Deep Breathing Exercises were given four times during the 2 hour trial period i.e. every 30 minutes for both of the two groups. 15 repetitions of apical, 15 repetitions of costal and 15 repetitions of diaphragmatic breathing exercises are given at each sitting in lying position with 30 degree head up position.



Photo-1: Showing Spirometer For Measuring Tidal Volume



Photo-2: Showing Meter For Measuring Maximum Peak Inspiratory Pressure, i.e. (PiMax)



Photo - 3 : Showing Mechanical Ventilator



Photo 4: Showing Endotracheal Tube :



Photo-5: Showing Pressure Support



Photo-6: Showing T - Piece

Respiratory frequency, heart rate, systolic blood pressure, and arterial oxygen saturation were measured by pulse oximetry, Chest expansion at Axilla, Nipple and Xiphisternum, Peak expiratory Flow rate, Single Breath count were recorded every 15 minutes during the trial of spontaneous breathing.

If a patient showed signs of poor tolerance at any time during the trial, mechanical ventilation was reinstated. Patients who showed no signs of poor tolerance were immediately extubated. Successful extubation was considered if extubation was performed after the spontaneous breathing trial of 2 hours, and reintubation was not required within 48 hours of extubation.

INSTRUMENTATION:

Wright's pocket peak flow meter, Tailors measuring tape, Nellcor puritan Bennett 190 pulse oximeter, Wright's spirometer, Mechanical ventilator, Pi Max meter, Endotracheal tube set & T piece

Data Analysis

Data were presented as medians with the 25th-75th percentile ranges or percentages as appropriate. Categorical variables were analyzed by chi-square tests, except when small size required the use of Fisher's exact test. Comparison of continuous variables among T-tube and pressure support groups was performed using Student's *t* test for variables, with normal distribution and the Mann-Whitney U test for variables with non normal distribution. Comparisons of continuous variables among the following three groups: (1) patients who failed a spontaneous breathing trial (Trial Failure Group), (2) patients reintubated (Reintubation Group), (3) patients successfully extubated.

Successful Extubation Group was made using one-way analysis of variance for continuous variables with normal distribution and the Kruskal-Wallis test for variables with non normal distribution. The incremental area under the curve was used as a summary statistic for the measurements for each patient to compare the respiratory frequency, heart rate, systolic blood pressure, oxygen saturation, Chest expansion at Axilla, Nipple and Xiphisternum, Peak expiratory

Flow rate, Single Breath count in the trial failure, and reintubation and successful extubation groups for the 2-h spontaneous breathing trial.

RESULTS

This study has highlighted three major findings. One: the percentage of patients successfully extubated after spontaneous breathing trials was 15% higher with Pressure Support of 7 cm H₂O + Deep Breathing Exercises than with T-tube + Deep Breathing Exercises. Two: The reintubation in the T-tube + Deep Breathing Exercises group was associated with a dramatic increase in mortality. Three: No patient developed any kind of pulmonary complications when extubated with pressure support of 7 cm H₂O + Deep Breathing Exercises.

Our results showed a significantly higher percentage of patients in the pressure support group successfully underwent spontaneous breathing trials. The findings that spontaneous breathing trials with pressure support led to higher trial-success rates but not to higher risk for reintubation, suggest that some patients fail spontaneous breathing trials with the T-tube because of the respiratory load imposed by the T-tube system, but they can be successfully extubated when this overload is eliminated by the pressure support.

Immediately after discontinuation of ventilator support, patients failing a spontaneous breathing trial showed respiratory frequencies, heart rates, and systolic blood pressures higher than patients who tolerated the whole 2-hour trial period properly. Oxygen saturations, chest expansion at all three levels, peak expiratory flow rate, single breath count significantly lowered and decreased, leading to a decrease in pulmonary complications.

The study has shown that both pressure support of 7 cm H₂O + deep breathing exercises and T-tube+ deep breathing exercises are suitable methods for spontaneous breathing trials before extubation in ventilated patients without difficulty in resuming spontaneous breathing.

DISCUSSION

Of the 40 patients, 20 patients were assigned to undergo spontaneous breathing trials with T-tube circuits + deep breathing exercises and 20 were assigned to pressure support ventilation of 7 cm H₂O+ deep breathing exercises. The two groups were similar with respect to the patient characteristics, the indications for mechanical ventilation, and respiratory functional parameters measured before the trial of spontaneous breathing

17 patients in the T-tube+ deep breathing exercises group successfully completed a 2-hour trial of spontaneous breathing and were immediately extubated; 3 of them required intubation within 48 hours. 19 patients in the pressure support+ deep breathing exercises group were extubated after a successful 2-hour trial of spontaneous breathing, and 1 of them required intubation within 48 hours. The percentage of patients failing the trial of spontaneous breathing was significantly greater when the T-tube+ deep breathing exercises were under taken.

The reintubation rate causing the initiation of mechanical ventilation was not different when the T-tube and the pressure support groups were grouped together. In patients who tolerated the trial of spontaneous breathing there were no differences between T-tube and pressure Support groups regarding ICU mortality.

CONCLUSION

Extubation rate is significantly high with pressure support of 7 cm H₂O + deep breathing exercises than T-tube+ deep breathing exercises. The chances of pulmonary complications is significantly low when pressure support of 7 cm H₂O + deep breathing exercises is used rather than T-tube+ deep breathing exercises. Pressure support of 7 cm H₂O + deep breathing exercises can be preferred for extubation than T-tube+ deep breathing exercises.

Ethics Approval: Rajiv Gandhi Cancer Institute & Research Centre, Sector. 5 Rohini. New Delhi India ethical committee approved the study and the procedures for gaining consent.

Conflict of Interests : I hereby declare that there are no interests of conflicts.

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Indian Physiotherapists' Experience of Learning Musculoskeletal Skills Using E-learning Resources: A Qualitative Study

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ABSTRACT

Health & well being students in United Kingdom acquire knowledge through blended learning approach, involving both classroom learning and using web based educational applications. This system of learning is new to Indian physiotherapy students studying in United Kingdom. **Objectives:** This study was conducted to gain the insight into learning musculoskeletal skills using e-learning resources, to determine the barriers encountered and to gain an understanding of the approach used to facilitate the use of e-learning resources in Indian healthcare education system. **Method:** Face to face, semi-structured interviews were conducted with Indian students enrolled in the MSc Applying physiotherapy course at Sheffield Hallam University, UK. A qualitative approach was used to analyze the data. **Result:** This approach to learning provides wide range of information about any given topic, it promotes evidence based learning and continuous professional development by providing access to up to date information and researches in the field of physiotherapy, it promotes self – paced learning and it is time saving. Participants' responses elicited issues addressing the need for practical sessions for learning hands-on skills, direct feedback from the tutor, lack of tutor-peer interaction and support, restricted access to paid databases and study materials, personal inclination towards particular learning style and technical challenges. Participants recommended strategies to overcome barriers such as incorporating online group discussion sessions into the modules, upgrade access and availability of the e-learning materials. Peer review further supports the reliability of the data analysis.

Keywords: E-learning, Musculoskeletal skills, Physiotherapy, Healthcare education.

INTRODUCTION

Expeditious progress in technology has impacted profoundly on the system of learning ¹. E- Learning refers to utilizing internet to augment the knowledge and practice, interact with the learners to gain assistance in the process of learning with the sole purpose to acquire deeper knowledge and wide range of up-to-date information thus improving the overall learning experience ^{2,3}.

Health care sector focuses on innovational academic learning approach to instigate continuous learning¹. Academic field of health care profession was introduced late to e-learning system⁴. However with rapid growth of internet professionals are showing high interest in e-learning because of its

convenience ^{5,6}.

Recently in United Kingdom e-learning is being considered as a highly desirable approach to meet learning needs of pre-registered health care students and for continuous professional development of National Health Services staff⁷. In India, the education program in the health care sector still continues to be mainly delivered through face to face learning. Although e-learning is not globally acknowledged as a favorable learning mode, it shows a path which assists in overcoming the obstructions in learning, confronted by the health care professionals⁷.

In recent years Health care professionals are finding E-learning resources advantageous for case based learning⁸ and problem based learning⁹. It's a

source of easy, widespread and up-to-date educational and professional information¹⁰. Continuous learning for health care professionals can further intensify the personal-professional development and expertise, and can also provide formal acknowledgement of the specialized skills¹¹. Time saving factor, online discussions, improved access to study resources are other reported advantages of e-learning¹².

Concern has been raised as adapting to e-learning could prove time consuming¹³. E-learning is also criticized for eliminating interaction with tutor and peer¹⁴. Also this approach to learning cannot address all areas of physiotherapy such as learning hands-on skills¹⁴.

Dyrbye et al 2009 and Peacock et al 2007 identified inadequate computer operating skills, time commitments, preference of learning style and interrupted flow of communication as the barriers to e-learning. Fear triggered by lack of required skills and knowledge about the technology has been identified as one of the greatest barrier¹⁶. On the other hand strategies like time management, online communication etiquette, computer competence have been suggested to facilitate e-learning¹⁵.

Effectiveness of any learning program depends mainly on the experience reported by its users. Few studies have been conducted to identify how practically physiotherapists embrace e-learning¹⁷. Studies of Peacock et al 2007, Moore et al 2006 and Mathur et al 2005 focused on perception of physiotherapists about e-learning; however the study population was Non-Indian so it is not legitimate to extrapolate the study findings to Indian physiotherapists who come from a different learning background. Thus the aim of conducting this study is to explore the perception of Indian Physiotherapists studying in UK about e-learning, highlight chief barriers and to determine ways to optimize successful implementation of e-learning in Indian physiotherapy curriculum.

MATERIALS & METHOD

Study Design: This is a qualitative study where phenomenal approach to research was considered as it focalizes on exploring lived experience of several people about a concept or phenomenon¹⁹.

Sampling: Purposeful sampling method was utilized as it involves the selection of information rich sources²⁰. It allows studying broad range of subjects with different level of experience, distinctive knowledge or proficiency²¹.

A list of students enrolled in MSc Applying Physiotherapy program in January 2011 and September 2011 cohort was derived. On behalf of the researchers an e-mail invitation with the information sheet was sent to the students by the administration staff of Sheffield Hallam University. Students with less than 6 months experience were excluded as they might have insufficient exposure to e-learning. Participation in the study was autonomous. On meeting the participants were given a standardized explanation regarding the study.

Data Collection: Face to face interviews were conducted. Topic guide included a mix of predesigned structured and semi structured open-ended questions. Structured questions gathered details like age, demographic data, and level of computing skill. Open-ended questions focused on ease of access, benefits, expectation and satisfaction of e-learning further encouraging the participants to provide detailed information on the topic²².

Pilot study was conducted to acquire vital information regarding aspect of study demanding improvement²³. After three pilot interviews, amendments were made in the topic guide to improve its content validity. This data was not included in the main study. Data saturation method was used to determine sample size; it's an appropriate method for researches in which suitable sample size is the outcome of extent and distribution of perception²⁴. With the progress of the study new themes and categories stopped emerging, thus the data saturation was reached resulting in sample size of 7.

Data Analysis: Transcribed interviews were read several times to derive themes relating to the positive and negative aspects of e-learning. Framework approach was used for data analysis; allowing data collection and analysis to be done simultaneously²⁵. Peer review and member checking targeted reliability and validity issues respectively^{26,27}.

RESULT

Table 1: Shows the demographic data of the participants

PARTICIPANTS	P1	P2	P3	P4	P5	P6	P7
AGE	25	26	24	26	25	25	25
SEX	M	M	M	F	F	M	F
PREVIOUS ONLINE COARSE	0	0	0	0	0	0	0
ONLINE SKILLS	I	I	I	I	I	I	I

P = Participants; Online skills = Novice , Intermediate , Advanced

Outline of results presented in this section is extracted from the theme summaries and includes true quotations from the interview transcripts shown as participants' coded name.

1. ATTITUDE TOWARDS E- LEARNING:

Participants acknowledged a range of advantages of e-learning.

Many participants acknowledged the time saving element of e-learning that helped them in acquiring wide range information in short time.

"Well as I said that strength is basically the time factor, it saves a lot of time and in a small duration you can gather a lot of information pertaining to the topic that you want to get" (P2)

Few participants appreciated e-learning for the fact that there are no time boundaries to learning. Some participants appreciated self-paced learning nature of this mode of learning. The comment from the participant illustrates their independence of self-selection of the study topic anytime in an e-learning environment.

"When I don't want to learn a topic, I have that freedom to pick another topic and learn that and probably look through other things. (P4)

One participant also acknowledged it as a suitable learning approach for slow learners.

Some participants reported that e-learning is an easy accessible and easily available learning resource.

"When I need to rush for my class or when I have something to give a quick look to I think e-learning is the best tool you have at that time" (P1)

Participants reflected on e-learning from both positive as well as negative perspectives. Positively, they appreciated the use of e-learning in providing new detailed information, such as:

"I mean I just like... got a chance to update myself, got a chance to learn new things. I have gained huge knowledge, it has made me better" (P7)

However few participants also reported that the information available online is vast and vague.

2. NEED FOR BLENDED APPROACH:

Participants recognized that theoretical knowledge can be obtained online, while practical sessions are important to learn hands-on skills which play a vital role in physiotherapy:

"If the others are guiding us or teaching us, it would be quite helpful to learn the hands-on technique as compared to learning them online" (P3)

However one participant also reported a situation to present negative perception of practical sessions.

"suppose when we are in class and if a teacher or a tutor is doing some technique, sometime the drawback is that there are a lot of people around and you might not be able to learn the technique properly" (P2)

A common opinion of the participants was absence of social interaction which is possible with class room learning. Participants reported importance of face to face discussions to exchange knowledge and assemble on each other's ideas:

".... when you sit with the bunch of people and discuss, new ideas always come up, new diagnosis and treatment protocols come up like that so it is always better to have combined learning approach

rather than just online" (P7)

Many participants suggested the need for tutor's feedback to correct the clinical practice and optimize learning by providing feedback on their practical technique:

"The feedback that you get from the tutor on spot is very important in my perspective because unless and until somebody corrects you, you are always going to practice the wrong thing" (P7)

They also demonstrated a focus on the necessity of blended learning approach to learning MSK skills, which involved both face to face and e-learning sessions.

3. BARRIERS: Participants expressed a diverse opinion regarding the barriers encountered.

Some participants presented awareness about the technical issues. Participants reported interrupted internet connection as the major technical challenge:

"You know sometimes the internet connection may be slow or there may be some problems with the connection. So at times when you really need some study materials you might not be able to get it". (P2)

Participants also reported barriers like poor computer access skills; problems regarding inaccessibility of blackboard site were also reported.

The e-learning environment presented challenges to receive support from the tutor and the peers; and establishing interaction with the peers that acted as a challenge for the participant to acquire knowledge through e-learning.

"There were times when I did not understand anything which was a kind of frustrating because you don't have someone who could provide you with proper explanation at that time" (P4)

Delayed response from the tutor was the concern reported by one participant.

Participants stated that e-learning method was challenging to accustom. Few mentioned the preference of traditional system of learning over e-learning:

"The point that I basically dislike about e-learning is that we are basically adapted to learning

from books, so it is difficult to understand the process of e-learning." (P1)

Participants also reported concern on the lack of real practical sessions that restricted their learning of hands-on skills.

Participants raised an issue about the costing and unavailability of certain important databases and articles, that becomes a barrier in making use of them:

"...but I don't think that the physiotherapists in all the areas of the world are able to use databases as most of them are paid, some are only available if you are associated with some university" (P5)

4. FACILITATORS: Participants offered considerable number of solutions to optimize the learning process in e-learning environment.

Upgraded access to study materials: Participants grew to acknowledge the need of improvised, easy to access and unpaid online study materials:

"If basically all these resources are available along with the full text and if they are not paid, it will be highly beneficial for the students to understand and deal with them more efficiently" (P5)

Participants expressed the absolute imperativeness of easily available resources and identified importance of self motivation and willingness to use online approach to learning by developing satisfactory technological skills:

"It was a different kind of experience like I said you need a lot of self motivation to do it" (P4)

Few participants reported the need for basic interest in computer to be beneficial. Participants suggested the essentialness to possess basic computer and internet browsing skills to facilitate access to the study resources in required e-learning environment.

One participant recognized the significance of online group discussions to stimulate information exchange.

"There was one experience that I had where we used online discussion forums, so it was like a video chat kind of a thing, we all shared our ideas. It was very interesting because we learned a lot from

it. So that was one rare instance when I felt online discussion was a must" (P4)

DISCUSSION

Reflection on Indian physiotherapist's experience of e-learning revealed some chief issues of concern, themes derived in this study display uniformity with the literature.

Participants reported that e-learning is a flexible and desired approach for learning outside the class. Researchers have discovered that e-learning is beneficial as it offers a degree of flexibility and makes learning a self-paced approach^{1,18,15,28}. Students' response in the present study is in line with the literature.

Clark et al 1994 stated that although there is an enhanced requirement for academic opportunity in NHS, there is reduced scope to discharge the staff for attending courses thus highlighting the need for a flexible mode of learning. E-learning provides the flexibility to incorporate education along with work³⁰. Derby et al 2009 reported that 88% of the students selected e-learning because of its flexibility and convenience, although students had previous e-learning experience which might have contributed towards their choice. In this study physiotherapists were new to this system of learning thus the comfort of using e-learning resources is more likely to influence their interest.

In this study responses were inclined in favor of blended approach to learning. Blake et al 2009 assessed the perception of nursing and midwifery staff where participants reported a mixed opinion on blended learning; found e-learning materials valuable and also appreciated the need of informative face to face lectures. It has been noticed that not every skill can be obtained through e-learning; face to face learning amalgamated with e-learning is required for effective knowledge delivery^{1,18,31}. Furthermore, dissimilarity of response was noticed in this study as some participants' reported it more appropriate for receiving theoretical knowledge. As the participants are musculoskeletal physiotherapists, it places a high demand for the need of practical sessions to acquire good hands-on skills. However e-learning is considered more desirable for cognitive learning^{32,33,34}. Thus the need of accessing the e-learning

resources might depend on the type of knowledge the physiotherapists want to acquire.

Participants reported technological challenges such as interrupted internet access and limited computer skills, a barrier. In the study by Mathur et al 2005 on Canadian physiotherapists found that Physiotherapists with better access to computer and internet were probably more interested in e-learning. All participants in our study had intermediate computer skills; however individuals with advanced skills might easily access e-learning resources and thus take more advantage of the available study materials.

Researchers have discovered that technical issues concerning internet glitches prevent the students from making use of the online study materials^{18,1,12,15}. Limited access to the study resources might force the learners to presume that these resources might be difficult to access or might not be appropriate for their field of interest.

Participants encountered difficulty to comply with e-learning; the findings demonstrate similarity with the literature^{18,1,15}. In the present study it might be related to the hesitation of the participants in using e-learning materials because of their adaptation to traditional learning system this further explains that despite of having the intermediate computer skills, they still faced trouble.

Moore et al 2006 reported, 33% of rehabilitation students stated that e-learning assisted in ameliorating their computer skills. Although our study did not assess the improvement in computer skills after undertaking e-learning, probably the participants in this study might have developed confidence and improved computer skills sometime after beginning the use of e-learning. A supplementary study in this field could target on the improvement of computer skills after undertaking e-learning.

Other issue arose was the lack of tutor-peer support and interaction. Studies indicate that e-learning fails to compensate for the personal interactions and discussions offered by face to face learning^{18,1,28} and presents with difficulty in sharing the ideas and acts as a barrier in forming peer relationships¹⁵. Participants reported that e-learning prevents face to face discussion and there is nobody

to provide explanation when needed, which affects understanding of the subject. The findings of this study comply with the findings of Moore et al 2006 who reported that 45% of the participants raised the issue of feeling disconnected which interfered with their process of acquiring knowledge. In our study participants were adapted to Indian style of learning that focuses on face to face learning thus their willingness to accept this new method of learning might influence their perceptions.

Increasing demand of online courses in the field of healthcare and research shows that e-learning could be implemented successfully³⁵. This study has academic, research and clinical implications. This study might promote the use of e-learning in India and will provide updated knowledge, which is elementary to clinical reasoning and decision making and thus is the key to professional development. The clinical decisions made by the physiotherapists will be backed-up with research evidences³⁶; thus may foster evidence based practice which may intern improve the patient centered care.

Strengths: This study used data saturation method to determine sample size; too small sample size fails to provide reliable results on the contrary a very large sample size involves unnecessary utilization of time and funds³⁷. Hence using data saturation method assisted in producing study findings without making unnecessary resource utilization.

Peer review and member checking methods were used to target reliability and validity issues respectively. Member checking omits inaccurate interpretation of participant's comments thus ensures validity of the findings²⁷. On the other hand peer-review maximized the reliability of the data analysis by minimizing the researcher bias²⁶.

Limitations: Batch antecedent to January 2011 cohort and those infrequent users of e-learning resources were not included, thus the study collects data from the under-represented population. Argument concerning the exclusion of students with less than 6 months e-learning experience could be raised. As appropriately diverse samples were not used, it could be a reason of early data saturation further influencing the research findings.

With in-depth interview, study results cannot

be generalized owing to small sample size and not considering random sampling method³⁸. Also as face-to-face interviews were conducted, participants' responses might be biased to prove themselves socially desirable thus affecting the data quality.

For further research in this area we recommend considering a qualitative study design with bigger and diverse sample size using random sampling method; this might help to elaborate on results of the present study.

CONCLUSION

The results of the study have supplemented the benefits of e-learning in context of the Indian physiotherapy curriculum. Positive responses and interests of participants in using e-learning resources indicate that this area of learning demands further research. It appears that e-learning will be well adapted as an approach in delivering advanced knowledge and skills in physiotherapy. It would also promote Continuous Professional Development and Evidence Based Practice amongst the Indian physiotherapists. Indian physiotherapy students appraised the benefits of online study resources as an approach to addendum with face to face system of learning. It is anticipated that e-learning will become amalgamated widely in Indian physiotherapy curriculum, but for this to be implemented it is fundamental to give considerations to the implications of e-learning on knowledge and practice of physiotherapy.

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A Study on Effect of Occupational Therapy Intervention Program Using Cognitive-Perceptual and Perceptual-Motor Activities on Visual Perceptual Skills in Children with Cerebral Palsy

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ABSTRACT

Objective: To find the effect of occupational therapy intervention program using cognitive-perceptual and perceptual-motor activities on visual perceptual skills in children with cerebral palsy. Methods: 30 children were selected who were diagnosed as cerebral palsy. All children were administered MOTOR FREE VISUAL PERCEPTION TEST, they underwent occupational therapy intervention program using cognitive-perceptual and perceptual-motor activities 5 days a week for 6 weeks. Posttest evaluation was done after 6 weeks following the therapy program. **Results:** There is statistically significant (p value < 0.05) difference between pre and post interventions for raw score and perceptual age. **Conclusion:** Occupational Therapy intervention emphasizing on cognitive-perceptual and perceptual motor training is effective for improving visual perceptual abilities in Cerebral Palsy children.

Keywords: visual perception, cognitive-perceptual and perceptual-motor activity, cerebral palsy.

INTRODUCTION

Visual perception is defined as the process responsible for the reception (sensory functions) and cognition (specific mental functions) of visual stimuli¹. Visual perception is a high-order system that allows people to perceive a world beyond their bodies and plan a vast range of different actions². Visual perception is highly responsible for a child's interaction with the environment and plays a leading role in his/her mental development³. Visual perceptual deficits also can influence children's areas of occupation, such as activities of daily living, education, work, play, leisure, and social participation⁴. Occupational therapist has used concepts from the various disciplines to develop guidelines for intervention related to visual perceptual dysfunctions in children and adults⁵. Visual perception is major intervention emphasis of occupational therapists working with children⁶. Ruf-Bachtiger (1989) has reported the enormous importance of evaluating some visual perceptual skills, to better understand children with visual

perception problems and to develop more effective treatment methods⁷. As far as our best knowledge, there is no documented intervention study addressing the above mentioned visual perceptual problem areas in a comprehensive way among the children with cerebral palsy.

MATERIAL & METHOD

This study is an experimental, prospective study design. 30 participants were randomly selected. Baseline evaluation: It was done once the patient fulfilled the inclusion criteria. Post intervention: It was done after 6 weeks of intervention.

Inclusion criteria;

Children with Cerebral palsy who are attending school & who have good vision.

Both sexes

Ability to follow general verbal instructions

Age 4 to 12 years

Exclusion criteria

- Children who have poor sitting balance
- Severe involvement of hand

Each participant evaluated by **MOTOR-FREE VISUAL PERCEPTION TEST**¹⁹

The MVPT is designed to assess the visual-perceptual strengths and weaknesses of children aged 4 years through 11 years 11 months.

The MVPT is 36 items, individually administered multiple-choice test of visual perception. The only response required from subject is that, he points to one of the four alternatives that he feels is correct response.

Intervention group will be administered occupational therapy intervention program using cognitive-perceptual and perceptual-motor activities 5 days a week for 6 weeks⁸. Post test evaluation was done after 6 weeks following the therapy program.

OCCUPATIONAL THERAPY INTERVENTION PROGRAM

Intervention program was developed on the basis of therapeutic principles of cognitive perceptual training and motor perceptual training.

Spatial relationship

- Building blocks
- Zigzag puzzles
- Puzzle boards
- Dot to dot fun
- Find the biggest and smallest pictures or blocks



1. PUZZLE

Visual discrimination

- Spot the difference
- Matching cards
- Finding the pair
- Letter search

Cross odd one

Figure ground perception

- Finding hidden pictures
- Counting from overlapping pictures
- Puzzle boards
- Visual closure
- Match the shadow
- Matching complete figures with incomplete figures



2. SHADOW PUZZLE

SPOT THE DIFFERENCE

Visual memory

For visual memory following strategies are used
 Chunking – organizing information into smaller units.

Maintenance rehearsal - Helps the child to hold information in his or her short-term memory.



3. MEMORY GAMES

Also, a set of activities were given from “**Training activities for visual perceptual skills**” published by Saera (solutions for learning and research), available through internet⁸.

This individualized intervention program was addressing the individual treatment needs of the child. Intervention program was carried out for 60 minutes, five times a week for 6 weeks. At the end of 6th week, post intervention assessment was done.

4. FINDINGS

Statistical analysis was done by calculating Mean value of raw score, and perceptual age. For the purpose of statistical analysis, Perceptual age (year)

was converted into months. Difference between mean of pre and post interventions of raw score and perceptual age was found out. Related 't' test was used to compare pre and post intervention scores

within the group and between the groups. P value less than or equal to 0.05 was considered as significant.

TABLE 1) COMPARISON OF RAW SCORES AND PERCEPTUAL AGE PRE AND POST INTERVENTION

		N	Mean	S.D	t Value	P value
Raw score	PRE	30	16.50	5.85	15.0666	0.0001
	POST	30	21.23	5.62		
Perceptual Age	PRE	30	59.97 (5 Y)	13.10	7.7850	0.0001
	POST	30	74.00 (6 Y 2 M)	19.52		

TABLE 2) COMPARISON OF DIFFERENCE OF MEAN VALUE OF RAW SCORE IN DIFFERENT AGE GROUPS

AGE GROUP	S.NO	PRE	POST	DIFFERENCE	MEAN OF DIFFERENCE	S.D	t value	P value
4 Yrs- 7 Yrs 11 months	1	9	13	4	4.29	1.61	1.6451	0.1111
	2	8	13	5				
	3	11	15	4				
	4	12	14	2				
	5	10	14	4				
	6	9	14	5				
	7	14	17	3				
	8	17	19	2				
	9	16	22	6				
	10	18	22	4				
	11	10	18	8				
	12	13	19	6				
	13	10	15	5				
	14	22	24	2				
	15	11	16	5				
	16	12	17	5				
	17	24	27	3				
8 Yrs- 11 Yrs 11 months	1	18	24	6	5.31	1.75	1.6451	0.1111
	2	12	20	8				
	3	22	28	6				
	4	21	25	4				
	5	25	29	4				
	6	26	29	3				
	7	26	29	3				
	8	15	22	7				
	9	24	28	4				
	10	24	30	6				
	11	18	26	8				
	12	22	26	4				
	13	16	22	6				

TABLE 2a) COMPARISON OF DIFFERENCE OF MEAN VALUE OF PERCEPTUAL AGE IN DIFFERENT AGE GROUPS

AGE GROUP	S.NO	PRE	POST	DIFFERENCE	MEAN OF DIFFERENCE	S.D	t value	P value
4 Yrs- 7 Yrs 11 months	1	48	48	0	7.94	5.34	5.2902	0.0001
	2	48	48	0				
	3	48	54	6				
	4	48	51	3				
	5	48	51	3				
	6	48	51	3				
	7	51	60	9				
	8	60	65	5				
	9	57	72	15				
	10	62	72	10				
	11	48	62	14				
	12	48	65	17				
	13	48	54	6				
	14	72	80	8				
	15	48	57	9				
	16	48	60	12				
	17	80	95	15				
8 Yrs- 11 Yrs 11 months	1	62	80	18	19.15	6.26	5.2902	0.0001
	2	48	60	12				
	3	72	98	26				
	4	70	83	13				
	5	83	104	21				
	6	89	104	15				
	7	89	104	15				
	8	54	72	18				
	9	80	98	18				
	10	80	108	28				
	11	62	95	33				
	12	72	89	17				
	13	47	72	15				

TABLE 3) COMPARISON OF DIFFERENCE OF MEAN OF RAW SCORE IN QUADRIPLEGIA AND DIPLEGIA CHILDREN.

TYPE OF INVOLVEMENT	S.NO	PRE	POST	DIFFERENCE	DIFFERENCE OF MEAN	S.D	t VALUE	P VALUE
Quadriplegia	1	17	19	2	4.25	1.39	0.7983	0.4341
	2	22	26	4				
	3	10	15	5				
	4	14	17	3				
	5	22	28	6				
	6	16	22	6				
	7	10	14	4				
	8	18	22	4				
Diplegia	1	18	24	6	4.79	1.58	0.7983	0.4341
	2	13	19	6				
	3	26	29	3				
	4	21	25	4				
	5	24	27	3				
	6	16	22	6				
	7	9	13	4				
	8	9	14	5				
	9	8	13	5				
	10	22	24	2				
	11	25	29	4				
	12	10	18	8				
	13	24	30	6				
	14	11	16	5				

TABLE 3a) COMPARISON OF DIFFERENCE OF MEAN OF PERCEPTUAL AGE IN QUADRIPLEGIA AND DIPLEGIA CHILDREN.

TYPE OF INVOLVEMENT	S.NO	PRE	POST	DIFFERENCE	DIFFERENCE OF MEAN	S.D	t VALUE	P VALUE
Quadriplegia	1	60	65	5	11.38	7.61	0.3449	0.7338
	2	72	89	17				
	3	48	54	6				
	4	51	60	9				
	5	72	98	26				
	6	57	72	15				
	7	48	51	3				
	8	62	72	10				
Diplegia	1	62	80	18	12.57	7.94	0.3449	0.7338
	2	48	65	17				
	3	89	104	15				
	4	70	83	13				
	5	80	95	15				
	6	57	72	15				
	7	48	48	0				
	8	48	51	3				
	9	48	48	0				
	10	72	80	8				
	11	83	104	21				
	12	48	62	14				
	13	80	108	28				
	14	48	57	9				

TABLE 4) COMPARISON OF DIFFERENCE OF MEAN OF RAW SCORE IN QUADRIPLEGIA AND HEMIPLEGIA CHILDREN

TYPE OF INVOLVEMENT	S.NO	PRE	POST	DIFFERENCE	DIFFERENCE OF MEAN	S.D	t-value	P-value
Quadriplegia	1	17	19	2	4.25	1.39	0.9226	0.3719
	2	22	26	4				
	3	10	15	5				
	4	14	17	3				
	5	22	28	6				
	6	16	22	6				
	7	10	14	4				
	8	18	22	4				
Hemiplegia	1	24	28	4	5.13	2.30	0.9226	0.3719
	2	18	26	8				
	3	26	29	3				
	4	12	20	8				
	5	11	15	4				
	6	12	17	5				
	7	12	14	2				
	8	15	22	7				

TABLE 4a) COMPARISON DIFFERENCE OF MEAN OF PERCEPTUAL AGE IN QUADRIPLEGIA AND HEMIPLEGIA CHILDREN

TYPE OF INVOLVEMENT	S.NO	PRE	POST	DIFFERENCE	DIFFERENCE OF MEAN	S.D	t-value	P-value
Quadriplegia	1	60	65	5	11.38	7.61	1.0039	0.3325
	2	72	89	17				
	3	48	54	6				
	4	51	60	9				
	5	72	98	26				
	6	57	72	15				
	7	48	51	3				
	8	62	72	10				
Hemiplegia	1	80	98	18	15.63	9.24	1.0039	0.3325
	2	62	95	33				
	3	89	104	15				
	4	48	68	20				
	5	48	54	6				
	6	48	60	12				
	7	48	51	3				
	8	54	72	18				

TABLE 5) COMPARISON OF DIFFERENCE OF MEAN OF RAWSCORE IN HEMIPLEGIA AND DIPLEGIA CHILDREN.

TYPE OF INVOLVEMENT	S.NO	PRE	POST	DIFFERENCE	DIFFERENCE OF MEAN	S.D	t-value	P-value
Hemiplegia	1	24	28	4	5.13	2.30	0.4115	0.6851
	2	18	26	8				
	3	26	29	3				
	4	12	20	8				
	5	11	15	4				
	6	12	17	5				
	7	12	14	2				
	8	15	22	7				
Diplegia	1	18	24	6	4.79	1.58		
	2	13	19	6				
	3	26	29	3				
	4	21	25	4				
	5	24	27	3				
	6	16	22	6				
	7	9	13	4				
	8	9	14	5				
	9	8	13	5				
	10	22	24	2				
	11	25	29	4				
	12	10	18	8				
	13	24	30	6				
	14	11	16	5				

TABLE 5a) COMPARISON OF DIFFERENCE OF MEAN OF PERCEPTUAL AGE BETWEEN QUADRIPLEGIA AND DIPLEGIA CHILDREN.

TYPE OF INVOLVEMENT	S.NO	PRE	POST	DIFFERENCE	DIFFERENCE OF MEAN	S.D	t- value	P- value
Hemiplegia	1	80	98	18	15.63	9.24	0.8184	0.4227
	2	62	95	33				
	3	89	104	15				
	4	48	68	20				
	5	48	54	6				
	6	48	60	12				
	7	48	51	3				
	8	54	72	18				
Diplegia	1	62	80	18	12.57	7.94		
	2	48	65	17				
	3	89	104	15				
	4	70	83	13				
	5	80	95	15				
	6	57	72	15				
	7	48	48	0				
	8	48	51	3				
	9	48	48	0				
	10	72	80	8				
	11	83	104	21				
	12	48	62	14				
	13	80	108	28				
	14	48	57	9				

DISCUSSION

There is evidence in the literature that visual perceptual deficits can be remediated for both, children who are healthy and children with cerebral palsy⁹. Tsai et al (2008) have reported that learning of visual perceptual skills can be improved through practical experience. It is, in the same way that children learn to extract relevant information from their environment through certain activities¹⁰. Warren (1993a) presented a developmental framework based on a bottom-up approach to evaluation and treatment of visual perception⁵. In this study, similar approach was used, finding children's level based on hierarchical model of visual perception and intervention was focused on that level.

COMPARISON OF PRE AND POST INTERVENTION SCORES:

Table 1) shows that **there is significant improvement after the occupational therapy intervention using cognitive-perceptual & perceptual-motor activities on visual perception skills of children with cerebral palsy**. These results are evident with previous research that visual perception can be enhanced through occupational therapy intervention using cognitive perceptual & perceptual-motor activities for children with ADHD¹¹.

James N. Jacobs (1968) used the Frosting program (draw line to target, find hidden pictures) to improve the visual perception and concluded that frosting program did increase the scores of visual perception¹², in this study also similar type of activities were used for the intervention.

Judith E Deutsch (2008) used computer games for intervention; he believed that these games are representative of real-world environment and required extracting relevant features from background information, and he also thought that visual perception skills are practiced while playing these games¹³. Though computer games are not used in this study, real world situations and games like puzzles and mazes were used. These games have equally been effective in improving cognitive-perceptual and perceptual-motor activities of children with cerebral palsy.

AGE WISE COMPARISON OF PRE AND POST INTERVENTIONS

Table 2 shows that there is difference in scores of visual perception between younger and older age group. This can be seen by the table 2 and table 2a though the raw score does not show significant difference but perceptual age shows significant difference between age groups. On closer probing, it was seen that children in older age group had better pre intervention scores than their younger counterparts. Post intervention they have not improved as much as their older counterparts. Younger children are developmentally behind than older children and probably further increase in duration of the intervention could have brought a progress in their post intervention scores. Naomi Josman et al (2006) reported in their study that second grade children performed better than first grade children and first grade children performed better than kindergarten children in visual perceptual skills¹⁴.

Children in older age group experience the environmental challenges much more than the younger children and therefore have ability to practice their visual perceptual skills better than younger children.

Comparison of pre and post scores of Quadriplegic, Diplegic and Hemiplegic CP children

From the table 4, hemiplegic children have shown better improvement than diplegics and quadriplegics. A definite association was found between disorders of postural mechanism and visual perception¹⁵. Motion integrates the somatosensory and visual experience. Hence quadriplegics with poor postural mechanisms showed lower raw scores and perceptual ages. Environmental demands are known through meaningful sensory stimuli and responses are adaptive¹⁵, these demands result in purposeful or goal directed responses as was evident with diplegics and hemiplegics.

In the current study there was significant effect of occupational therapy intervention using cognitive-perceptual and perceptual-motor activities on visual perceptual skills.

CONCLUSION

Occupational Therapy intervention emphasizing on cognitive-perceptual and perceptual motor training is effective for improving visual perceptual abilities in Cerebral Palsy children.

Hemiplegic and diplegic CP children show better progress with intervention than quadriplegic CP children.

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Effect of Aerobic Exercises, Yoga and Mental Imagery on Stress in College Students – A Comparative Study

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ABSTRACT

Background: Stress is a natural physical response to perception of a stimulus. As the body responds in various forms to stress, certain predictable changes occur which may be positive or negative.

Aims - To evaluate and compare the effect of aerobic exercises, yoga and mental imagery on stress in college students.

Method: 90 participants were randomly allocated to 3 groups. Group A received aerobic exercises, Group B yoga and group C mental imagery. Demographic data of each participant were obtained & intervention was given for 45minutes/day for 4 days/week for 2 week. Hassel's scale, Uplifts scale and Lakaev Academic Stress Response Scale were used as outcome measures for pre and post intervention respectively.

Results: Significant reduction in stress was seen in all 3 groups. When between groups analyses were done, there was statically significant improvement in Group C as compared to other two groups. Significant changes were found in outcomes in mental imagery and aerobic exercises while there was no significant changes in Blood Pressure & respiratory rate in yoga group.

Conclusion: The present study concludes that aerobic exercises, yoga and mental imagery helps in reduction of stress. Mental imagery was proved to be effective as compared other methods.

Keywords – Stress, Aerobic exercises, Yoga, Mental Imagery, Hassel's and Uplifts scale, Lakaev Academic Stress Response Scale.

INTRODUCTION

Stress is a natural physical response to perception of a stimuli. When a stressor (triggers or stimuli that produces stress) is perceived by the body it responds with the flight or fight reaction. The pituitary gland releases adrenocorticotrophic hormone (ACTH) hormone into the bloodstream, which stimulates the adrenal glands to produce adrenaline (epinephrine), noradrenaline (norepinephrine) and cortisol, collectively known as "stress hormones". These hormones enable us to stay sharp and focused, speed up the reaction time and temporarily boosts an individual's strength¹. Common causes of stress in college students include; greater academic demands, peer pressure, changes in family relations and one's social life, making the individual more vulnerable

to depression². Stress can cause immediate effects like increased heart rate & blood pressure, anxiety, panic attacks etc. and long term effects like hypertension, myocardial infarction, stroke, memory loss etc³.

In the present study effectiveness of aerobic exercises, yoga and mental imagery on stress management was compared in college students. Aerobic exercises, is the rhythmical contraction and relaxation of large muscle masses over an extended time⁴. Studies have reported stress reduction in depression and anxiety following aerobic exercises^{5,6} leading the union of the individual psyche with the transcendental self⁷. Yoga therapy also showed significant stress reduction in epileptic patient⁸ and sportsperson⁹ respectively.

Mental imagery is cognitively reproducing or

visualizing an object, scene or sensation as thought it were occurring in overt, physical reality. Studies suggested that imagery techniques can reduce stress by elevating the immune system thus inducing relaxatio¹⁰.

