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Prevalnace of Knee Pain in Chronic Stroke Patients with Weight Bearing Asymmetry

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Abstract

Background : Stroke is sudden loss of neurological function caused by an interruption of the blood flow to the brain. Stroke survivors experience a long-term balance and mobility problems. Generally the non-paretic limb bears more weight than the paretic limb; this is known as weight bearing asymmetry. Walking dysfunction is most commonly reported limitation after stroke and can markedly affect independence, quality of life, and participation. As a resut of weight bearing asymmetry and persisting stroke-related gait deviations there can be development of secondary musculoskeletal complications.

Materials & Methodology : A cross-sectional study with stroke (n=100) patient was done in duration of 6 months. Patient with pain in knee before stroke, hemispatial neglect, who couldn't follow verbal commands, unable to stand independently, were excluded. Weight bearing asymmetry was checked with the help of 2 weighing scales. Pain was assessed with the help of McGill pain questionnaire.

Results : It was found that mean age of patients was 52.89 years, mean height was 1.67, mean weight was 65.18kgs, and mean BMI was 23.45 (normal). Mean time since stroke was 24.21 months, mean weight on right lower limb was 32.46 kg and mean weight on left lower limb was 32.26 kg and mean McGill pain score was 23.40. Correlation analyses revealed a moderate positive relationship between weight and weight on right lower limb ($r=-0.51$, $p<0.01$) also weight and weight on left lower limb ($r=-0.57$, $p<0.01$). A moderate negative relationship between weight on right lower limb and weight on left lower limb ($r=--0.41$, $p<0.01$). Finally, it was found that out of 100 chronic stroke patients, 48 patients had knee pain in non-paretic limb with weight bearing asymmetry.

Conclusion : There is impact on knee joint in chronic stroke patient with weight bearing asymmetry.

Keywords : *stroke, weight bearing asymmetry, knee pain, McGill pain questionnaire.*

Introduction

The world Health Organization (WHO) has defned Stroke as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin.[(1)] Stroke is sudden loss of neurological function caused by an interruption of blood fow to the brain. [(2)]

There are two types of stroke. One is ischemic and other is hemorrhagic. The commonest type of stroke is ischemic, which affects 80% of the individuals with stroke. Ischemic type of stroke occurs when there is a clot block which impairs blood fow which in turn deprives brain its essential oxygen and nutrients. Abnormal bleeding in extra vascular areas of brain can be result of rupture of a cerebral vessel which is known as hemorrhagic stroke. [(2)]

A variety of focal defcits are possible, which includes change in the level of consciousness and sensory, motor, cognitive, perceptual and language function impairments. Neurological defcits that persists for at least 24 hours can be classifed as stroke. The impairments that persists longer than 3 weeks and which may lead to lasting disability is known as residual

neurological impairments.[2]

Impaired balance or postural control is one of the commonest problems in individual with stroke. This results in poor performance of activities of daily living, mobility, uneven weight distribution which is known as weight bearing asymmetry and also leads to increased risk of falls. Balance disability can be seen in all types of balance control that are static, dynamic and responses to external perturbations.[3]

It is difficult for individuals with stroke to accept and bear weight on the paretic leg so they mostly exibit asymmetry in standing and also during ambulation, where the greater proportion of body weight is being borne on the non-paretic leg. Generally it has been reported that the non-paretic leg bears more weight than the paretic leg; which is known as weight bearing asymmetry. The percentage of the body weight that is being borne by the non-paretic leg can be as high as 61%.[4]

Normal gait is symmetrical, both spatially and temporally, slightly with inter limb difference, but gait post stroke is generally weight bearing asymmetry. This is characterized by spatial, temporal and biomechanical difference in paretic and non-paretic lower limb. There are temporal asymmetries in stance time, single support time, double support time and swing time and spatial asymmetry in step length of post stroke patient.[5]

This repetitive loading is commonly accepted as one mechanism that might lead to degeneration in a joint. Most commonly it is seen at the hip or knee joint which might causes pain. Pain in lower limb is an issue post stroke and a problem that may get worst over time. The potential for the development of secondary musculoskeletal issue such osteoarthritis long after discharge is of great concern. [6]

This is a concern because pain in knee could exacerbate post stroke gait deviation which could further restrict independence limit the quality of life. Even after complete rehabilitation of stroke, walking dysfunction persists. [6]

Improving mobility after discharge by rehabilitation is important as this has received less attention. But if it is given less importance, then there is risk of development of secondary musculoskeletal complications. As a result of persisting stroke-related gait deviations. [6]

Materials and Methods

An approval for the study was obtained from the Institutional Ethical Committee. A cross sectional study was conducted in subjects with Chronic Stroke in tertiary care hospitals of Miraj. Sample was achieved by Purposive sampling method. A total of n=100 subjects were selected. All the subjects were screened for inclusion criteria i.e. both Male & Female of Age group between 25 to 65 years, both types of Stroke Hemorrhagic and Ischemic, with weight bearing asymmetry, Ability to stand or walk with or without assistive device, Ability to understand and follow verbal request and Subject who are willing to participate in the study. Subjects excluded were who had Knee pain before stroke, Patient with hemi-spatial neglect, Unable to understand or follow verbal request, Unable to stand independently or with assistive devices and Subject not willing to participate. Informed consent for participation of subjects in the study will be obtained. Demographic data, BMI, side of affection of all the patients was recorded. Patients were then asked to stand on one weighing scale to measure their weight. Then two weighing scales were kept at 10cms distance apart and at a distance of 2 meter from the wall and the subject were instructed to stand as erect as possible while placing one foot on each scale and looking forward. For safety, therapist would stand beside the subject. The weight on each scale was then recorded. Three trails were conducted for each subject with the subject stepping down the scales between trails to allow the scale to return to zero. The mean of the three reading of each weighing scale was calculated for each limb. Then the patient was asked if he/she has pain in his non-paretic knee. If he/she had knee pain then McGill pain questionnaire was used as a pain outcome measure.

Mcgill pain questionnaire : The scale contains 4 sub-scales evaluating the sensory effective, evaluative and miscellaneous aspects of pain and a 5 point pain intensity scale. The pain rating index contains 78 paint descriptor items recognized into 20 sub-classes each containing 2-6 words that fall into four major sub-scale: sensory (sub-class 1-10), affective (sub-class 11-15), evaluative (sub-class 16) and miscellaneous (sub-class 17-20). There is also an item of pain intensity scale, a measure of the magnitude of pain experienced by an individual,

is a numeric verbal combination that indicated overall paint intensity (31) and includes 6 levels: nun (0), mild (1), discomforting (2), distressing (3), horrible (4), and excruciating (5). [7]

Findings

Table1: Age group wise distribution of chronic stroke patients

Age groups	Frequency	Percentage
≤30 years	7	7
31-40 years	13	13
41-50 years	16	16
51-60 years	32	32
>60 years	32	32
Total	100	100

Table 1 shows that, there were 7(7%) subjects≤30 years of age, 13(13%)between 31-40 years of age, 16(16%)between 41-50 years, 32 (32%) subjects between 51-60 years and >60 years of age with chronic stroke.

Table2: Gender distribution of chronic stroke patients

Gender	Frequency	Percentage
Females	41	41
Males	59	59
Total	100	100

Table 2 shows that, there were 41(41%) female subjects and 59(59%) male subjects with chronic stroke.

Table 3: Side affected distribution of chronic stroke patients

Side Affected	Frequency	Percentage
Left	53	53
Right	47	47
Total	100	100

Table 3 shows that, there were 47(47%) subjects having their right side affected and 53(53%) subjects having their left side affected.

Table 4: BMI distribution of chronic stroke patients

BMI Categories	Frequency	Percentage
Normal	94	94
Overweight	6	6
Total	100	100

Table 4 shows that, there were 6(6%) subjects were overweight and 94(94%) subjects having normal BMI.

Table 5: Distribution of chronic stroke patients according to time since stroke

Time since stroke	Frequency	Percentage
<1 year	27	27
1-2 years	36	36
2-3 years	21	21
3-4 years	10	10
>4 years	6	6
Total	100	100

Table 5 shows that, there were 27(27%) subjects had stroke before <1 year period, 36(36%)had stroke before 1-2 years period, 21(21%)had stroke before 2-3 years period, 10 (10%) subjects had stroke before 3-4 years period and 6(6%) subjects had stroke before >4 years period.

Table 6: Correlation between variables of subjects with chronic stroke

Sr. No.	Pearson Correlation	p value
1	Weight	Weight on right lower limb
	0.51	<0.01
2	Weight	Weight on left lower limb
	0.57	<0.01
3	Weight	McGill Pain Score
	-0.14	0.36
4	Weight on right lower limb	Weight on left lower limb
	-0.41	<0.01
5	Weight on right lower limb	McGill Pain Score
	-0.12	0.42
6	Weight on left lower limb	McGill Pain Score
	-0.04	0.78
7	BMI	Time Since Stroke
	-0.145	0.14
8	Time Since Stroke	McGill Pain Score
	-0.22	0.14

Correlation analyses revealed a moderate positive relationship between weight and weight on right lower limb ($r=-0.51$, $p<0.01$) also weight and weight on left lower limb ($r=-0.57$, $p<0.01$) So, it indicates that as weight of patient increases, weight on right or left lower limb also increases. A moderate negative relationship between weight on right lower limb and weight on left lower limb ($r=--0.41$, $p<0.01$). So, it indicates that as weight on right lower limb of patient increases, weight on left lower limb decreases. There was no correlation between rests of the variables of patients.

Discussion

The purpose of this study was to find out prevalence of knee pain in non paretic limb in chronic stroke patients with weight bearing asymmetry. In my study, 100 participants within the age group of 24-65 years of age visiting department of neuro physiotherapy, COP, MMC, Miraj were included.

After taking the Ethical clearance from the ethical committee of COP, MMC, Miraj. Participants were recruited according to inclusion and exclusion criteria and were examined for weight bearing asymmetry and asked for pain in knee pain in the non-paretic limb

Table and fg 1 shows that, there were 7(7%) subjects≤30 years of age, 13(13%) between 31-40 years of age, 16(16%)between 41-50 years, 32 (32%) subjects between 51-60 years and >60 years of age with chronic stroke.

In this study, patients from age of 24 years to 65 years where taken as subjects for study. The mean age is 52 years. And the standard deviation is 12.00.

The stroke in age group 40 or less is 3.8%. Stroke in Trivandrum occurred at rate of 7.1 per 1000 per year in aged ≥ 55 years. In registries of Mumbai showed mean age of stroke patients was 66 years.[9]

Table and fg 2 shows that, there were 41(41%) female subjects and 59(59%) male subjects with chronic stroke.

In Mumbai registry, women had lower stroke rate than men that is crude incidence rate, 149/100,000 person-years for men verses 141/100,000 person-year for women. Women were older (68.9 years) compared to men (63.4 years).[9]

Table and fg 3 shows that, there were 47(47%) subjects having their right side affected and 53(53%) subjects having their left side affected.

In this study, Table and fg 4 shows that, there were 6(6%) subjects were overweight and 94(94%) subjects having normal BMI, so we could not see signifcant number of subjects with knee pain.