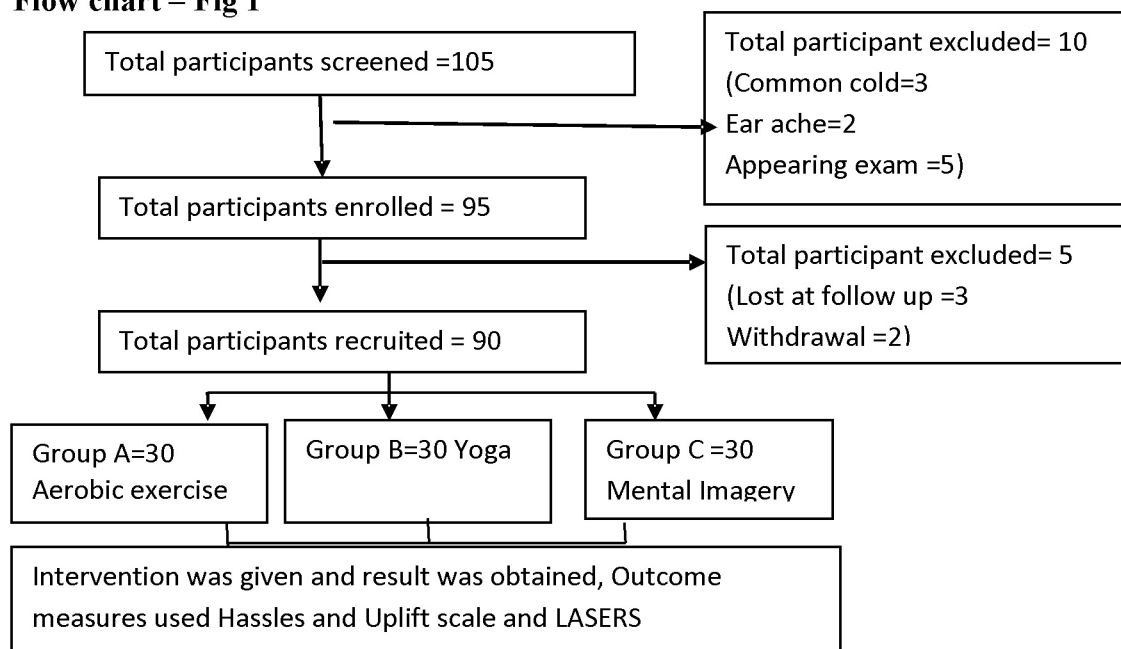
Although few studies are available to reduce stress, they have incorporated various techniques. Literature available in reducing stress in college student is sparse. To the best of our knowledge the comparative study between mental imagery, yoga and aerobic exercise is lacking. So, the objective of the study was to determine the effect and compare the effect of Aerobic exercises, Yoga, Mental Imagery on stress. The secondary objective was to study the effect of the above intervention on vital parameters.

METHODOLOGY: After the approval from the institutional ethical committee. 105 college students from various Institutes were randomly screened for stress using Lakaev Academic Stress Response Scale (LASRS). It consists of total 22 questions of 4 domains that are affective, behavioral, psychological, and cognitive. The participants rate how much time they experience the symptoms on a 5 point Likert scale. It has sound psychometric properties.¹¹ Subject with score more than 50 on LASRS and age between 18 to 25 years were included in the study.

Exclusion criteria were exam going student, BMI less than 16kgs/mtr², mental illness, any preexisting

or acute medical condition. Consent was taken from 90 participants who fit into the inclusion criteria. Demographic data of each participant were obtained. All the participants were randomly allocated using envelop method into 3 groups. Each group consisted of 30 participants. Group A received aerobic exercises in form of Warm-up exercises for 10minutes, interval training 30 minutes and cool down period 5minutes.¹² Group B was treated with yoga, which included warm-up exercises for 10minutes, 20 minutes yoga and 15 minutes Shavasana.¹³ Group C was treated with mental imagery which consisted 10minutes of relaxation & mental imagery 35 minutes.¹⁴ For all 3 groups, intervention was given for 45minutes/day for 4 days/week for 2 weeks. The outcome measures were assessed before commencing the treatment and at the end of the study duration. Outcome measures used were Hassles and Uplifts scale and LASRS. The vitals were also assessed before and after completion of program which included pulse rate, respiratory rate and blood pressure. Pulse rate was obtained by palpation method. RR was obtained by counting number of chest rise and Systolic blood pressure (SBP) and Diastolic blood pressure (DBP) was measured using digital BP machine. The Hassles scale consists of over 118 items hassles are the irritant which can range from minor annoyances to fairly major problems, pressures or difficulties. The uplifts scale consist of the 136 events, which may be the source of peace, joy or satisfaction.¹⁵

Flow chart – Fig 1



STATISTICAL ANALYSIS

Series of analysis were performed by using SPSS 16 version. The significance level was $p < 0.05$. Mean and standard deviation (SD) of demographic variable (age, BMI) of all 3 groups were obtained. t-test was used to assess the significance level of each outcome between pretest and post test score. The pretest score and post test score of all 3 groups were tested for the significance with ANOVA. Pair wise comparisons were done with Tukeys multiple post hoc procedures for significance between groups.

RESULTS

Total 90 participants, 30 in each group were studied and data was analysed. The mean age of participants in group A, group B and group C were 21.4 ± 2.59 , 22.43 ± 1.35 and 22.1 ± 2.12 respectively. In group A 19 were male 11 were female, in group B

3 male 27 female and Group C 4 male and 26 were female respectively. Mean BMI of participants were 22.54 ± 3.82 in group A, 22.76 ± 4.45 in group B and 22.76 ± 4.38 in group C. (TABLE 1)

Table 1: Demographic data of the participants.

Demographic characteristic	Group A	Group B	Group C
Age	21.4±2.59	22.43±1.35	22.1±2.12
Gender			
Male	19	3	4
Female	11	27	26
BMI	22.54±3.82	22.76±4.45	22.76±4.38

Significant changes were observed in Hassels, Uplifts and LAKAEV, when comparison was done within the pre-test and post test score. When 3 groups were compared at pre-test and post test score by ANOVA, it showed no significant differences except the pretest score of UPLIFTS was significant. (TABLE 2).

Table 2: Pre and post-test Comparison of scores between three groups (A,B,C) and Hassel’s, Uplifts and Lakaev scores.

Outcome Measures	Group	Pre test	Post test	p- value
HASSELS Scores	A	58.5±19.1	42.7±14.1	0.0001*
	B	55.1±11.1	43.3±8.1	0.0001*
	C	56.9±12.5	41.3±10.1	0.0001*
	F- value	0.41	0.248	
	p- value	0.66	0.78	
UPLIFTS Scores	A	52.8±11.1	65.2±10.6	0.0001*
	B	58.9±12.6	67.6±12.9	0.0001*
	C	62.1±10.5	66.7±15.3	0.0001*
	F-value	5.068	0.258	
	p- value	0.0083*	0.77	
LAKAEV Scores	A	54.7±7.6	42.5±6.1	0.0001*
	B	56.9±9.2	43.5±7.1	0.0001*
	C	57.1±7.9	43.1±9.2	0.0001*
	F- value	0.7691	0.13	
	p-value	0.46	0.87	

We observed a significant difference in all the vitals that were recorded between the pretest and post test scores. When comparison was done between the pretest and post test score by ANOVA, there was

difference in pulse rate and respiratory rate in pre test score between the groups. Posttest comparison & all 4 vitals that were assessed were significant.(TABLE 3)

Table 3: Comparison between three groups (A,B,C) and SBP, DSP, pulse rate and respiratory rate.

Outcome	Groups	Pre test	Post test	p- value
SBP	A	120.7±5.7	123.5±4.6	0.0001*
	B	121.2±4.5	120.7±2.7	0.0001*
	C	122.3±3	119.1±2.6	0.0001*
	F- value	0.976	12.31	
	p- value	0.38	0.0001*	
DBP	A	79.8±5.5	81.9±3.6	0.0001*
	B	79.3±5	80.9±3.8	0.0001*
	C	80.6±4.6	77.4±3.8	0.0001*
	F-value	0.53	11.81	
	p- value	0.59	0.0001*	
Pulse rate	A	75.1±3.3	78.2±2.5	0.0001*
	B	74.6±2.7	76.1±2.3	0.0001*
	C	77±4.3	74.4±3.5	0.0001*
	F-value	3.88	13.46	
	p- value	0.0247*	0.00001*	
Respiratory rate	A	19.9±2.5	23.3±2.1	0.0001*
	B	20.7±2.3	20.4±1.9	0.0001*
	C	21.4±2.1	18.7±2.4	0.0001*
	F-value	3.28	35.45	
	p- value	0.042*	0.0001*	

Pair wise comparison of all outcome measures were done, which showed significant difference between the group A Vs C in uplifts, group A Vs B and group A Vs C in SBP. There was a difference in DBP between group A Vs C and group B Vs C. With respect to pulse rate and respiratory rate there was a significant differences between all the groups. (TABLE 4)

Table 4: Pair wise comparison of the entire outcomes between the groups by Tukey's multiple post hoc procedures.

OUTCOME	GROUP	P1	P2	P3
HASSEL'S SCALE	A vs B	0.6360	0.9774	0.0920
	A vs C	0.9039	0.8801	0.9909
	B vs C	0.8806	0.7725	0.1211
UPLIFTS SCALE	A vs B	0.1041	0.7571	0.1564
	A vs C	0.0067*	0.8970	0.0006*
	B vs C	0.5347	0.9614	0.1059
LAKAEV SCALE	A vs B	0.5633	0.8587	0.8144
	A vs C	0.5061	0.9540	0.6049
	B vs C	0.9954	0.9704	0.9358
SBP	A vs B	0.9172	0.0062*	0.0131*
	A vs C	0.3671	0.0001*	0.0001*
	B vs C	0.6025	0.1995	0.0500*
DBP	A vs B	0.9120	0.5559	0.9436
	A vs C	0.8130	0.0001*	0.0013*
	B vs C	0.5644	0.0016*	0.0036*
Pulse rate	A vs B	0.8989	0.0154*	0.0229*
	A vs C	0.0833	0.0001*	0.0001*
	B vs C	0.0290*	0.0560	0.0001*
Respiratory rate	A vs B	0.3078	0.0001*	0.0001*
	A vs C	0.0330*	0.0001*	0.0001*
	B vs C	0.5302	0.0063*	0.0059*

DISCUSSION

Stress is defined as, " a set of events in the social milieu which modify steady state conditions so as to activate adaptive mechanisms"¹⁶. The present study was aimed to evaluate and compare the effectiveness of aerobic exercises, yoga and mental imagery on stress and vital parameters in college students.

In the present study, stress reduction was seen in normal population of age group 18-25 years. Systolic BP, diastolic BP, pulse rate and the respiratory rate also showed significant changes. The probable reason could be attributed to aerobic exercises. These exercises benefit the individual by strengthening the muscles involved in respiration, by facilitating the flow of air in and out of the lungs. Thereby improving oxygen level and the pumping efficiency which together is called as aerobic conditioning. This helps in improving mental health & reducing stress¹⁷.

Significant changes were found in Hassel's and Uplifts scale and pulse rate in the present study when yoga therapy was administered to the college going students. Strong correlation exists between yoga and hormone regulation. It is already demonstrated in a study that the levels of cortisol is reduced after yoga thus reducing stress and anxiety¹⁸. Yoga also stimulates endocrine and nervous system which further regulates hypothalamic-pituitary- adrenal axis indirectly reducing stress^{19,20}.

Following mental imagery changes were also noted in the stress levels, blood pressure, pulse rate and respiratory rate. Following MI, there is increase in cerebral metabolic rate leading to increased cerebral blood flow and oxygen supply and inducing relaxation. It also helps in keeping the neuroanatomical circuits functional. Another reason could be because of the influence of MI on emotional systems as well as there can be overlapping of the signals with process involved in mental imagery and this perception leads to response. This can be considered as an important reason for significant reduction of stress in response to mental imagery intervention, as compared to aerobic exercise and Yoga.

Relaxation was given in yoga therapy and aerobic exercises, through cool down period . In mental imagery participant relaxed in his or her comfortable position throughout the session, with positive instruction which contributed to maximises the relaxation. Positive instructions followed by positive perception led to positive response among the participant. Major limitation faced by investigator was that the long term effects of this study were not monitored because of participant's preoccupation.

CONCLUSION

The present study concludes that aerobic exercises, yoga and mental imagery are beneficial in reduction of stress. Mental imagery was proved to be more effective as compared to aerobic exercises and yoga in terms of stress management in college students.

Clinical implication: Results of the present study can be utilised as an adjunct therapy for management of stress and to reduce its consequences.

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Conflict of Interest – None

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A Comparative Study between Efficacy of Low Level Laser Therapy (LLLT) with Mulligan's Mobilization (MWM) Over Ultrasound Therapy with Mulligan's Mobilization (MWM) in Patients with Acute Supraspinatus Tendinitis

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ABSTRACT

Background: Supraspinatus tendinitis is a common condition faced by general population. In clinical setting it is treated by conservative treatment and physiotherapy. Ultrasound therapy, Low Level Laser Therapy (LLLT) and mulligan's mobilization are the treatment of all approaches.

Intervention is directed towards resolving each impairment or activity limitations identified in physical therapy examination. Currently, most author advice conservative (non operative) intervention which consists of manual therapy and pain relieving modalities.

Objective: To compare the effectiveness among the LLLT with Mulligan's mobilization and Ultrasound with Mulligan's mobilization.

Method: 50 patients of age group between 20 to 60 years with supraspinatus tendinitis were assigned into two treatment groups. Group A was treated with low level laser therapy with mulligan's mobilization (MWM) by physiotherapist, while Group B was treated with ultrasound therapy with mulligan's mobilization by physiotherapist for 8 weeks with 5 sessions per week. The outcomes were evaluated with visual analogue scale (VAS) and goniometry measurement prior and after the treatments.

Results: The results showed that both the groups were effective in treatment of acute supraspinatus tendinitis. Statistical analysis shows that there is reduction in pain and increase in ROM of shoulder by both the group; however the inter group comparison showed that group B higher effect in reduction of pain and the increasing the ROM of shoulder than group A.

Therefore alternative hypothesis is selected and null hypothesis is rejected.

Conclusion: This study leads to the conclusion that US therapy with mulligan's mobilization (MWM) is more effective than LLLT with mulligan's mobilization (MWM) to reduce pain and increase ROM of shoulder in treatment of acute supraspinatus tendinitis.

Keywords: *Supraspinatus Tendinitis; Low Level Laser Therapy, Ultrasound Therapy, Mulligan's mobilization and Movement With Mobilization.*

INTRODUCTION

The common belief is that impingement of the supraspinatus tendon leads to supraspinatus tendonitis (inflammation of the supraspinatus/rotator cuff tendon and/or the contiguous peritendinous soft tissues), which is a known stage of shoulder

impingement syndrome (stage II) as described originally by Neer in 1972. Pain, muscle weakness, restricted ranges of motion and soft tissue crepitus are generally present (Neer 1983).¹

The supraspinatus outlet is a space formed by the acromion, acromioclavicular joint, and coracoacromial

arch. The supraspinatus tendon runs through this outlet. Any abnormalities of this outlet can cause impingement of the supraspinatus tendon.² Most of the individual with shoulder pain suffer due to supraspinatus tendinitis, as it is the commonest tendinitis lesion at the shoulder joint.³ Shoulder pain is one of the most common of all peripheral joint disorders with the point incidence amongst the general population said to be as high as 20%.⁴

The pathogenesis of supraspinatus tendinitis is generally well understood. Tendon of supraspinatus has a zone of avascularity. It is called as a critical portion of the tendon of codman's zone. This portion of supraspinatus tendon is prone for degenerative changes.

The enlarged or degenerative subacromial bursa causes impingement of supraspinatus tendon. Which in turn lead to ischemia resulting in reactive inflammatory process. Ischemia of the muscle or tendon also occurs due to persistent high intra muscular pressure (more than 30 mm of Hg.). As supraspinatus reaches this level at fairly low contraction, the repeated elevation of the shoulder can lead to ischemia.⁵ Frequent forceful overhead activities causes repeated compression of subacromial contents. The results eventually summate as the activity persist. The ensuing inflammatory reaction involves vascular congestion and oedema into the tendon and bursa further reduces the subacromial space leading to further impingement.⁶

The causes of supraspinatus tendonitis can be broken down into extrinsic and intrinsic factors. Extrinsic factors are further broken down into primary impingement, which is a result of increased subacromial loading, and secondary impingement, which is a result of rotator cuff overload and muscle imbalance. In athletes whose sport involves stressful repetitive overhead motions, a combination of causes may be found.^{7,8}

Weakness and dysfunction of the rotator cuff muscles leads to elevation of the humeral head during arm abduction which causes compression of the tissues under the acromion process. Oedema and haemorrhage of the supraspinatus tendon occur which can eventually lead to the tendon degeneration and rupture. Other causes of supraspinatus tendinitis

include calcific tendinitis, trauma, crystal deposition, infection, or autoimmune conditions.⁹

Tendinitis of supraspinatus manifest as pain on lateral aspect of the shoulder, painful arc and/or pain on full elevation of shoulder and tenderness at a greater tuberosity of humerus.^{3,10}

There is a shoulder pain, especially with movement and at night, weakness in the arm and shoulder, snapping sensation in the shoulder with movement, tenderness and swelling in the upper front part of the shoulder and in severe cases, inability to raise the arm to shoulder height.

X-rays, MRI, Ultrasonography and arthroscopy of the shoulder is used for the diagnosis of supraspinatus tendinitis.⁹

There are various treatment options available with physical therapist to treat Supraspinatus tendinitis. These includes Ultrasound, Laser, TENS, Hot pack, Cold pack, Progressive resisted exercise Mobilization with movement, Maitland mobilization & exercise including/g posterior capsule stretching, postural correction exercises, isometric exercises, codman's exercises and an exercise program focusing on rotator cuff strengthening and scapular stabilization.^{2,7,9,11} Nonsteroidal anti-inflammatory drugs (NSAIDs) could help in reducing the pain for mild to moderate symptoms and in severe cases local subacromial corticosteroid injection might be given to decrease pain.^{2,7,9,11}

METHODOLOGY

30 Patients who are diagnosed to have supraspinatus tendinitis will be randomly assigned to one of two groups. Each group will consist of 15 patients of both genders, within the age from 25 to 60 yrs. Group I was the LLLT+MWM group. Patients in this group were given LLLT of energy density 4 J/cm², frequency of 10 Hz, treatment time of 20 seconds, irradiated area of 1cm². Group II were given ultrasound of frequency 1 MHz, Intensity of 1.0 W/cm², Pulsed mode with duty cycle of 1 : 4, 8 minutes treatment time is to be given¹³. Both groups were given MWM on the involved shoulder as described by Mulligan with a subject in a relaxed appropriate position, therapist's hand was used over the appropriate aspect of head of the humerus

by applying a force to the lower end of the humerus or to the greater tuberosity. A counter pressure also was applied to the scapula with the therapist's other hand. The glide was sustained during slow active shoulder movements to the end of the pain free range and released after return to the starting position. Three sets of 10 repetitions were applied, with 1 minute between sets along with simple exercise program for shoulder. The whole treatment for both the group were given 6 days per week for 8 weeks. Ethical clearance for the study was granted

by institutional ethical committee shree devi college of physiotherapy, Mangalore, Karnataka State, India. All subjects received verbal and written information about the study and signed a consent form.

STATISTICAL ANALYSIS

RESULTS

Comparison of parameters within the group A and group B before the treatment

Table 1 : Comparison of parameters within the group A and group B before the treatment

Pre-Treatment									
Parameter	Group	N	Minimum	Maximum	Mean	Std. Deviation	Median	t value	p value
VAS	Group A	25	6	9	7.76	1.091	8.00	.399	.692
	Group B	25	6	9	7.64	1.036	8.00		
	Total	50	6	9	7.70	1.055	8.00		
Active shoulder abduction	Group A	25	64	87	72.28	6.288	70.00	.350	.728
	Group B	25	60	87	71.60	7.422	70.00		
	Total	50	60	87	71.94	6.817	70.00		
Active shoulder flexion	Group A	25	64	92	74.36	8.291	74.00	.464	.645
	Group B	25	55	90	73.24	8.786	75.00		
	Total	50	55	92	73.80	8.473	74.00		

Table shows that there is no significant difference between group A and group B before the treatment in all the parameters as $p > 0.05$

Table 2: Pre post comparison of VAS within the group.

Parameter: VAS											
Group		N	Minimum	Maximum	Mean	Std. Deviation	Median	Mean difference	change (%)	t value	p value
Group A	Pre-Treatment	25	6	9	7.76	1.091	8.00	4.320	55.67	16.438	.000
	Post-Treatment	25	2	5	3.44	.768	3.00				
Group B	Pre-Treatment	25	6	9	7.64	1.036	8.00	4.520	59.16	21.614	.000
	Post-Treatment	25	2	5	3.12	.881	3.00				

In group A, mean of VAS before the treatment was 7.76 ± 1.09 and after the treatment it was 3.44 ± 0.76 resulting in 55.67% reduction in pain level which is statistically significant as $p = 0.000 < 0.01$.

In group B, mean of VAS before the treatment was 7.64 ± 1.03 and after the treatment it was 3.12 ± 0.88 resulting in 59.16% reduction in pain level which is statistically significant as $p = 0.000 < 0.01$.

Test shows that there is high significant decrease in VAS both in group A and group B as $p < 0.01$ so both the groups are effective in reducing pain.

Comparison of VAS between the group

Table 3: Comparison of VAS between the group.

Parameter: VAS						
Group	N	Mean difference	S.D difference	change (%)	t value	p value
Group A	25	4.320	4.320	55.67	.595	.554
Group B	25	4.520	4.520	59.16		NS

In group A there was 55.67% decrease in pain where as in group B 59.16% decrease. Test shows that there is no significant difference between group A and group B as $p=0.554 > 0.05$ so we concluded that both the groups are equally effective in treatment.

Pre post comparison of active shoulder abduction within the groups

Table 4: Comparison of active shoulder abduction within the groups

Parameter: Active shoulder abduction

Group	N	Minimum	Maximum	Mean	Std. Deviation	Median	Mean difference	change (%)	t value	p value
Group A Pre-Treatment	25	64	87	72.28	6.288	70.00	53.240	73.66	40.197	.000
Group A Post-Treatment	25	118	133	125.52	4.547	125.00				HS
Group B Pre-Treatment	25	60	87	71.60	7.422	70.00	60.880	85.03	32.292	.000
Group B Post-Treatment	25	120	142	132.48	7.142	135.00				HS

In group A, before the treatment mean active shoulder abduction was 72.28 ± 6.29 and after the treatment it was 125.52 ± 4.55 resulting in 73.66% change which is statistically significant as $p=0.000 < 0.01$.

In group B, before the treatment mean active shoulder abduction was 71.60 ± 7.44 and after the treatment it was 132.48 ± 7.14 resulting in 85.03% change which is statistically significant as $p=0.000 < 0.01$

Comparison of active shoulder abduction between the groups

Table 5: Comparison of active shoulder abduction between the groups

Parameter: Active shoulder abduction

Group	N	Mean difference	S.D difference	change (%)	t value	p value
Group A	25	53.240	53.240	73.66	3.316	.002
Group B	25	60.880	60.880	85.03		HS

In group A 73.66 % improvement and in group B 85.03% improvement. Test shows that there is significant difference between group A and group B as $p=0.002 < 0.01$ so group B is better than group A comparatively.

Pre post comparison of active shoulder flexion within the groups

Table 6. Comparison of active shoulder flexion within the groups

Parameter: Active shoulder flexion

Group	N	Minimum	Maximum	Mean	Std. Deviation	Median	Mean difference	change (%)	t value	p value
Group A Pre-Treatment	25	64	92	74.36	8.291	74.00	48.640	65.41	28.163	.000
Group A Post-Treatment	25	100	137	123.00	7.632	125.00				HS
Group B Pre-Treatment	25	55	90	73.24	8.786	75.00	57.120	77.99	36.940	.000
Group B Post-Treatment	25	120	140	130.36	5.693	130.00				HS

in group A, before the treatment mean active shoulder flexion was 74.36 ± 8.29 and after the treatment it was 123.00 ± 7.63 resulting in 65.41% change which is statistically significant as $p=0.000 < 0.01$.

in group B, before the treatment mean active shoulder flexion was 73.00 ± 8.79 and after the treatment it was 130.36 ± 5.69 resulting in 77.99% change which is statistically significant as $p=0.000 < 0.01$.

Comparison of active shoulder flexion between the groups

Table 7: Comparison of active shoulder flexion between the groups

Parameter: Active shoulder flexion						
Group	N	Mean difference	S.D difference	change (%)	t value	p value
Group A	25	48.640	48.640	65.41	3.658	.001
Group B	25	57.120	57.120	77.99		HS

In group A 65.41% improvement and in group B 77.99% improvement. Test shows there is significant difference between group A and group B as $p=0.002 < 0.01$ so group B is better than group A comparatively.

Table 7: shows that there is no significance effect of age on treatment as $p > 0.05$.

Effect of age on the treatment

Table 8: Effect of age on the treatment

Correlations				
Age with change		Karl pearson correlaiton coefficient	p	
Parameter	Group			
VAS	Group A	.315	.126	NS
	Group B	.103	.625	NS
Active shoulder abduction	Group A	.089	.673	NS
	Group B	-.111	.597	NS
Active shoulder flexion	Group A	-.055	.793	NS
	Group B	.006	.976	NS

Effect of gender on treatment

Table 9: effect of gender on the treatment

change						
Parameter	Group	Gender	Mean	Std. Deviation	t value	p value
VAS	Group A	F	4.31	1.377	.048	.962
		M	4.33	1.303		
	Group B	F	4.89	.601	1.345	.192
		M	4.31	1.195		
Active shoulder abduction	Group A	F	52.31	8.360	.725	.476
		M	54.25	4.159		
	Group B	F	62.11	10.080	.482	.634
		M	60.19	9.304		
Active shoulder flexion	Group A	F	47.00	5.401	.988	.334
		M	50.42	11.147		
	Group B	F	56.56	7.401	.268	.791
		M	57.44	8.132		

Table shows that gender is not significantly different for males and females in group A as well as in group B in all the parameters as $p > 0.05$.

DISCUSSION

Efforts were made in this study to examine the results of Low Level Laser Therapy, Ultrasound Therapy and Mulligan’s Mobilization as a treatment of acute supraspinatus tendinitis. The study was conducted on 50 subjects of acute supraspinatus tendinitis, which were pre diagnosed by orthopaedic surgeon. All the subjects in our study were not to perform any strenuous activities in order to reduce the intrinsic forces in the tendon, as it is a common

practice in the early stages of tendinitis treatment.both the groups were given codman’s exercise in common as it relieves pain through gentle traction and oscillatory movements.

The results demonstrated that subjects treated with both the intervention, low level laser therapy with MWM and ultrasound therapy with MWM showed a significant improvement in range of shoulder movements and reduction in pain. LLLT with MWM group showed 55.67% reduction in pain level. While US therapy and MWM showed 59.16% reduction in pain level.

To check the effectiveness of both the

interventions, comparison between pre to post treatment VAS score and AROM score was done for the groups. The finding of the t test suggested that LLLT and MWM is effective in reducing pain ($t=16.44$, $p=0.000$), increase in active shoulder abduction ($t=40.20$, $p=0.000$) and increase in active shoulder flexion ($t=28.16$, $p=0.000$). US therapy with MWM is effective in reducing pain ($t=21.61$, $p=0.000$), increase in active shoulder abduction ($t=32.29$, $p=0.000$), and increase in active shoulder flexion ($t=36.94$, $p=0.000$).

But when both the groups were compared US with MWM demonstrated better improvement over LLLT with MWM in vas score ($t=3.66$, $p=0.001$), active shoulder abduction score ($t=3.32$, $p=0.002$) and active shoulder flexion score ($t=3.658$, $p=0.001$).

Low-level Laser Therapy (LLLT) - the most widely-used name given to this form of photo biomodulation - can have both a photobiostimulative effect and a photobioinhibitive effect within the irradiated tissue - each of which can be used in a number of therapeutic applications.

According to the study, US therapy is effective in treating supraspinatus tendinitis, which supports the results of Naslund(2001) who found that ultrasound was effective in seven randomized controlled trials in the review of medicine literature and few other studies.¹²

The effectiveness of ultrasound depends upon the intensity, frequency, and duration of treatment. The dose of ultrasound used in this study was chosen from evidence available in the literature. The possible explanation for the findings of this study showing ultrasound relieved the pain and increase the range of shoulder abduction and flexion can be its biological effects.

Few researchers believed that ultrasound has only placebo effect. But the results have contraindicated this statement as it showed improvement not only in VAS score, which is subjective, but also in AROM score which is objective analysis.

Mobilization with movement is used in this study for mobilizing shoulder. The use of MWM for peripheral joints was developed by Mulligan. This technique combines a sustained application of a manual technique "gliding" force to a joint with

concurrent physiologic (osteo-kinematic) motion of the joint, either actively performed by the subject or passively performed by the therapist.^{13,14}

LLLT with MWM little less improvement in VAS and AROM score compare to US therapy with MWM. The possible explanation for this can be the lack of standard calibration of machine and lack of awareness about the LLLT.

According to the study, the result obtained showed that group B subjects who received US therapy with MWM had better improvement in pain reduction and increase in the AROM than group B.

This study had only 50 subjects which is a small size there is a probability the result obtained from the study was biased and larger sample size may give a clearer picture.

CONCLUSION

This is randomized comparative study, which was conducted to study the effect of Low Level Laser Therapy with Mulligan's Mobilization(MWM) and Ultrasound Therapy with Mulligan's Mobilization(MWM) for reduction in pain and increasing AROM of shoulder in acute supraspinatus tendinitis.

The study results shows that there is significant increase in AROM of shoulder as a result of both LLLT with MWM and US Therapy with MWM.

There is a significant difference between Low Level Laser Therapy with Mulligan's Mobilization(MWM) and Ultrasound Therapy With Mulligan's Mobilization(MWM) in the treatment of acute supraspinatus tendinitis. This says that we are accepting an alternative hypothesis and rejecting a null hypothesis.

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Depression in Mothers of Cerebral Palsy Children: Rural versus Urban

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ABSTRACT

Introduction: Cerebral palsy includes a group of disorders affecting body movements, balance, and posture. Loosely translated, cerebral palsy means “brain paralysis.” Children with cerebral palsy suffer from several problems, so the family especially the mothers undergo a lot of social and emotional difficulties. Care and attention required is quite high in such cases, so it hampers routine life of parents especially mothers. Various studies worldwide have proved that there is high prevalence of anxiety and depression in mothers having child with CP. A set of norms and taboos in each society have different view about social issues and different point of views.

Methology: 60 mothers, having children with cerebral palsy were studied. The criterion for set up i. e. rural and urban was based on the locality. Children were screened for categorizing GMFCS level. Mothers were assessed with the Beck Depression Inventory Scale (BDIS). The data were classified according to the different variables studied viz., age, gender of the child, types of cerebral palsy, religion, and location of residence, mother’s age and mother’s education. Result showed varied difference in depression on the basis of various factors.

Conclusion: The study shows marked level of depression in the mothers having child with cerebral palsy, in both rural and urban pockets. There are various factors which are affecting the level of depression in mothers such as mother’s age, mother’s education, child’s gender, child’s GMFCS level, child’s age through the study we can conclude that these factors have an impact on level of depression in mothers of cerebral palsy child in considerable amount.

Keywords: Cerebral Palsy, Mothers, Depression, Urban Area, Rural Area.

BACKGROUND

Cerebral palsy (CP) is an umbrella term encompassing a group of non-progressive, non-contagious motor conditions that cause physical disability in human development. Cerebral palsy includes a group of disorders affecting body

movements, balance, and posture¹. Cerebral palsy is caused by abnormal development or damage in one or more parts of the brain that control muscle tone and motor activity (movement)². It is estimated that worldwide incidence being 2 to 2.5 per 1000 live births. In India, prevalence of CP is high. During delivery one out of 100 children are affected by CP. Inadequate medical facility increases this incidence in all regions especially in rural or remote villages.

Children with cerebral palsy suffer from several problems, so the family especially the mothers undergo a lot of social and emotional difficulties. Care and attention required is quite high in such cases, so it hampers routine life of parents

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especially mothers. The birth of a developmentally disabled child is a family stressor and mothers often feel guilty and sense of responsibility more than the other family members; hence, they are more involved in compensation strategies to overcome their children’s disability. Even worry about the future of the child, her/his improvement, its development can be major issue in these mothers. Various studies worldwide have proved that there is high prevalence of anxiety and depression in mothers having child with CP. There are many factors determining the severity and prevalence of the problem. These factors differ from society to society. A set of norms and taboos in each society have different view about social issues and different point of views. These complete social environments have different impact on problems and it determines the severity³.

Depression, in psychology is a mood or emotional state that is marked by feelings of low self-worth or guilt and a reduced ability to enjoy life⁴. Loss of interest in daily activities, appetite or weight changes, sleep changes, anger or irritability, loss of energy, self-loathing, reckless behavior, concentration problems, unexplained aches and pains⁵. These are the behavioural changes depicting depression, feeling of helplessness and hopelessness.

The economic stress may be multiplied by additional hospital and medical costs. Parents’ Social life may become non-existent⁴. They may be fearful of rejection by their friends and relatives. Additional stress is likely to occur in families of disabled infants, depending on each family’s unique characteristics. However, the psychological impact experienced by these families is common-shock, denial and grief

⁵. Mothers of children with CP may be at risk of depression, and the interventions that take into account the moderating effects of social support it may increase maternal adaptation. Every child affects his/her family in the process of growing up based on the characteristics of the child and characteristics of the family. Different society has different impact on family. The study tries to compare the state of mothers from two different societies.

METHODOLOGY

60 mothers, having one or many children with cerebral palsy for more than one year alive, were included as participants in the study. Out of them 30 were from rural area and 30 participants were from urban area. The criterion for set up i. e. rural and urban was based on the locality where the participants belong for more than one year. The age of the mothers was 30 ± 10. The children were screened for categorizing GMFCS level. The mothers were asked to fill in the Beck Depression Inventory Scale. It is a 21 item self-administration scale rated on 4-point scale ranging from 0-3. It has cut-off score of 14, with the range of 14-19 for “mild depression”, 20-28 for “moderate depression” and 29-63 for “severe depression.” The data was analyzed by SPSS software. The data were classified according to the different variables studied viz., age, sex, types of cerebral palsy, religion, location of residence, mother’s age and mother’s education.

A.CHILDS AGE: In both rural and urban samples level of depression in mothers found remarkably high at age range 2-5 years, while the trend continues to next age range i-e 6-10 yrs. in urban pockets.

TABLE A1: AGE OF CHILD VS DEPRESSION IN RURAL POPULATION

AGE	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
<1	0	14.22%	0	0	33.33%	0
02-05	60%	85.77%	50%	63.33%	0	0
06-10	20%	0	50%	18.11%	66.66%	0
>11	20%	0	0	18.11%	0	0

TABLE NO A2: AGE OF CHILD VS DEPRESSION IN URBAN POPULATION

AGE	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
<1	0	0	33.33%	11.11%	0	50%
2-5	0	66.66%	16.66%	66.66%	44.44%	0.00%
6-10	100%	33.33%	50%	11.11%	55.55%	50%
>11	0	0	0	11.11%	0	0

B.CHILD GENDER: Unable to draw any conclusion regarding gender of child and depression level in mothers, as the sample size is inadequate.

TABLE NO B1: GENDER IF CHILD VS DEPRESSION IN RURAL POPULATION

GENDER	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
BOY	60%	42.88%	75%	27.77%	100%	0.00%
GIRL	40%	57.11%	25%	27.22%	0	0

TABLE NO B2: GENDER OF CHILD VS DEPRESSION IN URBAN POPULATION

GENDER	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
BOY	0	33.33%	66.66%	100%	77.77%	100%
GIRLS	100%	66.66%	33.33%	0	22.22%	0.00%

C. MOTHER'S EDUCATION: In urban pockets depression levels are considerably high in graduation grade, whereas rural counterpart it is high in secondary grade.

TABLE NO C1: MOTHER'S EDUCATION VS DEPRESSION IN RURAL POPULATION

EDUCATION (CLASS)	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
I	0%	14.22%	0%	0%	0%	0%
II	0%	14.22%	25%	0%	0%	0%
III	60%	71.44%	50%	81.88%	33.30%	0.00%
IV	0%	0.00%	0	18.11%	33.33%	0.00%
V	40%	0.00%	25%	0%	33.33%	0%
VI	0%	0.00%	0%	0%	0.00%	0%

TABLE NO C2: MOTHER'S EDUCATION VS DEPRESSION IN URBAN POPULATION

EDUCATION (CLASS)	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
I	0%	0%	0%	0%	0%	0%
II	0%	0%	0%	0%	0%	0%
III	0%	0%	0%	22.22%	33.33%	50%
IV	0%	0%	0%	11.11%	22.22%	50%
V	100%	100%	83.33%	55.55%	44.44%	0.00%
VI	0%	0%	16.66%	11.11%	0.00%	0.00%

D.MOTHER’S AGE: Depression grips more in the range 26 to 30 year age mothers in both rural and urban population group and after 30yrs the level of depression lowers down again.

TABLE NO D1: MOTHER’S AGE VS DEPRESSION IN RURAL POPULATION

AGE	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
<25	20%	71.40%	25%	54.40%	66.60%	0.00%
26-30	60%	28.50%	25%	27.20%	33.30%	0.00%
31-35	0%	0%	25%	9%	0%	0%
>36	20%	0%	25%	9%	0%	0%

TABLE NO D2: MOTHER’S AGE VS DEPRESSION IN URBAN POPULATION

AGE	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
<25	0%	0%	16.60%	11.10%	22.20%	50%
26-30	0%	33.30%	33.30%	44.40%	55.50%	50.00%
31-35	0%	66.60%	50%	44.40%	22.20%	0.00%
>36	100%	0%	0%	0.00%	0.00%	0%

E. GMFCS LEVEL: The level of GMFCS is directly proportional to the level of depression. As GMFCS level goes high depression level also rises.

TABLE NO E1: CHILD’S GMFCS LEVEL VS DEPRESSION IN RURAL POPULATION

GMFC’S LEVEL	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
I	60%	14.22%	0%	9%	33.33%	0%
II	0%	42.88%	25%	36.33%	33.33%	0.00%
III	20%	28.55%	75%	9%	0%	0%
IV	20%	14.22%	0%	36.33%	0%	0%
V	0%	0.00%	0%	9%	33.33%	0%

TABLE NO E2: CHILD’S GMFCS LEVEL VS DEPRESSION IN URBAN POPULATION

GMFC’S LEVEL	BECK DEPRESSION INDEX SCORE					
	I	II	III	IV	V	VI
I	0%	0	33.33%	0%	11.11%	0%
II	0%	100%	33.33%	33.33%	22.22%	0.00%
III	100%	0%	16.66%	33.33%	33.33%	0.00%
IV	0%	0%	16.66%	33.33%	22.22%	100%
V	0%	0%	0.00%	0.00%	11.11%	0.00%

DISCUSSION

The study was conducted to compare many variables amongst mothers from rural and urban areas having children with cerebral palsy. The level of depression is quit high in mothers when children

are in the age range of 2 to 5, this trend further continues till the age of 10 as the age range 2 to 10 is generally more worrisome for mothers. The care factor concern to mother is almost common in all children up to one year. After one year when phase of development starts it has remarkable difference

between mothers having normal child and mothers with CP child. Mothers of children with different levels of disability tolerate high level of stress. Since pressure of performance, hectic life style, nuclear family structure gives more depression. As far as gender of child concerns it has been observed that mothers with male child found anxious to recover the child. The simple reason is that male child considered valuable in Indian society. So mothers are more worried for male siblings than female. As far as criteria of education concerns the sample survey clearly depicts the fact that education and awareness develops the tendency of worrying. The data of mother's education shows that, as awareness grows worry also grows. The level of depression is high in mothers with graduation grade level in urban pockets, while in rural pockets depression level is high in secondary grade level. This fact can be coincidence that general education level in rural area is of secondary grade and it is of graduate grade in urban area. Mothers of cerebral palsy (CP) children, as an integral part of the team have a lot of social and emotional problems. Some studies focused on the status of mothers having CP children and they stated that mothers having CP children had depressive symptoms and lower quality of life; in addition 30% of mothers having CP children had the symptom of depression above cutoff on Center for Epidemiologic Studies- Depression (CES-D) Scale.

CONCLUSION

The study shows marked level of depression in the mothers having child with cerebral palsy, in both rural and urban pockets. There are various factors which are affecting the level of depression in mothers such as mother's age, mother's education, child's gender, child's GFMC'S level, child's age through the study we can conclude that these factors have an impact on level of depression in mothers of cerebral palsy child in considerable amount.

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Effect of Nutritional Status on Balance Score among Females

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ABSTRACT

Objective: To Evaluate the effect of nutritional status on balance score among females.

Method: 90 females, age 22 ±2 yrs, with BMI 18.5 -29.0 kg/m², were divided into three 3 groups group A , B & C as per BMI classification given by WHO as lean, normal & overweight . all the subject were undergone balance score testing with the help of SEBT

Results: Mean Absolute difference ± standard deviation (for SEBT score) for three groups were found to be Group A 7.4 + 3.91, Group B 4.11 + 3.03 & Group C 6.96 + 2.96

Conclusion: Both group A & C balance score was significantly affected therefore balance score gets affected by nutritional status of an individual

Keywords: Postural balance. Body mass index. SEBT

INTRODUCTION

Balance is defined as the process that maintains the center of gravity within the body's support base and requires constant adjustments that are provided by muscular activity and joint positioning. Most nervous and musculoskeletal system diseases can alter this balance control.¹⁻³

Maintaining postural balance requires sensorial detection of the body's movements, integration of sensory-motor information into the central nervous system and an appropriate motor response. The position of the body in relation to space is determined by visual, vestibular and somatic sensitive functions. Muscular control and dynamic maintenance of balance involve the activity of coordinates of muscular kinetic chains. Adipose tissue accumulation and body mass increases can cause a reduction in the body balance and be a major contributing factor concerning falls, particularly when combined with low muscular

mass, which can generate biomechanical failure of muscular responses and loss of stability mechanisms. Maintaining postural balance requires sensorial detection¹⁻³ of the body's movements, integration of sensory-motor information into the central nervous system and an appropriate motor response. The position of the body in relation to space is determined by visual, vestibular and somatic sensitive functions. Muscular control and dynamic maintenance of balance involve the activity of coordinates of muscular kinetic chains. Adipose tissue accumulation and body mass increases can cause a reduction in the body balance and be a major contributing factor concerning falls, particularly when combined with low muscular mass, which can generate biomechanical failure of muscular responses and loss of stability mechanisms⁴⁻⁵

Intake of a diet sufficient to meet or exceed the needs of the individual will keep the composition and function of the otherwise healthy individuals within the normal range. This equilibrium is disturbed by these processes : decreased intake ,increased requirements and altered utilization. When this disequilibrium occurs, then loss of body tissues ensues. However, lack of nutrients produces a series

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of metabolic changes in relation to energy & protein metabolism within hours or days of reducing nutrient intake, long before demonstrable anthropometric changes. As well these functional changes predict complications better than other anthropometric parameters showing that reduction in muscle power is a better predictor of complications than weight loss or arm muscle circumference. Thus malnutrition and its adverse consequences depend upon altered intake, functional change and finally anthropometric effects.⁶

In the assessment of the nutritional status of individuals and communities, anthropometric measurements play a very important role for the following reasons: departures from normal can often be detected earlier by anthropometry than by clinical examination; and anthropometric figures are more objective than clinical assessments.⁶

Adult malnutrition has received much less attention than that of the child. This focus appears at least I Consultant, Nutrition Unit, World Health Organization, 1211 Geneva 27, Switzerland. Requests for reprints should be addressed to Dr Bailey at this address. 2 Head, Unit of Human Nutrition, National Institute of Nutrition, which is a WHO Collaborating Centre in Nutrition, Rome, Italy. Reprint No. 5647 in part unjustified, and many public health workers report that parents often sacrifice their own feeding in times of serious food shortage (acute or chronic) in favour of young children in the family. The latter may also benefit from unusually prolonged breastfeeding. Moreover, if the ability of the adult breadwinner to function is compromised because of malnutrition, the children of the household are clearly at high risk of becoming malnourished themselves.⁷⁻⁸

METHOD

This is a descriptive observational study carried out in a cross-sectional manner without intervention. 60 female volunteers were evaluated. The inclusion criteria were: a) signing of the free and informed consent statement, b) female sex, c) age between 20 and 26 years, d) no physical activity for a minimum of six months other than house hold work, e) absence of neurological, cardiovascular, metabolic, rheumatic or vestibular diseases, f) no injuries or previous surgery on the legs and g) absence of knee or ankle clinical

instability.

PROCEDURE

120 subjects were contacted out of which 90 female subjects (age 22 ± 2 years) were selected who were fulfilling inclusion criteria for the study. Subjects were explained about the purpose of research and informed consent were taken. They were allocated in various groups as per set criteria of BMI. According to W.H.O classification of B.M.I (body mass index) as underweight (lean) is < 18.5 kg/m², normal is 18.5–24.9 kg/m² and overweight is 25.0–29.0 kg/m².⁹⁻¹¹

Group A comprise of subjects having BMI < 18.5 kg/m²

Group B comprise of subjects having BMI 18.5–24.9 kg/m²

Group C comprise of subjects having BMI 25.0–29.0 kg/m²

Subjects were given verbal description of whole procedure. General assessment and anthropometric data had been collected.

The dominant leg was checked by asking subjects to kick the football placed in front of them, the initiation of movement done by the leg first, will be refer to as dominant leg (stance leg) of the individual.

The length of the stance leg was measured from the anterior-superior iliac spine to the most distal point of the ipsilateral medial malleolus, using a standard tape measure while participants lay supine on a plinth. star excursion balance test (SEBT) was performed to check for balance.¹²⁻¹⁴

DATA ANALYSIS

Table : Shows mean and standard deviation of the subjects for balance score in Group A, B, C.

Group	Mean Absolute difference ± standard deviation (in degree)	F value (2, 58)	p - value
A	7.4 ± 3.91	8.6	0.000**
B	4.11 ± 3.03		
C	6.96 ± 2.96		

**Significant at p<0.01

There is a statistically significant difference between body mass index (B.M.I) and SET score in Group A, B and C for dominant leg

Taken together these results suggest that balance score deviates from normal when Body mass index (B.M.I) either decreases or increases i.e overweight or underweight. Therefore statistically significant difference between Body Mass Index and SEBT score were seen

DISCUSSION

Studies have demonstrated that the accumulation of fat tissue can reduce body balance and contribute towards falls among extremely obese teenagers and adult patients . This study showed a positive correlation between BMI and increased postural instability (greater shifts required in order to keep postural balance) and was in agreement with Hills (1991), who affirmed that excess weight and low level of physical activity increased postural instability⁴⁵ . A 20% increase in body mass reduces the ability to make adjustments in response to external disturbances in the orthostatic position and increases postural instability

Patients with BMI greater than 30 kg/m² maintain shorter times in balance and longer times unbalanced as compared with nonobese individuals, such that obesity would influence the limits of postural stability. The authors report that obesity (high BMI) will affect the selection of motor strategies employed to maintain postural balance.¹⁵

Factors that influence balance include sensory information obtained from the somatosensory visual, and vestibular systems and motor responses that affect coordination , joint Range of motion (ROM), and strength. Other Factors to be considered include: leg dominance, fatigue or learning effects, age, sex, height, weight, physical activity level and specificity, and previous lower-extremity injury¹⁶

Postural control is a complex and dynamic perceptual-motor process that involves the integration of three sensory subsystems (visual, vestibular, and somatosensory), which cue the neuromuscular system to activate postural muscles in response to specific task or environmental conditions¹⁷.

These results safely suggest that incorporating the evaluation of body composition in patients with equal BMI and also goes with the study done by Julia Greve, Angelica Alonso etal (2007), which suggests that the measurement of the shift response time, can help understand and use this correlation in order to prevent falls and other incapacities of obese patients., the correlation between balance measure and BMI associated with body composition could be useful to prescribe and evaluate physical activity program results for obese patients.

CONCLUSION

Both Group A & C balance score was affected so it can be concluded from the present study that balance score gets affected by Nutritional status of an individual

Conflict of Interest –No

Source of Funding-self

Ethical Clearance - Not Required.

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Physiological Cost Index of 6 Minute Walk Test and its Correlation with 6 Minute Walk Distance in Elderly, Mumbai

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ABSTRACT

Introduction: It is difficult to measure energy expenditure and oxygen consumption in elderly on a daily clinical basis due to expensive & cumbersome equipments required to measure it. Physiological cost index is relatively easy to perform, safe and cost effective and uses a mode of exercise that is integral to their activities of daily living.

Aim: To find the physiological cost index (PCI) of 6 minute walk test and its correlation with 6 minute walk distance in elderly.

Study Design: Its a correlational study conducted on 60 individuals above 60 years of age during a period of one year.

Study Procedure: The 6 minute walk test was conducted along a long 30m hallway. The distance walked and heart rate, respiratory rate, blood pressure and rate of perceived exertion were recorded pre and post test. Using the data obtained from 6 minute walk test, PCI was calculated.

Statistical Analysis : Pearson's rank order correlation coefficient test and t-test was used to analyse the data.

Results: The mean PCI is 0.17 ± 0.12 beats/m in elderly in our study. The mean 6 minute walk distance is 282.07 ± 63.14 m. There exists a correlation between physiological cost index and 6 minute walk distance in elderly individuals which is statistically significant.

Conclusion: Physiological Cost Index is decreased in elderly. There exists a correlation between physiological cost index and 6 minute walk distance in elderly.

Keywords: *Physiological Cost Index, 6 minute walk distance, Correlation, Elderly.*

INTRODUCTION

Elderly is defined as the population aged 60 years and above by the WHO. According to the demographic profile of elderly in India, the old-age dependency ratio climbed from 10.9% in 1961 to 13.1% in 2001 as a whole.¹ By 2030, the world's population 65 and older is expected to reach 12 percent, and by 2050, that share is expected to grow to 16 percent. This shows that elderly population forms a major part of the dependant population. This shift in the age structure of the world's population

poses challenges to society, families, businesses, health care providers and policymakers to meet the needs of aging individuals.² Thus it is important to study health related issues concerning them and how aging affects their physical performance and the corresponding energy expenditure.

With aging, potential causes of the age-related loss in aerobic power include decreases in maximal heart rate, stroke volume and arterio-venous oxygen difference. The aging of oxygen transport in elderly progressively restricts the ability of the senior citizen

to undertake even the normal activities of daily living such as walking up a slight rise.^{3,4} All components of energy expenditure alter with aging, in particular energy expenditure for physical activity.

It is important to know the energy cost of a particular activity in elderly, so as to find out whether a particular activity requires predicted amount of energy consumption or is the energy expenditure increased or decreased with respect to normal values.

To measure energy expenditure, estimation of VO_{2max} is gold standard measurement. It is difficult to measure energy expenditure and oxygen consumption in elderly on a daily clinical basis due to expensive & cumbersome equipments required to measure it. The use of heart rate monitoring to assess energy cost during walking probably originates from MacGregor, who introduced the Physiological Cost Index(PCI).⁵

The Physiological Cost Index (PCI) is a simple tool used to measure energy expenditure during walking. The PCI was established by MacGregor (1979) who recognized the need for a simple, functional and non-invasive method of measuring the physiological cost of walking that could be equally applied in domiciliary and clinical environments.⁶ The PCI is founded on the principle that heart rate and walking speed are linearly related to oxygen consumption (VO_{2max}) at sub-maximal levels of exercise (Astrand & Rodahl, 1986).⁶

Physiological cost index estimates the energy cost of a particular activity. To estimate energy expenditure of activities of daily living in elderly we can simply calculate the PCI of their daily activities.

Various tests have been used to estimate the functional capacity in elderly. 6 minute walk test is a sub maximal field test which measures functional capacity. It is safer, easier and better reflects with activities of daily living. Using PCI of 6 minute walk test we can estimate the energy required for performing daily activities.

This study aims to use a tool practically available on a daily clinical basis, so as to measure the energy expenditure while walking in elderly, that is PCI. Our further aim is to find whether any correlation exists

between PCI and 6 Minute Walk Distance.

METHODOLOGY

Materials used in the study were sphygmomanometer, stopwatch, measuring tape, and stethoscope

Subjects who fulfilled the inclusion criteria were taken for the study. It is a study conducted on 60 individuals above 60 years of age.

Exclusion criteria were

1. Subjects with a major illness of pulmonary, cardiovascular, musculoskeletal and/or neurological system likely to have a negative effect on gait.
2. Subjects taking medication that can influence heart rate (e.g. beta blockers).
3. Use of assistive device.
4. Subjects not willing to participate

STUDY PROCEDURE

Case record form was filled and demographic data collected from each subject. Resting heart rate, respiratory rate, blood pressure and rate of perceived exertion were taken.

The 6 minute walk test was conducted along a long 30m hallway. A mark was made at each end of walkway to indicate where the person was to turn. Subjects walked alone during the test unless the researcher felt that they were unsafe. Subjects were instructed to walk as far as possible and cover as much distance as possible in 6 minutes. Standardized encouragement was given in between at 1, 3, and 5 minutes interval. After completion of test, heart rate, respiratory rate, blood pressure and rate of perceived exertion were taken immediately and after 1, 3 and 5 minutes to see the recovery of subjects to baseline parameters.

Using the data obtained from 6 MWT, PCI was calculated as follows:

PCI = Final heart rate – resting heart rate (beats/min)

Speed (m/min)

PCI is then calculated in beats/m

Statistical Analysis

The data was entered using MS-Excel 2007 and analyzed using SPSS-16 software. P value less than 0.05 was taken as significant. Pearson’s rank order correlation coefficient test was used to find the correlation between 6 Minute walk distance and Physiological cost index during 6 minute walk test.

The t-test was applied to find the significance of the above correlations.

RESULTS

TABLE 1: Table 1 shows age wise and gender wise distribution.

AGE	61-70yrs	53	88.33%
	71-80yrs	7	11.66%
GENDER	Male	24	40%
	Female	36	60%

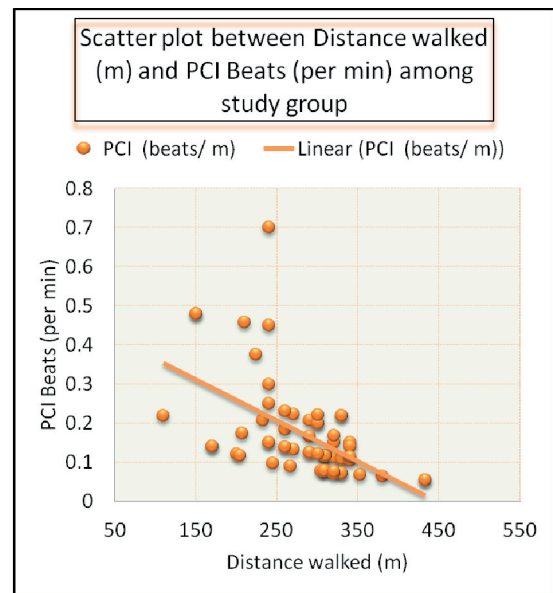
TABLE 2 : Table 2 shows the mean age, distance walked in 6 minutes and the PCI calculated from the data obtained.

Variables	N	Mean	Std. Deviation
age (years)	60	65.27	4.27
dist walked (m)	60	282.07	63.14
PCI (beats/ m)	60	0.17	0.12

The mean distance ambulated was 282.07 + 63.14 m range (110-433m). 26 subjects were able to cover more than 300m. 6 subjects took a pause and all the subjects were able to complete the 6 minute walk test. The mean PCI calculated from the 6 minute walk test was 0.17 + 0.12 beats/m range (0.055-0.7beats/).

TABLE 3: Table 3 shows the correlation between 6 MWD and PCI.

Variables		PCI (beats/ m)
Dist walked (m)	Pearson Correlation	-0.534
	P value	0.000
	Correlation is	Significant



Graph 1: Graph 1 shows the scatter plot between 6 MWD (m) and PCI(beats/m).

CORRELATION : 6MWD – PCI

The graph shows that there exists a correlation between PCI and 6 Minute walk distance. $r = -0.534$. The result is statistically significant. $p \text{ value} = 0.0007 \text{beats/m}$.

DISCUSSION

It is important to measure the energy expenditure to know the amount of effort involved in order to ambulate, and thus reduce the fatiguability whenever possible. Also the energy thus conserved can be utilised for other activities which would go a long way in improving the quality of life in elderly individuals.

This study was undertaken to find the physiological cost index in elderly individuals. The objective was to find the correlation between physiological cost index(PCI) and 6 minute walk distance, using 6 minute walk test in elderly

In this study the mean PCI was 0.17+0.12 beats/m. and mean speed calculated was 46.9+10.4m/min. The mean change in heart rate was 7.47+4.26 beats/min. In a study done by Cheng Hsun Wu (2007) on normal adults (mean age 28.48+4.85years) while walking, the PCI calculated was 0.44 + 0.13beats/m. (range0.2-0.79).⁷ Another study done by Graham RC, Smith NM, White CM. (2005) found that the PCI values were 0.30 + 0.1 and 0.34 + 0.1 in 40 healthy subjects

mean age(34.5+12.6years), where subjects were made to walk on two different shape tracks.⁸

Thus the PCI is at the lower limit of the range worked out in normal adults by the above mentioned authors.

With aging, there is an increase in body fat mass, and a decrease in lean body mass. This decrease in lean body mass occurs primarily as a result of losses in skeletal muscle mass. The loss in muscle mass is responsible for the age-associated decrease in basal metabolic rate, muscle strength, and activity levels, which, in turn are the cause of decreased energy requirements in the older adult. Daily energy expenditure declines progressively through adult life.⁹

As the maximal heart rate achieved decreases with age, the change in heart rate is also less thus decreasing the physiological cost index.

This is supported by the study done by Demetra D. Christou and Douglas R. Seal in May 2008 who in their study concluded that maximal heart rate decreases with age which is related to reduced β adrenergic responsiveness, and a decrease in the intrinsic heart rate (HR_{int}).¹⁰

In this study the mean 6 MWD was 282.07 + 63.14m which is reduced as compared to healthy adults thus reducing the speed as well(Speed=6MWD/time). This is supported by study done by Stephen & Hacker who in their study in 2002 provided reference data for 6MWT in elderly people. Their study showed that there is progressive decline in the 6MWD with increasing age.¹¹

Thus with aging the overall aerobic capacity decreases, reducing the 6 minute walk distance, speed as well as the functional performance

In this study we found that there exists a correlation between PCI and 6 minute walk distance. ($r = -0.534$) and the value is statistically significant [$p = 0.007$] This finding suggests energy expenditure correlates well with the functional capacity in elderly. It also suggests that, as the 6 minute walk distance increases the PCI decreases, implying that when the functional capacity improves, the energy expenditure is reduced while walking in elderly.

This is supported by the study done by Adriana Costa de Oliveira et al in 2009 which suggests that the PCI correlates with the 6 minute walk distance in healthy children and adolescents.¹²

These findings suggest that if elderly individuals work optimally at submaximal levels of exertion, their energy expenditure for a particular activity will be less and thus saving more energy. It is important to keep this concept in mind that elderly individuals already have less physiological reserve and they perform daily routines closer to the functional performance threshold.⁹ Thus they shouldn't be taxed upto their maximal threshold for any activity. Thus with this study analysis we can say that for submaximal levels of exertion in elderly, the energy expenditure is less and as their endurance and performance improves, the energy expenditure will further reduce in accordance with the correlation results.

As in elderly the aerobic capacity is reduced, our aim should be to formulate exercise protocols with submaximal levels of exertion, which will target the strength and endurance in elderly and thus improve their performance. As the aerobic capacity will improve so will the performance and the energy required for a particular activity will be reduced.

CONCLUSION

Thus we can conclude that PCI is decreased in elderly. There exists a correlation between physiological cost index and 6 minute walk distance in elderly.

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Conflict of Interest : Nil

Ethical Clearance: An approval from the ethical committee of Nair Hospital was taken for conducting this study.

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Effectiveness of Early Physiotherapy to Prevent Lymphedema after Breast Cancer Related Surgery

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Background- Breast cancer-related lymphedema is one of the main complications and most dreaded sequelae of breast cancer and its therapies. Disruption of the lymphatic circulation through breast carcinoma associated axillary lymph node dissection, with or without radiation therapy, reportedly is the most common cause of lymphedema in developed countries.

Objective- To determine the effectiveness of early physiotherapy in reducing the risk of secondary lymphedema after surgery for breast cancer. **Method-** It was a randomized control trial conducted on 20 subjects divided in 2 groups, one group was control group and other was experimental group. The early physiotherapy group was treated by a physiotherapist with a physiotherapy programme including manual lymph drainage, massage of scar tissue, and progressive active and action assisted shoulder exercises. This group also received an educational strategy. The control group received the educational strategy only. **Results-** By using unpaired t test we have found mean value of difference for difference between QLQ score of group A & group B was 9.80 and 3.60 respectively ($p=0.0001$) and mean value of difference for difference between volumetric measurement of group A & group B is 4.00 and 39.50. Thus early Physiotherapy is more effective than education strategy in preventing lymphedema post mastectomy breast cancer patients. **Conclusion-** Early physiotherapy could be an effective intervention in the prevention of secondary lymphedema in women after surgery for breast cancer involving dissection of axillary lymph nodes.

Keywords- breast cancer, lymphedema, manual lymph drainage

INTRODUCTION

Acquired interruption or damage to the axillary lymphatic system after surgery or radiotherapy for breast cancer can lead to regional or generalized accumulation of lymph fluid in the interstitial space, known as secondary lymphedema¹. The factors that might influence the development of secondary lymphedema after surgery are the number of lymph nodes removed, radiotherapy to the axilla, postoperative wound infection, postsurgical drainage time, lack of mobility, and obesity¹.

Breast cancer is the most frequent malignancy in women, with an incidence of 35-44 new cases

per 100,000 women/per year. Breast cancer patients develop lymphedema following breast cancer treatment, and the risk increases every year. Thus, breast cancer-related lymphedema is one of the main complications and most dreaded sequelae of breast cancer and its therapies, and can have long-term physical and psychosocial consequences for patients. It consists of the accumulation of lymph in the interstitial spaces, principally in the subcutaneous fatty tissues, caused by a defect in the lymphatic system. It is marked by an abnormal increase of tissue proteins, edema, chronic inflammation and fibrosis².

Stage I presents with pitting and is considered reversible; some women in this stage have no increased arm girth or heaviness and no signs of pitting oedema. As the oedema progresses, it becomes brawny, fibrotic, non-pitting and irreversible (stage II). In advanced lymphedema (stage III), which rarely occurs following breast cancer treatments, cartilaginous hardening occurs, with papillomatous

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outgrowths and hyperkeratosis of the skin².

Problems associated with lymphedema include: pain, altered sensations such as discomfort and heaviness, difficulties with physical mobility, physiological distress, recurrent infections and social isolation². Intensive treatment is mainly used for severely swollen or misshapen limbs, where an elastic garment cannot be fitted. MLD is a gentle massage technique, which stimulates the lymphangiomotoric activity³. An increased level of activity associated with exercise may reduce body weight and increase the shoulder's range of motion and improve muscle strength⁴.

METHOD

It was a randomized control trial conducted on 20 subjects divided in 2 groups, one group was control group and other was experimental group. The early physiotherapy group was treated by a physiotherapist with a physiotherapy programme including manual lymph drainage, massage of scar tissue, and progressive active and action assisted shoulder exercises. This group also received an educational strategy. The control group received the educational strategy only

INCLUSION CRITERIA

- Age ranges above 18 yrs
- Women undergone unilateral breast cancer surgery with axillary lymph node dissection

EXCLUSION CRITERIA

- Recurrence or relapse of breast cancer
- Bilateral breast cancer
- Untreated infection
- Untreated heart disease
- Untreated renal disease
- Untreated DVT
- Any other physiotherapeutic contraindications

PROCEDURE : Patients were screened for inclusion/exclusion criteria . Patients fulfilling the inclusion and exclusion criteria were included in the study. Each patient in this study was instructed about the different evaluation and treatment procedures to gain her confidence & co operation throughout

the study. Subjects were randomly divided into 2 groups i.e. Group A and Group B. Group A was given educational strategy and early physiotherapy. Group B was given only educational strategy. Both programmes will last for 3 weeks, with 3 visits per week.

Early physiotherapy intervention includes:

1. Manual Lymphatic Drainage
2. Stretching exercises of levator scapulea, upper trapezius, pectoralis major, medial and lateral rotators of shoulder
3. Progressive active and active assisted exercises of shoulder
4. Proprioceptive neuromuscular facilitation exercises without resistance for upper limb

Manual Lymphatic Drainage: Manual lymphatic drainage (MLD) is a specialised, gentle type of massage and an important part of lymphedema treatment. The aim is to shift or encourage the extra lymph to move away from the swollen area so it can drain normally. MLD also encourages and improves lymph drainage in the healthy lymph vessels, which helps keep fluid away from swollen areas. Slow rhythmic repetitive stroking with kneading effleurage, these sequential techniques with elevation of part to be drained is applied. First proximal part i.e, axilla is drained to make pathway for clearance of distal fluid areas. Direction of effluage is specific towards the part with lymphedema that has to be drained. Distal to proximal stroking is done. The edematous part is drained with proximal part first and then distal part.

Proprioceptive Neuromuscular Facilitation

1. D1 Flexion Pattern: flexion, adduction, external rotation.
2. D1 Extension Pattern: extension, abduction, internal rotation.
3. D2 Flexion Pattern: flexion, abduction, external rotation.
4. D2 Extension Pattern: Extension, adduction, internal rotation.

Educational Strategy includes:

- Instructions with printed materials about the lymphatic system, concepts of normal load

versus over load, source of secondary lymphedema, identification of possible precipitating factors.

- Instructions and precautions were given to the subjects in form of printed material in regional language

- Intervention to prevent lymphedema:
- avoidance of trauma
- prevention of infection
- avoidance of arm constriction
- use and exercise of the arm

Exercise guidelines:

1. Perform exercises twice daily every day.
2. Have needed equipment at hand, such as a foam roll, wedge, or exercise wand.
3. Wear compression bandages or a customized compression garment.
4. Precede lymphatic drainage exercises with total body relaxation activities.
5. Follow a specified order of exercises.
6. Perform active, repetitive movements slowly, about 1 to 2 seconds per repetition.
7. Elevate the involved limb above the heart during distal pumping exercises.
8. Combine deep breathing exercises with active movements of the head, neck, trunk, and limbs.
9. Initially, perform a low number of repetitions. Increase repetitions gradually to avoid excessive fatigue.
10. Do not exercise to the point where the edematous limb aches.
11. Incorporate self-massage into the exercise sequence to further enhance lymph drainage.
12. Maintain good posture during exercises.
13. When strengthening exercises are added to the lymph drainage sequence, use light resistance and avoid excessive muscle fatigue.

Precautions to be followed during study period:

1. Avoid heavy lifting on the surgical side for 4 weeks after surgery. Return to lifting gradually after this period.
2. Keep your surgical arm loose and moving

within the limits you are given after the surgery

3. Avoid any activity that bounces and jostles the breast for 2 weeks after surgery.
4. Use pillows to elevate your arm at night to decrease swelling during first week. Put pillow between your arm and side at night to prevent from rolling on the surgical side.
5. Avoid repetitive motions with the arm on the surgical side such as vacuuming for 2 weeks after the surgery
6. Perform shoulder ROM exercises as tolerated.
7. Perform low impact exercises after surgery once pain is under control.
8. Do not lift your arm above shoulder level until cleared by your surgeon.

Exercises Prescribed to Both Groups:

1. Active circumduction of the arm
2. Exercises on a foam roll
3. Bilateral hand press.
4. Wand exercise, doorway or corner stretch, and towel Stretch
5. Unilateral arm exercises with the arm elevated
6. Bilateral, horizontal abduction and adduction
7. Overhead wall press
8. Wrist and finger exercises

RESULT

TABLE 1: 1Comparison of Mean Scores of Quality of Life Questionnaire of pre and post treatment using paired t –test in Group A.

	MEAN	SD	P	T	Significance
Pre-treatment	59.96	4.48	<0.0001	3.9257	significant
Post-treatment	52.40	3.34			

INTERPRETATION: P value is <0.0001, t value is 3.9257 which is significant

TABLE 2: Comparison of Mean Scores of Volumetric Measurement of pre and post treatment in Group A

	MEAN	SD	P	t	Significance
Pre-treatment	102.50	7.91	0.0031	4.00	Significant
Post-treatment	106.50	2.48			

INTERPRETATION: P value is <0.0001, t value is 4.00 which is significant

TABLE 3: Comparison of Mean Scores of Quality of Life Questionnaire of pre and post treatment using paired t –test in Group B.

	MEAN	SD	P	t	Significance
Pre-treatment	60.20	4.59	0.0001	7.7198	Significant
Post-treatment	56.70	3.50			

INTERPRETATION: P value is <0.0001, t value is 7.7198 which is significant

TABLE 4: Comparison of Mean Scores of Volumetric Measurement of pre and post treatment using paired t –test in Group B.

Parameter	MEAN	SD	P	T	Significance
Pre-treatment	107.00	8.56	<0.0001	12.1579	Significant
Post-treatment	145.50	11.41			

INTERPRETATION: P value is <0.0001, t value is 12.1579 which is significant

TABLE 5: Comparison between Quality of Life Questionnaire score of Group A and Group B using unpaired t –test.

	MEAN	SD	P	T	Significance
Group A	9.80	3.01	0.001	5.71289	Significant
Group B	3.66	1.65			

INTERPRETATION: P value is 0.001, t value is 5.71289 which is significant

TABLE 6: Comparison between Volumetric Measurement of Group A and Group B using unpaired t –test.

	MEAN	SD	P	T	Significance
Group A	4	3.16	<0.0001	10.5841	Significant
Group B	39.50	10.12			

INTERPRETATION: P value is <0.0001, t value is 10.5841 which is significant

Mean Age of subjects of both groups was found to be 62.4 yrs.

DISCUSSION

This clinical was conducted to evaluate the effectiveness of early physiotherapy in prevention of lymphedema in post mastectomy breast cancer patients. In this study there were 20 subjects and 2 groups i.e. 10 in each group. Group A was given early physiotherapy and group B (control group) was given educational strategy. Manual lymph drainage, improves the lymph circulation, especially subcutaneous circulation, to stimulate the initial lymphatics, and to stretch the lymph vessels, consequently improving the removal of interstitial fluid. Manual lymph drainage encourages and improves reabsorption without increasing filtration¹. Lymphedema of the upper extremity is a common occurrence after patients receive therapeutic interventions for breast carcinoma⁵. Physical activity can reduce recurrence of breast cancer, the importance of evidence-based training instructions for these patients is essential⁶. An additional benefit of exercise is the possibility of reducing obesity, which has been identified as a risk factor in the development of lymphoedema⁷⁻⁸. Manual lymph drainage stimulates superficial lymphatic vessels to remove excess interstitial fluid and it moves it through subepidermal (under the skin) fluid channels that form when lymphatics are damaged⁹. Manual lymph drainage encourages and improves resorption without increasing filtration. It has been shown to be effective in the treatment of lymphedema because it improves the removal of fluid from interstitial space¹. MLD combined with PNF are effective in treating lymphedema after mastectomy. Exercise therapy also significantly improves physical condition and relieves depression and anxiety of cancer patients¹⁰.

Prolonged stretches at the shoulder have been shown to be highly effective in other patient groups at risk of developing significant loss of range¹¹. Thus Prolonged stretches may be effective to decrease stiffness and pain after breast cancer surgery. Positive change in exercise activity has resulted in higher quality of life and favourable bodily pain and general health scores¹². Natural killer cytotoxic activity increased after exercise in cancer patients, along with lymphocyte proliferation and granulomatous cell counts¹³.

CONCLUSION

Early physiotherapy along with educational strategy was more effective than only Educational strategy in prevention of Lymphedema in post mastectomy breast cancer patients. Thus, hypothesis is proved.

Limitations: Sample size was small.

Recurrences were not to find out the long term effect of the treatment.

Total duration of study was less

Suggestions: The sample size can be larger.

The study can be carried for a longer duration.

Close monitoring of daily activities could be done.

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A Study to Determine the Influence of Tibiofemoral Degeneration over Hamstring Flexibility and Functional Performance

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ABSTRACT

Aim of the study was to determine the influence of tibiofemoral degeneration on hamstring flexibility by means of passive knee extension test, gait parameters and functional performance using lower extremity functional scale (LEFS). The overall relationship between each variable of the study was found using Pearson Correlation and was at a significant level of 0.01. Correlation of relationship of hamstring to step and stride length was shown positive and negative with cadence.

Keywords: Tibiofemoral degeneration, passive knee extension test, gait parameters, LEFS

INTRODUCTION

Degenerative joint disease is a musculoskeletal disorder that affects a large proportion of population throughout the world. It predominantly affects the weight bearing joints such as hip, knee, ankle and vertebral column (Ronald et al 2004). Knee is a weight bearing joint of lower limb which has the primary function of lengthening and shortening of the limb, thus assisting the hip in positioning the foot. Degenerative joint disease of knee is more common among Indian population than that of western in relation to lifestyle pattern, primarily targeting medial and lateral tibiofemoral compartment of knee than the patellofemoral compartment (Roy D Altman et al 2004). Report states that prevalence of osteoarthritis of knee joint rose from 2% in men and 3.5% in women between age group of 45 – 54 years to 9.1% and 17.4% respectively among those who were 65 – 74 years (Davis et al 1991). The joint reaction forces are an important contributing factor in the development of degenerative joint disease, a leading cause of disability in aging adults (Berenbaum F, Hochberg MC et al 2001). Alignment of knee is affected by the alignment of hip, ankle and foot, hence malalignment of knee can result from malalignment of hip, ankle and foot joints, from muscle imbalances, from abnormal loads on the knee joint (Davids JR et al 1996). Normal valgus alignment of knee results in a narrower base of support during stance, requiring

less lateral shift to keep body's centre of mass over its base of support during single limb stance and gait (Saunders JB et al 2009). Among individuals with degenerative joint disease of knee, 5 degrees of lateral tibial version with respect to femur is reported (Carol Oatis 2009). In addition to flexing and rotating the knee, the hamstring reportedly contributes to the stability of the knee, provide active resistance to anterior glide of tibia on the femur, and perhaps a critical substitute in anterior collateral ligament deficient phase. Hamstring is predominantly active during normal gait, and the most prominent period of activity is at the transition between swing and stance period of gait cycle. The role of hamstring is to slow the extension of knee in late swing and to help extension of hip in stance phase and so excessive activity of hamstring muscles can produce decreased knee extension in these phases of gait (Flynn TW et al 1995). Co-contraction of hamstring and quadriceps helps to stabilize knee and protect the ligamentous structures. Presence of knee flexion contracture precludes the use of passive support mechanism. With the knee flexed, weight of head, arm, and trunk produces a flexion moment at the knee. Hence, contraction of quadriceps femoris muscle is required to maintain the standing position. This greatly increases metabolic cost of erect standing. Also, alters the magnitude and direction of forces at the knee and contribute damage to knee joint capsule.

Degenerative changes predisposes to mechanical failure of hyaline articular cartilage, becomes thinner and due to friction, bone eburnates. This results in marginal osteophytes causing joint stiffness and degeneration on the medial compartment tilts the knee into genu varum (Donald A Neuman et al 2nd edition). The tibiofemoral joint sustains large moment during functional activities. In frontal plane, during normal locomotion, the ground reaction force applies an external adduction moment on knee during mid stance (Hunt MA et el 2006). This adduction moment increases the forces applied to medial tibial plateaus and femoral condyles. Thereby, it is important to recognize the relationship between joint and muscle forces and their possible associations with degenerative joint disease. Hence, the present study is aimed to determine the influence of tibiofemoral compartment degeneration on hamstring flexibility and functional performance of subjects.

SUBJECTS & METHODS

We included 100 patients within the age group ranging from 40-60 years who were diagnosed by radiography changes for a period of at least four weeks with degenerative knee (tibiofemoral).patients symptomatic of other conditions such as isolated patellofemoral degeneration, previous surgeries, adverse neural tension, septic arthritis, deformities of lower extremities were excluded from this study. The purpose of the study was explained to the participants, and informed consent was obtained. The subjects with tibiofemoral compartment degeneration were evaluated for length of hamstring muscle, by means of passive knee extension test, and gait parameters. Finally functional performance was assessed using Lower Extremity Functional scale

The subject’s knee was passively extended by a standardized force, while the hip was stabilized in 90 degrees of flexion. The knee angle was measured with a standardized goniometer and represented the hamstring muscle length. The subjects were instructed to walk through a stretch of fifty meter along the marking on the floor during which the cadence was calculated. The subjects were then made to wet their feet and walk along the marking on the floor, there after stride length and step length was measured.

Lower Extremity Functional Scale is a self

reporting scale. This was presented to the subjects in the form of hand outs and appropriate instructions were given. The hand outs were collected back and were scrutinized for the score. The total score is the sum of points scored for all the twenty activities. Each activity scored maximum of four points and the least was zero point. The overall score of the scale is eighty. Four activities which were not applicable to our lifestyle were not considered, which made a maximum score of the scale as sixty four for sixteen activities. Percentage of maximal function was calculated by the formula LEFS score ÷ 64 x100.

The SPSS version 16.0 software (statistical package for social sciences)was used to perform statistical analyses. Descriptive statistics were used for general features. Overall relationship between each variables of this study was found using Pearson’s correlation coefficient. The level of statistical significance was p<0.01.

RESULTS

The mean age of participants by means of one sample t-test is described in table 1.the mean and standard deviation of hamstring length, stride, step, cadence and LEFS by means of one sample t-test is shown in table 2.description of table 3 is Mean and standard deviation based on gender variance. The overall relationship between each variables of this study is shown in table 4. On comparison of the relationship of hamstring to the gait parameters showed a positive correlation to step and stride length.

Whereas a negative correlation with cadence. Also, all the included gait parameters showed a high level of significance to LEFS. Correlation of hamstring length with gait parameters and the functional scale was at a significant level of 0.01. The values and the relationship as stated earlier proved to be statistically significant.

Table I: Mean age of the participants (One sample t-test)

Gender	n	Mean ± SD
Male	25	50.04 ± 5.81
Female	75	47.88 ± 6.11
Total	100	48.42 ± 6.08

Table II: The mean and standard deviation of hamstring length, stride, step, cadence and LEFS by means of one sample t – test

	N	Mean ± SD
Length (degree)	100	34.78 ± 8.07
Stride (cm)	100	38.03 ± 5.58
Step (cm)	100	18.31 ± 2.75
cadence	100	29.39 ± 4.41
LEFS (%)	100	70.26 ± 10.47

Table III: The mean and standard deviation representing gender variation of the variables.

	Gender	N	Mean	Std. Deviation	t	p
Length (degree)	Male	25	32.40	8.554	-1.719	.089
	Female	75	35.57	7.800		
Stride (cm)	Male	25	38.97	5.446	.970	.334
	Female	75	37.72	5.624		
Step (cm)	Male	25	18.59	3.127	.593	.555
	Female	75	18.21	2.626		
Cadence	Male	25	28.96	4.560	..561	.576
	Female	75	29.53	4.382		
LEFS (%)	Male	25	69.288	10.2428	-.533	.595
	Female	75	70.581	10.5941		

Table IV: Relationship between hamstring Length and Stride length, Step length, Cadence and LEFS

	Hamstring Length (degree)	Stride length (cm)	Step length (cm)	cadence	LEFS (%)	
Age	Pearson Correlation	-.180	-.111	-.165	.199*	-.524**
	Sig. (2-tailed)	.073	.269	.100	.047	.000
Hamstring Length (degree)	Pearson Correlation		.399**	.421**	-.370**	.468**
	Sig. (2-tailed)		.000	.000	.000	.000
Stride length (cm)	Pearson Correlation			.837**	-.717**	.298**
	Sig. (2-tailed)			.000	.000	.003
Step (cm)	Pearson Correlation				-.925**	.329**
	Sig. (2-tailed)				.000	.001
Cadence	Pearson Correlation					-.339**
	Sig. (2-tailed)					.001

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

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

DISCUSSION

This preliminary study demonstrated a positive correlation between hamstring flexibility and Lower Extremity Functional Scale in tibiofemoral joint degenerated subjects. In addition, hamstring flexibility is highly significantly related to step length, stride length and cadence.

The Tibiofemoral joint sustains large moment during functional activities and normal gait (Hunt MA 2006). Hamstring is one of the muscles that contributes to the stability of knee and is active during normal gait, decelerate the extension of knee in late swing and to help extend hip in stance phase. Muscle imbalance causes abnormal stress on the joint and can lead to joint degeneration (Andriacchi TP 1994).

It is significant clinically, to recognize the incidence of lack of flexibility and impaired functional status among patients suffering degenerative joint disease.

The relationship between walking speed and muscle activity is complex and depends on the muscle. However, the relative contribution of hip flexors and extensors to propulsion increases with walking speed. Predominantly many abnormal gait patterns found among individuals with impairment are characterized by decreased walking velocities.

Hence, our study aimed to determine the influence of tibiofemoral compartment degeneration on hamstring flexibility and functional performance of subjects in the present study. In this study, the hamstring flexibility of hundred subjects was measured along with LEFS and gait parameters.

It is evident from table 2, that the hamstring flexibility is related to gait parameters such as step length, stride length and cadence. Also, hamstring flexibility has its profound effect on LEFS score.

The outcome measure used in this study proved to be valuable in measuring functional status supported by previous studies done by Yeung TS 2009.

In previous studies, hamstring flexibility was measured in relation with patellofemoral pain syndrome (Lisa C White 2009). Similar studies done by G. Li (2006), proved the effect of tibiofemoral joint kinematics on patellofemoral contact pressure under

simulated muscle loads.

The physiological explanation supporting the influence of hamstring flexibility is that, excessive activity of hamstring can produce decreased knee extension in late swing and at ground contact during gait (Flynn TW 1995).

Gait alteration may occur with degenerative joint disease of knee depending on whether there is a collapse of the medial (or) lateral knee compartment owing to degeneration.