In the study, of Patterson and Sibley [6] stroke+arthritis group was heavier and older. It could be a possibility that they were exposed longer to the abnormal joint load imposed by primary stroke related motor impairments and this lead to decrease in mobility which in turn lead to weight gain and increase in BMI. So, they could see n=1010 out of n=3784 had arthritis. [6]

In this study, Table and fg 5 shows that, there were 27(27%) subjects had stroke before <1 year period, 36(36%)had stroke before 1-2 years period, 21(21%)had stroke before 2-3 years period, 10 (10%) subjects had stroke before 3-4 years period and 6(6%) subjects had stroke before >4 years period. All the subjects included were chronic but only 48 subjects had pain in the knee joint of non paretic limb out of 100 subjects.

In the study, of Patterson and Sibley [6] 55% chronic stroke individuals exhibit increased stance duration on their non-paretic limb compared to their paretic limb. This increased stance duration exposes the non-paretic limb to excessive and repetitive loading, this mechanism leads to degeneration at knee joint and pain.[6]

The main fnding of this study is that, patient with stroke have knee pain in the affected side with weight bearing asymmetry that is 48 patients out of 100 have knee pain. In the study of Patterson ans Sibley [6] 53 % adults who dwell in the community have knee pain as compared to those without stroke 43%.[6]

In this study, all the individuals were taken with weight bearing asymmetry who bore weight on the unaffected limb. It was found that weight on the right lower limb minimum was 19 kg and maximum was 45 kg. Mean of which is 32.46 and standard deviation is 5.99. And weight on left lower limb minimum was 21 kg and maximum was 44 kg. Mean of which is 32.26 and standard deviation is 6.32. Correlation analyses revealed a moderate positive relationship between weight and weight on right lower limb ($r=-0.51$, $p<0.01$) also weight and weight on left lower limb ($r=-0.57$, $p<0.01$). In the study "falls, sway, and symmetry of weight-bearing after stroke" the right and left sided hemiplegic individuals, both types were found to favor their non-paretic limb. [8] In the study of Dr. B.O.A Adegoke, O.Olaniyi and C.O. Akosile [4] subjects bore a mean of 60.3% of their body weight on the non-paretic limb in this study. [4]

In this study we have found that there is more knee pain in men and compared to women. Which is not related to any age group. This may be because of the different challenges each individual faces. As the individuals were not taken from a particular area with common challenges. Also in this study number of male participants is more that is 59 males and 41 females this being the limitation of the study.

In the study, Szopa et al.[5] there is signifcant difference in gait patterns in terms of spatiotemporal and kinematic parameters. Hemiparetic patients exhibit variation in joint kinamatics in between individuals. The most common kinematic deviation in gait is asymmetrical movement of pelvis, insuffcient paretic hip and knee fexion in swing phase, and excessive ankle plantar fexion. [5]

In the study, Patterson and Sibley[6] arthritis in non-paretic knee joint is exhibited because the joint is exposed longer to the abnormal joint load imposed by the primary stroke by the primary stroke related impairments which lead to decrease in mobility. [6]

Conclusion

We can see knee pain in non-paretic lower limb with weight bearing asymmetry in 48 subjects. In normal day to day practice we tend to pay less attention to strengthening and conditioning of the non-paretic lowerlimb because, we pay much attention to the paretic limb. Further study can be done to compare the individuals for knee pain after physiotherapy intervention. Perform a study with overweight population. The study can be carried out using force plate.

Conflict of Interest : None.

Source of Funding : Self.

Ethical Clearance : The ethical clearance was obtained from the Institutional Ethical Committee of College Of Physiotherapy, Wanless Hospital, Miraj Medical Centre, Miraj.

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Effect of Backpack on Static and Dynamic Balance in Healthy School Children: A Comparison

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Abstract

Purpose: To assess and compare static balance using Single limb stance test (SLST),dynamic balance using Paediatric reach test(PRT)and Star excursion balance test (SEBT)with backpack and without backpack in healthy school children

Method: 150 healthy school children between 10-14 yrs were assed using SLST, PRT, SEBT with backpack and without backpack. The data was analysed using paired t test.

Result: The scores for all tests were significantly low while carrying backpack ($p<0.0001$)

Conclusion: Balance abilities in healthy school children get affected while carrying backpack.

Keywords: *backpack, balance, static, dynamic, school children*

Introduction

Backpacks are commonly used by almost all students, military personnel and hikers.[1, 2] Increasing homework, more number of textbooks,bigger size of texts, variety of objects to be carried to school has lead to a significant increase in load to be carried at school.[3,4] Lack of storage space,[3,5] and increased travelling time along with this load has drawn attention of several researchers and regulatory authorities on ill effects of the backpack on school children.

Amount of weight carried by children in their backpack generally exceeds the recommended 10%body weight limit .[6,7,8] Backpack , when carried posteriorly, causes shift of COG posteriorly and higher, leading to forward trunk lean and forward head posture.[7,9]In children , who already have larger heads and higher COG as compared to adults, this causes further deleterious effect on postural system. An individual uses antigravity muscles while quiet standing, ankle strategy while reaching in front or back within BOS and stepping strategy while going out of BOS.[10] With this added weight and altered biomechanics, these systems get challenged, which may lead to altered balance.

With today's changing scenario the children have to travel alone in public transport or on cycles or walking to reach to the schools. Heavy backpacks, challenged balance control system, along with heavy traffic and changing surroundings may increase the risk of falls in these children.

A lot of emphasis has been given to postural changes[9,7,11]and pain[12,13,14] due to backpacks, but altered balance issues in daily life due to backpack have been comparatively ignored, hence this study was designed with objectives of assessing and comparing the balance scores using SLST(Single leg stance test),PRT(Paediatric reach test), SEBT(Star excursion balance test) with back pack and without backpack in healthy school children.

Methods

Design-This was a quasiexperimental design where participants served as their own control. Chit method was used to decide the order of the measurements for participant carrying backpack or no backpack.

Participants- 150 participants (calculated from a pilot study with SD-5.62,alpha-0.05,beta-0.9) between 10-14 years , of both gender , with ability to attend all data collection sessions and whose informed consent

was provided by parents were selected for the study. Any child with a history of spinal cord injury or deformity, fatigue, history of ear infection, lower limb injury or deformities, visual and hearing impairments, inability to follow commands, any neurological conditions, pre-existing condition that prevented the child from carrying backpack or low back pain limiting use of backpack was excluded from the study.

Outcome measures-

Single leg standing test (SLST)-Participants were made to stand barefoot and 2 ft away from the wall. They were asked to fxate gaze on given point at eye level and 20 ft away from standing point. They were made to have stance on one lower limb and the other lower limb fexed 90^0 at hip and knee with ankle in neutral, hands on hips. The time was noted from the moment of lifting the leg and stopped when the stance limb moved on the foor or foot touched down or participant's gaze moved away from target or participant kept the leg hooked at stance limb in spite of warning twice. 5 min of rest was given between each test. Mean of 3 readings was taken as fnal reading. This is the standard test used commonly for children and has reliability of 0.91 to 1.00.[15]

· Paediatric reach test (PRT)- The participants were asked to stand with their regular shoes and stand. Foot positions were marked with masking tape and kept same for all trials. The examiner stood at back of the participant.The loop of the tape was put around the middle fnger.They were asked to keep the arm at 90 degree forward fexion elbow straight and wrist in maximum neutral and move as far as possible without lifting the heels in front and maintain the position for 3 sec .Mean of 3 reading was taken as the fnal reading. The difference between two positions was noted. The test has inter rater reliability of 0.54-0.88 and intra rater reliability of 0.50-0.93 , concurrent validity ranged from 0.42-0.77 and construct validity ranged from -0.79 to -0.88 .[16]

· Star excursion balance test (SEBT) - The participant was asked to stand at the center of a grid laid on the foor with 8 lines extending at 45 degree increments from the center of the grid. They stood in center and reached as far as possible with one leg without lifting the stanced limb and touched the line with the most distal part of the foot and as lightly as possible . The subject returned to a bilateral stance while maintaining balance .6 practice sessions were given. Final reach distance was measured from center to the most distal point on line touched .The test hasvalidity ranging from0.38 to 0.93 [17] with value of 0.59-0.95 and 0.68-0.95 intra rater and inter rater reliability respectively .[18]

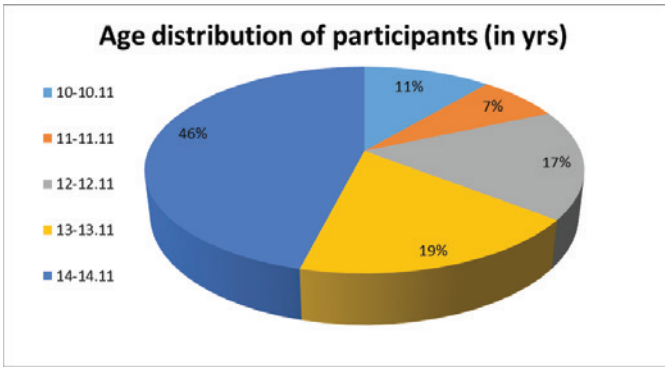
Procedure-

IEC clearance and informed consent from parents was taken .Age, height,weight, weight of backpack of the participant were recorded. Chit method for recording with or without backpack served as a means of reducing condition induced bias. Daily backpack of participant was used as the load while taking readings with backpack. A rest of 10 minutes was given between each test. The sequence of SLST,PRT,SEBT was kept constant.

Statistical Analysis

Demographic data was studied using descriptive statistics and other test results were compared by paired t test usingSPSS 17.0.

Results



Graph 1-

Graph 2-

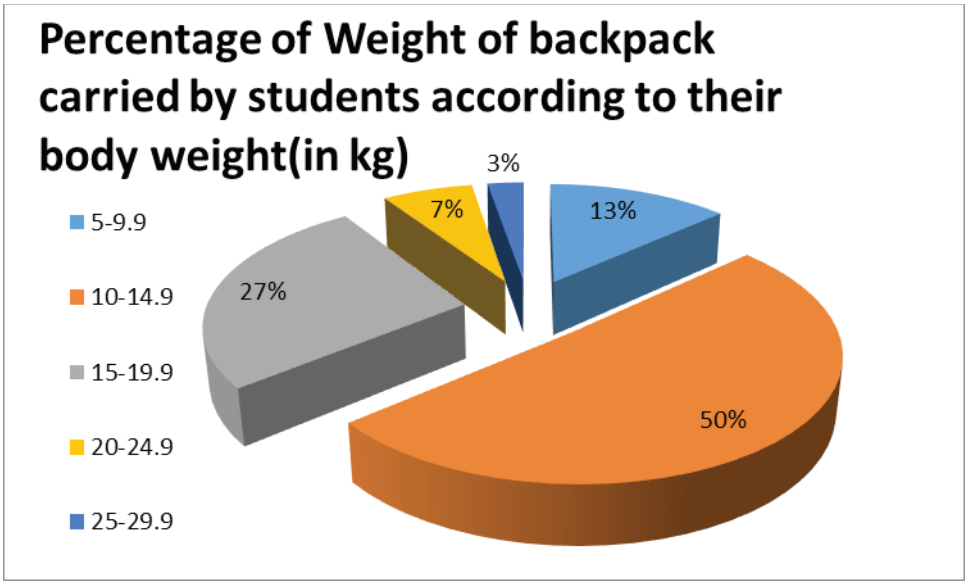


Table 1-COMPARISON OF SCORES WITH BACKPACK AND WITHOUT BACKPACK (using paired T test)

TESTS		Without backpack		With backpack		P value
		mean	SD	mean	SD	
SLST(cm)		131.97	54.65	96.80	40.44	<0.0001*
FRT(cm)		15.28	3.71	13.39	3.51	<0.0001*
SEBT (Directions)9(cm)	Anterior	42.63	6.87	39.99	6.44	<0.0001*
	Anterolateral	43.73	6.90	41.43	7.28	<0.0001*
	Lateral	42.21	8.13	45.43	12.11	<0.0001*
	Posterolateral	44.52	8.26	41.90	8.49	<0.0001*
	Posterior	42.79	8.51	39.89	8.16	<0.0001*
	Posteromedial	43.802	6.37	37.48	7.74	<0.0001*
	Medial	30.251	9.13	27.30	8.58	<0.0001*
	Anteromedial	40.613	7.94	38.08	7.84	<0.0001*

Discussion

Recommended weight limit for the backpack to be carried by children is 10% of their body weight.[6, 7, 8] 50 %of the children in this study carried backpack weighing more than 10 %of their body weight.

EFFECT OF BACK PACK ON STATIC BALANCE-

We used SLST with eyes open as a measure to assess static balance. Here, the COG lies lateral to S_2 vertebra so hip abductors and side fexors of trunk have

to contract to maintain the state of equilibrium in this position.[19]With backpack it shifts more laterally and above thus, challenging balance system. The participants showed signi f cantly low scores for duration of single leg stance test while carrying backpack (p<0.0001)

Very few studies describe single leg stance balance in healthy adolescents. No normative data was available for single leg standing with eyes open as most of the researchers used eyes closed in static condition and eyes closed and open in dynamic conditions to assess balance in healthy adolescents. We did not f nd any study assessing balance and effect of backpack on it using single leg stance hence no data was available for reference or comparison. But, this f nding is in accordance with other researchers who studied the effect of load on static balance using postural sway.

One of the studies investigated modi f cations in sway parameters induced by backpack in Italian primary school children and found signi f cant load induced increase in all sway parameters and linear relation between sway area and backpack weight. Since postural sway is an effective indicator of balance abilities, any alterations in it suggest that backpack carriage originates balance impairments.[20]

Similar f ndings were observed in another study on college students, where all the sway parameters increased in proportion to the weight added(p<0.0001). [21]

Study of effects of carried weight on random motion and traditional measures of postural sway was done in military soldiers using force plates. Here stabilogram analysis revealed that with increase in load the weight and center of excursion increased linearly but muscle activity changed minimally, suggesting that increased load challenged stability, reduced randomness of movement sway and made the load carrier exert greater control in order to maintain balance. [22]

Another study, on effects of external load on balance during upright stance,while examining the ability of new balance control model to predict those effects,also showed that, on application of external load, the COP mean velocity in A-P direction and RMS distance in M-L direction increased thus, concluding that external load affects balance and may lead to falls risk.[23]

EFFECT OF BACKPACK ON DYNAMIC BALANCE-

Activities performed by children like reaching forward while playing imitates the PRT. The task causes displacement of center of gravity in forward direction by rotating around ankle joint with maintained hip extension, thus activating ankle and hip strategy. It has been observed that healthy individual activate ankle strategy for this task. Hamstrings work concentrically to control the forward tilt of the pelvis while Gastrosoleus work eccentrically to stabilize knee joint while reaching in front.[24] with added load of backpack COG shifted further anteriorly increasing the amount of force required to be generated by gastrosoleus. This in turn might have affected the reach distance.This theory was supported by the f ndings of our study where, the paediatric reach test distance was signi f cantly low while carrying backpack (P<0.0001).

The other most commonly performed activity by children is jumping / hopping. Hence we chose SEBT as the other outcome measure for dynamic balance assessment. Here standing leg requires good range of motion at ankle dorsi f exion , knee f exion, hip f exion , adequate glutei and other antigravity muscle strength in order to control closed kinematic motion occurring while performing this task.[25] As the motion is performed in anterior, posterior, medial, lateral directions, it challenges gluteus maximus, medius, minimus, tibialis anterior, gastrosoleus. When there was increase in mass due to backpack, the COM moved up, distance from ankle to COM changed, weight of gravitational force on the mass increased, thus in turn,net muscle action required to maintain equilibrium also increased and made the situation more challenging for participants. This was re f ected as decreased distance while performing SEBT with backpack(p<0.0001) in our study.Findings of this study are similar to the f ndings of one of the previous studies where signi f cant changes in gait patterns and increase in trunk lean posture were observed when the load was increased to 15-20%of body weight of the child(p<0.05).[26]

Most of the previous researchers have used posturography or balance master to assess balance during dynamic conditions. As walking velocity and altered gait pattern indirectly represent the dynamic stability, we

tried to match these parameters with dynamic balance scores of this study.

One study showed significant difference in velocity control and directional control while carrying backpack in children .[27]Another study also highlighted back pack induced gait instability which resulted in significantly reduced walking velocity cadence and increase in double support time in adolescents with backpack weighing 20% of body weight of students.[28]

Study on effect of back pack on cervical and shoulder posture in students showed significant difference in cranio vertebral angle, anterior head alignment(p=0.04,0.03) and suggested that postural responses in high school children were sensitive to load carriage equivalent to 15% of body weight.[29]

Thus, this study strengthens the observations of previous researchers who concluded that, balance system gets challenged while carrying backpack due to change in center of mass and altered muscle work required to maintain equilibrium suggested by altered posture, affected gait quality and postural sway.

According to prior suggestions from APTA and ACA, the weight of backpack should be between 5%-15% of bodyweight of the child. [30]They have expressed concerns about heavy backpack, various aches and pains, risk of brachial plexus injuries. We suggest that, affected balance and hence risk of falls should also be one of the concerns while deciding backpack load in children.

Although the children could not be blinded for the experimental hypothesis of the study, independent evaluators performed tests for both conditions and the participants were blinded for their scores till scores for both conditions and scores of all participants were recorded. All tests in the study were performed on the same day hence effect of fatigue might have affected the scores. To avoid this, we kept the same sequence of tests and no inter test comparisons were done to draw conclusions. The weight of backpack varied in all students, but as the same student served as control this might not have affected the final results. We used quick and simple outcome measures to assess balance as it suited our scenario but, more sophisticated lab equipments, like posturography, can be used for complex analysis of activities while carrying backpack. The study considered only immediate effects while carrying backpack. Similar studies on prolonged use and in different conditions will help us to strengthen evidence on effects of backpack on school children.

Conclusion

Static and dynamic balance abilities get challenged while carrying backpack in healthy children of 10-14 yrs hence appropriate measures should be taken to reduce the impact of load thus reducing risk of falls in school children.

Conflict of Interest -Nil

Source of Funding –Self

Ethical Clearance-Institutional clearance was obtained.

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Association of Hand Performance with Neck Disability in Text Neck Syndrome among College Students

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Abstract

Objective – To study the association between neck pain, neck disability and hand performance in text neck syndrome among college students

Methodology – A correlation study was done on 60 college students. Subjects having history of shoulder or neck pathology, musculoskeletal disease or anomaly, history of surgery of spine, history of surgery of neck or shoulder, recent surgery, chronic medical illness were excluded. Detailed assessment form was filled by the subjects regarding name, age, dominant hand, duration of hours spent on mobile phone, visual analog scale, etc. along with Neck disability index. Later, their hand performance was checked using Jebsen Taylor Hand Function test for both non dominant and dominant hand.

Result - The data was not normally distributed so Pearson's correlation coefficient was used to assess the correlation between neck disability index and hand function test. Results were found to be statistically significant at 5% level. "r" value was calculated between NDI and all the seven tasks of JTHFT for both Non dominant and dominant hand's function separately. With regard to hand dominance, this study revealed that whole population wrote faster with dominant hand as compared to non dominant hand.

Conclusion - This study provides evidence that hand dominance has an important role as it can affect hand functioning. Especially high-level fine dexterity activities can be altered with prolonged texting.

Key words: *Neck Disability Index, Jebsen Taylor hand function, text neck syndrome, smart phone*

Introduction

Our body is connected with our head by an important structure "Neck". All over the world, neck pain is considered as a fourth cause of disability. [1] The repeated stress injury leading to pain over the neck region due to prolonged use of handheld devices like mobile phones, tablets, e-readers, etc. causes text neck. [2] The individuals who have a habit of texting or watching for long hours are more prone to get affected. Flexing the neck for more time can cause a turtle neck position. Many individuals keep their smart phone on lap or waist in sitting position which makes them bend their neck in flexion. This position if maintained for a longer duration can decrease the Lordosis in the lower cervical vertebra. This leads to an increase in posterior curvature of the upper thoracic vertebra. Dr. Dean L Fishman was the one to coin the term text neck. Secondary to neck pain, the text neck can also cause thoracic kyphosis, shoulder pain, radiating pain till hand, upper back pain, and headache. People spending more hours while gazing down at smart phones, causes stiffness around the neck region. While staring sharply downwards on the mobile phones, it can cause excessive anterior curve in the lower cervical vertebra, and excessive posterior curve in the upper thoracic vertebra to maintain balance. Forward headed posture is one of the common problems seen in people who keep texting on smart phone. This can also lead to lower back pain in chronic stages. It is noted that walking while using a smart phone harms lumbar region. Also, muscular activity around the shoulder is increased due to smart phone usage. It is evidenced that people tend to flex their head more during standing when they are using the mobile phones as compared to neutral standing. [3]

People's contemporary lifestyle has now become mainly dominated by computer technology. Smart phones are considered as a common thing among adolescents. It has now become a need for every individual. As a smart phone is beneficial for making our work easier, it also has a bad impact on our health. A survey revealed that people spend more than 20 hours per week on texting, using social media, etc. It can give rise to various musculoskeletal disorders. This results in damage of muscle fibers and muscle tone. It is a growing health concern as mobile technology is leading affecting millions worldwide. It was seen in a study that there were more than 6 billion smart phone users worldwide. It is also reported that 79% of the population who are in the age group of 18 to 44 keep their smart phones with them the whole day except 2 hours of their walking time. [4] This topic is a growing health concern that can possibly affect millions of people worldwide. In the current situation, text neck is becoming a popular word across the world.

Female individuals are seen as more active on smart phones as compared to male individuals. They spend more time per day on texting, social media, messaging, etc. people using excessive smart phone experience several behavioral changes. This change in behavior is seen as an addiction. [7]

Material and Methods

A correlation study (cross-sectional design) was conducted in which 60 college students who were enrolled in Amity University, Noida were involved. Prior to data collection, informed written consent was obtained from the participants. Both male and female subjects were included in the study. The subjects who spend more than 4 hours per day active on smart phone [5], no musculoskeletal or neurological disorders affecting the upper or lower extremity [6], are college students [9], No history of the physical or mental disease [8] were included for the study. Subjects should know the English language. Subjects having a history of shoulder or neck pathology [9], musculoskeletal disease or anomaly [12], history of surgery of spine [6], history of surgery of neck or shoulder [12], recent surgery [6], chronic medical illness [12] were excluded.