Lateral knee degeneration would result in a varum knee, causing the knee to thrust medially during gait. Medial degeneration would result in varus knee, causing the knee to thrust laterally during gait (Darlene Hertling et al 2006).

Table 1 represents the mean age of participants by means of one sample t – test. The mean age of male subjects was 50.04 ± 5.81 and mean age of female subjects was 47.88 ± 6 .

The mean and standard deviation of hamstring length, stride, step, cadence and LEFS by means of one sample t – test is shown in table 2.

Description of table 3 is Mean and standard deviation based on gender variance, does not show much of statistical significance in difference for hamstring length, and stride length, step length, cadence and LEFS, which has also been represented graphically.

The overall relationship between each variables of this study was found using Pearson correlation as shown in table 4. On comparison of the relationship of hamstring to the gait parameters showed a positive correlation to step and stride length.

Whereas a negative correlation with cadence. Also, all the included gait parameters showed a high level of significance to LEFS. Correlation of hamstring length with gait parameters and the functional scale was at a significant level of 0.01. The values and the relationship as stated earlier proved to be statistically significant.

Subjects included for this study were not categorized based on their nature of work or occupation. This factor might have had an influence on the outcome.

Intrinsic factors to the subjects who were included for the study such as obesity could have also had an influence on the outcome.

Considering the above stated data and discussion, proves the current study to possess a significant relation between hamstring flexibility and functional performance, which is readily influenced by tibiofemoral compartment degeneration.

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Correlation of Low Back Pain and Diastasis Rectus Abdominis in Post Menopausal Women between the Age Group of 50-60 Years

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ABSTRACT

Aim: To find the correlation of low back pain and diastasis rectus abdominis in post-menopausal women between the age group of 50-60 years.

Objectives:

1. To find the prevalence of low back pain in post-menopausal women.
2. To assess low back pain using visual analogue scale.
3. To assess the disability due to low back pain using Roland Morris disability questionnaire.
4. To assess the diastasis recti in postmenopausal women.
5. To find the correlation of diastasis rectus abdominis with low back pain in post-menopausal women.

Abstract: A correlational study was conducted in 100 postmenopausal multiparous females within the age group of 50-60 years. They were surveyed for low back pain using visual analogue pain scale and Roland Morris questionnaire for disability; out of which 77% had low back pain. These participants were then assessed for diastasis rectus abdominis using diastasis recti test. The mean VAS of low back pain was 5.31. The mean disability due to low back pain was 38.55%. The mean of diastasis recti was 2.89cm. The test was statistically significant by using unpaired t test and coefficient of correlation test.

Result: There was a partial positive correlation between diastasis rectus Abdominis and Low back pain in post-menopausal women within age group 50-60 years.

Keywords: *Diastasis rectus abdominis, low back pain, post menopausal women, disability, diastasis recti test.*

INTRODUCTION/BACKGROUND

Rectus abdominis is a muscle running vertically on each side of anterior wall of abdomen. There are two parallel muscles separated by a midline band of connective tissue called linea alba. The muscle arises by two tendinous heads: lateral head from lateral part of the pubic crest and medial head from the anterior pubic ligament. It is an important postural muscle. It is responsible for flexing the lumbar spine, as when doing a crunch. It also helps in keeping the internal organs intact and in creating intra-abdominal pressure¹.

Diastasis rectus abdominis is defined as separation between two bellies of rectus abdominis².

The hormonal changes taking place during menopause causes stretching of the abdominal muscles. It is more common in multiparous women due to repeated episodes of stretching during pregnancy³. Thus the biomechanical changes and stretching of these muscles facilitate the appearance of diastasis of rectus abdominis muscle. This may produce musculoskeletal complaints such as low back pain as a result of decreased ability of the abdominal musculature and thoracolumbar fascia to stabilise the

pelvis and lumbar spine⁵.

MATERIAL & METHOD

1. STUDY DESIGN

Type of Study: Correlational Study

Duration of Study: 6 Months

Location: Metropolitan City

2. sampling Design

Sampling Method: Convenience Sampling

Sample Population: Post Menopausal Women
- (50-60 Years)

Sample Size: 100

3. Outcome Measures

Visual analogue scale

Roland Morris questionnaire

Diastasis recti test

SELECTION CRITERIA

A) INCLUSION CRITERIA:

- Full term normal delivery
- Multigravida females
- Age group of 50-60 years
- Women willing to participate in the study.

B) EXCLUSION CRITERIA:

- Females undergone any abdominal surgeries
- Any orthopaedic surgeries
- Any neurological condition
- Any cardiac condition
- Hesitant females
- Uncooperative patients
- Female on hormone replacement therapy.
- Already on exercise Programme.

PROCEDURE

Total 100 postmenopausal multiparous females within the age group of 50-60 years were surveyed for low back pain using visual analogue pain scale and Roland Morris questionnaire where questions have been designed to give the information about how their low back pain affects their ability to manage in day to day life. Before handling the questionnaire,

each subject was given detailed information about the purpose of the study with an assurance that the information given will be used only for data collection, but otherwise it would be kept totally confidential. Consent was taken in the language best understood by the females. The statements given in the Roland Morris questionnaire were translated in the language best understood by the subjects. They were instructed to put a mark next to each appropriate statement. The total obtained score was calculated to find the level of disability. Patients having low back pain were assessed for diastasis recti.

DIASTASIS RECTI TEST: The diastasis recti test was performed with the patient in crook lying position. The subject slowly raises her head and shoulders off the floor, reaching her hand towards the knees, until the spine of scapulae leaves the floor. The therapist places the fingers of one hand horizontally across the midline of the abdomen at the level of umbilicus. If a separation exists, the fingers will sink into the gap between the rectus muscles or a visible bulge between the rectus bellies may be appreciated. The number of fingers that can be placed between the muscle bellies is documented. The separation of 2 c.m (i.e. 2 finger widths) is considered normal. Diastasis rectus abdominis will be confirmed if a separation of greater than 2 finger widths between the two rectus abdominis bellies exists².

FINDINGS

TABLE 1: Demographic data

PARAMETERS	
NO.OF CASES	100
AGE(YEARS)	
MEAN	53.68
SD	3.94
RANGE	50-60
NO.OF PREGNANCY	
2	69
3	22
>3	9

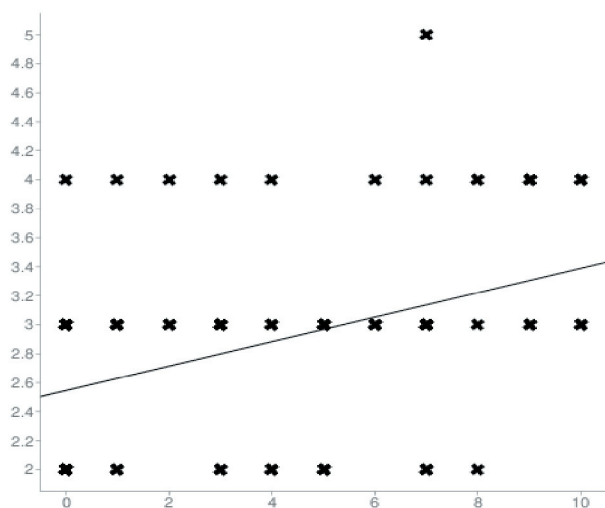
INFERENCE: The above data shows the distribution of women participated in the study from age 50 years to 60 years.

TABLE 2: Prevalence of low back pain

LOW BACK PAIN	
YES	77
NO	23

INFERENCE: The above data shows the prevalence of low back pain in post-menopausal women was 77.

TABLE 3: Correlation of low back pain and diastasis rectus abdominis



PARAMETERS	MEAN	STANDARD DEVIATION	SIGNIFI-CANCE
VAS	4.09	3.29	SIGNIFI-CANT
DIASTASIS RECTI	2.89	0.69	

INFERENCE: The above data shows the correlation of low back pain and diastasis recti. The test was statistically significant by using unpaired t test and coefficient of correlation test.

CONCLUSION

This study concludes that there is a partial positive correlation between low back pain and diastasis recti abdominis in post-menopausal women within the age group of 50-60 years.

Acknowledgment: It’s my great pleasure and privilege to express my deep felt gratitude to Dr. Devyani Bhiwgade (Asst. Prof), who immensely helped us and rendered their advice, precious

time, constant encouragement, knowledge and relevant information regarding our study and whose suggestions and guidance has enlightened me on this subject.

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Comparative Analysis of Bruce, Balke and Naughton Treadmill Protocols in Normal Subjects

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ABSTRACT

Introduction: The study was initiated to compare the most popularly used Bruce, Balke and Naughton test protocols, considering cardiopulmonary responses like HR, BP and RPE as criteria in same subject population.

Methodology: 60 Normal Healthy subjects between age group 20-59 years were recruited for the study after informed consent. Basal Parameters i.e. HR, BP and RPE were taken for all subjects before and immediately after the termination of the Bruce, Balke and Naughton test..

Results: Demographics characteristics of the subjects were : mean age of subjects were 36.62 + 11.55 years, 50% total were male and rest were female. Results were compared in two groups 20-39 and 40-59. The statistical test used were t- test and ANOVA and the significance level was decided as p<0.05.

Conclusion: To achieve optimal clinical results, the selection of treadmill protocols should be based on the individual performing the test and objective of the test

Keywords: Bruce, Balke , Naughton, treadmill test protocols, Cardiopulmonary Responses.

INTRODUCTION

In 1976, Pollock et al did a Comparative Analysis of Four protocols : Bruce, Balke, Taylor, & Ellestead for maximal treadmill stress testing¹. In 1991, Myers et al did a Comparison of Ramp versus standard exercise protocols: Bruce, Balke, Taylor & Astrand, however no one test was thought to be superior to the others².

Aim: To compare the most popularly used Bruce, Balke and Naughton test protocols, considering cardiopulmonary responses like HR, BP and RPE as criteria in same subject population.

METHODOLOGY

Instrumentation: Treadmill, polar digital HR

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monitor, Aneroid BP Apparatus, stethoscope

Exclusion Criteria:

Absolute Contra Indication as ruled out by the physician: Resting ECG abnormalities, recent MI, unstable angina, ventricular arrhythmias, heart blocks, pacemakers, CHF, Cor Pulmonale, aortic stenosis or any other rheumatic heart disorders, acute infections, pulmonary embolism.

Relative Contra Indication as determined by physician are DBP>115 SBP>200, pregnancy, electrolyte abnormalities, PVC's, ventricular aneurysm, diabetes uncontrolled, chronic infectious diseases like hepatitis AIDS.

Procedure: 60 Normal Healthy subjects between age group 20-59 years were recruited for the study after informed consent. All volunteers were screened for entry into the study on the basis of normal physical examination by a medical practitioner and on the basis of being negative on the PAR- Q .

Before starting the test, all volunteers were asked to sign a consent form, complete a medical history questionnaire (PAR Q) and describe personal details to be noted on Data Collection Form.

Proper instruction and a trial walk on treadmill was given to every subject a day prior to start of the actual test, to familiarize them with the different speed of the three protocols and to decrease their anxieties. Basal Parameters i.e. HR, BP and RR were taken and age predicted max HR was calculated i.e. $220 - \text{age}$ and was reported on data collection form, to ensure that the subject does not exceed their Target Heart Rate Zone.

The session started with 10 minutes of warm up which included calisthenics exercises and stretching (same for all subjects at all instances) after which the subject started with actual test. A table of random number was used to select the order in which tests were administered and the test was single blinded (subject blinded to the protocol). Testing sessions were scheduled at one week interval preferably at same time and same day. Subjects fasted 3 hours before the test and care was taken that on day of testing they were in fit condition. However, drinking water was allowed.

HR and BP was monitored for all subjects before and immediately after the termination of the test. Also the predicted METS, VO_2 & total duration for which subject exercised on each test was noted from the treadmill and the individual's level of exertion was quantified on rate of perceived exertion (RPE) Borg 6-20 scale.

Termination Criteria for the test: In all subjects was if any symptom or discomfort (like fatigue, SOB etc.) beyond which he/she was unable to carry out the test. After termination of the test then the subject was made to sit till all the parameters returned to near normal and the recovery time was noted on Data Collection Form.

RESULTS

Demographics characteristics of the subjects were : mean age of subjects were 36.62 ± 11.55 years, 50% total were male and rest were female. Results were compared in two groups 20-39 and 40-59. The statistical test used were t- test and ANOVA and the significance level was decided as $p < 0.05$.

Profile of HR- After the tests mean HR in Bruce protocol was significantly ($p < 0.05$) high as compared to Balke and Naughton. But the difference was not found to be statistically significant in both age groups. However the HR of subjects in higher age groups 40-59 years was significantly low as compared with subjects of age group 20-39 years in all three protocols. (Table 1)

Profile of Systolic BP- After the tests mean BP in Bruce protocol was significantly ($p < 0.05$) more as compared to Balke and Naughton. But the difference was not found to be statistically significant in both age groups. However the SBP response post test of subjects in higher age groups 40-59 years was significantly high as compared with subjects of age group 20-39 years in all three protocols. (Table 1)

Table 1: SBP and HR at three instances: Post Protocol in both the age Groups

Age (years)	S.B.P. (Mean \pm SD)			H.R. (Mean \pm SD)		
	Bruce	Balke	Naughton	Bruce	Balke	Naughton
20-39	154.1 ± 14.8	145.6 ± 20.2	147.43 ± 19.7	174.20 ± 10.9	171.77 ± 11.5	172.17 ± 10.4
40-59	161.86 ± 16.0	157.6 ± 16.5	151.86 ± 16.8	151.57 ± 14.7	147.47 ± 11.8	148.93 ± 12.5

Profile of Predicted METS: After the tests predicted METS in Bruce protocol was significantly ($p < 0.05$) more as compared to Balke and Naughton. But the difference was not found to be statistically significant in both age groups. However the METS of subjects in higher age groups 40-59 years was significantly low as compared with subjects of age

group 20-39 years in all three protocols.

Profile of duration: For both the age groups the duration was significantly low in Bruce protocol as compared to Naughton and Balke protocol. However the difference between the duration of Balke and Naughton were not statistically significant. Also, the

duration was significantly less in higher age groups, 40-59 years as compared with subjects of 20-39 years in all three protocols. (Table 2)

Table 2: Duration of Exercise /Workout and RPE in all Protocols in both the age Groups

Age (years)	Duration (Mean \pm SD)			RPE (Mean \pm SD)		
	Bruce	Balke	Naughton	Bruce	Balke	Naughton
20-39	12.0 \pm 2.8	19.54 \pm 3.6	20.07 \pm 4.6	14.66 \pm 1.3	11.93 \pm 1.8	12.8 \pm 1.62
40-59	9.64 \pm 3.0	14.35 \pm 5.9	15.52 \pm 5.5	14.10 \pm 1.46	11.7 \pm 1.74	12.1 \pm 1.36

Profile of RPE: RPE was significantly higher in Bruce protocol as compared to Balke and Naughton. However, the difference was not found to be statistically significant between Balke and Naughton. Also there was no statistical difference between the two age groups within all three protocols. (Table 2)

All the subjects recovered in 2 minutes after the protocol. They were kept under observation for 30 minutes post exercise.

DISCUSSION

To assess cardiopulmonary system different treadmill protocols have come into existence over a period of time. We selected three very widely used protocols i.e. Bruce, Balke and Naughton for comparison in our study.

Balke was devised with constant speed of 5.3kph and increase of grade of 1% at every stage (i.e. 1 min stage and total duration of 26 mins)

Naughton having constant speed of 4.8 kph with increase in grade of 2.5 % at every stage (i.e 2 min stage and total duration of 28 minutes)

Bruce shows greater variations i.e. speed from 2.7 kph to 8.8 kph and grade starts with 10% and increased by 2% at every stage (i.e 3 minutes stage and total duration of 21 minutes)⁶

In our study all volunteers were subjected to all 3 protocols on the treadmill and it was observed that maximum physiological values for HR, BP & METS were not statistically different when compared in all three protocols. However it was observed that the total duration required to achieve these maximum responses in each of these protocols varied significantly. In Bruce protocol, subjects achieved maximal responses at a very short duration i.e. for

age group 20-39 years it was 12 minutes and for 40-59 years it was only 9 minutes, as compared to Balke and Naughton where they required almost the same duration i.e. for 20-39 years- 19 mins, 40-59 years- 14 mins and 20-39 years- 20 minutes and 40-59 years 16 minutes respectively.

Even RPE varied significantly in three protocols being higher in Bruce which suggests that subjects perceived a greater exertion in achieving maximal responses in lesser duration in Bruce protocol as compared to Balke and Naughton protocols. This is due to higher increments in Bruce protocol.

Although the maximal HR was similar in all three protocols, it was the rate of increase in HR that changed significantly among the three tests. It was observed in our study that Bruce has a primary advantage of relatively short duration needed for most subjects to reach maximal effort. However, this may be a disadvantage for elderly and cardiopulmonary compromised patients because the large increments in between the stages may be too great to cope up with the stress. With age and deconditioning there is a decrease in average values of maximum aerobic power or VO_2 max and there is inefficiency in reaching its submaximal or maximal percentage.

In his study, Skinner has observed that at the age of 25 years functional capacity is 12-13 METS (1 MET higher for males,) after which there is a drop of approximately 1 MET by each 7 years. Thus, in a 60 year old VO_2 Max would be 7-8 METS, which dropped to 5-6 METS in institutionalized and highly deconditioned elderly³.

In Bruce, 2nd stage workload is 4 kph (12%) which requires 7 METS, and so it is at near VO_2 Max for most elderly people. Also, the relatively large increase in between the stages and as the test progresses above

stage, the additional energy cost of running as compared with walking, limits their performance³.

However, advantage of this protocol is that, the abrupt increase in the exercise intensity many increase sensitivity to ischemic changes. Therefore, we can say that Bruce is a choice for young active individuals and to evaluate cardiovascular system with increased sensitivity^{5,8,9}.

Balke, as described earlier has survived test of time where speed is constant and grade increases every minute. Constant treadmill speed requires only an initial adaptation in stride and produces less ECG and BP artifacts than do protocols involving higher speeds⁴. It was originally developed to assess physical fitness and endurance in reasonable healthy subjects^{4, 8,9}. However, in older deconditioned individuals the 5.3 mph speed may be too fast therefore it could be a test of choice for normal sedentary subjects who should be able to cope up with this speed⁵. Long duration of this protocol as compared to Bruce still remains a drawback of this test to complete which, performance by an individual, is influenced more by endurance^{4,7}. The nature of gradual increase in grade with constant speed makes this test more applicable to assess functional capacity. Therefore, it can be safely utilized for a Customized cardiac rehab program because increment is more gradual¹⁰.

Naughton, another test of our study is also a longer duration test, which unlike Balke has a less speed i.e. 4.8 kph, so it is suggestive for older deconditioned individuals⁵. Later, it was modified to a speed of 3.2 kph for the initial 6 stages⁵. Paul. S Fardy in his study used this protocol to assess the cardiovascular system of post MI patients in early stages i.e. before hospital discharge or shortly after discharge. This has been used extensively in recent years to classify patients into high risk and low risk categories that have important prognostic and therapeutic implications. This is also used in CHF and for cardiac transplant where patients have limited exercise tolerance⁴, though duration is a drawback but it can establish more precise end points for setting training guidelines.

Thus, to achieve optimal clinical results, the selection of treadmill protocols should be based on the individual performing the test and objective of the test.

Acknowledgement: Nil

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Conflict of Interest/Source of Funding

There is no conflict of Interest and all authors are well informed. Source of funding is self and Ethical clearance was taken from the physician who examined the normal subjects & informed consent was taken.

Comparison of Tufts Assessment of Motor Performance Scale and Motor Assessment Scale in Community Walking Spastic Diplegic

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ABSTRACT

'Cerebral Palsy' is one of the common Neurological disorders seen by the physiotherapist in pediatric population. It is very often seen that the patients having similar control are tested on command, as joint wise movement through various postures function differently in day to day performance through various activities. All component that contribute to functional performance tested separately when put together may give an idea of performance but may vary from actual performance.

Design and Methodology: Cross sectional study done on incidental sample of 35 community walkers, cerebral palsied spastic diplegic children from All India Institute of physical Medicine and Rehabilitation, Haji Ali, Mumbai.

Children assessment done which includes voluntary control, one leg standing, obstacle walking, Functional performance observe on Tufts Assessment of Motor Performance (TAMP) and Motor Assessment scale (MAS) compared in Cerebral Palsied children.

Result: Ambulation activities in TAMP and walking activities in MAS shows low score in spastic CP diplegic children and also Advance hand activities and Feeding shows low score in CP diplegic children. TAMP requires less time and less skills of the Physiotherapist than MAS .

TAMP is more simpler than MAS. TAMP Correlated with MAS was found to be positive and statistically significant at ($P < 0.01$). Voluntary control of UL correlated with Advance hand activity, Hand function and Upper arm function of MAS, Feeding and Dressing activities of TAMP was found to be positive and Statically significant at ($P < 0.01$). Voluntary control of LL correlated with Walking activity of MAS, Obstacle walking, Ambulation activities of TAMP was found to be positive and Statically significant at ($P < 0.01$).

Conclusion:- Voluntary control itself gives sufficient idea about the functional level of UL and LL.

Keywords:- Cerebral Palsy, Tufts Assessment of Motor Performance, Motor Assessment Scale, Voluntary Control

Short cuts: - [Cerebral Palsy (Cp), Tufts Assessment of Motor Performance (TAMP), Motor Assessment Scale (MAS), Voluntary Control (VC)]

BACKGROUND

Cerebral Palsy: is one of the common Neurological disorder seen by the physiotherapist in pediatric population. Prevalence of cerebral palsy varies from 1.5 to 2.5 / 1000 live births. (Zaman et al 1992).⁴ Again the spastics are more than the dyskinetic. Children

shows developmental delay, reduced mobility, poor balance and postural instability which limit the overall activity of the child required for independence in functional performance.

The recovery of functional independence following a neurological insult is a complex process

requiring the reacquisition of many skills. (Shumway cook 1995).^{31,32}

Ultimately recovery has meaning till the patient is functionally independent. Physiotherapists do the assessments of control, mobility and stability. It is very often seen that the patients having similar control are tested on command, as joint wise movement through various postures function differently in day to day performance through various activities.⁴

A performance is the accomplishment of a given task measured against preset known standards of accuracy, completeness, cost, and speed. All components that contribute to functional performance tested separately when put together may give an idea of performance but may vary from actual performance.

DESIGN AND METHODOLOGY

Sample : Incidental sample of 35 community walking , spastic diplegic cerebral palsied children took part in study from AIIPMR, Mumbai.

Study design: Cross sectional study. Written consent taken.

Inclusion Criteria :-Bobath (1971) –At about age 5 yrs., child has good control of his balance, can jump, play games and can co-ordinate selective and precise movements of his hands for manual skills and also in TAMP requires children of above 6 yrs, who are able to understand the instructions require for the test. So, children above 5 yrs of age are taken .

Exclusion Criteria : Sever MR, gross cognitive, perceptual and behavioral problem excluded .

METHODOLOGY : A basic routine assessment done with that, Voluntary control (Dr.M.G.Mokashi)²²- For knowing the control over spasticity, voluntary control done, Single leg stance time ,Foot placement obstacle .To observe the Functional performance, **Tuffs Assessment of Motor Performance (TAMP)^{14,15,26} and Motor Assessment scale (MAS)⁹** compared in participants. Pilot study for MAS and TAMP done on 50 normal children with same age group. Communications and wheelchair items from TAMP were excluded as Indian children were unable to write English and type, and patients were ambulant.

Total assessment time was approximately 50 min

including for TAMP -15-20 min and MAS -15-20 min .The results of each scale were recorded on a separate sheet of Performa.

OBSERVATION, ANALYSIS AND RESULT: 35 community walking spastic diaplegics , cerebral palsied type took part in study,out of that 12 girls and 26 boys with mean age 10.2 ± 4.0 yr.

MOTOR ASSESSMENT SCALE(MAS) : Carr et al (1985) : Poole and whitney (1988); loewen and Anderson (1988) Eight hierarchical measures largely focused on disability, and it is useful in patients with upper motor neuron weakness and popularly used in stroke patients (Carr & Shephard-1987)⁹. A pilot group of 50 normal children , with mean age 8.5 ± 2.2 yr was assessed on MAS to confirm it’s effectivity for Indian children.

Table No. 1 : Results obtained for pilot study of normal children on MAS are as follows:

Activities	Mean score obtained by normal children/ maximum score	% obtained score
Supine to side lying	6/6	100%
Supine to sitting	6/6	100%
Balance sitting	6/6	100%
Sitting to standing	6/6	100%
Walking	6/6	100%
Upper arm function	6/6	100%
Hand function	6/6	100%
Advance hand activity	6/6	100%
Total	48/48	100%

All children have scored maximum on each activities resulted into 100% score. Thus it can be concluded that, MAS is applicable to the children above 6 yrs of age.

Tuffs Assessment of Motor Performance (TAMP): have five Modules under two headings. Scoring is based on Assistance, Approach, Pattern and Proficiency.

The test was given to 50 normal children and results are as follows;

Table No. 2 Module wise score obtained by normal children on TAMP.

Modules	Mean score obtained by normal group/ Maximum score	% of obtained score
Bed Mobility	72/72	100%
Transfer	36/36	100%
Ambulation	48/48	100%
Feeding	36/36	100%
Dressing	120/120	100%
Total	312/312	100%

Thus all children have scored maximum on each module resulted into 100%score .Therefore TAMP could be applied to Indian children above 6yr.

Performance of Cerebral palsy group on TAMP was considered for each module was converted in the percentage score.

Table No. 3 : Comparison of mean % score of CP spastic diplegic on different modules of TAMP.

MODULES	MEAN % SCORE	S.D.
Bed Mobility	91.47%	± 0.067
Transfer	89.52%	± 0.086
Ambulation	74.17%	± 0.071
Feeding	89.05%	± 0.104
Dressing	92.60%	± 0.090
Total	88.74%	± 0.055

In this table, it seen that, if ranking of performance is done, Dressing 92.60 % ± 0.090 has highest and Ambulation 74.17% ± 0.071 got lowest, In CP diplegics, upper limbs are minimal involved than the lower limbs, so they scored high in dressing etc. In Ambulation module also the performance is 74%. The activities of Ambulation and elevation are scored of performance as ability to do the listed activities are not accurately graded rather than gradation of quality accurately.

Table No. 4 : Comparison of mean score of CP diplegic on different activities of Ambulation.

Ambulation activities	Mean score of CP diplegic children	Mean score of Normal children	Difference
Walking	9.29 ± 0.79	12 ± 0.00	Significant
Walking on ramp	8.83 ± 0.95	12 ± 0.00	Significant
Upstairs	8.77 ± 0.97	12 ± 0.00	Significant
Downstairs	8.71 ± 9.96	12 ± 0.00	Significant

Elevation is more difficult than Ambulation. Downstairs appears to be more difficult than upstairs. Walking on ramp is also more difficult. As compared to normal children CP children score is less on Ambulation activity. So difference is significant.

Table No. 5 : Comparison of mean score of CP diplegic on different activities in MAS.

Activities	Mean	S.D
Supine to side lying	4.63	± 0.97
Supine to sitting	5.43	± 0.56
Balance sitting	5.26	± 0.89
Sitting to standing	3.73	± 0.98
Walking	3.49	± 0.78
Upper arm function	5.49	± 0.61
Hand function	5.67	± 0.45
Advanced hand function	3.74	± 0.98
Total	37.43	± 3.08

In this table, it shows that CP children in upper arm function and supine to sit scored high mean. And in Advance hand activity sitting to standing, walking scored low mean. Spastic diplegic child has obvious spasticity in the lower limbs and none in the upper limbs except for fine motor-coordination defects.

In TAMP & MAS, for lower limb balance items are less, so for the quality of Locomotor performance one leg standing and obstacle walking, two activities are added.

Grading: Obstacle walking and one leg standing score is Min. is 0 and Maximum is 4.. Studies by **Steffen et al (2002)** suggests that physical therapist must use age related data when interpreting patient's data obtained on berg balance scale^{3,12,13,23}. So to

established normative value of one leg standing and obstacle walking is obtained from pilot group of 50 children mean age 8.5 ± 2.2 .

Table No. 6: Score obtained by normal 50 children on one leg standing and Obstacle walking as follows :

Activities	Mean of obtained Score / Max. score	% of obtained
One leg stance	4/4	100%
Obstacle walking	4/4	100%
Total	8/8	100%

It shows that all children have scored maximum on each activity resulted in to 100% score

Table No. 7 :Comparison of one leg standing and obstacle walking in CP diplegic children with normal children:

Activities	Mean score of CP diplegic children	Mean score of Normal children	Difference
Obstacle walking	2.46 ± 0.98	4 ± 0.00	Significant
One leg stance	1.17 ± 0.79	4 ± 0.00	Significant

Table No. 9: Gender wise comparison of CP diplegic on MAS & TAMP, on obstacle walking & one leg standing.

Scale	Male	Female	Unpaired Test		Difference is
	Mean S.D.	Mean S.D.	T Value	P Value	
MAS	37.04 ± 3.81	38.40 ± 3.85	-0.383	0.408	not significant
TAMP	276.52 ± 10.88	277.70 ± 10.11	-0.180	0.858	not significant
Obstacle Walking	2.32 ± 1.11	2.80 ± 0.92	-1.211	0.235	not significant
One leg standing	1.12 ± 0.83	1.30 ± 0.68	-0.607	0.585	not significant

There is no Gender wise difference observed on activities of MAS & TAMP, obstacle walking & one leg standing.

TAMP and MAS both are performance oriented scales and some activities having similar contribution of body parts for the performance. Therefore the task analysis of different sub activities of modules in TAMP and activities of MAS with reference to contribute body part control was done and co-related

The CP diplegic children, will make excessive use of whatever righting and equilibrium reactions are present 'above the waist'. they therefore use excessive compensatory movements of head, upper trunk and arms, as the legs and hips are too stiff to take a step. They lack balance and rotation and seem to fall from one leg to other in walking (Bobath 1959). So, CP diplegic children in both activities scores low mean than normal children.

Voluntary Control: is for knowing the control over spasticity (Dr. M.G. Mokashi)²² Grading of voluntary control is from 0 to 4, maximum score for Upper Limb (56) and

Lower Limb (48) and percentage of that taken in consideration.

Table 8. Comparison of voluntary control in CP diplegic children

Voluntary control	Mean with S.D
UL	67.41 ± 8.2
LL	47.41 ± 7.3

In this table it shows that, voluntary control of lower limb has low mean score.

As in diplegics lower limbs involved more than upper limbs.

with each other and found correlated by Pearson correlation / 2-tailed(0.001 level).

DISCUSSION

Equilibrium reactions serve to maintain or regain balance during a shift in the COG^{31,32}. These reactions are affected in spastic diplegic cerebral palsy children and so Ambulation is altered.

Ambulation activities in TAMP and walking activities in MAS shows low score and also Advance hand activities and Feeding shows low score in CP diplegic children. TAMP Correlated with MAS was found to be positive and statistically significant at $P < 0.01$).

Voluntary control of UL correlated with Advance hand activity, Hand function and Upper arm function of MAS and Feeding and Dressing activities of TAMP was found to be positive and Statically significant at ($P < 0.01$).

Dissociation or the ability to differentiate movements between the various parts of body which is lacking in spastic children ,so VC is poor due to stereotypical pattern present in them. **(Karel Bobath)**

Voluntary control of LL correlated with Walking activity of MAS, Ambulation activities of TAMP, Obstacle walking activity was found to be positive and statically significant at ($P < 0.01$).

MAS were constructed to assess stroke hemiplegics wherein UL is more involved than LL whereas CP diplegics have a reverse case. Initiation in ADL a diplegic may resort to UL as a better strategy.

MAS walking seem to be sensitive test. But ambulation including walking is a programmed not mediated at cerebral level while the voluntary control is a non-programmed mode. Therefore the differences are expected to be there. Obstacle walking is more of a task imposed on walking. To me, it is a programmed-non programmed combination on feedback mode where sensory inputs are accounted for.

Coming to UL, ADL need non-programmed control though some ADL may be stored as learnt programmed. Yet their command remains to be voluntary. ULs are more under cerebral control though in equilibrium reactions the component of protective extension of arm is valuable.

CONCLUSION

The above study shows that, time taken for TAMP by normal children was 4 minutes, CP children took 6 minutes .TAMP requires less time and less skills of the Physiotherapist then MAS .Time taken for MAS by normal children was four minutes, CP children took 8 minutes .Time taken to perform on MAS was more, because all children had to perform from

simple to complicated task. For MAS Physiotherapist need to be more attentive. On TAMP CP children scored 88% and on MAS CP children scored 77% .Thus TAMP is simpler than MAS. Voluntary control itself gives sufficient idea about the functional level of UL and LL.

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Conflict of Interest:- There is no conflict of interest

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A Study to Find Out the Effect of Circumferential Pressure on Flexor Carpi Radialis H-reflex in Post Stroke Patients - An Observational Study

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ABSTRACT

Introduction: Hyper tonicity is a common symptom observed following upper motor neuron syndrome. Flexor carpi radialis (FCR) muscle motoneuron reflex excitability can be assessed by evaluating changes in the Hoffman reflex (H-reflex). Increased motoneuron excitability has been postulated to be a contributing factor in causing spasticity (defined as a velocity-dependent increased resistance of the stretch reflex). An indirect measurement of muscle tone is the measurement of motoneuron reflex excitability. This study was conducted to observe the effect of circumferential pressure applied over the spastic flexor carpi radialis, it changes over H reflex amplitude was taken into consideration.

Purpose: To find out the effect of circumferential pressure on flexor carpi radialis H-reflex in patients with post stroke.

Methodology: 10 participants were selected based on inclusion and exclusion criteria. H-reflexes were recorded before pressure application to obtain a baseline value for comparison of data. Then the circumferential pressure was applied over FCR with use of sphygmomanometer for 1 minute and H-reflex was taken with applied pressure and then finally it was taken post pressure. A sphygmomanometer was inflated to 51-60 mmHg to provide the pressure around the forearm.

Outcome measure: H-reflex amplitude.

Data analysis: A one-way analysis of variance with repeated measures was applied to compare pre pressure, during pressure and post pressure measurements against the baseline value. The data was analyzed using the SPSS version 14; ANNOVA was used to analyze the data.

Result: the result showed the F value is non-significant for the current data.

Conclusion: The study suggests circumferential pressure does not significantly decreases the H-reflex amplitude in participants with post stroke.

Keywords: H-reflex amplitude, circumferential pressure, spasticity.

INTRODUCTION

The term Stroke or Brain attack is defined as the sudden loss of neurological function caused by an interruption of the blood flow to the brain.¹ Types of stroke are ischemic and hemorrhagic. Ischemic stroke is the most common type, affecting 80% of individual with stroke while hemorrhagic stroke occurs when blood vessels rupture, causing leakage of blood in and around the brain.¹ Interruption of blood usually occurs because a blood vessel bursts or is blocked by

a clot.¹ Stroke is global health problem. It is second commonest cause of death and fourth leading cause of disability worldwide.² In developed countries, stroke is the first leading cause for disability, second leading cause of death.² In India, the overall prevalence rate for stroke lies between 84 – 262 per 100,000 in rural area⁵ and between 334 – 424 per 100,000 in urban areas.³ Mean age for onset of stroke for men in India ranges from 63-65 years and for women 57-68 years.² Indian studies have shown that about 10-15

% of strokes occur in people below age of 40 years.² Stroke leads to various signs and symptoms, which includes alteration in tone (commonly spasticity), loss of superficial and deep sensations, muscle weakness, abnormal synergy patterns, abnormal reflexes, gait abnormality, altered coordination, difficulty in speech, bladder and bowel dysfunction, speech and swallowing difficulty, problems in perception and cognition.¹ Following stroke, patients have loss of motor, sensory and higher cognitive skills to various degrees which diminish their ability to balance effectively and make necessary postural adjustments.¹ If the part of the brain is injured from a stroke, the information may not be processed well.¹ Hyper tonicity is a common symptom observed following upper motor neuron syndrome. Hyper tonicity & Spasticity words are used interchangeably. Spasticity has been defined classically by Lance as a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes.¹ The prevalence of spasticity after first stroke has been inconsistent, ranging between 18% and 38%.^{3,4,5,6,7,8} In addition, a recent study indicated that prevalence of spasticity in patients with stroke referred to the rehabilitation medicine was 42.4%.⁹ Excessive spasticity needs to be controlled, because it can interfere with functional recovery, and may lead to secondary complications such as contractures and pain.^{10,11} Reflex hyper excitability and soft tissue stiffness have been reported to contribute to increased resistance to passive stretch.¹² A circumferential pressure applied around an extremity and inflated to certain pressures, it provides pressure to peripheral receptors and to agonist and antagonist muscles.¹³ Therapists have postulated that circumferential pressure can decrease muscle tones. The H-reflex is a monosynaptic reflex in which the afferent and efferent arcs consist of a group of afferent fibers from muscle spindles and the alpha-motor axons respectively. It provides a way to assess conduction in the proximal segments of both motor end sensory axons as well as an assessment of the excitability of the anterior horn cell pool.³

AIMS AND OBJECTIVES:

- To evaluate the H-reflex on flexor carpi radialis muscle in post stroke patients before pressure.
- To evaluate the H-reflex on flexor carpi radialis muscle in post stroke patients during

pressure.

- To evaluate the H-reflex on flexor carpi radialis muscle in post stroke patients after pressure.

HYPOTHESIS

Null hypothesis

- There is no significant effect of circumferential pressure on flexor carpi radialis H-reflex in post stroke patients.

Experimental hypothesis

- There is significant effect of circumferential pressure on flexor carpi radialis H-reflex in post stroke patients.

MATERIALS & METHOD

- **Source of data collection :** Physiotherapy centers in and around Rajkot
- **Study design :** An observational study
- **Study population:** Post stroke patients
- **Sampling method :** Purposive sampling
- **Sample size:** 10 patients were included
- **Materials used:** Treatment Table, Pillow, EMG-NCV Instrument (RMS Ep Mk-II, Version 1.1), Spirit, Cotton, Electrode Gel, Adhesive tape, Measuring tap, Pen, Paper, Bipolar Stimulating Electrode , Ground Electrode, Surface Electrodes, Sp hygmanometer, Record or data collection sheet , Consent form.

Inclusion criteria:

- Age: Between 25-65 years
- Gender : Both male and female
- Subjects having unilateral hemi-paresis with Brunnstrom recovery stage 2-4.
- Post stroke patients.
- Ability to understand and follow instructions.

Exclusion criteria:

- Fixed contracture at wrist and elbow joints.
- Subjects taking anti-spastic drugs. (e.g. tizanidine, baclofen, etc)
- Recent injection of botulinum toxin in past <3 months of time.
- Neurological conditions other than stroke.
- Cardio vascular disorder e.g myocardial

infarction, Valve replacement, etc

- Non-consent.

PROCEDURE

The patients were interviewed to collect demographic data including age, etiology; time elapsed from the onset of condition and affected side etc. Written consent was taken. Before testing commencement, all patients were asked to rest on the bed with shoes removed for 5 minutes and remain comfortable and relaxed. To provide a quite testing environment, all tests were performed in a close quite room with natural light from windows. All the patients were asked to empty their bladder prior to testing. The room was electrically shielded and earth grounded for H-reflex measurement. The electrophysiological data was collected from the affected side. The motor nerve conduction study was performed first to get the maximum compound motor action potential and to get the best stimulating and recording site. Subjects were positioned in supine with elbow extended and then H-reflex recording was taken before the application of pressure for baseline measurement. A sphygmomanometer cuff was applied at the forearm of affected side. A sphygmomanometer cuff was inflated to 51-60 mmHg to provide pressure around the forearm. H-reflex recordings were taken during and after 1 min of application of pressure.

• METHOD FOR MOTOR NERVE CONDUCTION STUDY:

Position of patient: Supine lying with elbow extended and forearm in supination.

Electrode placement:

Recording active: Electrode was positioned over the belly of the flexor carpi radialis (FCR). This site is located at one-third distance from the medial epicondyle of humerus to the radial styloid process of radius.

Recording reference: Positioned over the brachioradialis muscle or 3 cm distal to recording active electrode.

Ground electrode: The ground electrode was placed anywhere between stimulating and recording electrode.

Bipolar stimulating electrode: The cathode placed over the median nerve at the antecubital fossa with the anode proximal. By using Bipolar-stimulating electrode, supramaximal stimulation was given over the median nerve until the maximum compound motor action potential (CMAP) was received.

Fig 1: Shows the placement of electrodes and stimulating sites.

Instrumentation Parameters:

Sweep speed: 5 ms/div

Sensitivity: 200-500 μ v/div

Filter setting: 5 Hz- 3 KHz



Fig 1 : method of MNCV

METHOD FOR H-REFLEX

The H-reflex was elicited in the FCR muscle of the affected side. The H-reflex in FCR muscle has been commonly employed in studies of H-reflex in the upper limb, and can be reliably evoked and measured.

Position of the patient: Supine lying with elbow extended and forearm in supination.