Material required: Board (1), Stopwatch (1), Plastic jar (1), Bottle caps (2), Paper clips (2), Pennies (2), Checkers (4), Kidney Beans (5), Teaspoon (1), Weighted cans (5), Light cans (5), Sentence cards (4), Pen (1)

Procedure:

The subject was made aware of all the instructions regarding the questionnaire and test before starting with the data collection. Subject was first asked to fill the consent form. A detailed assessment form was filled by the patient regarding age, dominant hand, duration of hours spent on mobile phone, etc. Afterward Neck disability index was filled by the subject. Later, Jebsen Taylor Hand Function test was done. (All the tests were performed from non-dominant hand first and dominant hand next to it) At every task, Stopwatch began after the therapist's command "START". EThe subject was asked to write a sentence which consisted of 24 letters and was of third-grade reading difficulty. The subject had to write the sentence in capital words and was asked to write the sentence as fast as possible.EThen the subject had to turn 3"x5" index cards as quickly as possible. The cards were oriented vertically in a horizontal row 2 inches apart.EThen the subject had to lift small objects like 2 paper clips, 2 regular sized bottle caps (1" in diameter, inside of cap facing up), and 2 US pennies and put it in an empty jar. These objects were 2" apart and in a horizontal row to the non dominant side of the jar. Paper clips were farthest and pennies nearest to the jar. ESimulated feeding was done next. In this procedure, 5 kidney beans were placed approximately 5/8" length on a clamp board. Kidney beans were oriented parallel to and touching the upright of the board 2" apart. Subject had to pick up these beans one at a time with the help of teaspoon and drop the kidney beans in jar as soon as possible.ENext step is stacking checkers. 4 standardized size $1^{1/4}$" diameter checkers were placed in a OOOO configuration. Subject stacked the checkers after the therapist said start.EThen the subject had to lift large, light objects. 5 empty cans were placed on board 2" apart. Subject lifted the cans and made those cans stand in front of them.EThen the subject had to lift large, heavy objects. Five 1 Lb cans were placed on board 2" apart. Subject lifted the cans and made those cans stand in front of them.

Data Analysis

Data analysis was performed using SPSS statistical

analysis software for windows. The numeric scores of neck disability index, hand function test, age, number of hours on smart phone for calling and texting, and duration spent in one day on smart phone were presented as Mean ± standard deviation. The data was not normally distributed so Pearson's correlation coefficient was used to assess the correlation between neck disability index and hand function test. The mean time was calculated for every individual (60 participants) to finish all the 7 tasks of JHFT. The mean time was then calculated with neck disability index to find the value of "r".

Results

The sample composed of 60 participants, most of them were females. Result analysis was done by SPSS statistical analysis software. Results were found to be statistically significant at 5% level. The average age group of participants was 21.11 along with standard deviation 1.4. The average and standard deviation of neck disability index was 4.5 and 3.8 respectively.

Table 1 Mean and standard deviation of outcome measures

Mean and Standard Deviation	
Age	21.11±1.40
No. of years the subject is using smart phone	5.75±2.12
No. of hours spent on phone for calling	1.39±0.78
No. of hours spent on phone for texting	4.32±2.71
Duration spent in 1 day on smartphone	9.0±3.89
Neck disability index	4.85±3.89

Each subject was found using smart phone more for texting as compared to calling.

Table 2 Pearson's correlation (r) for non dominant hand (in correlation with NDI):

Tasks	**Average time (hh:mm:ss)**	**Pearson's correlation (r)**
writing	00:52.2	0.12
simulated page turning	00:05.6	0.16
lifting small common objects	00:06.2	0.15
simulated feeding	00:08.0	0.05
stacking checkers	00:02.1	-0.11
lifting large, light objects	00:05.2	0.02
lifting large, heavy objects	00:05.5	0.02

Table 3 Pearson's correlation (r) for dominant hand (in correlation with NDI):

Tasks	Average time (hh:mm:ss)	Pearson's correlation (r)
writing	00:13.4	-0.12
simulated page turning	00:04.8	0.21
lifting small common objects	00:05.8	0.14
simulated feeding	00:07.1	0.07
stacking checkers	00:01.6	-0.13
lifting large, light objects	00:04.4	0.06
lifting large, heavy objects	00:04.6	0.09

Table 4 mean of jebsen taylor hand function test tasks

Mean (Jebsen Taylor Hand Function Test)	
Non dominant Dominant	
Writing	00:52.2 00:13.4
Simulated page turning	00:05.6 00:04.8
Lifting small, Common objects	00:06.2 00:05.8
Simulated feeding	00:08.0 00:07.1
Stacking checkers	00:02.1 00:01.6
Lifting large, Light objects	00:05.2 00:04.4
Lifting light, Heavy objects	00:05.5 00:04.6

Table 5 pearson's correlation of dominant and non dominant hand for 7 tasks

Pearson correlation coefficient (r)		
	Non dominant	**Dominant**
Writing	0.12	-0.12
Simulated page turning	0.16	0.21
Lifting small, Common objects	0.15	0.14
Simulated feeding	0.05	0.07
Stacking checkers	-0.01	-0.13
Lifting large, Light objects	0.02	0.06
Lifting light, Heavy objects	0.02	0.09

Pearson's correlation between neck disability index (NDI) and Mean of 60 subjects individually for all tasks from non dominant hand is 0.14 and from dominant hand is 0.03.

Discussion

In the present study, I tried to gain knowledge regarding text neck syndrome and how it affects hand performance. Neck pain is one of the factors every individual experience once in a lifetime. In later stages, it can affect our activities of daily living and cause dysfunction. People who use smart phone for longer duration tend to get a fexed neck posture which results in spinal stress. Spinal stress is due to improper curvature. Flexion neck posture can cause tightness in the muscles around the neck. In this study, an informed consent was given to the subjects frst. Along with that, neck disability index and demographic details were flled by the subjects. Jebsen Taylor Hand Function Test was administered to check the hand performance.

Association was found between neck disability index and the hand performance of each subject. Number of Hours subject uses smart phone in a day for calling and texting was seen separately. Hand performance for both dominant and non-dominant hand was checked. Pearson's correlation test was used to compare the data obtained. Subject's correlation was calculated for both dominant and non dominant hand with reference to neck disability index. Our results in the present study showed that prolonged smart phone usage can cause neck disability and affected hand coordination. Maximum people use smart phone for more than 5 hours a day. Concerning hand dominance, this study revealed that the whole population wrote faster with the dominant hand as compared to non-dominant hand. For simulated page-turning, dominant hand was faster by just a slight difference than the non dominant hand. Stacking checkers task was done in almost the same time by dominant and non dominant hand.

Sami S. Alabdulwahab et al did a study on smart phone use addiction can cause neck disability. A sample of 78 students was taken which concluded that there was a relationship between addiction of smart phone use and the extent of problems associated with neck disabilities. [8]

A study was done by Mary K. N. Takla et al named Jebsen Taylor Hand Function Test: gender, dominance, and age difference in healthy Egyptian population in 2018. This study was done to establish normative data

for hand function using JTHFT and to know the effect of age, gender and hand dominance on hand function. Participants were taken and were asked to perform the 7 sub tests i.e. writing, simulated page turning, lifting small common objects, simulated feeding, stacking checkers, lifting large light objects, lifting large heavy objects. It was concluded that handedness and age may affect the hand function. [10]

A study done by Sydney Y Schaefer et al, named within-session practice effects in the Jebsen Hand Function Test (JHFT) took 12 adults with a mean age of 26.3 years and with no neurological impairment. ANOVA was used to test the main effects of hand (right and left). Assumptions of normality were confirmed for the total JHFT time. Both the dominant and non dominant hand showed significant improvement across repeated administrations. [11]

As text neck syndrome is a repetitive stress injury, one can easily overcome this by taking frequent breaks like every 20 minute in between the smart phone use to relax the muscles. Either we can make hand position slightly higher so that our neck does not bend too much while using smart phone.

Limitations

-Due to COVID-19, sample size was less.

-The study is restricted to Young-adult population.

-There were more female subjects than male subjects.

Conclusion

This study presents the normative data of college students. This study provides evidence that hand dominance has an important role as it can affect hand functioning. Especially high-level fine dexterity activities can be altered with prolonged texting. Due to improper posture during texting, our neck stresses a lot which can further lead to changes in hand coordination. This study has demonstrated that there is an association of hand performance with neck disability in text neck syndrome among college students.

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Effectiveness of Exercise with Balloon for Low Back Pain in Young Adults: A quasi experimental study

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Abstract

Background: Low back pain is a common musculoskeletal disorder which may be acute, sub acute and chronic in nature. Low back pain is expressed in 42% in adults. Low back pain occurrence is at an early age and can cause disease progression. Low back pain is due to suboptimal breathing patterns and impairments of posture and trunk stability. Many muscles used for the postural control and respiration are same that is diaphragm, transverses abdominis and muscles comprising the pelvic floor. The diaphragm is the key muscle for the respiratory pump with attachment from the lower six ribs, xiphoid process of sternum and the vertebral column. Diaphragm performs both postural and breathing function. Disruption in one function could negatively affect the other.

Objectives: 1. To find the Effectiveness of 90/90 bridge with ball and balloon exercises and Interferential therapy for pain and disability in low back pain among young adults.

2. To find the Effectiveness of Interferential therapy for disability and pain in low back pain among young adults.

3. To compare the effectiveness of 90/90 bridge with ball and balloon exercise and Interferential therapy together and Interferential therapy alone for pain and disability in back pain among young adults.

Study Design: A quasi experimental study

Methods: 18 adults who had mechanical low back pain were included in the study. Participants were divided into 2 groups .Group A received 90/90 bridging with ball and balloon and interferential therapy and Group B received interferential therapy alone. Exercises were given twice a day for 3 days for 4 weeks. Pre and post exercise evaluation is taken by using numerical pain rating scale and Modified Oswestry disability index scale Questionnaire. Data was analyzed using independent T test and paired T test.

Result: In both the group there was improvement but there is a significant difference in 90/90 bridge with ball and balloon exercise and interferential therapy than the IFT alone among the young adults with low back pain.

Conclusion: This study concludes that there is greater effect of 90/90 bridge with ball and balloon exercise on patients with mechanical low back pain.