Electrode placement:

Recording active: Electrode was positioned over the belly of the Flexor carpi radialis (FCR). This site is located one-third the distance from the medial epicondyle of humerus to the radial styloid process of radius.

Recording reference: Positioned over the brachioradialis muscle or 3cm distal to recording active electrode.

Ground electrode: The ground electrode should

be placed anywhere between stimulating and recording electrode.

Bipolar stimulating electrode: The cathode was located over the median nerve at the antecubital fossa with the anode distal. Sub maximal stimulation was given with a pulse width of 0.5–1.0 ms and the current intensity was slowly increased until the H-reflex maximize with an absent or minimally present FCR compound motor action potential (CMAP).

Figure 2 and 3 shows the placement of electrodes and method for the H-reflex taken before and during pressure application

Instrumentation Parameters:

Sweep speed: 5 ms/div

Sensitivity: 200-500 µv/div

Filter setting: 5 Hz-3 KHz



Fig 2: H-reflex before pressur,

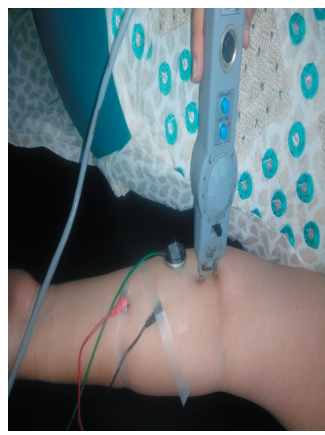


Fig 3: H-reflex during pressure

STATISTICAL ANALYSIS

STUDY DESIGN: An observational study.

A SPSS version 14.0 windows statistical program was used for all data analyses. Ten H-reflex amplitudes (peak-to-peak measurement) were averaged for the baseline condition and for during and post pressure application. Separate one-way analyses of variance (ANOVAs) for repeated measures were used to evaluate changes in the H-reflex amplitude across test conditions.

RESULT

The below figure 4 shows number of patients and distribution of age in treatment group. The mean for the age group is 55.9 years and standard deviation is

4.24 years.

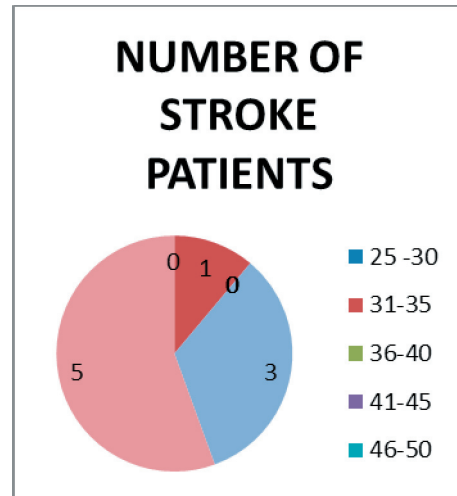


Fig 4: age distribution graph (in years)

The below figure 5 shows mean and SD for the pre, during and post H-reflex amplitude.

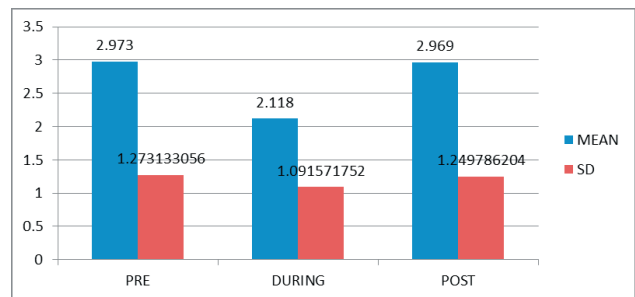


Fig 5: graph for mean and SD for H-reflex amplitude (mV)

The ANNOVA shows the none significant value of P i.e. 0.2083. ANNOVA states that the data are sampled from populations with identical SDs. This assumption is tested using the method of Bartlett. The data are sampled from populations that follow Gaussian distributions. This assumption is tested using the method Kolmogorov and Smirnov. F value obtained for the current data is 1.663.

DISCUSSION

Study was conducted to know the effect of circumferential pressure on spasticity. This study shows that circumferential pressure around the forearm does not significantly decreases the H-reflex amplitude. Circumferential pressure applied around the FCR reduced the motor neuron excitability in post stroke patient, but this reduction in excitability does not last till 1 minute post pressure. It was noticed that during the application of pressure there was

significantly decrease in H-reflex amplitude. But when the H-reflex amplitude was taken 1 minute post pressure, it seemed to have value near to baseline H-reflex amplitude. It is an arduous task to decide, which mechanism is primarily responsible for the reflex variability observed in this study. The application of continuous pressure around a limb activates a wide spectrum of afferents and spinal circuits.

J. Agostinucci et al in 2009 studied the effect of circumferential air splint on soleus stretch reflex during voluntary ramp planter flexion, which showed that the circumferential pressure technique may not be as efficacious in reducing muscle hyperactivity but also stated that circumferential pressure does not affect everyone in the same way when muscle contraction and movements were a condition.¹⁴

Limitation for the study was small sample size, the particular phase that is acute, sub acute or chronic individually was not considered and type and site of lesion was not considered.

As a further recommendation it can be stated that if circumferential pressure applied around the FCR and the movement is facilitated in upper limb along with the pressure application, the result may vary for the change in H reflex and can also be conducted with large sample size.

CONCLUSION

The study concluded that circumferential pressure does not significantly decrease the H-reflex amplitude when taken post pressure.

Clinical Implication: For the clinical purpose it can be useful by applying continuous circumferential pressure to reduce the spasticity.

Source of Fund: Instrument of EMG-NCV provided by Shree K.K. Sheth Physiotherapy College, Rajkot

Ethical Clearance: Taken from Shree K.K. Sheth Physiotherapy College, Rajkot

Conflict of Interest: Nil

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To Study the Cognitive Performance in Middle Aged Obese Males and Females

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ABSTRACT

Introduction: Many studies have been done over the years to shown the effect of obesity on cognition. But no study has so far documented which gender is more affected. The purpose of this study was to determine the cognitive performance in middle aged obese males and females. **Method:** A sample of 60 subjects were taken in the study and purposively divided into 2 groups: Group 1(30 males) and Group 2 (30 females) with a mean age of 49 years. Body Mass Index (BMI) and Waist to Hip Ratio (WHR) were measured as indices of obesity. Various cognition tests of different domains were administered. **Results:** t-test and regression analysis were used to analyze the data. Finger Tapping Test and Delayed Verbal Recall Test were found to be significantly affected more in females than males. **Conclusion:** Cognitive performances of females were found to be more affected in the presence of obesity as compared to the males.

Keywords: Obesity, Cognitive Performance, Cognitive Measures, Middle Aged.

INTRODUCTION

Obesity is a significant health problem and its rising prevalence in many developing countries and societies is leading to rapid social transitions, such as indigenous peoples.¹ According to WHO, the prevalence rates of obesity and overweight in middle aged men and women (age 45-59) is nearly 80%.⁴ Moreover if obesity continues to increase at the present rate, projections indicate that more than 2.3 million adults will be obese by 2015.⁴ In addition to the rising prevalence of obesity and its associated risk factors, many researches had done over the years to determine the effect of obesity on cognitive performance and found the significant relation between them. So far it has not been documented which gender is more affected. Hence, the purpose of the study is to determine the cognitive performance in middle aged obese males and females.

AIM AND OBJECTIVE: To find out whether there exist any relationship between obesity and cognitive performance for middle aged males and females.

METHODOLOGY

Research Design- Observational Study

Inclusion Criteria

- Both males and females are included in the study.
- Age group 45-55 years.¹
- BMI should be in a range of 30.0-34.9kg/m² (Obese class I)¹
- Waist to hip ratio >0.90 in males and >0.85 in females.¹
- Should understand verbal command/English
- Only sedentary working professionals are considered for the study.³

Exclusion Criteria

- Any history/diagnosed case of musculoskeletal disorder which would affect the outcome of study.²
- Any history/diagnosed case of neurological or psychiatric disorder which would affect the outcome of study.²
- History of traumatic brain injury.²
- History of drug/alcohol addiction.²

Outcome Measures: Mini Mental State Examination, Finger Tapping Test, Trail Making Test, Clock Draw Test, Delayed Verbal Recall, Category Fluency test.

PROCEDURE

A total 60 subjects (30 males and 30 females) who met the inclusion criteria were recruited from the local community with the age group between 45-55 years. Informed consent was signed prior the study. Body Mass Index and Waist to hip Ratio were measured as indices of obesity. Mini Mental State Examination was obtained for the Global cognition. In addition to this, five different domains of cognition were considered and one test of each domain was administered. Individual reading was obtained for each subject.

- **Motor Speed- Finger Tapping Test**

Subjects were in a sitting position and were asked to press the Space Bar with their right index finger as many times as they can in 10 seconds. They do this once for practice, and then there were three test trials. The test was repeated with the left hand. The score was the average number of taps, right and left.⁴

- **Attention- Trail Making Test**

It consists of two parts, each with 25 circles distributed over a white sheet of paper. In Part A the circles are numbered from 1 to 25. Subject was required to draw a line connecting the circles in numerical sequence as quickly as possible. Part B includes numbers from 1 to 13 and letters from A to L. Subject was required to alternate between numbers and letters as he proceeds in ascending sequence. The score was obtained as the number of seconds needed to finish each part.⁵

- **Executive Function- Clock Draw Test**

Subject was given a sheet of paper with a large pre-drawn circle on it and was instructed to draw numbers in the circle to make the circle look like the face of a clock and then draw the hands of the clock to read 10 after 11. Scoring was done based on the six-point scoring scale. Higher scores reflect a greater number of errors and more impairment. A score of ≥ 3 represents a cognitive deficit, while a score of 1 or 2 is considered normal.⁶

- **Memory- Delayed Verbal Recall**

12 words list of any category (flowers, fruits, animals, body parts, parts of house, furniture) was given to subjects and instructed to read it out and learned it and then presented either verbally after 25 min. scoring was made on the basis of correct recall responses.⁷

- **Language and Comprehension- Category Fluency Test(Animal Naming)**

Subjects were instructed to orally generate exemplars of animals within a 60-second time period. Responses were recorded, and the dependent measure was the total number of correct animal's named. A score of ≥ 14 was considered normal.²



Subject performing Trail Making Test

RESULT

Data was analyzed using t- test for two independent variables to find out the significant difference between the two groups. Further, regression analysis was administered to find out the effect of independent variable (BMI, WHR) on dependent variables (Cognitive Tests)

Subjects were divided into two groups, Group 1 i.e. Males (N=30) and group 2 i.e. Females (N=30). Mean Age for both the groups was found to had a non-significant difference ($p > 0.05$). Mini Mental State Examination, Trail Making Test Clock Draw Test and Category Fluency Test showed non-significant difference in both the groups ($p > 0.05$).

However, Finger Tapping Test for both the Right and Left hand found to be significantly affected more in females than males ($p = 0.05$). Similarly, Delayed Verbal Recall Test was found to be significantly affected more in females than males ($p = 0.01$).

With regression analysis it was found that BMI had significant effect on MMSE (47% in males, 32% in females), Trail Making test Part I (75% in males and 25% in females) and Part II (47% in Females) and WHR was associated with Category Fluency test (14% females).

Comparison of dependent variables between males and females subjects

Variables	Males (N=30)		Females (N=30)		t-value
	Mean	Std Deviation	Mean	Std Deviation	
Mini Mental State Examination (MMSE)	21.20	1.297	20.67	0.994	1.787 ^{NS}
Right Finger Tapping Test (RFTT)	37.94	2.828	36.24	2.071	2.655 ^{**}
Left Finger Tapping Test (LFTT)	28.73	1.954	25.71	2.752	4.887 ^{**}
Trail Making Test (TMT): Part I	85.57	4.967	86.67	4.663	0.884 ^{NS}
TMT: Part II	181.7	10.1	183.03	9.034	0.528 ^{NS}
Clock Draw Test (CDT)	3.23	0.898	3.53	0.90	1.293 ^{NS}
Delayed Verbal Recall (DVR)	8.53	1.306	7.87	1.042	2.186 [*]
Category Fluency Test (CFT)	8.63	1.829	8.30	1.535	0.765 [*]

NS= Non Significant

* Significant at 0.05 level

** Significant at 0.01 level

DISCUSSION

The purpose of this study was to examine the cognitive performance in middle aged obese males and females. For this, 60 subjects were recruited and purposively divided into two groups i.e. Group 1 (30 males) and Group 2 (30 females). Obesity was measured with the help of Body Mass Index (obese class I was taken into consideration) and Waist to Hip Ratio. Mini Mental State Examination was done for global cognition. Other than that, 5 different domains of cognition were taken and 1 test of each domain was administered. The results of this study suggest that females demonstrate decreased cognitive performance on specific measures in the presence of obesity.

It had been seen that Mini Mental State Examination (MMSE) which used to measure the global cognition, Trail Making Test (TMT), Clock Draw Test (CDT) and Category Fluency Test (CFT) used for attention, executive function and comprehension respectively showed non-significant difference between the two groups ($p > 0.05$). Thus,

both the groups (Males and Females) had impaired attention, executive function, comprehension and global cognition at merely on equal level.

Past researchers had assumed that the diet-induced changes in hippocampal neuronal plasticity may affect the memory and the global cognition. The hippocampus is a brain region critical for learning and memory. They found that there was an impact of both obesity and high carbohydrate diet in promoting cognitive decline.⁹

Also, it had been seen that the Finger Tapping Test for both the right and the left hand and Delayed Verbal Recall were found to be significantly affected more in females than in males ($p=0.05$). One possible reason for this could be a positive association of obesity and dementia. Obese people (BMI > 30) had a 74% increased risk of dementia, while overweight people (BMI 25.0-29.9) had a 35% greater risk of dementia when compared with those of normal weight (BMI 18.6-24.9).¹⁰

It had also been seen that Body Mass Index (BMI) as an independent variable was found to had a significant effect ($p=0.01$) on Mini Mental State Examination (47% in Males and 32% in Females) and on Trail Making Test: Part I (75% in Males and 25% in Females) and Part II (47% in Females). It

could be due to the positive association of BMI and the brain volume. An increased BMI would lead to greater white matter volume and decreased gray matter volume causing hyper-intensities in the brain region which in turn results in decreased cognitive performance.⁸

Hence, it can be stated that the obesity had a significant effect on cognition and females were shown to be more affected than males.

CLINICAL RELEVANCE

As it was observed that obesity has an effect on the cognitive performance of both males and females, therefore, weight reduction approaches can be prescribed so that the vicious cycle break off. Also, females can be targeted for the therapy as it was seen more in female group.

LIMITATION OF STUDY

- Sample size is small.
- The study is done only on sedentary working professional.
- Years of obesity was not considered.

SCOPE FOR FUTURE RESEARCH

- More than one test for each cognitive domain can be used for more effective analyses.
- Effect of other metabolic syndrome on cognition can also be incorporated.

CONCLUSION

The study concluded that with the increase in the obesity, the cognitive performance decreases. It showed the significant effect on both the groups, but females were found to be more affected than males.

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A Study to Find Out Relationship of Cognition and Functional Performance with Balance in Post Stroke Patients- An Observational Study

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ABSTRACT

Introduction: Stroke or brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. It is associated with various neurological signs & symptoms. Clinically, a variety of focal deficits are possible, including changes in the level of consciousness and impairments of sensory, motor, cognitive, perceptual, and language functions. All impairments generally lead to balance problems. This study explored the relationships between the cognition and balance as well as functional performance and balance of patients with stroke.

Aim of the Study: To find out the relationship of Cognition and Balance as well as Functional Performance and Balance in post stroke patients.

Method: This study was carried out in physiotherapy OPDs in and around Rajkot city. Total 25 subjects of stroke were selected aged between 25 – 65 years. They were selected according to inclusion & exclusion criteria and written consents were taken. Subjects were assessed for Mini-mental status examination for cognition, Functional independence measure for functional performance, Berg balance scale for balance after stroke incidence.

Data Analysis– Data were analysed using SPSS 14 software by Sperman’s Correlation Coefficient .

Result– Statistically significant Relationship of cognition, functional performance and balance in post stroke patients. P value was found 0.01, which shows the statistical significance.

Outcome Measure– Mini–Mental State Examination (MMSE), Functional Independence Measure (FIM), Berg Balance Scale (BBS).

Conclusion– There was a significant relationship Cognition and balance as well as Functional Performance and Balance in post stroke patients.

Keywords- Stroke, Cognition, Functional Performance, Balance.

INTRODUCTION

Stroke or brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain.¹ Ischemic stroke is the most common type, affecting 80% of individual

with stroke.¹ Hemorrhagic stroke occurs when blood vessels rupture, causing leakage of blood in and around the brain.¹ Stroke leads to various signs and symptoms which includes alteration in tone, loss of superficial and deep sensations, weakness, abnormal synergy patterns, abnormal reflexes, altered coordination, impaired balance, speech and swallowing difficulty.¹ In India, the overall prevalence rate for stroke is lie between 84 – 262 per 100,000 in ruler area and between 334 – 424 per 100,000 in urban areas.² Indian studies have shown that about 10-15 % of strokes occur in people below

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age of 40 years.³

Decline in functional performance, gait, balance and cognition are common among aging population. Such a decline could significantly affect their performance during activities of daily living.⁴ Cognitive function has previously been related to fall risk in long-term care environments. Although cognitive loss generally makes rehabilitation more difficult for the healthcare team, Morghen et al. recently reported that persons with moderate to severe cognitive impairments were often able to ambulate independently 1 yr after total hip replacement.⁵

Mobility limitations and cognitive impairments, both common with aging, reduce levels of physical and mental activity, are prognostic of future adverse health events, and are associated with an increased fall risk. Importantly, the link between cognitive impairment, mobility limitations and the tendency to falls is recognized in the literature.⁶ Apart from age, osteoporosis, previous fractures, and falls are independent risk for hip fractures. Side of the fractures is positively correlated with the side of hemiparesis.⁷

Dysfunction of balance control is one of the most common physical impairment observed after stroke. Balance problem is associated with reduce ambulatory function and restricted social interference.¹ Impaired balance has been implicated in the poor recovery of activities of daily living and is related to incidence of falls between 23% and 50%. Falls are the number one medical complication after acute stroke.⁸

Cognition is the act or process of knowing, including, awareness, reasoning, judgment, and memory.¹ cognitive deficits, physical and emotional disturbances as well as social support affect functional recovery⁹

For Cognition: The Mini-Mental State Examination (MMSE) or Folstein test is a sensitive, valid and reliable 30-point questionnaire that is used extensively in clinical and research settings to measure cognitive impairment. It is commonly used in medicine and allied health to screen for dementia.¹⁰

For Balance : In 1995 Berg K et al, found the reliability of Balance scale at Center for Gerontology and Health Care Research, Brown University, USA in elderly residents with stroke. Before that in 1989 it was used with 38 balance items in the scale.¹⁰The research

supported the use of Balance Scale and so it named Berg's Balance Scale.¹⁰The scale consists of 14 items requiring subjects to maintain positions or complete movement tasks of varying levels of difficulty.¹⁰

For Functional Performance : D. Kidd, in 1993 proved the reliability and validity for FIM. FIM is comprised of 18 items, grouped into 2 subscales - motor and cognition. The Functional Independence Measure (FIM) scale assesses physical and cognitive disability. This scale focuses on the burden of care - that is, the level of disability indicating the burden of caring for them.^{1,10}It is used to measure the patient's progress and assess rehabilitation outcomes. This scale is useful in clinical settings of rehabilitation.^{1,10}

AIM & OBJECTIVES

To assess the relationship between cognition and balance in post stroke patients.

To assess the relationship between functional performance and balance in post stroke patients.

HYPOTHESIS

Null Hypothesis: There is no significant relationship of cognition and functional performance with balance in post stroke patients.

Alternative Hypothesis: There is significant relationship of cognition and functional performance with balance in post stroke patients.

METHOD

25 subjects were taken in this observational study ageing from 25-65yrs. Among these included both male and female gender from various clinical setup. Convenient sampling was done and the subjects were informed about the goal of the study. Also, informed consents were taken from the subjects. They underwent general screening and then followed by the tests for inclusion criteria and exclusion criteria.

Inclusion criteria: Age between 25 years to 65 years.

Gender : both male and female.

Ischemic and hemorrhagic types of stroke.

Patients with acute, sub acute and chronic stages of stroke

Exclusion criteria: Any surgeries in low back

and lower limbs.

Any recent musculoskeletal injuries like fractures, dislocation, joint instability or any soft tissue injuries.

Sever Communication problem.

Blurred vision, vestibular system dysfunction.

Patients with other form of neurological dysfunction. e.g. Parkinson’s disease, multiple sclerosis etc

Cognitive function of the subject was assessed by Mini-Mental Status Examination test. MMSE tests the individual’s orientation, attention, calculation, recall, language and motor skills. Each section of the test involves a related series of questions or commands. The patient receives one point for each correct answer and can receive a maximum score of 30 points. A score below 20 usually indicates cognitive impairment.¹⁰

Functional performance of the subject was assessed by Functional Independence Measure. FIM score was taken on the level of assistance required for an individual to perform activities of daily living. The scale includes 18 items, of which 13 items are physical domains based on the Barthel Index and 5 items are cognition items. Each item was scored from 1 to 7 based on level of independence, where 1 represents total dependence and 7 indicates complete independence. Possible scores range from 18 to 126, with higher scores indicating more independence.

Balance of the subject was assessed by Berg Balance Scale. BBS consists of 14 items. A score of zero represents an inability to complete the item and a score of 4 represents the ability to complete the task independently. It is generally accepted that scores of less than 45 are indicative of balance impairment (Berg et al. 1992; Zwick et al. 2000). Each item is scored from 0-4 for a maximum of 56 points.^{7,1} It took 10 – 15 minutes for assessment.¹⁰

RESULTS AND TABLES

Data was analyzed by using SPSS 20 software ,using Spearman’s correlation test. The mean age of both male and female was 54.12 and SD is 4.24.

Table 1: Shows number of subjects and distribution of age in treatment group.

Age Group (Years)	No. of Patients
25-30	1
31-35	2
36-40	2
41-45	1
46-50	1
51-55	3
56-60	7
61-65	8
TOTAL	25
MEAN	54.12
STDEV	4.2426407

Table 2: ** Correlation is significant at the 0.01 level (p value=<0.01)

Measure	Spearman Correlation Coefficient	p value	No. of patients
BBS	.879**	.000	25
FIM	.879**	.000	25

Spearman correlation coefficient between BBS AND FIM is .879 with p = .000 Table 2 shows moderately positive correlation between BBS AND FIM.

Table 3: ** Correlation is significant at the 0.01 level (p value=<0.01)

Measure	Spearman Correlation Coefficient	p value	No. of patients
BBS	.753**	.000	25
MMSE	.753**	.000	25

Spearman correlation coefficient between BBS AND MMSE is .753 with p = .000 Table 3

shows moderately positive correlation between BBS AND MMSE.

DISCUSSION

In this study measure of cognition and balance as well as functional performance and balance were taken to establish the relationship between the above two parameters. It has been hypothesized that MMSE

and FIM would be associated with balance in post stroke patients and the result supports the alternative hypothesis. The scales which have been used for the study are easily applicable to the patients within the short time span, having good reliability and found useful tool to identify the patients who has more problem with balance. However, the cognition and functional performance are not the only factor responsible for balance, other factors need to be rule out.

The results of the present study partly confirm those obtained by the few studies that took into account the impact of perceptual, cognitive, sensory, and motor factors on functional performance. Hutoxi et al 2012 did research on a cognitive impairment in Parkinson's patients and its correlation with freezing gait episode and bradikinesia And found that both associated with cognitive dysfunction .¹¹ Regression studies conducted by Lincoln et al took into account perceptual, motor, and cognitive deficits simultaneously in predicting the score on the ADL, and they came to the conclusion that perceptual deficits had little impact on the ADL. These studies show that it is difficult to obtain a clear picture of the relative and simultaneous impact of motor, cognitive, and perceptual sequela on functional performance.¹²

There was also some study that shows low corelation between the functional performance and balance. Rushikesh K. Joshi conducted a study on Relationship of executive function , educational status and quality of life with the functional balance in older adults and found that Executive function and functional balance showed a low correlation. This means that higher the executive function, better will be the functional balance of the individual. Moreover, educational status also affects the functional balance of the individual¹³

Limitation of the study :. Type and site of lesion was not considered. Duration of stroke was not taken into consideration.

Clinical implication: MMSE,FIM,BBS are easily applicable tool and can be applied within minutes. Patients with relative low scores can be advised to be careful or to take further inpatients rehabilitation.The process of cognitive rehabilitation involves assessment of cognitive functions, identification of specific areas of impairment, goal setting and institution of

appropriate rehabilitation techniques.

Further recommedication :Combine this variable to other . Study can be done on specified stage of stroke, eg: patients only in sub-acute or chronic

CONCLUSION

MMSE and FIM are able to explain the balance in post stroke patient. There is significant relationship between cognition and balance as well as functional performance and balance. Cognition and functional performance are some of the factors responsible for balance in post stroke patients and might contribute to balance and balance related problems.

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Sniff Nasal Inspiratory Pressure in Healthy Individuals in Ahmadabad

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ABSTRACT

Introduction: Conventional method to assess inspiratory muscle strength is performed using mouth pressure measurements obtained during maximal inspiratory effort against an occlusion for at least 1 sec (P_Imax).¹ Sniff Nasal Inspiratory Pressure (SNIP) is an accurate and noninvasive approximation of esophageal pressure swing during sniff maneuvers. Though it underestimates inspiratory muscle strength in some subjects, since SNIP is noninvasive and is easier to perform than P_Imax, it can be considered as the first simple test to assess inspiratory muscle weakness. SNIP and P_Imax may reflect the different aspect of inspiratory muscle function² and it is reported that activity and strength of diaphragm is better evaluated by SNIP than P_Imax.^{3,4,5} SNIP can be used to measure inspiratory pressure in patients with neuromuscular or musculoskeletal disease in whom it is impossible to measure VC and P_Imax.⁶

Aim: To determine normal values of sniff nasal inspiratory pressure for healthy individuals in ahmadabad

Methodology: Cross-sectional observational study was carried out on 100 randomly selected healthy subjects aged between 18 to 40 years (43 males & 57 females) who were either student or staff of Govt. physiotherapy college, Ahmadabad and fulfilled the inclusion and exclusion criteria. SNIP was measured using Micro Respiratory Pressure Measurement (Micro RPM) device. Data analysis was done using Microsoft excel-2003. Mean and SD were calculated.

Results Mean and SD values of SNIP are 55.0±28.9 cm H₂O for men and 38.0±20.0 cm H₂O for women. The mean SNIP is significantly lower for women than for men.

Concluion & Clinical Significance: The present study provides useful normative data for assessing sniff nasal inspiratory pressure in Ahmadabad population which may be used as an additive tool to measure inspiratory muscle strength in future.

Keywords: Sniff nasal inspiratory pressure, inspiratory muscle strength, micro respiratory pressure measurement device. Maximum Inspiratory Pressure (P_Imax).

INTRODUCTION/BACKGROUND

The strength of inspiratory muscles can be assessed either by volitional or by nonvolitional tests. The volitional tests are simple, portable and inexpensive. But their main limitation lies in their dependence on maximal voluntary neuromuscular activation, which is difficult to ascertain in practice. In contrast, the cortical motor command is bypassed

by nonvolitional tests such as phrenic nerve magnetic stimulation.⁷ It offers the most reliable measure of diaphragm contractility, but is not widely available because it requires expensive equipment and it may overestimate the diaphragm strength that is actually available to the patient in case of upper motor neuron lesions.⁸ Thus, notwithstanding their limitations, volitional tests remain on the first line and must be best exploited.

Maximum inspiratory pressure (PI,max) is the classic volitional test of inspiratory muscle strength, which is uncomfortable for many subjects and results prone to important variations and low results reflect not only inspiratory muscle weakness but lack of motivation and /or coordination of patient. Moreover, several independent variables like difference in the technique used, type of mouth piece used and time taken to learn the maneuvers and level of motivation explain the variations in results.

The sniff is an alternative manoeuvre that is more natural and easier for most subjects. During a maximal sniff, there is strong activation of the diaphragm and of the scalene muscles.^{9,10} Thus, the sniff has proved valuable to assess diaphragm strength using transdiaphragmatic pressure (sniff Pdi), or global inspiratory muscle strength using oesophageal pressure (sniff Poes).^{3,11} More recently, the method of sniff nasal inspiratory pressure (SNIP) was proposed as a noninvasive test of inspiratory muscle strength.¹² This very simple procedure consists of measuring peak nasal pressure in one occluded nostril during a maximal sniff performed from relaxed end-expiration through the contralateral patent nostril. During a vigorous sniff, the nasal valve of the patent nostril collapses and the pressure measured beyond the collapsed segment closely reflects oesophageal pressure and, therefore, inspiratory muscle strength.

MATERIALS & METHODOLOGY

Study design

Cross-sectional observational

Random sampling method was used for data collection. Total 100 healthy subjects whose age was between 18 to 40 years were selected from the staff and students of Govt. Physiotherapy College-Ahmadabad, where the study was carried out.

Inclusion criteria

Normal healthy individuals between 18 to 40 years of age

Exclusion criteria

Subjects having any cardio-respiratory, neuromuscular, musculo-skeletal or cerebro-vascular disease, pregnancy, sinusitis, rhinitis, deviated nasal

septum, or any kind of nasal obstruction and subjects who are competitive athletes

Materials/Equipment used

Micro RPM device, Data collection sheet, Pencil, Sterilized cotton and Chair

Procedure

SNIP was measured using micro RPM device. Nasal plug, which is connected via catheter (made up of polyethylene) to the micro RPM, was inserted into one nostril of the subject, who was sitting on a chair. Choice of Rt./Lt. nostril was decided by each subject. The contra lateral nostril was kept open during sniffing. Each subject was encouraged to relax & breath normally while keeping the mouth closed. Then subject was instructed to take sharp, short sniff with maximum effort from Functional Residual Capacity(FRC).¹³All subjects were asked to repeat the same maneuver 15 times (to take into account the learning effect) with interval between each of 30sec.^{14,15,16,17} Auditory & visual feedback was given to each and the best of 15 maneuvers was recorded.



Figure-1 SNIP Measurement

RESULTS

The best of 15 sniff maneuvers of each subject is used to calculate the Mean & Standard Deviation (SD) for men & women. Statistical analysis was done using Microsoft Excel 2003.

Table-1: Mean Age of Males and Females

SUBJECTS	MEAN(yr)	SD(±)
MALES	28.09	6.597
FEMALES	23.05	4.576

Table- 2: BMI values of Males and Females

SUBJECTS	MEAN(kg/m ²)	SD(±)
MALES	21.416	3.252
FEMALES	21.219	3.814

Table-3: SNIP values of Males and Females

SUBJECTS	MEAN (cmH ₂ O)	SD (±)
MALES	78.23	23.43
FEMALES	66.12	19.53

DISCUSSION

The mean values of SNIP in present study are 78.23 ± 23.43 cmH₂O for men and 66.12 ± 19.53 cmH₂O for women.

Uldry and Fitting determined the mean values of SNIP in Caucasian population, aged 20 to 80 years, and reported mean values of 91.0–117.0 cmH₂O for men and 75.5–94.0 cmH₂O for women.¹⁵

Naoto Kamidea at al determined mean values of SNIP in Japanese population, aged 18 to 69 years, were obtained: 76.8 ± 28.9 cmH₂O in men and 60.0±20.0 cmH₂O in women.²

Comparing the values of this study to the Caucasian & Japanese population, the mean SNIP values of this study tended to be lower than Caucasian population for both men & women, while there is no significant difference in values when compared to the Japanese population.

Moreover, lower limits of normal SNIP in this study is 54.8 cmH₂O in men & 46.59 cmH₂O in women. Whereas Uldry and Fitting reported lower limits as 52-78 cmH₂O in men and 47.5-66 cmH₂O in women¹⁵ and Naota Kamidea at al reported lower limits as 32.9 cmH₂O in men and 28.8 cmH₂O in women². Therefore, the lower limits of normal SNIP also tended to be lower in this study population than Caucasian and Japanese population.

So SNIP values below 54.8 cmH₂O in men & 46.59 cmH₂O in women may be considered as indication of inspiratory muscle weakness in this study population.

However, these values are too low for diagnosing inspiratory muscle weakness because, in American

Thoracic Society (ATS)/ European Respiratory Society (ERS) statement on respiratory muscle testing (2002), it is mentioned that SNIP values >70 cmH₂O in men & > 60 cmH₂O in women are unlikely to be associated with significant inspiratory muscle weakness.¹⁸

Harik Khan RI et al investigated determinants of maximal inspiratory pressure and showed that smoking had no effect on P_Imax.¹⁹

Naoto K et al investigated SNIP in healthy Japanese also proved that smoking history had no effect on SNIP value.² So effect of smoking on SNIP was not considered in this study.

A previous study involving Caucasian population found that the SNIP values were related to age in both men & women¹⁵ and that involving Japanese population found that SNIP values were related to age in men & BMI in women².

A study found that SNIP is similar in children & adults, probably due to predominant activation of diaphragm and showed the relative stability of transdiaphragmatic pressure across ages.⁴

It has also been reported that combinations of two non- invasive tests (P_Imax & SNIP) reduces diagnosis of weakness about 20% compared with the either test alone & has higher precision than a single test.¹⁴

LIMITATION

Limited age group & sample size.

Whether the sniff performed properly from the FRC could not be confirmed.

Poorly motivated subjects might have performed submaximal efforts during maximum sniffs.

Subjects were selected from Ahmedabad city only, so the results cannot be generalized for all population.

CONCLUSION

Normative values of SNIP obtained from the present study ranges between 54.8 to 101.66 cmH₂O in Males & 46.59 to 85.65 cmH₂O in Females.

Thus, present study provides useful normative data for assessing inspiratory muscle strength by using SNIP in Indian population.

CLINICAL IMPLICATION

Based on this study, SNIP may be used in combination with P_Imax as an additive tool to assess inspiratory muscle strength and it may provide clinically useful information in patients with pulmonary, neuromuscular & musculoskeletal disorders in Indian population.

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Conflict of Interest - Nil

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Ethical Clearance – was taken

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Relationship of Balance among Three Different Trimester of Pregnancy

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ABSTRACT

Introduction-Pregnancy triggers a wide range of changes in a women's body which includes weight gain, postural changes, hormonal changes joint laxity and musculotendinous strength
Aim and Objective-The purpose was to study the relationship of balance among three different trimester of pregnancy. **Methodology**-90 pregnant women (aged 18-28 years) were tested for their balance using TUG test. Timed Up and Go (TUG) test was performed in first week of second, fifth and eighth month of pregnancy respectively. One Way ANOVA was used to find the differences among groups. **Results**- The result suggest that there is statistically significant differences between TUG score among Group A, B, and C. **Conclusions**- It was concluded that Balance is significantly affected in pregnant women and is more evident as pregnancy progresses.

Keywords – Pregnancy, Balance, TUG score

INTRODUCTION

Pregnancy triggers a wide range of changes in a women's body which includes weight gain, postural changes, hormonal changes, joint laxity and musculotendinous strength^(1,2). Various Anatomical and physiological changes during pregnancy have the potential to affect the musculoskeletal system at rest and during exercise⁽³⁾.

AIM AND OBJECTIVE

The aim was to study the relationship of balance among three different trimesters of pregnancy.

METHODOLOGY

120 pregnant females were approached for the study. Out of which 90 were selected as per inclusion criteria to participate in the study. 30 Subjects were each from first week of second, fifth and eighth month of pregnancy. After proper explanation of the purpose and procedure of study, written consent was taken. Height and Weight were documented from the first prescription when they were diagnosed as pregnant. Verbal description of whole procedure was explained and general assessment was done followed

by the subject to perform Timed Up and Go (TUG) Test. Inclusion Criteria were Pregnant women of the age-group of 18-28 years⁽⁴⁾. Primagravida, Functional Available Range of motion of Lower Limb and Spine Normal BMI- 18.5- 24.9 kg /m². Any diagnosed case of musculoskeletal/neurological/psychological/psychiatric/dermatological deficits or disorder that can affect the study⁽⁵⁾. Vestibular pathologies / infections⁽⁶⁾. Any Systemic illness, Any complications during pregnancy. Post Cryotherapy⁽⁷⁾, Pre-eclampsia⁽⁸⁾, Diagnosed case of Diabetes Mellitus^(8,9) were excluded from the study.

The Timed Up and Go (TUG) test is a functional test which is used for the assessment of Balance. The TUG test will be performed with the subject sitting comfortably in a straight-backed chair (Standard chair with seat height 46cm, arm height 67cm) with her back against the chair and resting her arms. The test incorporates the time that a person takes to rise from a chair, walk three metres, turn around, walk back to the chair, and sit down. A distance of 3 metres (9.8 feet) will be marked with the help of chalk from the initial sitting position of the subject. (Figure 1)

RESULTS

The result suggest that there is statistically significant differences between TUG score among Group A, B, and C.(Table 1)

Graph 1 shows the means of the TUG score of the group A, Group B and Group C, and reveals that the Group C has maximum value as compared to Group A and B.

Graph 2 shows the mean differences of Group A and Group B, Group B and Group C, Group A and Group C and found that the Group A and C have maximum rise when compared to group B and C and Group A and B.

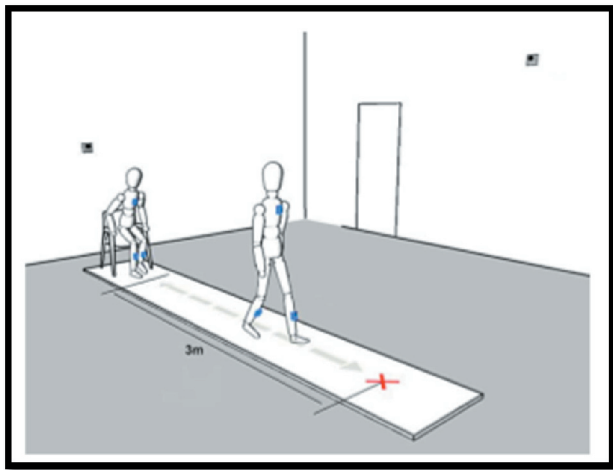
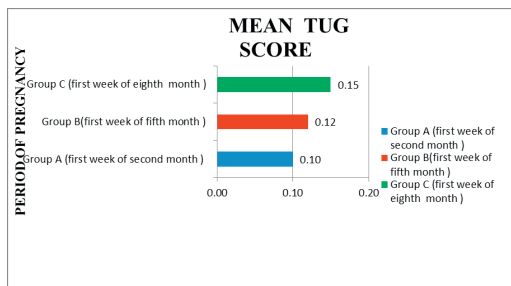


Figure 1- Timed up and Go Test (TUG test)

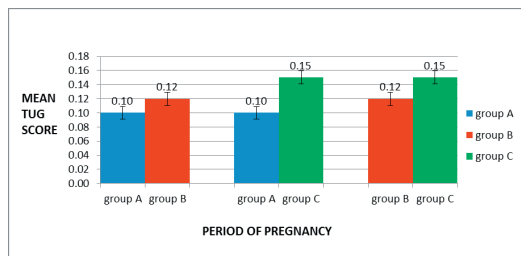
TABLE 1: Comparison Of Tug Score Among Three Groups- Group A =first week of second Month Of Pregnancy ,Group B = first week of fifth Month Of Pregnancy And Group C = first week of eighth Month Of Pregnancy,- One Way Anova

SCORE	GROUP A (N=30)		GROUP B (N=30)		GROUP C (N=30)		F VALUE	t-VALUE		
	MEAN	S.D.	MEAN	S.D.	MEAN	S.D.		A/B	A/C	B/C
TUG_A	.1059	.00741	.1278	.00936	.1518	.00688	249.747**	10.042**	24.858**	11.317**

****Significant At .01 Level**



Graph 1- Comparison of Mean TUG Score Among Group A, B and C.



Graph 2- Comparison of Mean differences among Group A vs Group B, Group A vs Group C, Group B vs Group C.

DISCUSSION

The result of the present study shows that there is statistically significant differences between TUG score among group A, B and C.(Group A- first week of second month , Group B- first week of fifth month, Group C- first week of eighth month of pregnancy).

As it is known that there are changes like increase of body mass, change of body mass distribution^[1], laxity of ligaments, loosening of joints, stretching of the muscles, which lead to the decrease of musculotendinous strength.⁽¹⁰⁾

The hormonal changes leading to pregnancy-related Low Back Pain are thought to be due to increased relaxin and estrogen levels. Relaxin is a polypeptide hormone produced by the corpus luteum in the late luteal phase of the menstrual cycle prior to pregnancy.⁽¹¹⁾ The hormone relaxin has been identified as being responsible for allowing

increased joint laxity during pregnancy and levels of relaxin are highest in the third trimester. Relaxin also has a direct effect on the collagen remodeling. In addition to relaxin, progesterone also contributes to increased joint laxity during pregnancy.⁽¹²⁾

The study done by Berdzik et al suggests that the Total Weight gain during pregnancy is between 9 and 14 kg. Considering segment body mass this weight gain is unique because it is mainly located in the trunk. The mean rate of increase for the lower trunk mass is 0.29 kg per week. It was concluded that there is a posterior displacement of the average location of the COG vertical projection within a base of support in a sagittal plane in late pregnancy. Because the greatest of the mass is in the anterior trunk area it appears that the posture adaptations must also occur in pregnant women to maintain postural stability while standing. The study concluded that there is a posterior displacement of the average location of the COG vertical projection within a base of support in a sagittal plane in late pregnancy. The adaptational change of the COG location in the advancing pregnancy is temporary.⁽¹³⁾ During pregnancy, biomechanical changes compensate for the increase in weight and the ventrally driven centre of gravity. Postural changes include lumbar lordosis, posterior upper body tilt, and increased sagittal pelvic tilt. Alteration of these central mechanics requires lower extremity joints to adapt by absorbing extra force.

The distribution of the mass will depend on the tissues affected in each trimester; in the first and second trimesters, maternal tissues such as blood volume, protein and fat stores predominate, whereas in the third trimester, the products of conception consisting of the fetus, amniotic fluid and placenta prevail.⁽¹⁴⁾

The lower trunk has significantly greater rates of change in weight than all other body segments during the second and third trimesters of pregnancy. The changing shape and inertia of the lower trunk requires postural adjustments such as elevation of the head, hyperextension of the lumbar spine and extension of knee and ankle joints. It has also been documented that there is an increased postural instability during second and third trimesters during pregnancy with increased reliance on visual cues, which indicates reduction in proprioceptive input

during this period.⁽¹⁾

Increasing in the body mass with every month of pregnancy is mainly related to the growth of the fetus, uterus, placenta the amount of amniotic fluid. Taking into account particular parts of the body the greatest increase of the body mass in the second and third trimester of the pregnancy occurs in the trunk area.⁽¹⁵⁾

Standing balance control relies substantively on proprioception (i.e., our sense of body position and movement)⁽¹⁶⁾. Preetha et al suggests that there is a significant increase in the proprioceptive error in pregnant women when compared to the non pregnant control subjects. This could be due to the altered proprioceptive input obtained from the lax ligaments around the ankle joint. The other factor that could alter the proprioceptive input could be due to the mild oedema around the ankle which is more common during the third trimester.⁽¹⁾

Santos et.al compared the ground reaction forces during the stance phase of gait cycle of pregnant women in the third trimester and non-pregnant women, and found a significant reduction in growth rates of the first peak of the vertical component. The fact that a pregnant women takes a longer time period in the first stage of acceptance of the weight may be associated with a lower walking speed, as an adaptations to maintain balance and compensate changes in the position of centre of gravity due to increased load. Another possibility is that the increase in the time of acceptance of weight is a gestational adjustment for better absorb the impact.⁽¹⁷⁾

Several studies have described a multifactorial etiology owing to the faulty foot adaptation occurring in pregnancy. The hormonal component of the etiology involves relaxin, an estrogen dependent hormone shown to relax the sacroiliac joint. Relaxin is known to exert its influence by triggering the collagenolytic system, increasing the water content of connective tissue, and activating fibroblasts in the synthesis of new collagen. During pregnancy, a 10-fold surge of relaxin weakens soft tissue structures and increases joint flexibility. Block et al revealed an increase in subtalar and first metatarsophalangeal joint of motion in pregnant women.⁽¹⁸⁾

FUTURE SCOPE OF THE STUDY

1. Relationship of Balance among last phase of pregnancy and early post-partum.
2. Relationship of Balance within Trimester of Pregnancy.
3. Evaluating Static and Dynamic balance among pregnant women.
4. Relationship of balance among three trimester of pregnancy in same subject.

CONCLUSION

Balance is significantly affected in pregnant women and is more evident as pregnancy progresses.

Clinical Relevance

Caring for pregnant women should emphasize the value of exercise and conditioning during pregnancy for both preventive and rehabilitative management. Appropriate Measures should be taken to improve balance deficits during early pregnancy.

Conflict of Interest- Nil

Source of Funding- Self

Ethical Clearance- Taken From Ethical Committee of Banarsidas Chandiwala Institute of Physiotherapy (BCIP), New Delhi.

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Effect of Flexible Flatfoot on Static and Dynamic Balance in School Going Children

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ABSTRACT

Objective: To know whether there is difference in Static and Dynamic balance in Flexible flatfoot children as compared to Normal arch foot Children.

Design: Experimental study

Setting: I.T.S Paramedical College, India

Participants: 100 students with flexible flat foot on the basis of the survey and 100 students with normal arch foot were compared for static and dynamic balance test. One leg standing test was used to measure the static balance test and Functional reach test was used to measure dynamic balance test.

Results: While comparing the Functional reach test and one leg standing test between the two groups showed insignificant difference but within the age group analysis it showed significant difference in both the groups for Functional reach test and one leg standing test.

Conclusions: As the age increases the stability of the children increased. These findings may have important implications for clinical practice and future research.

Keywords: Flexible Flat foot, static balance test, dynamic balance test, school going children.

INTRODUCTION

Balance is the ability to control the Centre of Mass (CoM) in relationship to the Base of Support (BOS).¹

Duration of single limb stance increases steadily from 32% in 1 year olds to 38% in 7 years old (39% is a typical adult value).² The arches of foot develop in parallel with gait during childhood and continue to form until a child is 8 to 10 years of age.³⁻⁴ According to Tsai LC (2006), Paik-Ling Harrison(2010), Vahid Ghasemi (2012) there is affect of balance in flatfeet adult.⁵⁻⁸

The FRT is a measure of dynamic postural control in children. Various studies suggest that since

FRT challenge the balance in one plane, multiple balance tests may give more complete findings. FRT may be used with other test to assess the static and dynamic balance ability in children. Children with developmental disability (pes cavus/pes planus) experience postural problem that include difficulty with balance and stability domain is smaller in children with flat foot. So, in present study we will examine the effect of flatfoot on static and dynamic balance test.

METHOD

Participants: A sample of 200 children were recruited from different schools of Ghaziabad and modinagar, U.P, India who met the inclusion and exclusion criteria.

Inclusion Criteria

- 1) Both Male and Female
- 2) Age: 5 to 13 years

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- 3) Is able to follow and obey commands.

Exclusion Criteria

- 1) History of any recent trauma.
- 2) Diagnosis of any upper limb, lower limb and spinal disorders.
- 3) Evidence of CNS involvement- Nystagmus, Vertigo.

PROCEDURE

The total 2620 students were screened out from different schools of Ghaziabad and Modinagar. Out of which flexible flat foot were seen in 100 students. 100 students with normal arch were also taken in the study for comparison and 2 Groups were formed.

OBSERVATION METHOD

The foot was graded as normal if the medial arch looked normal. If the arch was only slightly impressed but still visible, it was graded as mild FF but was still categorized as normal. Moderate FF meant that the longitudinal arch was not visible in stance. If the medial arch was convex, with the head of the talus presenting on the plantar aspect of the foot immediately below and anterior to the medial malleolus, it was graded as severe FF. Moderate and severe FF groups were put together to compare with the normal and mild FF groups. When the arch appeared normal on raising the heel, the flatfoot was considered as flexible.⁹

The groups were:

Group A- Flexible Flatfoot children (100 children) and

Group B- Normal arch foot children (100 children)

The children were categorized according the age and sex while performing the test. Two children of same age group and sex were randomly taken from each of the group and were allowed to perform one leg standing test and functional reach test by giving adequate rest interval within the test.

One Leg Stance Tests (OLSTs).¹⁰⁻¹¹ Both legs must be alternately tested, and differences between sides are noted. The client stands on both feet and crosses the arm over the chest, then picks up one leg and

holds it with the hip in neutral and the knee flexed up to 90 degrees. The lifted leg may not be pressed into the stance leg. This stance is scored with a stopwatch. Five 30 second trials are performed for each leg (alternating legs), with a maximum possible scores of 150 seconds per leg. Normal young subjects are able to stand for 30 seconds.

The Functional Reach Test (FRT).¹²⁻¹⁵ The client stands near a wall with feet parallel. Attached to the wall at shoulder height is a yardstick. The client is asked to make a fist and raise the arm nearest the wall to 90 degrees of shoulder flexion. The examiner notes the position on the yardstick. Beginning position is subtracted from end position to obtain a change unit in inches. Three trials are performed. Normative data are available, and the test is reliable. However, the standard error of measurement for this test may be as high as 2 inches.

These test were done for both the groups and data were taken for data analysis.

STATISTICAL ANALYSIS

Independent t- test was used to compare both the group for static and dynamic balance test. The p-value of 0.05 or less was considered significant. The Bonferroni Post hoc analysis was applied to find out the pair wise comparison of Group A and Group B for age (5-7 years, 8-10 years, and 11-13 years). Values were presented as mean± standard deviation. Statistical significance was set at p< 0.05.

RESULTS

Between the group analysis FRT for age group 5-7, 8-10 and 11-13 reflected insignificant difference and between the group analysis of One leg standing test for age group 5-7, 8-10 and 11-13 also reflected insignificant difference.

Functional reach test of different age group 5-7, 8-10, 11-13 years of Group A were taken and the group were compared by the independent t- test and Bonferroni Post hoc test. Result reflected significant difference. Post Hoc (Bonferroni) pair wise comparison showed significant difference between 5-7 v/s 11-13 year and showed insignificant difference between 5-7 v/s 8-10 year and 8-10 v/s 11-13 year.

Table 1: Comparison of age groups 5-7, 8-10, 11-13 years for FRT in Group A

	5-7 year N=45 Mean±S.D	8-10 year N=34 Mean±S.D	11-13 year N=21 Mean±S.D	F value	P-value
FRT	6.58±1.82	7.7±1.96	8.8±1.25	12.938	.000

Pair	P value
5-7 yrs v/s 8-10 yrs	.011
5-7 v/s 11- 13 yrs	.000
8-10 v/s 11-13 yrs	.079

P value ≤0.05 was considered significant.

One leg standing test of different age group 5-7, 8-10, 11-13 years of Group A were taken and the group were compared by the independent t- test and Bonferroni Post hoc test. Result reflected significant difference. Post Hoc (Bonferroni) pairwise comparison showed significant difference between 5-7 v/s 8-10 year and showed significant difference between 5-7 v/s 11-13 year and 8-10 v/s 11-13 year.

Table 2: Comparison of age groups 5-7, 8-10, 11-13 years for OLST in Group A

	5-7 year N=45 Mean±S.D	8-10 year N=34 Mean±S.D	11-13 year N=21 Mean±S.D	F value	P-value
OLST	19.68±8.45	26.40±4.10	25.40±7.25	10.275	.000

Pair	P value
5-7 yrs v/s 8-10 yrs	.000
5-7 v/s 11- 13 yrs	.008
8-10 v/s 11-13 yrs	1.00

P value ≤0.05 was considered significant.

Functional reach test of different age group 5-7, 8-10, 11-13 years of Group B were taken and the group were compared by the independent t- test and Bonferroni post hoc test. Result reflected significant difference. Post Hoc (Bonferroni) pairwise comparison showed significant difference between 5-7 v/s 11-13 year and showed insignificant difference between 5-7 v/s 8-10 year and 8-10 v/s 11-13 year.

Table 3: Comparison of age groups 5-7, 8-10, 11-13 years for FRT in Group B

	5-7 year N=46 Mean±S.D	8-10 year N=32 Mean±S.D	11-13 year N=22 Mean±S.D	F value	P-value
FRT	6.78±2.12	7.53±1.53	8.86±2.215	8.247	.000

Pair	P value
5-7 yrs v/s 8-10 yrs	.311
5-7 v/s 11- 13 yrs	.000
8-10 v/s 11-13 yrs	.051

P value ≤0.05 was considered significant.

One leg standing test of different age group 5-7, 8-10, 11-13 years of Group B were taken and the group were

compared by the independent t- test and Bonferroni post hoc test. Result reflected significant difference. Post Hoc (Bonferroni) pairwise comparison showed

significant difference between age 5-7 v/s 8-10 years and 5-7 v/s 11-13 years and showed insignificant difference between 8-10 v/s 11-13 years.

Table 4: Comparison of age groups 5-7, 8-10, 11-13 years for OLST in Group B

	5-7 year N=46 Mean±S.D	8-10 year N=32 Mean±S.D	11-13 year N=22 Mean±S.D	F value	P-value
OLST	19.95±9.23	26.91±3.61	27.45±2.99	14.025	.000

Pair	P value
5-7 yrs v/s 8-10 yrs	.000
5-7 v/s 11- 13 yrs	.000
8-10 v/s 11-13 yrs	1.00

P value ≤ 0.05 was considered significant.

DISCUSSION

Present study investigated whether there is significant difference in the static and dynamic balance ability in the flatfoot children as compared to normal arch feet children. Functional reach test and one leg standing test were outcome measure.

A study was done by Danhoe B et al 1994¹⁶ and concluded that there was effect of age primarily and the weight did not significantly explain more variance on Functional reach test. A study done by Norris et al. 2008¹⁷ and concluded that age, height and weight does not have any effect on FRT in 5 year old children. Similarly, results found in the present study demonstrated that there is no significant difference in functional reach test between the flatfeet children as compared to normal arch feet children.

A study was done by Paik ling Harrison et al 2010⁴ and concluded that degree of pes planus deformity increases the degree of static postural stability decreases and similarly a study done by Jay Hertel et al 2002¹⁸ and concluded that subjects with cavus feet used significantly larger COP excursion areas than did subjects with rectus feet. However, COP excursion velocities were not significantly different among foot types. The results found in present study demonstrated that there was no change in one leg standing test in flatfeet children as compared to the normal arch feet children.

A study done by Sutherland et al 1980³ concluded that duration of single limb stance increases steadily to 38% in 7 years old children. Similarly, a study done by Assainte et al 1995 and 2005¹⁹ concluded that 7 to 8 years of age information specifying head position in relation to gravity becomes more available to the equilibrium control centres and thus allows the child to use an articulated mode of head control. There may be transient dominance of vestibular processing in locomotor balance at this stage.

A study done by S. Schneiberg et al, 2002²⁰ and concluded that kinematic data from markers placed on the arm, head and trunk showed that younger children used immature pattern of reaching, characterized by increased variability. With increasing age, hand trajectories become smoother and less variable while interjoint coordination become more consistent. Finally trunk displacement and variability also decreased with age. By 8 to 10 years of age children of age showed variability similar to that in adults.

As per development wise consideration there was no change in Functional reach test score and One leg standing test score in flatfeet children of age 5-10 years, 8-10 and 11-13 years.

While comparing pair wise 5-7 v/s 11-13 years showed a change in functional reach test whereas, 5-7 v/s 8-10 years and 8-10 v/s 11-13 years showed

no change in functional reach test score in flatfoot children. Similarly, While comparing pair wise 5-7 v/s 8-10 years showed a change in one leg standing test whereas, 5-7 v/s 11-13 years and 8-10 v/s 11-13 years showed no change in one leg standing test score in flatfoot children.

While comparing pair wise 5-7 v/s 11-13 years showed a change in functional reach test whereas, 5-7 v/s 8-10 years and 8-10 v/s 11-13 and 5-7 v/s 8-10 years showed no change in functional reach test score in normal children. Similarly, While comparing pair wise 5-7 v/s 11-13 years and 5-7 v/s 8-10 years showed a change in one leg standing test whereas, 8-10 v/s 11-13 years showed no change in one leg standing test score in normal children.

Limitations of the Study and Scope of Future Research

The following were the limitation of our study:

- The present study duration was only six month and due to the shortage of time I only visited few schools in and around Ghaziabad. In Future, I recommend performing such studies extensively in a larger area which cover large number of schools (students).

- I have compare only two tests (i.e. FRT and OLST test) in present study. Therefore, in future I recommend to compare with different type of other test like timed battery test, postural sway, multidirectional reach, combination test batteries, functional scale and dual task scale and comparison of sensory and vestibular aspect of balance.

- In present study Flexible flatfoot is compared with normal arch feet children. Therefore, I suggest for further studies to compare flexible flatfoot with rigid flat foot with different set of balance test.

CONCLUSION

From the results of the present study, FRT and OLST value differ in the flatfoot children as compared to normal children but there is no significant difference seen in FRT and OLST in the flatfoot children as compared to normal children Thus, it can be concluded that FRT and OLST value differ in the flatfoot children as compared to normal children but there is no significant difference seen in FRT and

OLST in the flatfoot children as compared to normal children.

In conclusion, there is no effect of FRT and OLST in flatfoot children as compared to normal arch feet children. Within age group comparison of FRT in flatfeet there is difference in FRT in 5-7 years of age as compared to 11-13 years of age of children. There is difference in OLST in flatfeet children in 5-7 v/s 8-10 years of age of children. Within age comparison of FRT in normal arch feet children there is difference in FRT in 5-7 years of age as compared to 11-13 years of age of children. There is difference in OLST in flatfeet children in 5-7 v/s 8-10 years and 5-7 v/s 11-13 years of age of children.

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Conflict of Interest - Nil

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Relationship between Ballet Dancer Turnout and Self Reported Lower Limb Injuries

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Background- Epidemiological studies of ballet dancer's show that 90% of professional dancers and 63% of student dancers have had a dance-related injury at some point in their ballet career. Screening of young and inexperienced dancers is necessary to identify musculoskeletal limitations and potential to injury, especially for those who wish to continue dancing as adults either for leisure or career. The purpose of this current study was to examine the possible association between the amount of compensated turnout and self reported lower limb injuries in ballet dancers.

Objective- To find out the difference between compensated turnouts of injured and non-injured group of ballet dancers and to find out the type of lower limb injuries in ballet dancers.

Method- It was a Descriptive co- relational study conducted on 22 Nonprofessional ballet dancers at Dance schools in Nashik and Mumbai. Each dancer was assessed for Functional turnout, Compensated turnout and Total passive hip external rotation. **Results-** By using unpaired t test we have found significant association between increased compensated turnout and self-reported lower limb injuries. (P=0.0002). **Conclusion-** The results of this study suggest that the dancers who force their turnout beyond their available hip range of motion have an increased risk of injury in lower extremities.

Keywords- ballet dancers, Functional turnout, Compensated turnout

INTRODUCTION

Although ballet is noted for its beauty and grace by audiences, it can be a source of injury and pain for dancers. Epidemiological studies of ballet dancers show that 90% of professional dancers and 63% of student dancers have had a dance-related injury at some point in their ballet career¹. Turnout is one area of research that is being explored in classical ballet. Turnout is a basic ability in ballet required for the execution of dance movement. Ideal turnout is defined as external rotation of both lower extremities so that the longitudinal axes of the feet are rotated 180° away from one another^{2,3}. Movement occurs primarily at the hip joints when turnout is executed properly⁴. According to Thomasen⁵. The minimum requirements to achieve ideal turnout are 70° of hip external rotation bilaterally, 5° of tibial external rotation bilaterally, and 15° of foot external rotation bilaterally. Few dancers are able to achieve ideal turnout without compensations at the pelvis/lumbar spine, knee, ankle, and foot joints. Ideal turnout is classically defined as external rotation of both lower

extremities so that the longitudinal axis of the feet is rotated 180° away from one another (Hamilton et al., 2006; Torres-Zavala, 1998)⁶. Unfortunately, only few dancers are endowed by nature with the ability to achieve ideal turnout (Clippinger, 2005)⁷. Ballet dancers who cannot attain these specific esthetic standards may disregard proper technique with an increased potential for injury.

Compensations made to increase turnout are excessive anterior pelvic tilt or lumbar lordosis⁸; excessive external tibia rotation ("screwing the knee") and excessive subtalar joint pronation ("rolling in")⁹. Consequently, it inevitably damages these joints and has profound effect on the potential for various acute and chronic injuries, particularly at the tibiofemoral and patellofemoral joints (Negus, Hopper, & Briffa, 2005)¹⁰. It is not surprising that 20% of aggravated knee pain was attributed to turnout among ballet dancers (Clippinger-Robertson, Hutton, Miller, & Nichols, 1986)¹¹. Injuries associated with improper turnout occur most frequently at the tibiofemoral and patellofemoral joints⁸. Injuries that have been

associated with excessive foot pronation include Achilles tendinitis, flexor hallucis tendinitis, tibialis posterior tendinitis, plantar fasciitis, bunions, and metatarsal stress fractures¹². Low back pain has been associated with dancers using excessive anterior pelvic tilt to increase turnout angle beyond the turnout enabled by hip external rotation⁸.

Studies also show that many ballet dancers do not have adequate hip external rotation to achieve the ideal turnout position of 180° without making compensations that place them at risk of injury. Compensated turnout is the difference between functional turnout angle and total (left plus right) hip ER ROM. This difference has also been referred to as "non-hip ER" and "below-hip ER." If the ideal anatomical resources are not available because of anatomical limitations and/or lack of training, compensations may develop that may predispose the dancer to acute or overuse injuries.

Screening of young and inexperienced dancers is necessary to identify musculoskeletal limitations and potential to injury, especially for those who wish to continue dancing as adults either for leisure or career. The purpose of this current study was to examine the possible association between the amount of compensated turnout and self-reported lower limb injuries in ballet dancers. Aim of the study was to examine associations between compensated turnout and injury history in nonprofessional classical ballet dancers. Objectives were to find out the difference between compensated turnouts of injured and non-injured group of ballet dancers and to find out the type of lower limb injuries in ballet dancers.

METHOD

It was a Descriptive co-relational study conducted on 22 Nonprofessional ballet dancers (12 with h/o of injury, 10 without any h/o of injury) at Dance schools in Nashik and Mumbai.

INCLUSION CRITERIA

- Age: 14-30Yr (Dancers' turnout may be difficult to influence skeletally after the age of 11-13 when the angle of femoral neck antetorsion is fixed. Any increases in turnout after this age may be the result of elongation of soft tissues or failure to use proper technique.)

- Had at least 1 years of classical ballet training.
- Nonprofessional female ballet dancers (Ballet students were selected over professionals, because of their standardized flexibility due to homogeneous Characteristics)

EXCLUSION CRITERIA

- Participants with unresolved non-serious injuries.
- Musculoskeletal injury that limited full participation in dance classes during the 4 weeks prior to participation in the study.
- Gross postural alignment deviations that could not be corrected with cueing, such as scoliosis, genu valgum, genu varum, or genu recurvatum.
- Neurological or physiological conditions that resulted in modification of their participation in dance class compared with their peers.
- Pregnancy

Distribution of subjects: The subjects were divided into 2 groups with a self-reported history of dance related injury (injured group) and with no self-reported history of injury (non injured group). Injury will be defined as any pain or dysfunction of the lower extremities that impacted the dancer's ability to practice or perform.

PROCEDURE: Each subject was screened for inclusion/exclusion criteria prior to the study. Gross postural screening was performed of each subject with plum line to assess any postural deviation .Outcome Measure used for this study was functional turnout, compensated turnout and total passive hip external rotation.

Measurement of External Hip Rotation: Hip external rotation ranges of motion were measured by the technique recommended by Magee¹³ with the subject in high sitting position. Passive hip external rotation range of motion was measured for each leg. Total passive hip external rotation measurement was obtained for right and left external rotation.



Fig.1. MEASUREMENT OF EXTERNAL ROTATION OF HIP

Measurement of Functional Turnout Angle in Standing: Functional turnout angles were measured in classical ballet positions. Each participant was asked to stand on a large sheet of white paper and to assume each position as they would in a normal class. They were instructed to orient their torso squarely to the front. A tracing was made around the participant's feet. Functional turnout angle is defined as the angle of bisection of the longitudinal axes of the 2 feet, will be measured using a universal goniometer. The longitudinal axis of each foot was drawn onto each tracing through the center of the rear foot and forefoot. The midpoint of the heel was used to landmark the center of the rear foot. The center of the forefoot was marked as the continuation of a line drawn along the second toe (to reflect the position of the second metatarsal). This method was used to minimize alteration from the actual axis in the presence of structural deviations such as hallux valgus or a prominent fifth metatarsal head. The angle obtained from the initial tracing is called the functional turnout angle.

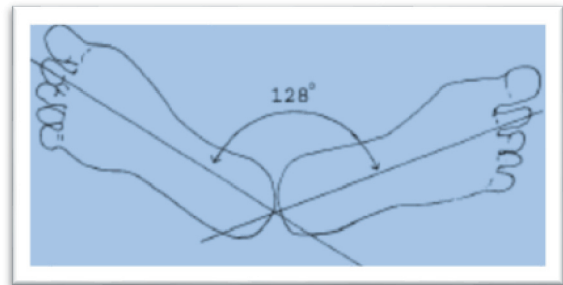


Fig.2 MEASUREMENT ON FUNCTIONAL TURNOUT

Measurement of Compensated turnout angle: The amount of compensated turnout was obtained by calculating the difference between the measured functional turnout position and the total passive hip external rotation range of motion. Turnout was considered compensated when the functional turnout measurement was greater than total passive hip external rotation range of motion. For a dancer to not have compensated turnout means that the difference between the dancer's functional turnout and bilateral hip external rotation was 0 or less.

RESULT

The mean value of each variable will be compared between the injured and non-injured groups using a 2-sample unpaired *t* test. Mean age of ballet dancers for injured was 18.75 and for non-injured group was 17.25. Mean BMI of ballet dancers was 19 and 21 in injured and non-injured respectively.

Table No. 1 Total Hip External Rotation

S.No	Mean	SD	SEM	N	P value	t value	Df	Confidence interval
Injured	89.58	6.89	1.99	12	0.0137*	2.7157	19	95%
Non Injured	100.56	11.58	3.86	10				

*statistically significant

Table no. 1 shows that mean of total hip external rotation of injured was less (89.58) as compared to non injured dancers (100.56). t value was 2.7157 and confidence interval was 95% and the difference between injured and non injured dancers was statistically significant (p= 0.013) with reference to total hip external rotation

Table No. 2 Functional Turnout

S.No	Mean	SD	SEM	N	P value	t value	Df	Confidence interval
Injured	151.67	10.30	2.97	12	0.0176*	2.6005	19	95 %
Non Injured	140.00	10.00	3.33	10				

*statistically significant

Table no.2 indicates that mean of functional turnout of injured was greater than (151.67) as compared to non injured dancers (140.00). t value was 2.6005 and confidence interval was 95% and the difference between injured and non injured dancers was statistically significant (p= 0.0176) with reference to functional turnout.

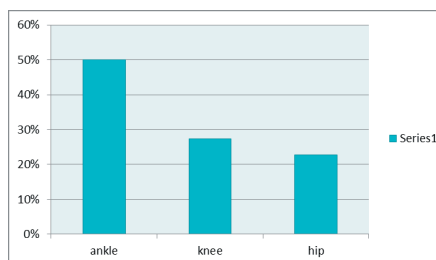
Table No. 3 Compensated turnout

S.No	Mean	SD	SEM	N	P value	t value	Df	Confidence interval
Injured	62.08	11.17	3.23	12	0.0002*	4.5413	19	95 %
Non Injured	37.22	13.94	4.65	10				

*statistically significant

Table no.3 reveals that mean of compensated turnout of injured was greater than (62.08) as compared to non injured dancers (37.22). t value was 4.5413 and confidence interval was 95% and the difference between injured and non injured dancers was statistically significant (p= 0.0002) with reference to compensated turnout.

Graph 1-Frequency of joint injuries:



Graph No. 1 states that ankle joint is most frequently injured joint (50%). Followed by knee(27.27%) and hip(22.72%).

DISCUSSION

The study was carried out to evaluate the relationship between turnout angle and self reported injuries. The study found that the ankle was the most frequently joint, Ryan and Stephens¹⁵ reported that 63% of dances reported injuries throughout their career. In the present study the dancers were instructed to assume the standard first position of functional turnout. No effort was made to position the subjects in technically correct turnout. The compensation to increase turnout was allowed. In classical ballet because of aesthetic premium is placed on 180° turnout. Many dancers will force their turnout beyond available hip range of motion. In this study, all dancers had their functional turnout that exceeded their passive hip range of motion. For example, one of the dancers with injury had a total hip external range of motion of 100° and her functional turnout was 160°. There was difference of 60°. This compensation was made somewhere between hip and ankle.

As the dancer ages, physiologic changes result in bony constraints that limit the available external rotation¹⁶. This correlates with the observation that only borderline improvements in HER have been attained in 16- to 18-year-old elite dancers during a 12-month training period¹⁷. Acetabulum shape and orientation, femoral anteversion angle, neck shaft angle, and tightness of the "Y" ligament of Bigelow are considered important determinants of HER¹⁴. Nevertheless, it has been documented that dancers' femoral version angles do not deviate from those of the general population sufficiently to explain their increased HER¹⁷. Dancers who do not have ideal turnout of the lower extremity may try to "force turnout" by using compensatory strategies along the kinematic chain. This rotator stress can lead to high joint stresses that increase the risk of damaging forces at the back and other lower extremities structure. This encourages biomechanically and esthetically unfavorable compensations such as lumbar hyper extension, anterior pelvic tilt, excessive tibial rotation and excessive subtalar joint pronation (Grossman 2000)¹⁸ producing excessive stress on medial aspect of knee, shin of tibia, ankle and foot (Mitcheli, Gillespie and Walaszeb, 1984; Hamilton, Marshall and Molnar 1992)¹⁹.

Hyperlordosis generates undue stress on the posterior elements of the spine. As for the other mentioned strategies, the augmented torsional forces on these lower extremity joints increase the risk of overuse injury⁸, particularly at the medial aspect of the knee, ankle, and foot. Among positions related to the knee, the most relevant may be genu recurvatum. It is regarded as an esthetic feature of classical ballet. This position may be associated with posterior capsular strain and pain⁸.

When dancers lack sufficient ankle and/or foot plantarflexion for pointe or demipointe positions, they may attempt to force plantarflexion, placing greater stress on the posterior ankle structures. Forcing plantarflexion has also been associated with "sickling," a malalignment at the foot-ankle complex in which the dancer fails to balance correctly on pointe or demipointe positions. "Sickling in" refers to varus alignment of the foot and increases stress of lateral structures of the ankle²⁰.

According to our study ankle is the area which is most commonly injured accounting for 50% followed by knee and hip. Ankle sprain is the most common traumatic injury in dance, including classical ballet and theatrical dance²¹; however, most injuries affecting dancers are considered to be overuse injuries, such as tendinitis and stress fractures.

This clinician recommends that dance instructors reduce the potential risk of injury to dancers by encouraging students to limit their functional turnout to a position that does not markedly exceed the total amount of external rotation present at the hips. Many dancers will never achieve the ideal turnout, yet can still enjoy the practice and performance of ballet.

CONCLUSION

The results of this study suggest that dancers who force their turnout beyond their available hip range of motion have an increased risk of injury in lower extremities. Ankle is the area which is most frequently injured. Dancers should be encouraged to avoid compensated turnout and focus instead on turning out within their range of motion limitations.

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Ethical Adherence: Yes

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Immediate Effect of Chest Physiotherapy in Neonates with Respiratory Problems

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ABSTRACT

Objective: This article aims at making CPT simple, so that it could be incorporated as a routine intensive care procedure in neonates with respiratory problem for managing respiratory ailments.

Introduction: Respiratory problems occur in 4 to 6% of neonates. Chest physiotherapy in the neonatal intensive care unit is associated with taking care of the neonatal lungs^[6]. CPT such as percussion, tapping or vibrating on the chest has been used to clear the secretions from the baby's lungs. Respiratory distress is one of the commonest disorders encountered within first 42-78 hours of life.

Study design: Experimental study

Sampling Method: Randomised sampling

Methodology: Single session study was done on 50 neonates with respiratory problems like IRDS, SBA, MAS, Congenital pneumonia. The contra indications to active CPT were ruled out before starting the intervention. The outcome measures were SPO₂, RR, and RDS score. Pre intervention outcome measures were taken after that intervention in form of active CPT was given and then suction was done. Immediately after the intervention again the outcome measures were recorded. The data was collected and analyzed.

Results: Z test was done to compare the values of SPO₂, RR, and RDS pre and post chest physiotherapy in 50 neonates. It signifies that the p value of pre and post physiotherapy Spo₂ is significant and it suggests that there is improvement in oxygen saturation after giving chest physiotherapy, and the p value of pre and post physiotherapy RR and RDS score is significant which suggests that there is decrease in the respiratory distress after giving chest physiotherapy.

Conclusion: This study suggests that introduction of CPT as an adjunct with ongoing medical treatment improves the oxygen saturation and reduces the signs of distress in neonates suffering from respiratory problems.

Keywords: Chest Physiotherapy, Respiratory Problems, NICU, SPO₂, Respiratory Distress Scoring (RDS) System.

INTRODUCTION

Over the last decade physiotherapy has become an acknowledged and often integral part of the management of newborn infants in Neonatal Intensive Care units (NICU) around the world^[1].

The role of chest physiotherapy in NICU has historically been mainly associated with the care of the neonate's lungs^[2]. Postural drainage, coupled with percussion, vibrations and suction are all

used in the physiotherapy management of neonatal respiratory disorders^[3]

Chest physiotherapy should be ordered by the attending neonatologist in consultation with the unit physiotherapist and nurse. Usual active physiotherapy includes gentle active vibrations and Suctioning.

Respiratory problems occur in 4 to 6% of neonates and account for significant mortality in the neonatal

period [4,5]. Chest physiotherapy (tapping or vibrating on the chest) has been used to clear the secretions from the baby's lungs. Chest physiotherapy (CPT) is thought to facilitate the drainage and clearance of these secretions [6].

The common respiratory problems encountered in neonates are Meconium aspiration syndrome (MAS), Birth asphyxia (BA), Infant respiratory distress syndrome (IRDS), congenital pneumonia [14].

Newborns are obligate nose breathers who can almost simultaneously breathe and swallow until two to three months of age [7]. A newborn infant's ribs are positioned horizontally, and the intercostals muscles are weak, resulting in a predominantly abdominal (diaphragmatic) pattern of breathing. This difference can lead to an increase in both airway resistance and obstruction [8]. Decreased recoil of the infant chest wall increases the possibility of lung collapse in the setting of lung disease. A neonate's lungs are less compliant, but their chest wall is more compliant than that of an adult.

The aims of chest physiotherapy in the newborn infant is to increase the clearance of lung secretions and maintain lung expansion with the potential benefits of

1. Reducing need for ventilatory support,
2. Improving oxygenation,
3. Prevention of endo tracheal tube obstruction, need for endotracheal tube changes and resultant hypoxia, and
4. Prevention of extubation failure [9].

The duration of CPT as well as number of positions employed will be dependent upon infant's condition and tolerance. This will also depend upon the judgment of the practitioner CPT should be used when secretions are not cleared by suction alone [10].

The side lying position is indicated when coarse crepitations are greatest on one side, or unilateral disease is indicated on CXR. Only perform side lying if the infant can tolerate it and avoid excessive neck flexion/ extension [10]. Contra lateral head support should be used. For upper lobe collapse/consolidation, the crib may be tilted to 15-25 degrees

head elevation [11].

Vibrations are given by the fingers of one hand molded to the shape of the baby's chest wall, with contra-lateral thumb support. Vibrations are at a rapid rate (approximately 120 / minute, with minimal compression pressure), and within the baby's tolerance [12].

The physiotherapist's other hand is cupped and supports the baby's head for the duration of treatment. During unilateral vibrations the head should be supported in the physiotherapist palm. Drain only one area per treatment [3].

Suctioning is performed after the use of active gentle vibrations.

Chest physiotherapy is used to prevent or reduce the mechanical consequences of obstructing secretions such as hyperinflation, atelectasis, misdistributions of ventilation, ventilation perfusion mismatch and increased work of breathing [6]. The application of CPT in airway management of adults with various respiratory problems has been shown to improve lung thoracic compliance and cardio respiratory function. However little is known about its effect on neonates [4,10].

MATERIAL & METHOD

Participants: This study was done on 50 neonates, both males and females from the NICU of SSG Hospital, Vadodara. Both pre and full term neonates, receiving oxygen at the rate of 3lit/min were included. Neonates on ventilator, VLBW (<1300gms) and those in whom CPT was contraindicated were excluded. It was a single session study which was completed over a period of one and a half month.

VARIABLES

Active chest physiotherapy in form of Positioning, percussion, gentle vibrations were given with single hand or fingers according to the area, pre physiotherapy nebulisation (using nebuliser with normal saline) was given and suction (using IFT, Suction apparatus) was done during and after CPT as needed.

OUTCOME MEASURES

Oxygen saturation SPO₂ (measured using

pulse oxymeter), Respiratory rate RR (readings on monitor), Respiratory Distress score (RDS) (breath sounds were heard using stethoscope) were taken after the session.

STUDY PROTOCOL

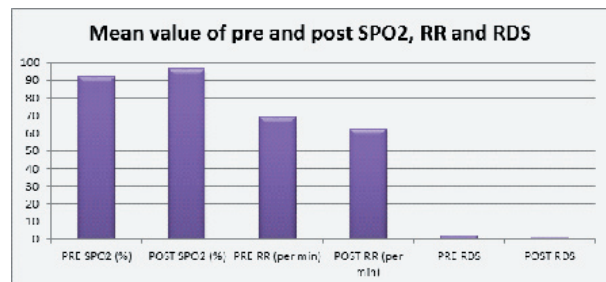
After taking consent from the parent/guardian of the baby the procedure was started. NICU medical management was given to all subjects as per the institutional NICU protocol and additional physiotherapy management was given. Physiotherapy intervention was given in the following order:

Basic details of the baby were taken in the assessment form. The vitals of the patient were taken priorly. There after the child was given nebulisation. Then chest physiotherapy was given which included proper positioning for easy drainage^[12], followed by gentle percussion on the chest, gentle vibrations were given in the expiratory phase usually at every third or fifth expiration because neonates^[10] have a higher respiratory rate as compared to adults so vibration at every expiration is not recommended^[11]. There after suction was done at last using the suction apparatus suction in between chest PT was also done if needed. At the end of the treatment again the outcome measures were noted. The intervention was stopped if any complications arise.

The frequency and rate of CPT was modified according to the condition and tolerance of the neonate.



FIGURE. CHEST VIBRATIONS



Graph: 1 Mean value of pre and post SPO₂, RR and RDS

RESULTS

The total numbers of subjects available for study were 50.

Before initiating the intervention, subjects were assessed for outcome measures. Data was analyzed by Z test.

Observations taken are described in the table and graph below.

TABLE: Showing Mean value of Pre And Post Spo₂, RR, RDS And p values in males and females

N=50						
	PRE SPO ₂	POST SPO ₂	PRE RR	POST RR	PRE RDS	POST RDS
MEAN	92.14	96.34	69.24	62.26	1.98	0.86
SD	2.52	2.08	6.76	5.39	0.76	0.53
p- value	0.000		0.000		0.000	

The above graph and table shows that p value of pre and post physiotherapy SPO₂ is 0.00 <0.05, which is significant and it suggests that there is improvement in oxygen saturation after giving chest physiotherapy.

The p value of pre and post physiotherapy RR and RDS is 0.00 <0.05, which is significant and it

suggests that there is decrease in the respiratory rate and RDS after giving chest physiotherapy and thus reduction in distress.

DISCUSSION

Specific indication for CPT intervention in an NICU should be present before any treatment is begun whether treatment is directed towards solving an

existing problem or preventing a potential problem. The common respiratory problems in neonates admitted to NICU in which physiotherapy has a distinct role are like, retention of secretions, mucus plugging, oxygen dependency, post extubation atelectasis^[13, 14].

In the current study examination of the effects of active CPT on neonates in combination with their routine medical management in NICU as per their protocol was done who were suffering from respiratory problems such as Respiratory distress syndrome, Meconium aspiration syndrome, Birth asphyxia, congenital pneumonia. Examination of effects of CPT was done on the physiological changes such as oxygen saturation, respiratory rate, and neonatal respiratory distress scoring system.

The clinical sign which require physiotherapy concern in such cases is increased mucus production, mucus plugging, tachypnea, and hypoxemia. Medical treatment of neonates with these diseases is supportive and generally includes oxygen therapy, thermal regulation, humidification, nutrition, antibiotic treatment; CPT can also be included as their treatment part. It focuses on assisting airway clearance, improving ventilation, and decreasing work of breathing^[12, 14].

In the current study there is immediate significant change in the respiratory rate, oxygen saturation, and RDS after CPT. Which satisfies the aim of the study. The above graph and table shows that p value of pre and post physiotherapy SpO_2 is $0.00 < 0.05$, which is significant and it suggests that there is improvement in oxygen saturation after giving chest physiotherapy.

The above graph and table shows that p value of pre and post physiotherapy SpO_2 is $0.00 < 0.05$, which is significant and it suggests that there is improvement in oxygen saturation after giving chest physiotherapy.

The p value of pre and post physiotherapy RR and RDS is $0.00 < 0.05$, which is significant and it suggests that there is decrease in the respiratory rate and RDS after giving chest physiotherapy and thus reduction in distress.

Menekes and Britt however stated that position

changes with bronchial drainage may improve the ventilation-to-perfusion relation in obstructed areas of the lungs^[15].