***Key words**: Balloon exercises, breathing exercises, low back pain.*

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Introduction

Low back pain is a common musculoskeletal disorder which may be acute, sub acute and chronic in nature. Low back pain is expressed in 42% in adults. Low back pain occurrence is at an early age and can cause

disease progression. The incidence of LBP in India has been reported to be 23.09%.[13]Low back pain is due to suboptimal breathing patterns and impairments of posture and trunk stability. Many muscles used for the postural control and respiration are same that is diaphragm, transverses abdominis and muscles comprising the pelvic floor, Studies have found that diaphragm contributes biomechanically to maintain trunk stability[2] ·Diaphragm performs both postural and breathing function. Disruption in one function could negatively affect the other.[3]Impaired kinematics of diaphragm and pelvic floor muscle and changes in breathing pattern were observed in patient with back pain undergoing a motor task. Studies have found that diaphragm contributes biomechanically to maintain trunk stability. Inefficient breathing could result in muscular imbalance and motor control alteration. Normal breathing mechanisms play a major role in posture and spinal stabilization. Breathing pattern disorder have been shown to contribute to pain and motor control deficit.[3]One of the most critical factors looked by the therapist is maintaining an optimal zone of apposition of the diaphragm, The zone of apposition (ZOA) is the area of the diaphragm encompassing the cylindrical portion which corresponds to the portion directly opposed to the inner aspect of the rib cage. The ZOA is important because it is controlled by abdominal muscles and directs diaphragmatic tension. When the ZOA is decreased, there will be several negative consequences like insufficient respiration and diminished activation of the transverse abdominis.[2]It has been found that, inefficient muscular stabilization results in delayed contraction of transverses abdominis causing LBP. Therefore, these changes in kinematics of trunk stabilizers may be responsible for low back pain.[13]When abdominal muscles and diaphragm are contracted at the same time the intra abdominal pressure increases and the stability of the trunk can be enhanced. Thus diaphragm is involved with bending and providing trunk stability along with abdominal muscles.[4]

These exercises have been designed in such a way, that all the core muscles get recruited while performing the exercises[13.]Effects of bridge ball and balloon exercise has been studied in athlete population for chronic back pain, with ball and balloon provide optimal ZOA of diaphragm that may help to address low back pain.[2]

Materials and Methods: This study was conducted among males and females aged between 18 to 25 years having mechanical low back pain with a sample size of 18. Prior to participation, the participants were explained about the study and an informed consent was obtained from them. Ethical clearance was obtained from University ethics committee. Participants were screened based on the inclusion and exclusion criteria.

Inclusion criteria were: Age group of 18-25 years, Mechanical low back pain, 2 months of low back pain

Exclusion criteria were: Fracture, Radiculopathy, Amputation, Spine deformity and Degenerative diseases.

INSTRUCTIONS FOR 90/90 BRIDGING WITH BALL AND BALLOON EXERCISE

-Lie down on your back with the feet placed on the wall, knees and hips should be bent at 90 degree angle.

-Place the ball between the knees.

-Keep the left hand above the head and a balloon in the right hand.

-Inhale through nose and exhale through mouth, perform bridging. Then keep low back flat on the mat. Should not press the feet on the wall, instead of that just pull down with the heels.

-You have to feel the back of the thighs and inner thighs engage, by keeping the pressure on the ball, maintain the position throughout the exercise regimen.

-Inhale through the nose and blow out slowly into the balloon.

-Pause 3 seconds with tongue positioned on the roof of your mouth to prevent the airflow out of the balloon.

-Should not pinch the neck of the balloon and by keeping the tongue on the roof of the mouth, inhale again through nose .

-Blow out slowly as you hold the balloon in the right hand.

-Don't strain cheeks and neck when you blow the balloon.

-After fourth breath in, hold the neck of the balloon and remove the balloon from mouth, let the air out of the

balloon.

-Relax and repeat this procedure for 4 times.

Findings

Statistical analysis was done using SPSS version 22. Data was entered into the Microsoft excel sheet, tabulated and subjected to statistical analysis, data was analysed using independent T test for comparison of 2 groups, paired T test used for the comparison of intra group before and after values

Results

Table 1: For the comparison of two groups independent T test is used. Comparison of the pre and post NPRS

	GROUP	N	Mean	Std. Deviation	t	df	P VALUE
NPRS-PRE	GROUP A	9	4	1.581	-0.164	16	0.871
	GROUP B	9	4.11	1.269			
NPRS-POST	GROUP A	9	0.56	0.726	-5.927	16	<0.001
	GROUP B	9	3.56	1.333			
NPRS DIFFERENCE	GROUP A	9	3.44	1.59	5.174	9.737	<0.001
	GROUP B	9	0.56	0.527			

Table 1: Comparison of the NPRS-PRE between the two groups shows that NPRS-PRE is higher in GROUP B group with a t value of -0.164 and is statistically non signi f cant with a p value of 0.871.

Comparison of the NPRS-POST between the two groups shows that NPRS-POST is higher in GROUP B group with a t value of -5.927 and is statistically signi f cant with a p value of <0.001

Comparison of the NPRS DIFFERENCE between the two groups shows that NPRS DIFFERENCE is higher in GROUP A group with a t value of 5.174 and is statistically signi f cant with a p value of <0.001

TABLE 2: For the comparison of two groups independent T test is used. Comparison of the Pre and Post MODI.

	GROUP	N	Mean	Std. Deviation	t	df	P VALUE
MODI-PRE	GROUP A	9	15.03333	7.067882	0.476	16	0.64
	GROUP B	9	13.32778	8.088821			
MODI-POST	GROUP A	9	4.441111	4.300949	-2.45	16	0.026
	GROUP B	9	12.09222	8.323319			
MODI DIFFERENCE	GROUP A	9	10.59222	7.137336	3.881	8.431	0.004
	GROUP B	9	1.235556	1.172157			

TABLE 2: Comparison of the ODI-PRE between the two groups shows that ODI-PRE is higher in GROUP A group with a t value of 0.476 and is statistically non signi f cant with a p value of 0.64

Comparison of the ODI-POST between the two groups shows that ODI-POST is higher in GROUP B group with a t value of -2.45 and is statistically signi f cant with a p value of 0.026

Comparison of the ODI DIFFERENCE between the two groups shows that ODI DIFFERENCE is higher in GROUP A group with a t value of 3.881 and is statistically signi f cant with a p value of 0.004

TABLE 3: Paired T test for comparison of the intra group before and after values.

GROUP A

		N	Mean	Std. Deviation	Paired Differences		t	df	P VALUE
					Mean Difference	Std. Deviation			
Pair 1	NPRS-PRE	9	4	1.581	3.444	1.59	6.499	8	<0.001
	NPRS-POST	9	0.56	0.726					
Pair 2	MODI-PRE	9	15.03333	7.067882	10.59222	7.137336	4.452	8	0.002
	MODI-POST	9	4.441111	4.300949					

GROUP B

TABLE 3: GROUP A

		N	Mean	Std. Deviation	Paired Differences		t	df	P VALUE
					Mean Difference	Std. Deviation			
Pair 1	NPRS-PRE	9	4.11	1.269	0.556	0.527	3.162	8	0.013
	NPRS-POST	9	3.56	1.333					
Pair 2	MODI-PRE	9	13.32778	8.088821	1.235556	1.172157	3.162	8	0.013
	MODI-POST	9	12.09222	8.323319					

On comparison of the mean values of NPRS-PRE and NPRS-POST the mean values of NPRS-PRE is higher with a difference of 3.444 is statistically signi f cant with a p value of <0.001.

On comparison of the mean values of MODI-PRE and MODI-POST the mean values of MODI-PRE is higher with a difference of 10.5922222 is statistically signi f cant with a p value of 0.002.

GROUP B

On comparison of the mean values of NPRS-PRE and NPRS-POST the mean values of NPRS-PRE is higher with a difference of 0.556 is statistically signi f cant with a p value of 0.013.

On comparison of the mean values of MODI-PRE and MODI-POST the mean values of MODI-PRE is higher with a difference of 1.2355556 is statistically signi f cant with a p value of 0.013.

Discussion

The present study was to f nd the effectiveness of 90/90 bridge with ball and balloon exercise and IFT for pain and disability in low back ache among young adults and to f nd the effectiveness of IFT alone and to compare the effectiveness of 90/90 bridge with ball and balloon exercise and IFT together and 1FT alone for pain and disability in back pain among young adults. There were total of 18 patients, patients were divided into 2 groups .Group A had 9 patients were they received 90/90 bridge with ball and balloon and IFT together. Group B had 9 patients were they received IFT alone for pain and disability in back pain among the young adults. Out of which 11 were female and 7 were males. In group A 5 were females and 4 were males, In group B 6 were females and 3 were males. In this study, the 90/90 bridge with ball and balloon exercise and IFT together has an effect to a greater extent than IFT alone in patients with low back pain.

The result of this study suggested that the group A has greater reduction of symptoms such as pain which is measured using NPRS and MODI questionnaire than the group B. Group A that is 90/90 bridge with ball and balloon and IFT together had greater reduction in the pain and decreased the severity of low back pain. These changes were not much in patients of Group B who received only IFT. Changes were present but only mild reduction of symptoms of pain than the Group A. While comparing the post NPRS difference between the two groups shows that NPRS difference is higher in group A than the group B and the comparison of the post MODI difference between the two groups shows that MODI difference is higher in group A than the group B.

In group A, on comparison of the mean values of NPRS pre and post the mean values of NPRS pre is higher with difference of 3.444 and is statistically signi f cant

with p value of < 0.001. In MODI, the mean values of MODI pre is higher with difference of 10.59222 is statistically signi f cant with p value of 0.0002.In group B, on comparison of mean values of NPRS pre and post, the mean values of NPRS pre is higher with difference of 0.556 and is statistically signi f cant with p value of 0.013. In MODI, the mean values of MODI pre is higher with difference of 1.2355556 is statistically signi f cant with p value of 0.013.The NPRS and MODI scores in the present study showed statistically signi f cant change in both the group but group A showed greater difference than the group B.

Previous research by Kyndall L Boyle demonstrated that the exercise of 90/90 bridge with ball and balloon optimized breathing and enhanced both posture and stability and also improved the respiratory function.[2]

A study by Kyochul Seo et al on the effects of balloon blowing exercise in a 90/90 bridge position using a ball on pulmonary function of females in their twenties, this study showed that 90/90 bridge with balloon blowing using ball can be used to improve the pulmonary function.[13]

Another study by Ali Rafaqat et al conducted on patients with chest intubation after trauma, were their objectives was to compare the effectiveness of balloon blowing exercises and incentive spirometry and that there is equal effect of incentive spirometer and balloon blowing.[9]

Our study found that there is difference in both the two groups but there is a higher difference in the group A that is 90/90 bridge with ball and balloon and IFT together. The role of diaphragm is respiration and also it is involved in lumbar stability, in the low back pain patients these 90/90 bridge with ball and balloon exercise will restore ZOA and spine to proper position where it allows it's both the respiratory and postural roles. These exercises provide an optimal zone of apposition (ZOA) of the diaphragm which helps to address LBP. These exercises have been designed in such a way, that all the core muscles get recruited while performing the exercises[2]. So there is effect of balloon blowing exercises in low back pain patients.

Limitation: The gender distribution is unequal and the patient enrolment is smaller sample size.

Conclusion: This study concludes that there is a greater effect of 90/90 bridge with ball and balloon exercise on patients with mechanical low back pain. It is proved that there is higher difference between 90/90 bridge with ball and balloon exercise and IFT together than IFT alone and in this study it is observed that balloon blowing exercise can be used by patients with low back pain, where it strengthens the diaphragm and helps in posture and stability .This balloon exercise can be implemented in the clinics.