However the use of CPT has also received much criticism, largely as a result of reports of adverse outcomes. Documented adverse outcomes include hypoxemia, bruising, rib fractures and intracranial lesions such as intra ventricular haemorrhage and porencephalic cysts^[16, 17]. In the current study not a single subject experienced any of these adverse effects of CPT. Hence it is recommended to use active CPT in treating such patients.

The value of p ($p < 0.005$) is significant in males as well as female post intervention meaning CPT is effective.

Supporting to some studies this study suggest that CPT have effects on secretion removal, oxygenation and other signs of respiratory problems^[14]. CPT can be introduced as treatment part with the ongoing treatment protocol in neonates with respiratory problems in the NICU^[9, 1].

CONCLUSION

This study suggests that introduction of CPT as an adjunct with ongoing medical treatment improves the oxygen saturation and reduces the signs of distress in neonates suffering from respiratory problems.

Acknowledgement: I thank my parents, husband, my brother for their constant support. I am grateful to all my patients and their parents and wish them a good health in the future. I dedicate my study to them.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: The study is approved by Departmental Research Committee.

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Effect of Neuromuscular Electrical Stimulation with Box and Block Activities vs TENS with Box and Block Activities in Hand Functions of Sub Acute Stroke Patients

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ABSTRACT

Background & Objectives: It has been proposed that stroke rehabilitation relates to the best type of training approach for motor recovery. The objective of this study was to assess, which type of effect is more effective in Neuromuscular Electrical Stimulation with Box and Block Activities vs. Tens With Box And Block Activities in Hand function Of Sub acute Stroke Patient. **Methods:** The subjects were invited to participate in the study. The subjects who met the inclusion criteria were selected. Subjects were divided equally into two Groups. I.e. NMES with Box and Block activities and TENS with box and block activity. The assessment was taken on number of successful trial and Fugl Meyer assessment scale (hand component – mass movement and grasps). Then the patients performed box and block activities within 1minute prior to the treatment in both groups. And the number of box and blocks transferred within 1minute were counted and noted. The subject made to perform 30 repetition to performed box and block activities along with NMES And TENS was given for Two sessions of 30 repetitions of box and blocks activities for 3days a week for 2weeks. The second reading was obtained at the end of second week. Each treatment session comprised of 30 repetitions and lasted for about 30 minutes. **Results:** subject benefited maximally in improvement in hand functions with neuromuscular electrical stimulation and Box & Block activities as compared to TENS with Box & Block activities. **Interpretation& Conclusion:** Neuromuscular electrical stimulation and Box & Block activities (Group A) shows better results improvement in hand functions as compared to TENS with Box & Block activities (Group B). Thus the neuromuscular electrical with box and block activities to improve hand function in sub-acute stroke.

Keywords: Neuromuscular Electrical Stimulation, Transcutaneous Electrical Nerve Stimulation, Fugl Meyer assessment scale, Box and Block activities, stroke.

INTRODUCTION

Stroke is defined as an acute onset of neurological dysfunction due to an abnormality in cerebral circulation with resultant signs and symptoms that correspond to involvement of focal areas of the brain.^{1, 2} There have been various studies on different techniques utilized to improve hand function. Neuromuscular electrical stimulation (NMES) and Transcutaneous electrical stimulation are recently been studied to regain hand function skills.^{5,6} Transcutaneous electrical nerve stimulation has been used to improve motor function in stroke rehabilitation; increased inflow of signals from sensory modalities could enhance plasticity of the brain and

may explain beneficial effect of this treatment.⁶ In many patients with severe stroke, the affected hand function never becomes useful, even after therapy.⁷ Only about 15% of those suffering from severe stroke recover hand function. Fugl Meyer assessment scale and box and block activities used to determine the effect of neuromuscular electrical stimulation and transcutaneous electrical nerve stimulation training.

MATERIAL & METHOD

An experimental pre-test, post-test same subject design was used in this study. An incidental quota sample of 30 stroke patients took part in the study. The subjects were selected from the inpatient department at M.A.H.Gov.Ayu.Hospital, Asarwa, Ahmadabad.

The group consisted of 21 males and 9 females having a mean age of 53.33 ± 8.84 (group A) and 48.7 ± 10.96 (group B) years. The subjects were assessed on Fugl Meyer assessment scale (hand component – mass movement and grasps). Then again the patients performed box and block activities within 1 minute after the treatment in both groups. And the number of box and blocks transferred within 1 minute were counted and noted.

FINDING

Thus an overall analysis of scores showed maximally improvement occurred with NMES with POST t value= 1.85 ($p < 0.05$) for B & B scores and t value=2.14 ($p < 0.05$) for FMA as compared to PRE t value=0.25 ($p > 0.05$) for B & B scores and t value=0.32 ($p > 0.05$) for FMA. NMES (POST) showed marked improvement in the ability of the subjects.

DISCUSSION

Hand Function and their improvement have been studied for many years; however comparatively little work has been conducted to Effect of Neuromuscular Electrical Stimulation with Box and Block Activities vs. Tens with Box and Block Activities in Hand function Of Sub acute Stroke Patient. The assessment was taken on Box and Block test and Fugl Meyer assessment scale (hand component – mass movement and grasps) are commonly used for the identification for hand function and their improvement.

John Chae, François Bethoux, demonstrated neuromuscular stimulation for upper extremity motor and functional recovery in acute hemiplegia. The parameter analysis revealed significantly greater fugl-meyer scores in treatment group. Data suggested that Neuromuscular Stimulation enhances the upper extremity motor recovery of acute stroke.⁵ The present study also shows significant improvement with Neuromuscular Electrical Stimulation with Box and Block activities in hand function of sub acute stroke.

Johanne Higgins, Nancy E. Mayo, study evaluated stroke patients with upper-limb motor deficits using measures of impairment and “activity limitation” to quantify recovery of upper limb function post stroke and to identify predictors of upper limb function and predictors of upper limb recovery following stroke.

The study also compares the recovery of upper limb function with that of lower limb. Measures of impairment and “activity limitation” of the upper limb and lower limb improved over the first 5 weeks. The Box and Block Test performance improved the most over first 5 weeks (standardized response mean = 1.34), followed closely by the 5 meter walk test (SRM=0.97). The present study also shows significant improvement with Box and Block activities in hand function in both group of sub acute stroke.

Similar study was also done for the Box and Block activities by Thomas platz, Cosima Pinkowski. The study was on Reliability and validity of arm function assessment with standardized guidelines for the Fugl-Meyer Test, Action Research Arm Test and Box and Block Test: a multicentre study. The results showed all three motor tests very high inter-rater and test-retest reliability. Correlation between the motor scales was very high.

L Sonde, C.Gip, conducted study on Stimulation With Low Frequency (1.7Hz) Transcutaneous Electrical Nerve Stimulation (LOW-TENS) Increases Motor Function Of The Post Paretic Arm. The results showed that motor function increased significantly in the treatment group, compared to control group. He concluded that stimulation by means of Low-TENS could be a valuable complement to the usual training of arm and hand function in the Rehabilitation of stroke patients. The present study also shows significant improvement TENS with Box and Block activities in hand function of sub acute stroke.

Neuromuscular electrical stimulation (NMES) is the application of electrical stimuli to a group of muscles, most often for the purpose of muscle rehabilitation. Neuromuscular electrical stimulation reduces spasticity and enhances the muscles strength of hemi paretic hand.

The active repetition exercises induced by neuromuscular stimulation enhance the motor recovery of stroke survivors. Central motor neuro plasticity that support the use of active repetitive training of the paretic limb to maximize motor recovery after stroke.

Transcutaneous electrical nerve stimulation has been used to improve motor function in stroke rehabilitation; increased inflow of signals from

sensory modalities could enhance plasticity of the brain and may explain beneficial effect of this treatment.

The positive result of afferent stimulation could be that, the number of nerve impulses from the paretic area increases excitability and improves the possibilities for functional recovery of partially denervated nerve cells surrounding the infract zone. It is also believed that afferent stimulation may make use of the brain plasticity and the capacity for reorganization. It has been suggested that these explanation would mainly be true for treatment in early phase, but the present result indicate that afferent stimulation may also help in later recovery.

So, the present study suggests that both Neuromuscular electrical stimulation with Box and Block activities and TENS with box and block activities, are effective in improving hand functions of sub acute stroke subjects.

CONCLUSION

The results show that neuromuscular electrical stimulation with box and block activities and Transcutaneous electrical nerve stimulation with box and block activities definitely improves the hand functions skill. From the study done it can be interpreted that Neuromuscular electrical stimulation with box and block activities shows better results as compared to Transcutaneous electrical nerve stimulation with box and block activities and thus the hypothesis holds true.

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Ethical Clearance: Permission for doing the study was obtained from the Principal, Sai institute of Paramedical and Allied Sciences, Dehradun, Uttarakhand.

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Effect of Facial Cooling by Ice Application in Management of Dyspnea

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ABSTRACT

Background and Purpose: Dyspnea affects the quality of life. There are many pharmacological and non pharmacological management including cold air by fan. The aim of this study was to know the effectiveness of ice application on face in the management of grade 4 dyspnea of any origin.

Study design and methodology: 52 patients were selected from various multi speciality hospital with grade 4 dyspnea of any origin. 35 males and 17 female with men age of 38.77+- 10.97 were included. Facial icing was given to each patient post evaluation for 10 minutes. The vitals such as RR, HR and Modified Borg's scale (MBS) for rate of perceived exertion were taken pre intervention and post intervention.

Results: The data were statically analysed using SPSS software version 10. There were a significant decrease in RR (p=0.00), HR (p=0.00) and MBS (p=0.00) post icing.

Conclusion: It is concluded from this study that facial application of ice relieves grade 4 dyspnea of any origin.

Keywords: *Dyspnea, facial icing, Modified Borg's scale*

INTRODUCTION

Dyspnea is the term generally applied to sensation experienced by individuals who complain of unpleasant or uncomfortable respiratory sensation. It is a very subjective term and involves the patient's perception of the sensation and their reaction to it. It is the result of interaction between multiple physiological, psychological, social and environmental factors.¹ Numerous receptors that have a role in sensing dyspnea are vagal receptors, chemoreceptor, proprioceptive receptors and upper airway receptors.²

The therapeutic goal of symptomatic management of Dyspnea is to relieve the patient's increased effort of breathing. This can be achieved by pursuing one or more strategies, including pharmacological and non-pharmacological interventions.³ Non-pharmacological interventions include ventilatory support, relaxation techniques, counseling, pursed lip breathing and cold air through a fan. All of these other than the cold air have evident literature but facial cooling in patient

population needs to be researched further.

The movement of cold air with a fan has been observed clinically to reduce dyspnea. Stimulation of mechanoreceptors on the face or a decrease in the temperature of the facial skin, both of which are mediated through the trigeminal nerve, may alter the afferent feedback to the brain and modify the perception of dyspnea.^(1, 4, 5, 6) Therefore there is a need to study if ice can be used as a tool for facial cooling. So the need of the study is to observe the effects of facial cooling by ice application in management of dyspnea.

MATERIALS & METHOD

52 patients with grade 4 dyspnea (ATS Scale)⁷ due to any cause at various multi-speciality hospitals were selected. Ice cubes, Terry towel, Modified Borg's Scale (MBS)⁸ for perceived rate of exertion, Wrist watch, Stethoscope were used for the study. The study was approved by local ethical committee. Patients with grade 4 dyspnea (ATS Scale) of any origin, and ages above 20 years were selected. Patients who cannot

tolerate ice, having fever above 38° C, those who require oxygen, with Trigeminal nerve damage, open wound on face, any facial allergy, with vasospastic disorders, Cryoglobinaemia were excluded.

Sensations on the face were also assessed prior to the start of intervention. Pre-intervention the patient's vital were documented as Pre respiratory rate and Hear rate (RR, HR.)

Patients were then interviewed about the respiratory sensation and explained about perceived rate of exertion. The parameters such as respiratory rate (RR) and heart rate (HR) was recorded by manual methods. Subjects were then told to grade their dyspnea according to (MBS) for perceived rate of exertion which was documented as Pre MBS.

The intervention was then started with ice packed in a terry towel. This was applied on the face with proper and firm contacts such as not to cause discomfort to the patient. This was done for 10 minutes all over the face.

Post intervention the vitals and MBS were recorded and documented .

30 minutes post-intervention the vitals and the Modified Borg's scale was recorded and documented as Post 30 min RR, HR and MBS.

STATISTICAL ANALYSIS

Mean and standard deviations were calculated. All analysis were done using SPSS software version 10. The parametric data of respiratory rate and heart rate were analyzed using single factor repeated measures ANOVA with a set p value of < 0.05. The non-parametric data of Modified Borg Scale was analyzed using Friedman's two way analysis of variance by ranks with a set p value of < 0.05. Descriptive analysis of the carryover effect was done.

RESULTS

52 subjects, 35 male and 17 females with a mean age of 38.75 ± 10.97 were recruited for the study. There was no untoward reaction to ice in all 52 patients. Patients with a heterogeneous group of conditions were selected (Table 1).

A significant decrease in the respiratory rate was observed post icing (p=0.000) and post 30 minutes

of icing (p=0.000) as compared with the pre icing respiratory rate (Table 2). The heart rate was also found to be significantly reduced post icing and post 30 min of icing with the p=0.000. (Table 3)

DISCUSSION

The study aimed to investigate the effect of facial icing in relieving dyspnea especially in grade 4 (ATS scale). The study was carried out in a heterogeneous population of patients with grade 4 dyspnea of any origin. The study design was a one time intervention with repeated readings being taken pre, post and post 30 minutes of intervention

Literature supports the fact that cold air directed on the face reduces breathlessness.^{1,3,4,5,6,10} Various authors have studied the effect of facial cooling in reduction of breathlessness by inducing breathlessness in normal subjects.^{4,9,12} There have been certain studies done on asymptomatic patients as well by inducing breathlessness in them.^{9,11,12}

In this study there was a significant decrease in MBS score, RR and HR immediately post intervention and also post 30 minutes of intervention. Schwartz stein and colleagues⁴ hypothesized the possible mechanism for decreased perception of breathlessness could be stimulation of trigeminal nerve due to facial cooling. The afferent information that results from stimulation of receptors in the distribution of trigeminal nerve is projected to the sensory cortex and thereby alters the perception of breathlessness.^{4,13}

Various authors^{14,15,16} have provided evidence to suggest that cooling of upper airway or stimulation of cold receptors in the upper airway depresses the respiratory activity in humans and animals.

Reduction in RR can be explained due to reduction in respiratory drive as it has been proposed that an increase in inspiratory motor output or respiratory drive causes an increased sense of effort and dyspnea.¹⁷ McBride and Whitelaw¹⁸ also showed that stream of cool air circulated through the nose diminished the frequency of diaphragmatic contractions during breath-holding. Dolfin¹⁹ has contributed saying that the pattern of breathing may be altered by stimulation of the trigeminal nerve with the rim of a mask. Such stimulation has also led to a decrease in respiratory frequency in infants.

The decrease in HR could be due to stimulation of structures innervated by the trigeminal nerve which has been shown to trigger the diving reflex^{20,21} which is characterized by reduction in HR and ventilation. Essentially the response is produced by the combination of water touching the face and either voluntary or involuntary arrest of breathing.

The diving reflex could have been stimulated due to the icing on the face. The decrease in HR results from increased activity of the sympathetic stimulus to the cardiac pacemaker. The nervous inputs and outputs for the response are coordinated in the brainstem by the respiratory, vasomotor and cardio-inhibitory centers.²¹

Table 1: Heterogeneous group of conditions from which subjects were selected

Diagnosis	Patients
Chronic obstructive pulmonary disease (COPD)	9
Chronic renal failure (CRF)	2
Guillian Barre syndrome (GBS)	1
Myasthenia Gravis (MG)	1
Pleural effusion (PE)	5
Pneumonia	4
Pulmonary tuberculosis (PTB)	22
Scoliosis	1

Respiratory Rate

Table 2: Comparison of respiratory rate pre, post and post 30 min of facial Ice application.

RR	Mean	S.D.	
Pre	33.94	3.82	
			p=0.00
Post	26.92	4.34	
			p=0.00
Post 30 mins	29.33	4.34	

As shown in table 2, there was a significant

decrease in respiratory rate post icing (p=0.000) and also there was a significant decrease in respiratory rate post 30 minutes of icing (p=0.000) from the pre icing rate.

RR: Respiratory Rate

Heart Rate

Table 3: Comparison of Heart rate pre, post and post 30min of facial ice application.

HR	Mean	S.D.	
Pre	77.46	6.67	
			p=0.00
Post	72.85	6.86	
			p=0.00
Post 30 mins	74.29	6.67	

As shown in table 3, there was a significant decrease in heart rate post icing (p=0.000) and also there was a significant decrease in the heart rate post 30 minutes of icing (p=0.000) from the pre icing rate.

Modified Borg Scale

Table 4 : Comparison MBS pre, post and post 30min of facial ice application.

MBS	Mean	S.D.	
Pre	9.85	0.36	
			p=0.00
Post	3.35	1.14	
			p=0.00
Post 30 mins	4.27	1.67	

As shown in table 4, there was a significant decrease in Modified Borg Scale (MBS) post icing and also post 30 minutes of icing. (p=0.000)

CONCLUSION

The conclusion is that facial icing does help in relieving grade 4 dyspnea of any origin. It reduces the perception of breathlessness, respiratory rate and heart rate.

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A Study to Evaluate the Correlation between Tinetti Performance Oriented Mobility Assessment (Tinetti Poma) with Functional Reach Test (FRT) and Timed UP and Go Test (TUG) in Assessing Balance among Elderly

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ABSTRACT

Introduction & Objectives: Tinetti Performance Oriented Mobility Assessment (POMA) a test which assesses balance and predicts falls. Compared to Berg Balance Scale, Tinetti POMA is a better outcome measure in predicting falls but it is time consuming. Functional Reach Test (FRT) and Timed up and go test (TUG) are simple and easily administered balance tests. In Neuro rehabilitation the outcome measures should be easy and quick to administer. To find a suitable alternative for time consuming Tinetti POMA, this study aimed at assessing the correlation between Tinetti POMA with FRT as well as TUG. **Materials and Methods:** A Cross-Sectional correlation study conducted in hospital & community setting with three months duration. Hundred elderly normal subjects matched for the inclusion criteria were taken for the study. Balance assessed in random sequence with Tinetti POMA, FRT and TUG. **Result:** Moderate correlation exists between TUG and POMA ($r=0.56$, $p=0.00$) and fair correlation was obtained between FRT and POMA ($r=0.39$, $p=0.00$). **Conclusion:** TUG a convenient balance test which can be substituted alone or with FRT to the time consuming Tinetti POMA in assessing balance among elderly.

Keywords: Functional reach test, Timed up and go test, Tinetti Performance Oriented Mobility Assessment, Balance

INTRODUCTION

Balance is a complex process involving the reception and integration of sensory input and the planning and execution of movement to achieve a goal requiring upright posture. It is the ability to control the centre of gravity (COG) over the base of support (BOS) in a given sensory environment.¹

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Maintenance of balance requires the co-ordination of the sensory, neural and musculoskeletal system.²

Various risk factors in old age affect balance and restrict safe mobility which increase the chances of fall.²⁻⁴ Falls can cause limitations, disability, institutionalization and sometimes even death.⁵ So prevention of fall has become a major focus in public health programs. Hence it is essential to identify individuals at risk, so that appropriate treatment goals can be established.⁶

Functional performance objectively measure the balance or walking tasks. An advantage of a functional balance scale is that it is practical for implementation in a variety of settings because of their low cost, its lack of complex equipment and

time efficiency. Presently there are a vast number of functional balance assessment tests available. So it is often difficult for a clinician to decide which scale to use and to decide which assessment is more appropriate. Some of them are Berg balance scale (BBS), Functional reach test (FRT), Timed up and go test (TUG), Tinetti performance oriented mobility assessment (POMA), Elderly mobility scale (EMS), Sensory oriented mobility assessment instrument (SOMAI), Physical mobility scale (PMS), etc.²

BBS and POMA are the most commonly used balance assessment scales.⁶ Statistically BBS shows high specificity in identifying people at risk for falls but low sensitivity in identifying who will fall.⁷ POMA is a balance test which assesses gait and balance separately with different balance subtests and has a better outcome measure in predicting falls.⁶ It has shown good performance on inter-rater reliability and concurrent validity.^{8,9} For community dwelling older people, POMA is the most suitable performance measure followed by TUG.¹⁰ Since POMA is time consuming, it is not easy to be administered to all patients. The simpler and easily administered tests are the FRT and TUG, and both of these do not have any subtest or subdivision, thus becoming time efficient. The TUG has good inter-rater (ICC=0.98-0.99) and intra-rater (ICC=0.97-0.98) reliability and is sensitive as well as specific in identifying individuals with balance impairment.¹¹ The inter-rater (ICC=0.99) and intra-rater (ICC=0.97) reliability of FRT is also found to be high.⁶

Outcome measures which are quick to administer and deliver accurate results are required for better assessment. A study done by Lin M et al,¹⁰ reported a moderate to strong correlation of POMA with TUG and fair association with FRT, but the circumstance for assessment varied and were not standardized. Moreover they included only people dwelling in rural areas. This study aims to find the correlation between POMA with TUG and FRT by overcoming these limitations.

MATERIALS & METHOD

Subjects: After obtaining ethical clearance from Institutional Ethics Committee, community dwelling normal elderly subjects of both gender, aged 60 to 80 years, and the caretakers from hospital, who were

willing to participate in this study, were recruited for the study using purposive sampling technique. The study held in a tertiary hospital. The inclusion criteria were to have a minimum score of 25 in Mini Mental Status Examination (MMSE),¹² to be able to stand for 60 seconds without the help of any assistive devices. Subjects were excluded if they had any severe visual or auditory deficits; any severe neuromusculoskeletal deficits, a previous history of fall in the past one year and marked disabilities in the upper limb or lower limb. All subjects were screened to ensure that they are medically stable. The recruitment of subjects was completed within a period of six months.

PROCEDURE

The purpose and procedure of the study was explained to all the subjects and an informed consent was obtained. Demographic data were collected from all the participants including MMSE. Balance was assessed using the FRT, TUG and POMA. The sequence of the test order was randomly assigned in order to avoid carry over effect of the balance skills during the testing time. Subjects were comfortably positioned in the required testing position and each test was demonstrated clearly before asking for the performance. All subjects were given a five minutes of rest between each test to minimize fatigue. The participants were guarded during all the test procedures to prevent fall. Karl Pearson correlation coefficient was used to find the correlation between FRT and TUG with POMA as well as the association between demographic data and outcome measures. Gender wise comparison with outcome measure was done using t test. The level of significance was set at $p < 0.05$. The data was analyzed using SPSS 13.

RESULTS

One hundred subjects completed all the three balance tests, out of which 45 were male and the rest female. The mean (SD) age, height, weight and MMSE score are given in table one. The mean (SD) of outcome measures and the correlation of POMA with FRT and TUG are given in table two. There is a significant fair to moderate correlation present between POMA and TUG ($r = -0.56$, $p=0.00$) and a weak correlation between POMA and FRT ($r = 0.39$, $p=0.00$). The association between outcome measures and gender (table three) as well as that with the age,

height and weight, is given in table four.

DISCUSSION

The aim of the study was to assess the correlation between TUG and FRT with POMA. TUG, FRT and POMA reflects the mobility and the balance of a person rather than assessing single neuro-muscular impairments.¹³ Significant fair to moderate correlation between TUG and POMA was obtained in this study ($r = -0.56$, $p = 0.00$), which indicates TUG can be used as a simple measure of balance comparable to POMA. A possible reason for the fair to moderate correlation between TUG and POMA, can be attributed to a small sample size in our study, where as a moderate correlation exist between TUG and POMA ($r = -0.55$) as reported by Mau-Roung Lin et al.¹⁰ It is also a sensitive and specific measure of faller status in community dwelling balance impaired older adults.¹² More over TUG is useful in detecting mobility impairments in elderly persons, is easy to conduct and requires very few equipments.

TUG is proven to be reliable and valid according to Bischoff et al¹³ and they proposed >12 second cut-off point for TUG among community dwelling adults and concluded further studies required to validate this. In our study though normal community dwelling elderly samples were taken, the mean TUG is 16.77 seconds. Albeit the mean age in both the studies does not differ much, 73.2 (3.2) for Bischoff et al and 71.56 (6.67), in our study. The variance in the duration can be attributed to gender difference of the samples taken in both studies. Bischoff et al included only elderly women and in our study both the genders were included.

During the entire course of study, all chairs used for TUG had a seat height of 45cm and armrest height of 65cm. Siggeirsdóttir¹⁴ suggested, the test performance is dependent on chair type and the chairs with armrests and a seating height of 44 – 47 cm should be used for best results. For frail elderly, POMA was challenging and the chance for fall during the test was more. So based on the correlations obtained from this study, we recommend to use TUG as a screening tool instead of POMA for frail elderly.

Only a significantly weak correlation exists between FRT and POMA in this study ($r = 0.39$, $p = 0.00$) indicating that FRT cannot replace POMA

in assessing balance. A similar scenario was also reported by Lin et al,¹⁰ where only a fair correlation exists between FRT and POMA ($r = 0.48$). The reason for the fair correlation in our study could be that FRT is influenced by the fear of falling, flexibility of ankle and hip joints, muscle strength of the plantar flexors, dorsiflexors, hip abductors and adductors and trunk stabilizers.¹⁵ Ironically the subjects may have increased their confidence in their ability to reach further each successive time which makes them more familiar with the test and thus making FRT an undesirable tool for assessing the prediction of fall in community dwelling older adults.⁶

The mean value of FRT, TUG and POMA reveals that males had significantly higher balance and mobility when compared to females (table three). Depending on the values obtained from the three scales, this study shows that women are more prone to falls. This is also supported by Hageman et al.¹⁶

A fair correlation exist when age was compared with TUG ($r = 0.23$) and POMA ($r = -0.28$). Conversely a poor correlation obtained when weight was compared with TUG ($r = -0.09$) and POMA ($r = 0.18$). This was supported by a previous study done by Bischoff¹³ who suggested that age, BMI and weight showed a weak correlation with TUG performance in community dwelling elderly women.

This study proposes a fair correlation between the age of the subjects and FRT ($r = -0.37$), which is similar to Duncan¹⁷ who suggested that age influences FRT. However in our study we found only a poor correlation between height and FRT ($r = -0.01$) which is contradictory to the previous literature by Duncan¹⁷ who suggested a correlation between FRT and height of the person.

Strength and weakness: The strength of this study is that subjects of both genders were involved and the assessment method was standardized for all the subjects. The weakness of this study is the range of motion of the ankle joint and foot as well the arm length were not considered. The study had a small sample size also.

CONCLUSION

The results of this study support our hypothesis that, there is a significant fair to moderate correlation

between the time consuming outcome measures POMA with quick screening outcome measures TUG, and there is a weak correlation between POMA and FRT. This indicates that TUG can be used as a simple measure of balance, suggesting that the clinician can save time by using TUG and have a workable assessment of balance as compared to the more time consuming POMA.

TABLE 1: Mean (SD) of the demographic variables n=100

Demographic variables	Mean	SD
Age	71.56	6.67
Height(cm)	170.11	6.94
Weight(kg)	69.79	11.36
MMSE	27.32	1.45

SD-Standard deviation, MMSE – Mini mental state examination

TABLE 2: The mean (S.D) for TUG, FRT, POMA and correlation n=100

Scales	Mean	SD	Correlation with POMA (p=0.00)	
			FRT	TUG
FRT (inches)	8.05	2.99	0.39	-0.56
TUG (seconds)	16.77	8.72		
POMA	23.94	4.66		

FRT – Functional reach test, TUG – Timed up and go test, POMA – Performance oriented mobility assessment, SD-Standard deviation

TABLE 3: Gender wise comparisons of outcome measures n=100

Scale	Gender	Mean	SD	Comparison
FRT (inches)	Female	7.23	2.79	t= 3.18, p = 0.002 HS
	Male	9.06	2.96	
TUG(seconds)	Female	18.56	10.51	t = 2.322, p = 0.022 sig
	Male	14.58	5.19	
POMA	Female	23.11	5.227	t = 2.003, p = 0.048 sig
	Male	24.96	3.65	

FRT – Functional reach test, TUG – Timed up and go test, POMA – Performance oriented mobility assessment, SD-Standard deviation

TABLE 4: Correlation of outcome measures with age, height and weight n=100

Demographic variables	Height	Weight	FRT (inches)	TUG (sec)	POMA
Age	-0.14	-0.09	-0.37	0.23	-0.28
Height (cm)		0.43	-0.01	-0.01	-0.03
Weight(kg)			-0.06	-0.09	0.18

FRT – Functional reach test, TUG – Timed up and go test, POMA – Performance oriented mobility assessment, Level of significance 0.05

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Awareness of Physiotherapy among Medical Professionals in Bathinda

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ABSTRACT

Introduction: Physiotherapy is an upcoming branch of health profession. It is multidisciplinary approach and is recognized worldwide but still, in India, it is not much appreciated. Increasing disability is becoming foremost concern to upgrade the standards and knowledge of Physiotherapy. It would only be possible if medical professionals have adequate inter professional knowledge and communication with the Physiotherapist.

Objective: To analyze the awareness of Physiotherapy among medical professionals in Bathinda.

Method and Material: A sample of 100 doctors, who were into active clinical practice in Bathinda, were approached. The basic qualification was MBBS, BAMS and BHMS from a recognized University of India. Post graduates were also included in the study. A written consent was taken from all the participants for their voluntary participation. A close ended self-administered questionnaire was distributed and collected for data analysis. The questionnaire consisted of three sections viz. Demographic data, General awareness which comprised of 5 questions and Professional awareness consisting of 10 questions.

Result: Almost 100% of the doctors were aware of Physiotherapy. Only 64% of the doctors were aware that Physiotherapists are first contact practitioners whereas only 67% knew the role of Physiotherapy pre-operatively.

Conclusion: The result of the present study suggested that there was significant awareness of Physiotherapy, but most of the medical professionals were not aware of the fact that Physiotherapists are first hand practitioners. They were unaware of the pre-operative Physiotherapy. Some of the medical professional were lacking in the knowledge about the complications of delayed or avoided Physiotherapy.

Keywords: Awareness, disability, Medical Professionals, referrals, Physiotherapy.

INTRODUCTION

Physiotherapy is an upcoming branch of health profession. It is multidisciplinary approach and is recognized worldwide but still, in India, it is not much appreciated and very less population has exposure to Physiotherapy, as a service as well as a career. Author's aim was to observe the awareness of Physiotherapy among professionals and physicians practicing in southwestern Punjab (Bathinda), India. High standard of patient care is the goal of medical team and it will be achieved only if there is effective communication between

the physician and Physical therapist so as to ensure level of care¹. It also aims at promotion of wellness which is only possible if there is optimal knowledge of each other's role and health profession. The Physiotherapist integrates the elements of patient management- examination, evaluation, diagnosis, prognosis and intervention, in a manner designed to optimize outcomes². The Physiotherapeutic treatment will only be effective if Physiotherapist understands the cultural, psychological and social factors that affect the patient's status³. As first hand practitioners, a doctor's referral is not necessary to see a Physiotherapist. Physiotherapists, doctors and

other health professionals often work as a part of a team to plan and manage treatment for specific condition⁴. The consultant Physiotherapist applies highly specialized knowledge and skills to identify problems, recommend solutions or produce a specified outcome or product in a given amount of time on behalf of patient¹. In Scotland, Department of Health and Medicines and Healthcare products Regulatory Agency had extended right of prescribing of medicines to a number of healthcare professionals including Physiotherapists⁵. Census 2011 shows that about 26,810,557 people in India are suffering from disability. Among the total, 14,986,202 are males and 11,824,355 are females⁶. In Punjab, 654,063 people are disabled. The proportion of disabled population by type of disability includes 82,199 in vision, 146,696 in hearing, 24,549 in speech, 130,044 in movement, 45,070 in mental retardation, 21,925 in mental illness, 37,973 in multiple disability, and 165,607 classified as any other kind of disability. The statistics reveal that 8.40% of geriatric population is disabled which is highest percentage of disability among all age groups⁶. The rate of disability is increasing because the disabled population is not being guided for Physiotherapy. There are not much cases referred for Physiotherapy. Studies have shown that Physiotherapy services can be more beneficial to the patient in improving his/her extent for disability and quality of life, if referred for Physiotherapy early. The figures show a need for implementation of Physiotherapy services not only at the urban health centre but also at primary health centre. Keeping in mind the disability rate in India, it becomes important to check the perspective and awareness of physicians referring their patients for Physiotherapy in southwestern region of Punjab. The practice of prescribing Physiotherapy treatment and Physiotherapy modalities is also an indicator of wrong attitude and poor knowledge among medical professionals^{7,8}. The reference depends on the knowledge about the profession of Physiotherapy, doctor's interaction with the Physiotherapist and his/her ideas and concepts about Physiotherapy. A lack in awareness among the practitioners and physicians had been reported in literature. The greatest challenge that Physiotherapists are facing today is creating awareness among the masses and other healthcare providers about the role of Physiotherapy in health care delivery. The present study was therefore designed to evaluate the Physiotherapy

awareness among medical professionals practicing in southwestern region of Punjab i.e. Bathinda.

METHOD & MATERIAL

Co-author obtained a list of professionals practicing in Bathinda, from their respective local registered body like MCI, Ayurvedic and Homeopathic. 100 physicians, who were into active clinical practice in Bathinda, were approached. The basic qualification was MBBS, BAMS and BHMS from a recognized University of India. Post graduates were also included in the study. A written consent was obtained from all the participants and their identity was kept confidential by giving them fictitious numbers. A close ended self-administered questionnaire was distributed and collected for data analysis. The questionnaire consisted of three sections viz. Demographic data, General awareness and Professional awareness. No drop outs were observed during the study.

RESULT

From the sample of 100, 70% of the doctors who participated in the study were practicing in private sector and rest 30% were government employees. All 100 subjects responded to the questionnaire and were aware of Physiotherapy (100%). Almost 86% of the doctors knew about the role of Physiotherapy in Intensive Critical care Unit., 94% of the doctors agreed to the fact that Physiotherapy was required post-operatively and 93% of them would refer there patients for post-operative Physiotherapy.

36% of the 100 doctors did not know that Physiotherapists are first hand practitioners. The conflicting response was between pre-operative Physiotherapy and post-operative Physiotherapy. Around 33% of the doctors were unaware of pre-operative Physiotherapy and 36% of them would not refer there patients for the same.

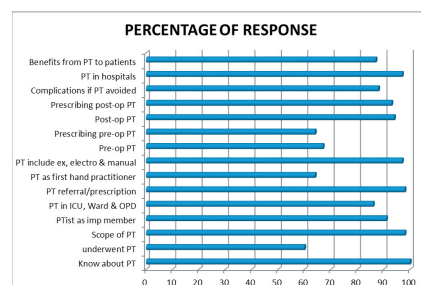


Figure 1: Percentage of response

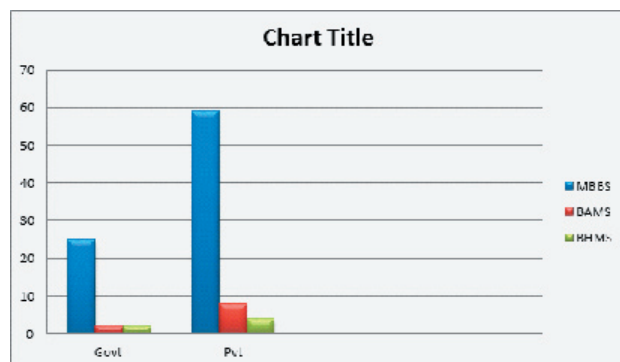


Figure 2. Percentage of professionals from private and government sector.

DISCUSSION

The present study was conducted to know the awareness of Physiotherapy among medical professionals. Physiotherapy is multidisciplinary approach hence it becomes important to know the awareness of the profession at different levels of treatment protocol. In this study, ophthalmologists were found to have good knowledge of Physiotherapy, but referrals from this faculty were almost nil. Psychiatrists were another faculty that were aware of Physiotherapy but lagged in referrals as they were not aware of the role of Physiotherapy in psychiatric patients. On the other hand, 20% general practitioners had positive attitude towards Physiotherapy with maximum referral rates. From E.N.T professionals, 50% of the doctors agreed to refer patients for Physiotherapy while others refused for the same. 80% of the general surgeons were aware of the pre-operative Physiotherapy and would refer their patients for pre-operative Physiotherapy. 75% of super specialist surgeons were aware of Physiotherapy and made referrals for Physiotherapy. Among gastroenterologists, 75% stated that they would refer their patients for pre-operative Physiotherapy. However, least references were made by gynaecologists. 77.77% of the gynaecologists agreed to refer their patients for pre-operative Physiotherapy, while 88.88% of the gynaecologists knew the role of Physiotherapy post-operatively. Only 25% of the radiologists knew the role of Physiotherapy pre-operatively. 80% of the Orthopaedicians would refer their patients for pre-operative Physiotherapy while 100% of them suggested Physiotherapy post-operatively. 60% of paediatricians refused to refer their patients for pre-operative Physiotherapy while 80% of them agreed to make referrals for post-

operative Physiotherapy. 60% of the physicians were of the opinion for pre-operative Physiotherapy, while 6.66% of the physicians refused to refer his patients post-operatively. The reason behind this was that most of the physicians were practicing in fields which were not linked to surgery, so they would rather not refer their patients for post-operative Physiotherapy. The sample size from other departments like chest OPD, neurology and pathology was very less. Chest physician was significantly aware of the pre-operative and post-operative Physiotherapy, while neurologist and pathologist were only aware of the post-operative Physiotherapy respectively.

The awareness of pre-operative Physiotherapy was poor among the homeopaths. Only 20% were of them were aware of Physiotherapy but 100% of the homeopaths heard about post-operative Physiotherapy.

On the contrary, 80% of the ayurvedic physicians were aware of pre-operative Physiotherapy and would refer their patients for the same, whereas 90% of them knew the role of Physiotherapy post-operatively.

The result is retrospective to the findings reported by Harrison¹ (1975), Waldman⁹ (2004), Dhiraj R Shete¹⁰ et al (2013) that stated all doctors of rural area were not aware of Physiotherapy services and its importance. Rahul Krishnan Kutty¹¹ et al (2013) revealed that 50% of the medical doctor's knowledge and attitude were inadequate and negative respectively. The result of study conducted by Robin Moremen Uili¹² et al concluded that physicians are most familiar with technical aspects of Physiotherapy and those with more knowledge of professional procedures used by Physical therapists are least comfortable sharing the responsibility for decision making when referring their patients to Physical therapists. There was no significant difference between the awareness among privately practicing doctors and doctors working in government hospitals, that is contradicting the result of Acharya R S¹³ that revealed the doctors working in private hospitals (93%) were more aware of Physiotherapy compared to those working in government hospitals (20%). Among the selected population, 60% of the subjects underwent Physiotherapy treatment. There was a positive response towards the treatment

they underwent. Significant percentage of the doctors agreed that Physiotherapist is an important member of multidisciplinary approach. The same result was found by Susan Berney¹⁴ which revealed that Physiotherapists are active in treating critically ill patients and are therefore important part of Multidisciplinary Team. About 91% of the doctors knew the role of Physiotherapy in various departments. Similar study was conducted by Nse A Odunaiya¹⁵ (2013) which revealed that 75.5% of the gynaecologist and obstetricians knew the role of Physiotherapy in gynaecology and obstetrics; Puckree T¹⁶ (2011) revealed that 64.01% of the medical students knew role of Physiotherapy in various medical fields. Whitfield¹⁷ et al (1996) also showed similar results. Only 86% of the doctors knew about the role of Physiotherapy in In Patient Department which was in contrast with a study conducted by Susan Berney¹⁴, Apurv Shimpi⁸ (2014) and T Puckree¹⁶ (2011). 98% of the doctors thought that there is a need for referral/prescription for Physiotherapy. The study showed similar results as done by Janet Bower Hulme¹⁸ (1988) revealed that Physiotherapy as referral included diagnosis from the referring doctor. Robin Moremen¹² (1984) revealed that significantly more than 10 patients were referred from Physical Medicine & Rehabilitation each week, neurologists referred three or more newer patients each week. Apurv Shimpi⁸ (2014) revealed that 95.5% of the doctors did made references for Physiotherapy. Surprisingly, only 64% of the doctors were aware of the fact that Physiotherapists are first hand practitioners. Similar study done by Apurv Shimpi⁸ in 2014 revealed that only 44.4% of the doctors thought that Physiotherapists are first hand practitioners. Another study done by T Puckree¹⁶ stated that only 60% of the medical students were aware of the fact that Physiotherapists can manage the patient independently. Odebiyi⁷ et al (2010), Asem¹⁹(2004) and Kerssens and Groenewegan²⁰ (1990) also reported the same results. The same was in contrast with the study done by Gallery²¹ (1997) and Lesley K Holdsworth⁵ et al (2008) which stated that 96% of the doctors considered Physiotherapists first hand practitioners. Same conflict was raised in a study conducted by Ferguson & Griffin²² in 1999. Department of health in Britain and Australia had accepted that Physiotherapists are capable of handling patients directly. Among 100 doctors, only

88% were aware of the complications if Physiotherapy was avoided for a particular condition. 97% of the physicians agreed to have Physiotherapy department in all hospitals and 87% of the physicians stated that their patients benefitted from Physiotherapy. During the study, many of the doctors showed interest in collaborating with a Physiotherapist to help promote the early wellness of their patients.