Conflict of interest: There is no con f ict of interests relevant to the submitted manuscript for any of the authors.

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Ethical Clearance- The ethical clearance for the study was obtained from the Yenepoya University Ethical Committee and the procedures followed were in accordance with the ethical standards of the committee.

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Knowledge and Attitude Towards Hepatitis B Patients among Physiotherapy Students- A Cross Sectional Study

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Abstract

Background: The Hepatitis B Virus (HBV) is associated with hepatocellular necrosis and inflammation of the liver, ranging from asymptomatic infection to rarely fulminant hepatitis. According to the World Health Organization (WHO), there has been a report of past or current HBV infection among 240 billion people around the world, and 340 million chronic HBV surface antigens carriers. Hepatitis B poses a major occupational danger to all healthcare profession. Thus the purpose of this study is to assess the knowledge and attitude of Hepatitis B among 3rd and 4th year physiotherapy students.

Material & Method: This cross-sectional study was carried out with sample size of (n=272) involved 3rd and 4thyear BPT students as per the number of students in per year from three relevant physiotherapy colleges. A self-administered validated questionnaire comprising of 51 questions was used to assess the knowledge and attitude towards hepatitis B patients among 3rd and 4thyear BPT students.

Results: The overall mean of knowledge and attitude was 17.86±3.739 with p value 0.001, whereas on comparison between 3rd and 4th year BPT students, 4th year BPT students reported more knowledge compared to 3rd year BPT students.

Conclusions: The study reported that although 3rd and 4th year BPT students had knowledge about hepatitis B however there is a need to educate them to improve their knowledge in the area of practicing universal safeguards, combating fear while handling high risk patients to avoid discriminatory attitude towards the beginning of 3rd year .

Keywords: *Hepatitis B, knowledge, attitude, physiotherapy students*

Introduction

According to WHO, hepatitis B infection is the most common liver infection in the world, which is caused by hepatitis B virus (HBV)[1] .HBV belongs to hepadnaviridae family and is is passed on by contact with body fuid, vertical transmission and unprotected sexual contact[2]. It is a global health problem which suggests that more than 2 billion people have been infected. Of these 240 million individuals are at risk of serious illness and death[3]. India has one fifth of the world's population. Since it accounts a large population of the HBV burden, it harbours 10-15% of the entire pool of HBV carriers of the world[4]. Although HBV vaccinations are available since 1982,which gives 90%-100% protection against HBV infection, still 2 billion people in the world have been infected with HBV[5,1] . The risk of contracting hepatitis B virus by healthcare worker (HCW) is four times greater than that of general population[6,3]. Reang *et al*., (2015), reported that thought the nursing students had good knowledge regarding Hepatitis B but the

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prevention taken was not satisfactory[7]. According to World confederation for physical therapy (WCPT), Physical therapy is services helps individuals and populations to develop, maintain and restore movement and functional ability throughout the life span[8]. Physiotherapists as such are not treating hepatitis B but give interventions for patients with any physical or physiological ailments who may also be suffering from hepatitis B. For such treatments often the physiotherapist or physiotherapy students has to attend the patient twice-thrice a day depending upon the reference. Sailee *et al*., (2017) reported that knowledge level of dental students was low regarding hepatitis B[9] .Similarly in an another study done by Bhadoria *et al*.,(2019), reported that the medical and nursing undergraduate students showed low knowledge about the disease[10]. Thus Physiotherapy students are in a risk of not only contracting the disease but also in a dilemma towards treating the patients and supporting them emotionally. So this study is aimed to assess the knowledge and attitude towards hepatitis B patients among physiotherapy students.

Materials & Methods

This Cross Sectional study was conducted among physiotherapy students of 3rd and 4th year in randomly selected three physiotherapy colleges in Mangalore, Dakshina Kannada, India. Permission was taken from Deans of three physiotherapy colleges in Mangalore. A self-administered questionnaire was framed and validated with the help of 5 experts in the field. A self-administered questionnaire consisting of 51 close-ended items were used for data collection. The questionnaire had three domains I] Demographic data, II] Knowledge and Awareness about hepatitis B, III] Attitude towards hepatitis B patients. There were 30 questions to assess knowledge & awareness about hepatitis B and 21 questions to assess attitude. Prior to data collection ethical clearance was obtained. An appointment was taken from the class coordinators of three physiotherapy colleges for data collection. The class coordinators of the following classes were approached and explained about objectives of the study. Among three colleges, one college didn't permit to collect the data within class hours, so the data collection was done after the class hours. Participants were asked to take part voluntarily and go through the consent form. The participants were explained about the aims and objectives and written inform consent was taken from each individual. The questionnaires were distributed to students in the classrooms and they were asked to fll it without discussing in 10 minutes. The sample size comprised of n=315 but only 272 BPT students gave their consent of which 146 were 3rdyear and 126 were 4thyear BPT students. It comprised of 179 females and 93 males BPT students. This cross sectional study was done applying mean, standard deviation, frequency, percentage, T-test and chi-square test. P value <0.05 was considered statistically signifcant. Statistical analysis was performed using the Statistical Package for Social Science (SPSS) software version 22 for windows version.

Results

Table 1 Gender distribution

Gender	Frequency	Percentage
Female	179	65.8
Male	93	34.2
Total	272	100.0

Data represents that 65.8% were female students and 34.2% were female students

Table 1 depicts that 146 were 3rd year and 126 were 4th year BPT students. Of which 179 were female and 93 were male respectively.

Table 2 Overall knowledge of hepatitis B among 3rd and 4th year physiotherapy students

Sl.No	Items	Yes (%)	No (%)	Not sure (%)
1.	Hep B is a viral disease	257(94.5)	8(2.9)	7(2.6)
2.	Hep B belong to hepadnaviral family	172(63.2)	17(6.3)	83(30.5)
3.	Jaundice is one of the symptoms	168(61.8)	48(17.6)	56(20.6)

Cont... **Table 2 Overall knowledge of hepatitis B among 3rd and 4th year physiotherapy students**

4.	Vaccination is effect against Hep B virus	232(85.3%)	16(5.9%)	24(8.8)
5.	Universal precaution will keep one safe	203(74.6)	21(7.7)	48(17.6)
6.	Hep B more infective than HIV	79(29.0)	112(41.2)	81(29.8)
7.	Hep B vaccine confer life time immunity	78(28.7)	98(36.0)	96(35.3)
8.	Aware of post exposure prophylaxis	106(39.0)	80(29.4)	86(31.6)

Table 2 .Data represents the overall knowledge of both 3rd and 4thyears BPT. Almost 94.5% knew it is a viral disease and 63.2 % said it belongs to hepadnaviral family. 85.3% believed that hepatitis B vaccination is effective in protecting against HBV infection. 54.0% knew hepatitis B was earlier known as serum hepatitis. 61.8% agreed that jaundice is one of the common symptoms. 74.6% said that application of universal precaution can protect them from contracting HBV. The results show that the overall knowledge was found to be good among 3rd and 4thyear BPT students respectively.

Table 3 Comparison of knowledge among 3rd and 4th year Physiotherapy students

Knowledge	Course year	N		P
Total	3rd	146	17.03±3.642	*0.001
	4th	126	18.81±3.637	

*Data represented The mean knowledge score in 3rd year is 17.03±3.642 whereas the mean knowledge score in 4thyear BPT was 18.81±3.637.So, there is a significant difference in knowledge between 3rd year and 4thyear BPT p=0.001**

Table 4 Overall attitude of hepatitis B among 3rd and 4th year physiotherapy students

Sl.No	Question	Yes (%)	No (%)
1.	Risk felt while treating Hep B patients	186 (68.4)	86 (31.6)
2.	Found long time patient positive would stop treating	37 (13.6)	235 (86.4)
3.	PT should know if patient is positive	261 (96)	11 (4)
4.	Will be competent to treat Hep B patients after BPT	235 (86.4)	37 (13.6)
5.	It is ethical responsibility to treat Hep B patients	250 (91.9)	22 (8.1)
6.	PT can safely treat Hep B patients	222 (81.6)	50 (18.6)
7.	PT with Hep B should not practice	97 (35.7)	175 (64.3)
8.	Hep B patients should not work	75 (27.6)	197 (72.4)

Table 4. Shows that the response to attitude based questions. 96% students strongly agreed that Physiotherapist should know about a patient's hepatitis B status and almost 68.4% feels at risk while treating hepatitis B patients. 91.9% felt that it's their ethical responsibility to treat a hepatitis B patient. 81.6% said that Physiotherapist can safely treat hepatitis B patients. Almost 72.4 said hepatitis B patients should be allowed to work.

Table 5 Comparison of attitude towards hepatitis B patients among 3rd and 4th year of physiotherapy students

Sl.No	Question	Year	Frequency (%)		P value
			Yes	No	
1.	Found long time patient positive would stop treating	3rd 4th	28(19.2) 9(7.1)	118(80.8) 117(92.9)	0.004
2.	PT should know if patient is positive	3rd 4th	135(92.5) 126(100)	11(7.5) 0	0.002
3.	Will be competent to treat Hep B patient after BPT	3rd 4th	117(80.1) 118(93.7)	29(19.9) 8(6.3)	0.001
4.	No. of patients treated will influence attitude	3rd 4th	101(69.2) 108(85.7)	45(29.5) 18(14.3)	0.001
5.	Other patients avoid rendering treatment from you if you treat Hep B patient	3rd 4th	44(30.1) 15(11.9)	102(69.9) 111(88.1)	0.001
6.	Hep B patient should not stay in community	3rd 4th	43(29.5) 20(15.9)	103(70.5) 106(84.1)	0.008
7.	Hep B patient should not work	3rd 4th	53(36.3) 22(17.5)	93(63.7) 104(82.5)	0.001

Table 5. Depicts the comparative results of attitude based question using chi-square test, where P value is <0.05.There was significant difference of opinion seen among 3rd and 4thyear BPT students in certain question. When asked whether other patient will avoid rendering treatment if they treat hepatitis B patient (30.1%) 3rdyear and (11.9%) 4th year BPT students said yes. (36.3%) 3rdyears agreed that hepatitis B patients shouldn't work while only (17.5%) 4thyear said the same. Thus there was significant association between the course year and the following questions. Thus 4th year BPT showed better attitude compared to 3rd year BPT in these questions.