CONCLUSION

The result of the present study suggests that there is significant awareness of the Physiotherapy, but most of the medical professionals are not aware of the fact that Physiotherapists are first hand practitioners. They are unaware of the pre-operative Physiotherapy. Some of the medical professional are lacking in the knowledge of complications of delayed or avoided Physiotherapy.

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Comparison of Effectiveness of Myofascial Release Technique and Cyriax Technique on Pain Response and Flexibility in Patients with Chronic Plantar Fasciitis

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ABSTRACT

Background- Plantar fasciitis is a common foot disorder in which patients have pain and tenderness at the sole of the foot. The present study aimed to evaluate and compare the effectiveness of myofascial release technique and cyriax technique on pain response and ankle flexibility in chronic plantar fasciitis. **Objectives-** To determine the effect of myofascial release technique along with conventional PT treatment and effect of Cyriax technique along with conventional PT treatment on pain response and flexibility in chronic plantar fasciitis and also to compare the effectiveness of MFR technique along with conventional PT and Cyriax technique along with conventional PT on pain response and flexibility in chronic plantar fasciitis patients. **Method** –It was a comparative study with a total of 30 participants with chronic plantar fasciitis out of which 15 were randomly allocated to Group A (myofascial release group) and Group B (Cyriax group). Therapeutic ultrasound with intensity of 1W/cm² and frequency of 1MHz for 5 min was given for a single session to all the subjects and then given the soft tissue mobilisation followed by exercises. Visual analogue scale, range of motion of ankle were outcome measures that were assessed before and after the treatment. **Results** - Paired sample t-test was used for intra-group comparison and for inter-group comparison unpaired t test was used using graph pad statistics software. **Conclusion-** Myofascial release therapy along with conventional PT treatment was more effective than Cyriax technique along with conventional PT treatment .

Keywords: *Plantar fasciitis, Myofascial Release technique, Cyriax technique, Therapeutic ultrasound.*

INTRODUCTION

Plantar fascia called as plantar aponeurosis, lies superficial to the muscles of the plantar surface of the foot. It acts as a truss to maintain the medial longitudinal arch of the foot, and assists during the gait cycle and facilitates shock absorption during weight bearing activities.¹ Heel pain commonly occurs in weight bearing due to inflammation of thick tissue at the sole. Stress to plantar fascia may also result because of injury, or a bruise incurred while walking, running or jumping on hard surfaces; or being overweight. ² Hence causes of heel pain may be described as plantar, lateral, medial, posterior and diffuse.³

Plantar fasciitis is an inflammatory condition which is common cause of foot pain in which pain and tenderness are located inferiorly at the plantar fascia origin.⁴ It is seen most commonly in sports that involves long distance walking, dancers, tennis players, non athletes whose occupation requires prolonged weight bearing.⁵ Other causes are mechanical stress involving compressive forces making foot's longitudinal arch flat. There is a loss of flexibility as the disease progresses due to calcaneal tendon retraction, fatigue, inextensibility and poor mechanics.⁶

Plantar fasciitis is considered to be a self limiting condition.^{7,8} In this study following treatments are included: Stretching of the calf muscle and plantar fascia and strengthening of the intrinsic muscles of the foot are two simple treatments for plantar fasciitis. Myofascial release technique is a soft tissue

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mobilisation technique mostly given to reduce the tightness and restriction in soft tissues.⁹This technique has been proposed to act as catalyst in the resolution.Cyriax i.e. deep transverse friction massage is a soft tissue mobilisation technique which includes a specific type of connective tissue massage applied precisely to soft- tissue structures.^{9,10}

METHODOLOGY

SELECTION OF SUBJECTS: 30 subjects from the out patient department of MVP MEDICAL COLLEGE AND HOSPITAL AND RESEARCH CENTRE, ADGAON and private clinic of Nasik who fulfilled the inclusion criteria were enrolled in the study after giving a written consent.

INCLUSION CRITERIA:

- Subjects who were diagnosed with plantar fasciitis .
- Subjects between 18 - 60 years old.
- Both male and female.
- Durations of symptoms of more than 6 weeks.
- Patients with VAS more than 5.

EXCLUSION CRITERIA:

- Signs and symptoms of systemic inflammatory disease.
- Subjects with infective conditions of foot.
- Any malignant conditions , immunosuppressed patients.
- Subjects with recent heel surgery ,signs and symptoms of local arthritis ,patients having lower limb symptoms from a lumbar spine lesion .
- Patients with nerve entrapment syndrome in heel or ankle .

PROCEDURE: Demographic data of each subject were recorded, after this they were randomly allocated to one of the study groups A and B respectively. 15 subjects in Group A received Myofascial release along with conventional physiotherapy and 15 in Group B received Cyriax along with conventional physiotherapy for the respective foot with chronic plantar fasciitis .Data was gathered before and after the treatment .Intensity of pain and ankle range of motion was assessed by VAS on questionnaire form

and Universal Goniometer . A common intervention program was executed for both the groups as conventional physiotherapy for plantar fasciitis; it includes ultrasound, stretching of plantar fascia and plantar flexors , strenthening of intrinsic muscles of foot & home exercise program. Therapeutic Ultrasound was first applied to patients of both groups in prone lying position . Then the part was cleaned and gel was applied to the involved part and then transducer was moved in a slow circular manner for 5 minutes with Intensity :1W/cm², Frequency: 1 MHz with a mode : pulsed 1:4 ratio.

Group A: Subjects then underwent myofascial release technique by using heel of hand and fingers technique for 10 min in supine lying. One hand stabilises the foot and heel of other hand is placed over the tip of MTP joint, giving slight pressure dragging the hand in downward direction towards the heel .



Figure 1 : Application of Myofascial Release technique on right heel .

Group B subjects were treated with the Cyriax manipulation i.e. Deep transverse frictions for 10 min . Transverse frictions were applied by manual pressure directly to the origin of the plantar fascia using a repetitive back and forth motion, transversely across the affected structure with adequate sweep to cover the affected area and sufficient depth to produce mechanical stretching of the underlying structure. The patient were positioned in half -lying and the great toe kept in Dorsiflexion throughout the application so as to maintain a stretch to the plantar fascia. Later stretching exercises were given to both the group after soft tissue mobilisation.



Figure 2: Application of Cyriax technique ie. Deep transverse Frictions .

Both the groups received treatment with a minimum interval of 48 hrs between the treatment sessions for 4 week. The remaining conventional PT program was as follows: The subjects were asked to perform a non- weight bearing calf muscle stretch in lying and followed by sitting , were asked to apply the stretch before putting their feet on the ground and weight bearing after sleep .The subjects were instructed to hold each end of a towel and place it around the ball of the foot and while pulling the towel towards the trunk until slight discomfort is noted in the posterior calf . This stretch were held for

30 seconds with 3 repetitions on each leg and whole process repeated 3 times everyday, another non-weight-bearing stretch was applied in sitting where subjects were then instructed to cross the affected leg over the contra-lateral leg and stretch the affected foot. They were asked to hold the stretch for 30 seconds , repeat it three times with three repetitions per day .

Towel curls and toe tapping exercises were done to strengthen the intrinsic muscles of the foot which lie proximal to the plantar fascia. Subjects were asked to do the toe curls exercise for ten times each leg and toe tapping exercise for 5 minutes in total daily.

DATA ANALYSIS

It was found that total number of males and female in group A were 3 and 12 respectively whereas in group B it was 7 and 8 respectively .Therefore it was noted females were more affected .Paired sample t-test was used for intra-group comparison and for inter-group comparison unpaired t test was used using graph pad statistics software.

Table 1: Comparison of Mean Scores of Visual Analogue Scale (VAS) and Ankle Range of Motion (Dorsiflexion and plantar flexion) of pre and post treatment using paired t –test in Group A.

	VAS Scores		Dorsiflexion		Plantarflexion	
	Pre - treatment	Post -treatment	Pre treatment	Post - treatment	Pre-Treatment	Post-Treatment
MEAN	7.86	3.67	16.73	21.67	27.33	33.13
SD	0.92	0.62	2.89	2.72	3.42	3.56
t value	17.2842		10.66		19.5943	
p value	<0.0001		<0.0001		<0.0001	

Interpretation: Therefore , the result is extremely statistically significant.

Table 2: Comparison of mean scores between Pre and Post treatment of Visual Analogue Scale (VAS), Ankle Range of Motion (Dorsiflexion and plantarflexion) using paired t- test in Group B.

	Visual Analogue Scale (VAS)		Dorsiflexion		Plantarflexion	
	Pre –treatment	Post- treatment	Pre - treatment	Post- treatment	Pre- treatment	Post –treatment
MEAN	6.46	3.20	16.67	19.6	33.33	38.13
SD	1.19	1.08	3.24	2.85	5.11	4.60
t value	10.3465		6.1041		12.6158	
p value	<0.0001		<0.0001		<0.0001	

Interpretation:Therefore, the result is extremely statistically significant.

Table 3: Comparison between Mean differences of the VAS and ankle range of motion (dorsiflexion and plantarflexion) Scores in Group A and Group B using unpaired t-test.

	Visual Analogue Scale Score		Dorsiflexion		Plantarflexion	
	Group A	Group B	Group A	Group B	Group A	Group B
MEAN	4.20	3.26	4.93	2.93	5.8	4.8
SD	0.94	1.22	1.79	1.87	1.15	1.47
t value	2.3426		2.9915		2.0744	
p value	=0.0265		=0.0057		=0.0473	

Interpretation: Therefore, the result is statistically significant.

RESULT

For both VAS and Ankle ROM in group A, result is extremely statistically significant (p value <0.0001). Thus, Myofascial Release technique along with conventional treatment helps in reducing pain and improving flexibility in chronic plantar fasciitis patients. For both VAS and Ankle ROM in group B, result is extremely statistically significant (p value <0.0001). Thus, Cyriax technique along with conventional treatment helps in reducing pain and improving flexibility in chronic plantar fasciitis patients.

The p value = 0.0265 and mean value of differences for VAS between Group A and Group B was 4.20 and 3.27 respectively. Also p < 0.05, the mean value of difference in group A and B for dorsiflexion was 4.93 and 2.93 respectively and for plantarflexion mean value of difference was 5.80 and 4.80 respectively. Thus Myofascial release technique along with conventional PT treatment was more effective than cyriax technique along with conventional PT treatment.

DISCUSSION

This study was conducted to evaluate and compare the effectiveness of MFR technique and cyriax technique on pain and flexibility in subjects with chronic plantar fasciitis along with conventional PT. In the present study, 30 subjects were included. Group A received MFR and Group B received Cyriax technique, both groups were given Ultrasound and conventional PT program for chronic plantar fasciitis patients. As seen in table 1, ie in group, paired t-test was applied which showed p < 0.0001, significant

pain reduction was achieved. The reason for pain reduction was non thermal effect of ultrasound in the form of stimulation of histamine release from mast cells and factor for microphages that accelerates the normal resolution.¹¹ Pulsed US is preferred for soft tissue repair and 1MHz was chosen as it is capable of reaching to deeper layer.¹²

When ultrasound is given it produces compression and rarefaction of cells and affects the movements of tissue fluid in the interstitial space, reduces the adhesion this process helps to reduce pain.¹³ Also, the subjects in group A received MFR after the application of US, which showed reduction in pain and improved muscle function i.e. Increased ankle dorsiflexion and plantarflexion. One of the reason for pain relief is the release of plantar fascia. When myofascial release is applied to the fascia it releases fascia restriction and break down the adhesion formation which mainly restricts the lengthening of plantar fascia.²

Also from table 1, ankle ROM was improved significantly i.e. MFR technique along with conventional PT program was proved beneficial. According to previous studies, the myofascial release is believed to free the impending blood vessel and nerves that passes near the plantar fascia and it improves the mechanical interface of plantar fascia, myofascial release also enhance body innate restorative power by improving circulation and nervous system transmission.^{14,15} Myofascial release also pent up emotions that may be contributing to pain and stress in the body. By giving myofascial release there is change in viscosity if the ground substances to a more fluid state which eliminates fascia's excess of pressure on the pain sensitive structure and hence this technique is proposed to act

as a catalyst in the resolution of the plantar fascia.
¹⁶The reasons mentioned above may explain the reason for relieving pain, improvement of range of motion in GROUP A – ¹⁷

Also GROUP B subjects received ultrasound followed by cyriax technique for 10 min, from the result shown in table 2, $p < 0.0001$ the difference is extremely significant. Thus Cyriax technique along with conventional PT program is effective for pain and flexibility in plantar fasciitis patients. Application of transverse frictions maintain muscle function, stimulate structural orientation without excessive formation of scar tissue. Deep transverse friction massage has effect in reducing pain and increasing muscle function as it reaches deep structures of body as ligaments and tendons.^{10,18} It is suggested that effect of transverse friction is to realign fibres without detaching them from their origin. However, mobilisation / exercises following application of transverse friction is important for realignment of fibres. Observation of wheal and redness after the application of transverse frictions for 10 min is sufficient to stimulate inflammation process and repair process.¹⁰In chronic inflammatory conditions deep transverse frictions produce therapeutic movement increasing frictional forces and generating heat to soften and mobilise adhesive scar tissue, thus improving muscle function.¹⁹ When unpaired t-test was applied between the two groups, the results showed mean value of difference for VAS in group A and B was 4.20 and 3.27 respectively, the mean value of difference in group A and B for dorsiflexion was 4.93 and 2.93 respectively and for plantarflexion mean value of difference was 5.80 and 4.80 respectively.

Thus myofascial release therapy along with conventional therapy is more effective than cyriax technique in chronic plantar fasciitis patients. As MFR is applied throughout fascia, pressure from the fascia is relieved increasing range of motion.

CONCLUSION

Myofascial release therapy along with conventional PT treatment was more effective than Cyriax technique along with conventional PT treatment.

Limitations: Sample size was small. Recurrences were not noted to find out the long term effect of the

treatment. Total duration of study was less.

Suggestion: Sample size should be taken more for accurate results. Recurrences of symptoms can be taken into consideration. Long duration of study can be performed.

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Trial of a Treatment on the Patients of Primary Osteoarthritis Knee

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ABSTRACT

Knee joint is composed of four components viz. capsule, synovial membrane, articular cartilages & bones. These all are damaged in osteoarthritis as per severity of the disease. The capsule is affected first when it hardens & contracts. As per literature the etiology of the primary osteoarthritis is uncertain⁵. If contraction correction of the joint capsule relieves the pain of osteoarthritis and proves its value in a clinical trial, the whole pathology of the disease can be understood and its treatment planned. With the same view a treatment was devised and put on trial in patients.

Keywords: *Knee joint, Osteoarthritis (O.A.), Contraction Correction Therapy (CCT), Clinical Trial, Radiological Gradation of O.A. Knee (Kellgren & Lawrence)*

INTRODUCTION

In this clinical trial a number of patients suffering from O.A. knee were treated with a particular therapy. The benefits of the treatment were noted & followed for a long time. The name of therapy is "Contracture Correction Therapy (CCT)".

AIMS AND OBJECTS

The current methods of treatment of Osteoarthritis knee in practice are not ideal & results unsatisfactory. They neither remove the cause nor correct the lesions of the disease. Their beneficial effects are temporary and vanish after a short time.

The treatment modality used in this trial removes the cause of the disease and corrects the reversible lesions. The pain subsides and disability disappears. To prove this quality of the treatment is the objective of this trial.

MATERIAL & METHOD

A total number of 94 confirmed cases of O.A. knee were selected to include in the trial. The confirmed diagnosis depended upon consideration of age >35 yrs., knee pain, morning stiffness, crepitus & X-ray findings. The X-ray findings included presence of osteophytes, narrow joint space, subchondral bone sclerosis and deformity of bone contour. These diagnostic features were in full agreement with clinical criteria laid down by Altman¹ and that by American college of Rheumatological classification. The first consisted of age > 38 years, knee pain, morning stiffness < 38 mins. and crepitus. The second comprised of radiological evidence of O.A. along with age > 58 years, morning stiffness < 30 mins. and crepitus.

Gradation of the disease was done according to Kellgren & Lawrence⁷ given in Table No. 1. This indicates the seriousness of the disease.

Table No.1 Different Grades of O.A.Knee & their features

S. No.	Name of Grade	Features Present in Skiagrams			
1	Grade-1	a- Osteophytes			
2	Grade-2	a- "	b-Narrow space		
3	Grade-3	a- "	b- "	c-Bone Sclerosis	
4	Grade-4	a- "	b- "	c- "	d-Bone deformity

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Out of total 94 O.A. patients 42 were treated by prevalent methods and rest 52 by CCT.

The Prevalent methods of Treatment of O.A. Knee:-

These are conservative and surgical.

A- Conservative Methods:-

I. Food Supplements

II. Drugs

III. Physiotherapy

IV. Miscellaneous

I. Supplements- Glucosamines, Chondroitine.

II. Drugs-

(i) Local - NSAIDS, Rubifascients

(ii) Systemic-Analgesics, NSAIDS

(iii) Intra-Articular Injections.

a- Corticosteroids e.g. Triamcinalone.

b- Viscosupplement-Hyaluranan (Inj. Halonix)

III. Physiotherapy-

(i) Quadriceps strengthening, cycling, walking⁴

(ii) Thermotherapy-Foamentation (water bottle, electric pad, wax therapy)⁶

(iii) Ultrasound therapy

(iv) Laser therapy

IV. Miscellaneous- Weight reduction in obesity, wearing elastic caps or braces on knee, avoiding kneeling & squatting.

B- Surgical Methods- [Hamblen,et al⁵]

In surgical treatment, the following are the operation most used-

1- Arthroscopic Wash out

2- Removal of loose bodies

3- Upper tibial osteotomy

4- Excision patella

5- Arthroplasty (knee replacement)

6- Arthrodesis

Contracture Correction Therapy (CCT):-

The therapy aimed at correction of the contracture in either anterior or posterior or both parts of knee capsule. Hence "contracture correction therapy or CCT" is the name of this treatment.

The CCT consisted of attaining & maintaining

following body postures:-

(i) Full knee flexion in lying supine - Fig. 1a

(ii) Knee flexion in lying prone - Fig. 1b

(iii) Full knee flexion by sitting on buttocks- Fig. 1c

(iv) Full Knee flexion in sitting on legs - Fig. 1d, 1e, 1f

(v) Full Knee flexion by sitting on soles - Fig. 1g

(i) Full knee flexion in lying supine - Fig. 1a



Fig-1a:- Full Knee Flexion in Supine Position. Hands at front of knee

(ii) Knee flexion in lying prone - Fig. 1b



Fig.1b Knee Flexion in Prone Position

(iii) Full knee flexion by sitting on buttocks- Fig. 1c



Fig.1c Full Knee Flexion sitting on buttocks

(iv) Full knee flexion by sitting on legs - Fig. 1d, 1e, 1f



Fig 1d Full knee Flexion by sitting on Legs – Lying prone with head and upper trunk raised



Fig 1e: Full knee Flexion by sitting on legs – Lying prone with whole trunk raised



Fig 1f: Full Knee Flexion by sitting on both legs

(v) Full knee flexion by sitting on soles- Fig. 1g



Fig 1g Full Knee Flexion by sitting on soles

Treatment Procedure

Every patient was taught to adopt the postures in which he stayed for 15-60 seconds, 2-4 times daily, sequence of postures was adhered to, and application of force to achieve a high degree of flexion was prohibited. After each posture relaxation was given by lying flat on back or abdomen for a period of 15-30 sec.

Body toning, light physical exercises and deep breathing were advised to all. Body toning consisted of mobilization of all trunk and limb joints; physical exercises walking or any sport and breathing of deep inhalation & exhalation. Attaining postures 1 & 2 in bed itself after waking up were most useful as they abolished the initial morning stiffness. In case of deficient full extension patients total therapy consists of morning walk, whole body toning & deep breathing only. Postures meant to flex the knees are not needed.

No analgesics were prescribed as they are indicated in acute phase of disease only. Accompanying anaemia, overweight and diabetes were treated appropriately. CCT was contraindicated in “Acute Exacerbation of O.A.” Age was no bar.

FINDINGS

The relief of pain and disability were taken to be the criteria of benefit by treatment. Every patient was followed for as long a period as possible.

The relevant observations have been given in the following tables-

Table No.-2a No. of patients treated with CCT and other therapies.

Total No.	94
Treated by CCT	52
Treated by other therapies	42

Table No.- 2b Showing Male/Female ratio

	M	F
Nos of Patients	22	30
Approximate %	40	60
Approximate Ratio	2	3

Table No.-2c Showing age group distribution

S.No.	Age Group	No. of Pts.	Approximate %
1	< 40 years	5	10
2	40-50 years	11	20
3	50-60 years	15	35
4	> 60 years	21	40

Table No.2d Showing predilection to Rt.or Lt.in Knee affection.

S.No.	Knee Side	No. of patients	
		Total	Rough %
1	Left	17	35
2	Right	8	15
3	Both	27	50

Table No. 2e - Incidence of different typical symptoms

S. No.	Symptoms	Total No. of pts.	Rough %
1	Pain	52	100
2	Stiffness	27	50
3	Disability	52	100

Table No. 2f - Incidence of different typical physical signs.

S.No.	Signs	Total No. of pts.	Rough %
1	Crepitus (palpable or audible)	51	100
2	Reduced range of movement	26	50
3	Deformity (flexion, shortening or bowing of knee laterally i.e. genu varus)	06	10

Table No. 2g - Showing division of pts. in different grades of O.A.

S.No.	Name of grade	No. of Pts. out of 52	
		Total	Rough %
1	Grade-1	16	30
2	Grade-2	24	50
3	Grade-3	6	10
4	Grade-4	6	10

Table No. 2h Showing concurrent systemic/metabolic diseases in the pts.

S. No.	Disease	No. of pts.	Remarks
1	Anaemia	10	
2	Over weight	10	See Note below
3	Obesity	4	“
4	Hypertension	2	
5	Diabetes Mellitus	3	
6	Rheumatoid Arthritis	1	

Note- Formulae used to calculate body weight
I Standard Wt.-

(i) Male - 5 Ft. of Ht. = 48 Kgs.

(ii) Female-5 Ft. of Ht.=44 Kgs.

+ 2 kg for each additional inch.

II. Over Wt- > 10% above std. wt.

III. Obesity - > 20% above std. wt.

Table No. 2i Showing follow up period.

S.No.	Period	No. of Patients	Approx. %
1	6month-1year	20	40
2	1year-5 year	27	50
3	> 5 years	5	10

Table No. 2j Treatment Results analysis

Sr. No.	Result	No. of Pts. (out of 52)	Remarks
1	Full Relief	51	-
2	Partial Relief	1	Pain subsided but deformity persisted
3	No relief	Nil	-
4	Complications	Nil	-

DISCUSSION

There is a pertinent question. How does CCT work or in other words what is the basis of this therapy? The reply is, as below:-

In my opinion the cause of O.A.knee is either deficient full flexion or deficient full extension in a particular case. The former is present in persons who in their waking period remain standing or sitting on chair. The flexion in standing is 0° while in sitting 90°.The range of 90° -145° is absent. The other cause works in person who remain seated on ground or couch most of time. Here the flexion is full 145° but extension is fully absent. The first cause is present in non-manual working class of society and the second in manual workers and inactive old persons. Western style commode users are affected more.

Any reduced movement produces a state of under-use of the joint which is a pre disposing factor in the development of O.A. knee.⁸

Any deficient full movement damages the joint capsule by its thickening and the articular cartilage by its necrosis as explained below -

Mechanism of Capsule Damage:

Normally when knee assumes the position of full flexion from full extension its anterior capsular ligament elongates. The distance between upper border of patella and tibial tuberosity increases from about 10cms to 12 cms. Functionally the anterior ligament is composed of quadriceps muscle, patellar ligament and fibrous joint covering. Its elongating capacity depends upon their elasticity. When the reduced range of motility persists for long it results in loss of elasticity of these structures giving rise to their thickening and contracture.

Mechanism of Cartilage Damage:

The articular cartilage is an avascular structure and survives on the diffused nutrients and oxygen from synovial fluid. The later is jelly like thick, secreted by synovial membrane at the joint periphery. From joint periphery it traverses to all over articular surfaces. The speed of transport depends upon the relative movements between the articular surfaces².

Thus in a state of reduced joint mobility-range cartilages will suffer lack of nutrition and oxygen resulting in their necrosis. Cartilage once dead cannot regenerate.

Summary of Etiology and Etiogenesis.

Any functional (such as deficient full flexion or full extension) or structural (e.g. thickenedcapsule or necrosed cartilage) abnormality alone can give rise to full grown O.A. of knee.

This view has been supported by

1- Hamblen et al ⁵ and

2- Doherty et al ³

Hamblen et al-

“Almost any abnormality of a joint may be responsible indirectly, for the development of osteo arthritis- often many years later.”

Doherty et al-

“All the joint tissues (cartilage, bone, synovium, capsular ligament, muscles) depend upon each other for health and function. Insult to any one tissue impacts on the others, resulting in a common O.A. phenotype affecting to whole joint.”

Mechanism of Pain Production-

The arthritic pain can arising in bone, articular cartilage, synovium or capsule. Let each be considered.

1. Bone - It is excluded as the seat of pain because pain of the disease starts much before the bone is affected.

2. Articular Cartilage-

“Cartilage has no nerves or blood vessels ⁴.

Pain cannot be transmitted by an un-innervated structure. In practice too it is quite often that pain is absent & crepitus is present. So this is also excluded.

3. Synovium-

The synovial membrane has no nerve endings & is insensitive to pain.(Kellgren & Samuel 1950; Barnette et. al. 1961)⁴

So this is also excluded similar to articular cartilage.

4. The capsule:-

Having excluded bone, art. cartilage & synovium the capsule is the only component left where pain can arise.

Pain starts only when knee is moved. For example when pt. wakes & tries to get up he feels pain (morning pain). In this activity knee flexes and its anterior ligament elongates by stretch. In reversal, on straightening the leg pain subsides due to extension of joint & removal of stretch from its anterior ligament. This concludes that the pain of O.A. knee is produced by stretch on its thick contracted ligaments.

Contracture develops in the anterior ligament where the cause of O.A. is deficient full flexion and in posterior part of capsule where the cause is deficient full extension.

SUMMARY

It is a prospective clinical trial of contracture correction therapy (CCT) on patients of O.A.knee.

A total of 94 patients were chosen & divided in two groups. One group of 42 patients was treated with various prevalent modalities and the other of 52 with CCT only. The constituents of CCT with its mode of action have been described alongwith relevant photographs.

The CCT is composed of five basic body postures. Adoption of which correct the contracted anterior or posterior ligaments of knee. After lengthening of ligaments there is no painful stretch on them. The increased range of movements of the joints cures the disabilities.

The details of the patients; their disease, duration of CCT given & follow up period have been noted in the observation tables.

In discussion etiology, etiogenesis, pathological lesions, symptomatology of O.A. knee have been described. The therapy has been shown to remove the cause & correct the main lesion, responsible for the chief symptoms of pain & disability.

CONCLUSION

The CCT is a specific treatment of O.A.Knee. As it removes the cause, the disease is cured if applied before the cartilages are destroyed. If applied after cartilage damage it keeps the disease under control so as to make the patient symptom free. The recurrence is well prevented if patient can provide a daily dose of knee movements from 0° to 145° & 145° to 0° viz full range of flexion and full range of extension.

The success rate noted was almost 100%. There were no failures or complications. It was effective in all the patients including those of advanced age, suffering from diabetes mellitus, anaemia, hypertension or obesity.

This therapy is not indicated in acute stage of O.A. & is less effective in presence of deformity Genu Varus (bow knee or convexity laterally). It is easy to carry out by the patient himself alone. There is no necessity of surgical intervention, manipulation or use of any device. No drugs are required except for the accompanying disease. The treatment is totally cost free.

As the trial has proved the efficacy of CCT in the treatment of O.A. knee its aim is well fulfilled.

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Qualitative Analysis of Postural Variations in Adolescent Girls

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ABSTRACT

Aim: • To observe the postural variation in segments of the body.

- To analyze the interrelationships among body segments
- To educate students to maintain healthier posture.

Methodology: Observational study is done with a sample size of 170 adolescent girls of age 18-20 years studying 1st -3rd year (students), bachelors of physiotherapy included in the study by convenient sampling from a physiotherapy college, Neelachal institute of medical sciences, Bhubaneswar, India using a posture grid and plumb line. The variation in each segment of the body from ideal posture and its interrelationships are obtained by computing mean absolute error and correlation coefficients and also student t-test is use to know the significance level.

Results: The result shows greater incidence of significant postural asymmetries and existence of interrelationships between segments at 90% significance level.

Conclusion: Study reveals presence of postural variations mainly in neck, shoulder and upper back which leads to musculo- skeletal pains in adolescent girls and interrelationships signifies variation in one segment leads to strain in the related segment which causes permanent postural deviations.

Keywords: Adolescent girls, postural evaluation, postural variations, segmental interrelations.

INTRODUCTION

Postural assessments and education are a part of physical therapy education and clinical practice. The ideal normal upright posture has been proposed in early 1990s when it was described as a state of balance requiring minimal muscular effort to maintain¹. Whereas the inadequate posture consists of poor interrelations between parts of the body and these imperfect interrelations, causes muscle tension and shortening, which makes joint movements more difficult to achieve². Childhood and adolescence are the most important periods for formation of musculoskeletal system and physical problems that occur in this phase is determined by many factors such as intrinsic and extrinsic factors which influences

a child's posture, like that of heredity, environment or physical conditions in which the child lives, level of physical activity, socioeconomic level, emotional factors and physiological abnormalities due to human growth and development. Further, postural responses to daily demands differ according to gender and individual's skeletal maturity³.

Children and adolescents of today frequently show inactive lifestyle, unhealthy nutritional habits as well as media-dominated free time activities. Because of the lack of exercise in the daily routine, prevalence of insufficient motor fitness and overweight has increased during the last decades⁴. Statistics show 40-65% of growing children and adolescents show postural and motor developmental deficits⁵⁻⁶. A weak

musculature, in particular weak crural and trunk musculature not only leads to limited motor skills, also increases the danger of spine instabilities as well as back pain⁷.

Critical period in a man's posture shaping take place around 7th year of life and period of pubertal spurt; posture is completely shaped during the period between 18 and 20 years of life⁸. In early teens and adolescence, especially in girls because of rapid growth and also development of secondary sexual characteristics, sitting habits, posture commonly deteriorates which leads to faulty posture most commonly rounded back⁹.

Occupation of a physiotherapist requires high physical fitness and properly functioning neuromuscular system. Working with patients is not always performed in accordance with the rules of work ergonomics. Lack of regulation of patient's bed, long-term work in prolonged position and load bearded during treatments are merely the examples of many inconveniences that physiotherapists have to deal during their daily work⁸. Consequently, students in the initial period of their education are endangered with postural defects because of incorrect motor activity.

Epidemiological studies have shown high prevalence of spinal postural deviations in children and adolescents with forward head posture (FHP), protracted shoulders (PS), rounded back which can be called as Upper cross syndrome (UCS) and is defined as "tightness of the upper trapezius, pectoralis major, and levator scapulae and weakness of the rhomboids, serratus anterior, middle and lower trapezius, and the deep neck flexors, especially the scalene muscles⁹.

The aim of the study is:

- To analyze and observe postural variations in each segment of the body and to find out the interrelationship between each segments of the body with one another which leads to musculoskeletal dysfunctions or impairments in future among adolescents girls in a physiotherapy college.
- To aware and educate the students to maintain healthier posture.

MATERIALS & METHODOLOGY

A sample size of 170 adolescent girls of age 18-20 years studying 1st, 2nd and 3rd year bachelor of physiotherapy were taken in the study after filling the informed consent formally in a physiotherapy college, Neelachal institute of medical sciences, Bhubaneswar, India. Students were asked to be in comfortable clothing. A posture grid in which each grid measures 10 ×10 centimeters, was approved by the ethical committee and a plumb line, which was hung on the midline of the grid, are used and the students were asked to stand in orthostatic posture in reference to plumb line and evaluation is done in lateral view¹⁰. The data was collected and represented graphically.

STATISTICAL ANALYSIS AND RESULTS

The data collected by evaluating 170 adolescent girls for determining changes in body segments we computed mean absolute error of each segment of the body by using an ideal grade point 10 for normal alignment of posture. Student t- test is done to identify the significance of the mean absolute error (changes in each segment of the body) which is depicted in **Fig.1**. Then calculation of correlation coefficient among the segments of the body is done for analyzing the interrelationships among the segments of the body and t- test is done to determine the significance of the interrelationship depicted in **Fig.2**.

Results shows maximum students are found to have postural asymmetries which are deviated from the normal ideal postural alignment. The results shown in **Fig.1** indicate about the changes observed in all the segments of the body. Minor changes are observed in head, spine, trunk, abdomen, lower back and ankle. Moreover, 90% significant changes are observed in regions of neck, shoulder and upper back of the body. Coming to the interrelationships among the segments of the body the results in **Fig. 2** shows the following:

- A change in head position from ideal posture is found to have positive correlation with neck, ankle; negative correlation with upper and lower back. Significant relationship exists between head and ankle at 90% confidence level.
- Changes in neck from ideal posture is having

positive correlation with upper and lower back regions; negative correlation with trunk, shoulder. Significant relationship exists between neck and trunk at 90% confidence level.

- Changes in Shoulder symmetry from ideal posture are having positive correlation with upper back, spine; negative correlation with neck lower back and ankle. Significant relationship exists between shoulder and upper back at 90% confidence level.

- Changes in Spine is having positive correlation with neck, shoulder, upper back and abdomen; a slight negative correlation with lower back. Significant relationship exists between spine and upper back, abdomen at 90% confidence level.

- Ankle is having positive correlation with head, neck; negative correlation with shoulder, lower back. Significant relationship exists between ankle and head at 90% confidence level.

- Upper back is having positive correlation with, neck, shoulder, spine, abdomen; negative correlation with lower back, trunk and ankle. Significant relationship exists between upper back and shoulder, spine at 90% confidence level.

- Trunk is having positive correlation with lower back; negative correlation with head, neck, upper back, spine and abdomen. Significant relationship exists between trunk and neck, lower back at 90% confidence level.

- Abdomen is having positive correlation with neck, spine; negative correlation with lower back. Significant relationship exists between abdomen and spine at 90% confidence level.

- Lower back is having positive correlation with trunk and neck; negative correlation with head, shoulder, upper back, spine and abdomen. Significant relationship exists between lower back and trunk at 90% confidence level.

DISCUSSION

The purpose of the study is to find out the postural asymmetries in adolescent girls. Deviations were evaluated using posture grid and a plumb line hung on the midline of the grid as a reference line. Deviations from this reference line observed and recorded. Computation of data is done for mean

absolute error to know the changes in each segment of the body from the ideal grade point 10 for ideal posture and t-test to identify the changes in the body segments, which are significant. To find out the interrelationships among the body segments, the correlation coefficient obtained and also used student t-test to identifying significant interrelationships of segments of the body. The above results indicate the presence of postural asymmetries and existence significant interrelationships among the segments. These results also shows the presence of upper cross syndrome which is very common in children going to colleges and schools carrying heavy bags, or sitting for prolonged time in improper chairs, while using computers etc. where lower cross syndrome is very less observed in adolescent group taken. In a study done by Ross et al.¹¹ commonly, found postural asymmetries and their biomechanical relationship to one another are the basis of the current postural model. Postural symmetry is composed of three primary aspects. The first is symmetry of structure or anatomic mirror symmetry from right to left and visa versa. The second is symmetry of function, as in the phrase "symmetrical gait", used to describe equal use of the right and left sides of the body. The third is symmetry of mass, which is the attitude of the body from front-to-back and side-to-side.

Adolescence girls are generally prone to mechanical and societal influences, which are responsible for changes in postural alignment and develop poor postural habits. Increased thoracic kyphosis, protruding head position, and loss of shoulder range are induced by slouched sitting, ill-fitting school desks, and overloaded backpacks. Changes in body image and its development with discomfort following growth spurts, particularly breast changes, in future leads to shoulder protraction and thoracic joint stiffness setting the stage for muscle imbalance and dysfunction in later stages¹².

From book "Clinical Biomechanics: Musculoskeletal Actions and Reactions" Williams & Wilkins that during adolescent spurt of growth changes in body occur to adjust with gravity¹³. In this phase if adaptive mechanisms fail an adolescent may face conditions like forward head posture due to hyperextension of neck and rounded shoulders, slouching of upper back etc. In a study done by Petricia et al.¹ observed presence of postural

abnormalities commonly in regions of head, shoulder and upper back leading to musculo-skeletal pain.

According to Straker et al.¹⁴, changes in neck postures occurs in many usual sitting positions for prolonged times may cause more flexed spinal posture. According to Penha et al.², higher incidence of postural alterations seen in girls of age 7 and 10 years of age. Rodrigo et al.¹⁵ concludes forward head, protracted shoulder and neck pain are common in adolescent girls.

Head stabilization in erect position on the body within base of support where centre of gravity lies between two malleoli of the ankle. This stabilization is achieved through ankle synergy, which occurs in distal- proximal pattern and head stabilization strategy in space that occurs in contrast to ankle synergy¹⁶.

In a review article done by Magnusson et al.¹⁷ it is said that extreme forward flexion of the cervical spine causes static contraction of neck and shoulder muscles to counteract the weight of the head. This extreme angle will show impact on upper trapezius muscle, also shows that load on the neck is correlated to trunk and head position. Muscle activity is less seen when trunk leans slightly backwards and neck is vertical.

Habituated slouched posture makes the chest goes inside; the shoulders round forward, the upper back hunches over (increased kyphotic curve) and the shoulder blades (scapulas) rotate/tilt down to the front. This posture causes will make the neck flexors, thoracic extensors, shoulder blade stabilizers muscles weak and tightens neck extensors, upper trapezius and levator scapulae muscles¹⁸.

In a study done by Mary et al.¹⁹ it is concluded that decreased endurance of trunk muscles is indicated as a predictor of occurrence of first time low back pain. Neumann et al.²⁰ stated that awkward trunk positions during work will lead to low back pain. Therefore, a strong relationship exists between trunk and low back.

Stephen et al.²¹ concluded that stability of abdominal wall muscles to generate force and change length throughout the lumbar spine range of motion. In a study done by Dolphus Thacker et al.⁹ said that

headaches are a major complication experienced by people who demonstrate UCS.

Another study by By Kyle Tiefel says upper cross syndrome is a problem which will continue in future as number of people sitting at desks and computers will increase and physical activity decreases²³.

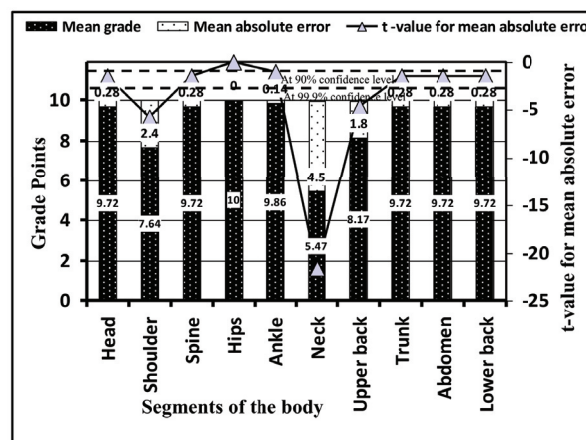


Fig. 1 Mean and mean absolute error for each segment of the body from grade point 10 of ideal posture in adolescent girls (18-20 years). Line graph indicates t-values for changes in the segments of body. For 90% and 99.9% confidence level t-value are ± 1.65 and ± 3.37 .

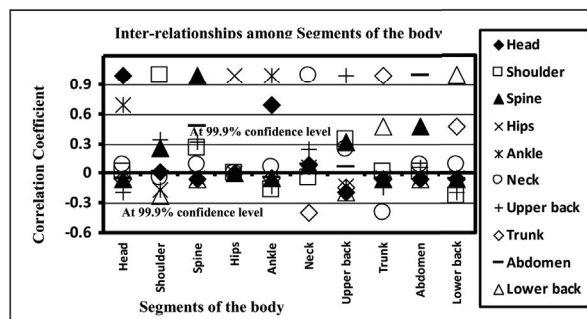


Fig.2 Interrelationships (correlations) among the segments of the body in adolescent girls (18-20 years). For 99.9% confidence level t-value for correlation coefficient is ± 0.324 .

CONCLUSION

The results of the study shows existence of some or the other postural asymmetries in adolescent girls mostly in head, neck, shoulders and upper back because of changes in activities like increase in their study time, while dealing patients and prolonged sitting in class rooms. So an education program on awareness of postural changes which occurs during adolescence which in future can lead to musculo-skeletal pains is to be conducted. Simple postural

exercises, optimal positions of posture while dealing with patients are to be encouraged by the students.

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