Discussion

This present study revealed that about 94.5% of the physiotherapy students agreed that disease is caused by a virus. Our results are in consistent with the study carried out by Baig *et al.,(*2015) among clinicians and medical students revealed that 99.0% identified Hepatitis B as a viral disease of liver pathology [11] . In another cross

sectional study done by Nagpal *et al*., (2016) 88.7% students know that hepatitis B is transmitted through virus where 3rd year students have the maximum and 1styear students have the minimum awareness in this regard[2] .The overall knowledge regarding transmission of hepatitis B through sexual contact (38%),body fuid (41.2%) which were expected to be low levels showed signifcant good level of knowledge. This fnding was in line with the study done by Abdela *et al*.,(2016) where most respondents knew that exposure to infected blood or body fuid are risk factors[12]. But, it was higher than 56.2% knowledge levels at Haramaya university [13], 59% from Iraq[14] and 14.5% from Lao DPR[15]. 8.8% didn't believed that HBV can cause liver cancer which was in line with a study done by Samuel *et al*.,(2009), reported 8.45% participants didn't believed[16]. Nevertheless we found that relatively lower proportion of the students knew that HBV has post- exposure prophylaxis (39.0%). This fnding was consistent with the previous study by Abdela *et al*.,(2016) that reported a good knowledge on HBV but poor knowledge on post prophylaxis[12] .More than 68.4% of participants were aware that they are at risk of contracting HBV and 85.3% believe that HBV vaccine is effective and safe. This fnding was in line with the study done by Hazmi *et al*.,(2015) from Saudi Arabia among dentists[17]. Asmari *et al*.,(2018), reported that only 33.5% students in their study agreed that at times hepatitis B patients are asymptomatic. In contrast 82.3% reported that hepatitis B patients can be asymptomatic[18].

Overall mean knowledge score of 272 BPT students is 17.86 ±3.739. The study showed that there is signifcant difference in knowledge between 3rd and 4thyear BPT (P=0.001).Mean knowledge is more in 4thyear compared to 3rdyear BPT. This is in line with the study done by Reang *et al*.,(2015), which concluded that the academic year of study were signifcantly associated with the knowledge of HBV infection (P=0.000)[7] .Statistically signifcant difference have been noted in the attitude of 3rdyear and 4thyear BPT for the responses to questions like if found that long time patient is positive would stop treating and whether physiotherapist should know a patient's hepatitis B status. Similarly in a study done by Peeran *et al*.,(2017), showed that the 3rdyear students agreed that the healthcare provider has the right to reject to treat a hepatitis B patient and the patient should inform about the hepatitis B status[19].This present study concluded that the 3rdyear BPT students are seemingly new at providing clinical treatment during the course and they still have not gained full exposure. Their attitude is framed more by the prevailing myths which may be from various sources. Comparatively, the willingness to treat HBV patients among 4thyear BPT students was the refection of more exposure and knowledge. This difference states that students start overcoming the fear of virus, while understanding the need to take adequate precaution as the students graduate to higher level in their practice of physiotherapy.

Conclusion

In conclusion, the present study showed that the overall knowledge was found to be good. The mean knowledge is more in 4thyear students compared to 3rdyear BPT students. It was seen that both 3rdyear and 4thyear BPT students have similar attitude except for the responses to some questions in which statistically signifcant responses have been noted. The difference in some areas has the potential in affecting patient care and the physiotherapist-patient relationship. Improving the curricula and increasing the amount of clinical exposure during early academic years should be emphasised. So that the minor difference noted between both groups can be corrected and thus obtain an overall increment in physiotherapy care provided to the HBV patients.

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Table 2 Overall knowledge of hepatitis B among 3rd and 4th year physiotherapy students

Self-funding

Ethical approval: Obtained from Institutional ethics committee.

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To Assess the Level of Stress Among University Undergraduate Physiotherapy Students

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Abstract

Background: The campus life is identified as very stressful period for so many students because of huge difference in education system as they have to pass through new academic and social environment. WHO has projected that stress disorder will be ranked as second most disabling disorders, except appropriate measures are taken for early diagnosis. This study was conducted to measure level of stress among undergraduate physiotherapy students using Student stress inventory (SSI). To help the students to avoid stress from the beginning and to provide them with suitable mental health care and the efficient method to cope with stress Therefore, the aim of this study is to assess the level of stress among the undergraduate Physiotherapy student at university.

Method: Cross-sectional analysis of 905 physiotherapy students of age ranged from 18-23 years was done. Informed consent was taken at the starting of the study and assessment of level of stress was done using Student Stress Inventory (SSI). Collected data was entered in SPSS and analysed using the same software.

Results: Data was analysed using Pearson's correlation coefficient which indicate a positive correlation between academic and environmental factors with the level of stress among students. Result of this study indicate mild to moderate level of stress among university students. Out of all item high parental expectation, worry about examination, delivering the class presentations, constant fatigue, headache were common complains of students

Conclusion: The undergraduate physiotherapy students of University experienced mild to moderate level of stress, out of all components environmental and academic factors were responsible for producing more stress among students of the all years.

Keywords: *Student stress inventory, level of stress, physiotherapy students.*

Introduction

Health profession education is highly demanding and competitive for students to manage with complex learning environment. For some individual healthcare profession could be a stressful experience, and may affect negatively. Some studies suggest that high stress level and psychological morbidity occur in health care profession students.[1]

WHO has projected that stress disorder will be ranked as second most disabling disorder, unless appropriate measures are taken for early diagnosis, prompt and effective treatment and prevention of stress.[2]

According to WCPT Physiotherapy is a health care profession concerned with human function and movement and maximizing physical potential within the spheres of promotion, prevention, treatment/ intervention and rehabilitation.[3]

Which includes four years of educational program with six months of internship practice. These four years

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may be stressful for students to get satisfaction with all their achievements. [4]

For university students change of school environment to university environment could cause a Psychological, Academic and Social shock to them, because of huge differences in educational system. [5]

According to Porter (1990), up to 60% of university students discontinue their course without completing their graduation and commonly it occurs in students of 1st and 2nd years as they can't cope up with psychological problems.[6]

For better professional growth university students have to adapt themselves for different psychosocial changes along with coping with academic and social demands.[7]

In all over the world stress become universal issue experienced by every individual, middle aged and younger adults are more conscious to stress than older adults.[8]

According to Hans Selye "stress is the non-specific response of the body to any demand for change".[9]

Stresses can be external or internal.

There are two types of stress:

1. Positive stress - It is associated with adaptation and is necessary for growth and development E.g. eustress

2. Negative stress - It is harmful and may exhaust adaptive capacities. E.g. distress[10]

Stress can be divided into four categories; a balance between under-stress and overstress must be emphasized and good stress must be realized to reduce distress.[11]

Stressors are the event or situations that cause the potential for Physiological, emotional, cognitive/ behavioural changes in individual stress.[12]

The impact of stress on students depends upon their values, expectations, perceptions thinking and their coping patterns. The stressful event can be physical or psychological. At first, the student losses control, when they are under stress. Then the student will have negative feelings, and the cycle begins and the more psychological and physiological effect occurs to the student.[10-12]

Selye considered that the absence of stress in life is not good and that it also has an active function.[13]

In student life stress was found as part of life and it may give impression on how students manage with the demands of academic life.[14]

Studies shows that high stress levels in students of medicine, dentistry, pharmacy and physiotherapy fields.[15-20] A high frequency of depression and anxiety has also been declared in medical students, especially females, compared to age-matched peers in the general population.[15]

There are so many reasons students are going through stressful period is pressure of good achievement, academic tasks, concern about future goals, academic commitments, financial level and poor time management skills.[21]

Also they are facing conditions like concern for good grades, social issues, interpersonal and family relationships, manage with the highly complex environment of college, examinations, too much work loads.[20, 22-23]

There are various assessment tools to measure stress level which is felt by the students along with their academic life. We have used student stress inventory (SSI) that can be help to measure the stress level among undergraduate physiotherapy students. [9]

Methodology

STUDY DESIGN: Cross -Sectional

POPULATION: University undergraduate physiotherapy students

SAMPLING METHOD: Convenient Sampling Method.

SAMPLE SIZE: 905

STUDY DURATION: 6 Month

INCLUSION CRITERIA: 905 physiotherapy students aged 18-23 years were included.

TOOLS & MATERIAL USED:

- Pen
- Data collection form
- Consent form
- Student Stress Inventory (SSI)

OUTCOME MEASURES: Student Stress Inventory (SSI)

DATA COLLECTION PROCEDURE:

Evaluation of undergraduate physiotherapy students was done. I have purposely Selected Physiotherapy students. For adequate representation to sample, the sample size was 905 students male and female between the age of 18-23 years were taken.

- **STEP 1:** Every student of respective years was approached individually. Purpose and objective of study was explained to them and written consent form was obtained prior to conducting the study. Each and every student of Physiotherapy was participated in the study voluntarily.
- **STEP 2:** Demographic data of all 905 students was collected, that includes; name, age, stay, gender & Year of study.
- **STEP 3:** SSI was given to all students & every domains of questionnaire was explained. Every student co-operated well & completed the data collection procedure.

Results

Table no.: 1 Mean and Standard deviation of stress subscales

Source of stress	Mean	SD
Physical Total	17.82	3.912
Ip.Total	18.13	4.337
Academic Total	21.49	5.865
Environmental Total	20.86	6.151

Table no.: 2 Level of stress experienced by students in physical subscale

Physical subscale						
	Mild		Moderate		Severe	
Year	Number of students	Percentage	Number of students	Percentage	Number of students	Percentage
1st	215	70.95%	87	28.71%	1	0.33%
2nd	237	72.92%	87	26.76%	1	0.30%
3rd	98	67.12%	48	32.87%	0	0.00%
4th	90	68.70%	40	30.53%	1	0.76%

Table no.: 3 Level of stress experienced by students in interpersonal relationship subscale

Interpersonal relationship subscale						
	Mild		Moderate		Severe	
Year	Number of students	Percentage	Number of students	Percentage	Number of students	Percentage
1st	216	71.28%	84	27.72%	3	0.99%
2nd	213	65.53%	105	32.30%	7	2.15%
3rd	92	63.01%	53	36.30%	1	0.68%
4th	90	68.70%	41	31.29%	0	0.00%

Table no.: 4 Level of stress experienced by the students in academic subscale

Academic subscale						
	Mild		Moderate		Severe	
Year	Number of students	Percentage	Number of students	Percentage	Number of students	Percentage
1st	118	38.94%	156	51.48%	29	9.57%
2nd	137	42.15%	161	49.53%	27	8.30%
3rd	98	67.12%	48	32.87%	0	0.00%
4th	66	50.38%	61	46.56%	4	3.05%

Table no.: 5 Level of stress experienced by the students in environmental subscale

Environmental subscale						
	Mild		Moderate		Severe	
Year	Number of students	Percentage	Number of students	Percentage	Number of students	Percentage
1st	145	47.85%	136	44.88%	22	7.26%
2nd	142	43.69%	164	50.46%	19	5.84%
3rd	63	43.15%	65	44.52%	18	12.32%
4th	65	49.61%	62	47.32%	4	3.05%

Table no.: 6 Correlation between age, stay and year of study with source of stress

		Physical	Interpersonal relationship	Academic	Environmental
Age	p	0.255	0.960	0.253	0.799
	r	0.038	-0.002	-0.038	-0.008
Stay	p	0.272	0.037	-0.069	0.000
	r	0.037	-0.069	-0.002	0.219
Year	p	0.522	0.827	0.044	0.877
	r	0.021	-0.007	-0.067	-0.005

Disscussion

Primary aim of this study was to assess level of stress among undergraduate university physiotherapy students by using student stress inventory (SSI) which provides information regarding level of stress as well as about stressors producing it and the precautions to be taken. A total of 905 undergraduate students, both males and females were assessed for different demographic variables such as Age, Gender, Stay and Year of study. Along with it the level of stress was marked on SSI by students themselves.

The values produced on SSI indicates mild to moderate level of stress among university physiotherapy students; Out of all the factors affecting stress present study found that Academic and Environmental factors were the ones which affected the students most.

The correlation between level of stress and different factors affecting stress depicted that there was a signi f cant negative correlation between stress and academic factor. Adding on to this, the students of this study group showed a positive correlation between level of stress and environmental factors which was signi f cant with p value ≤ 0.05. Other components of student stress inventory when correlated with students' stress level; the results were not signi f cant ($p \geq 0$).

The possible reasons for the above-mentioned f ndings could be because of students staying at hostel and away from their families. Living alone in hostels/ apartments and Lack of recreation activities could be one of the reasons. According to the study performed in the United Arab Emirates many students in the 1st year were staying away from their family for 1st time and may need more emotional support compared to 2nd year student this could be an indication of student's level of stress related to environmental factors.[24]

Another positive result of our study was the correlation between Academic factors and stress produced by such factors. This result can be supported by a study on internship students of Shree Swaminarayan physiotherapy college, Surat which has mentioned that Medical and Paramedical students are expected to learn and master a huge amount of knowledge, attitudes and skills for which they have to work hard which in turn put them under lots of stress. It was observed that academic examination for medical and Para-medical students are stressful and produces changes in vital parameters which affected their academic performance.[4] In academic subscale nervousness for class presentations and examinations are more common factors by which

students taking stress. Students fnd difculty to dealing with tough subjects.

In physical subscale headaches, excessive worry, and constant tiredness are common symptoms among students that may be due to the Irregular eating habits, lack of exercise and sleep problems which are associated with a higher incidence of psychological disorders. According to Asian Journal of Psychiatry, stress probably occurs due to the concern about future and fear of failure being the most stressful thing among students. Stress might occur due to increased workload and limited leisure time which must have caused our students to mark more on headaches, excessive worry and constant tiredness symptoms.[25,7]

Maximum students of our study showed high parental expectations and frustration by lack of faculty management as few of the interpersonal relationship parameters which were causing stress among them. These fndings can be supported by few of the other factors indicated by Riphah International University which concluded that Major percentage of stressors faced by students are self-imposed including competition, problem solving, tension taken in exams and viva's and to get love and care from friends and parents. [26]

Conclusion

The University undergraduate physiotherapy students experienced mild to moderate level of stress, out of all components environmental and academic factors were responsible for producing more stress among students of the all years.

Conflict of Interest-Nil

Source of Funding- Self

Ethical Clearance –Taken from institutional advisory board.

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Association of Anxiety with Cognition and Academic Performance in Overweight and Obese Adolescents - A Cross Sectional Study

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Abstract

Aims: To determine the correlation between cognitive and academic levels in anxious overweight/obese adolescents.

Methods: The Spence Child Anxiety Scale (SCAS) was used to check the level of anxiety on 98 overweight/obese adolescents aged 12-16 years. After meeting inclusion criteria participants were evaluated by Mini Mental State Examination (MMSE) for level of cognition and Academic Performance Rating Scale (APRS) for academic performance.

Results: 5.10% of obese/overweight adolescents had moderate cognition, and 13.27% mild cognition. No significant association was seen in BMI and anxiety with cognition and academic performance, however, a positive correlation was seen between cognition and academic performance ($p<0.05$).

Conclusion: Anxiety rates in overweight/obese adolescents are not directly proportional to levels of cognition and academic performance. However, age rise has a correlation with BMI rise and level of anxiety. The research showed that cognition levels are associated with academic performance.

Keywords: *Adolescent, Obesity, Anxiety, Cognition, Academic Performance*

Introduction

Weight gain and fat storage were regarded as a sign of health and prosperity in ancient days. Today, with living standards rising, weight gain and obesity pose an increasing risk to health among kids and young people worldwide.[1] Childhood and adolescent obesity has reached epidemic proportions globally, despite attempts to encourage weight loss.[2] The mechanisms responsible for enhancing adolescent obesity are not fully understood, but hereditary variables, climate, metabolism, behavior, culture and socio-economic status all play a part in obesity. Factors leading to enhanced incidence of overweight and obesity among adolescents in India include lifestyle modifications connected with decreased outdoor physical activity, enhanced use of screen time, and elevated family revenue.[3]

Prevalence rates in the USA have risen 2 to 3 times over 25 years, 2 to 3 times over 10 years in England and 4 times over 18 years in Egypt, according to different research.[4] The present prevalence in India of adolescent overweight ranges from 4% to 22%.[5] Recent estimates show that about 9.1% of adolescents in the district of Belgaum are overweight and 4.1% are obese.[1,27]

As with adults, adolescent obesity causes a cluster of risk variables for cardiovascular disease. The significant medical co-morbidities connected with

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adolescent obesity are metabolic risk factors, including hypertension, dyslipidemia and chronic inflammation, enhanced tendency for blood coagulation, endothelial dysfunction and hyperinsulinemia.[26] Often pulmonary complications include sleep-disordered breathing (sleep apnea), asthma, and intolerance to exercise. In an obese adolescent, developing asthma or exercising intolerance may restrict physical activity. Depression, anxiety disorder and ADHD are major psychological co-morbidities.[6]

Anxiety is a normal phenomenon that occurs during a child's growth, and although fears of adolescence may be quite intense, most of them vanish as rapidly as they appear. Fear and anxiety will persist and become so intense in some children that they start to interfere with their daily functioning.[7] Adolescence is regarded a critical time when mental disorders may manifest themselves, leading to a greater danger of future chronic mental illness.[8]

Various studies point to adolescent overweight / obesity associations with social and psychological features such as depression, anxiety, social withdrawal, etc. Obesity can be a risk factor for disorders of anxiety. Obesity can lead to disturbances of anxiety through different pathways. For example, weight-related discrimination and stigma for obese people may be deeply distressing. Additionally, the adverse impact of obesity may be particularly stressful on health and quality of life. Thereafter, both pathways can lead to anxiety disorders.[9]

Adolescent anxiety disorders are accompanied by a wide variety of negative impacts on life. It also affects the functioning of adolescents with peers, school and recreation, and can lead adolescents to under-reach in school and other areas of life.[10] Anxiety is a distressing issue, particularly among kids and adolescents who are constantly being assessed in schools. Although some reviews explain the etiology of anxiety, much study is required on anxious adolescents, such as the diagnostic structure and psychopathology of people experiencing test anxiety.[11]

A research was carried out on highly obese primary school kids in China who found that they had a considerably lower intelligence quotient than the controls.[12] A similar study on Thai kids (grade 7 to 9) found a link between overweight status and poor school performance.[13]

With recently documented prevalence rises, obesity along with anxiety is now one of the most urgent issues facing adolescents today. The effect of obesity on academic achievement was a contentious issue and the proof on this front was inconclusive.[14] Literature disclosed obese adolescents with impairments in nearly all cognitive areas i.e. attention, verbal and visual memory, decision-making. However, there were a large number of methodological constraints that need to be taken into account in interpretations and findings of an autonomous impact. There is currently insufficient evidence to indicate a strong connection between obesity and cognitive impairment in adolescents due to these methodological constraints.[15]

In order to better understand the connection between adolescent obesity and cognition, further study is suggested.[15] Further studies are required to determine if obesity and anxiety are determinants of reduced academic achievement.[14]

The aim of the research is therefore to determine the correlation between cognitive and academic levels in obese adolescents with anxiety.

Materials and Methods

The study was carried out in Belagavi district of Karnataka. A descriptive cross-sectional design was used in this research using a quantitative approach. The investigator adopted the descriptive research design because, the study aimed to provide a current account of the correlation between cognitive and academic levels in obese adolescents with anxiety. The investigator also chose a quantitative approach because of its ability to infer from more participants than other methods. Approval was granted by the Institutional Ethical Committee before the study was conducted. Data on the total number of higher secondary schools were obtained from the District Officer, Belagavi, in determining the sample size for the study. An open-ended sample size was chosen based on the suitability of the research. In selecting the schools, a simple random sampling method was used. The chosen schools' higher authorities had been approached and the study started after approval.

Students aged 12 to 16 years of chosen schools within Belagavi were the target population for the research. Subjects were requested to participate in the study after finding their suitability according to the inclusion and exclusion criteria. Participants, their parents and teachers were informed about the nature of the study written informed consent was received from each research participant. All subjects were assessed for their height and weight and the BMI was calculated. The participants falling into the category of overweight / obese were tested for their levels of anxiety. Subjects were included if they met the following criteria: (1) Those who were willing to participate (2) BMI > 85th percentile on the BMI-for-age growth chart (3) > 60 T-score on the Spence Child Anxiety Scale (SCAS). Subjects were excluded if they were under any weight loss medication or any workout program for weight loss.

After recruitment into the study, using the Mini Mental State Examination (MMSE), each participant was assessed for their cognition level. The MMSE begins with a graded assessment of orientation to place and time, for which a maximum of 10 points is possible. This is followed by testing two aspects of memory. The first is the immediate recall for three objects presented orally, followed by a serial sevens task which is interposed to assess attention, concentration, and calculation, and also to prevent the individual from rehearsing the three objects previously learned. A maximum of 11 points may be obtained in this section of the test. The final section surveys aphasia by testing functions of naming, repetition, understanding a three-stage command, reading, writing and copying a drawing. There is a maximum of 9 points which may be obtained on this section, for a total possible MMSE score of 30 points. Internal consistency appears to be moderate with Cronbach alpha scores reported between 0.6 and 0.9. Test-retest reliability has been examined in several studies, and in those where re-examination took place within 24 h reliability by Pearson correlation was usually above 0.85.[16]

Another questionnaire filled out by the subject class teacher, the Academic Performance Rating Scale (APRS), evaluated the academic performance of each participant. The APRS is a 19-item scale that was developed to reflect teachers' perceptions of children's academic performance and abilities in classroom settings. It includes items directed towards work performance in various subject areas, academic success, behavioral control in academic situations, and attention to assignments. Teachers answered each item using a 1 (never or poor) to 5 (very often or excellent) Likert scale format. Seven APRS items (i.e., nos. 12, 13, 15- 19) were reverse keyed in scoring so that a higher total score corresponded with a positive academic status.[17]

ASSOCIATION BETWEEN OBESITY AND COGNITION: (Table 1)

Cognition	Obese	%	Overweight	%	Total	%
Mild	5	38.46	8	61.54	13	13.27
Severe	3	60.00	2	40.00	5	5.10
No	36	45.00	44	55.00	80	81.63
Total	44	44.90	54	55.10	98	100.00
Chi-square 0.6791 P = 0.7122						

ASSOCIATION BETWEEN BMI, ANXIETY, COGNITION AND ACADEMIC PERFORMANCE: (Table 2)

Variables	Correlation between age with			
	N	Spearman R	t-value	p-level
BMI	98	0.5261	6.0621	0.0001*
Spence child anxiety	98	0.0298	0.2918	0.7711
Spence child anxiety (T)	98	-0.2966	-3.0431	0.0030*
Standardized mini mental state examination	98	0.1406	1.3917	0.1672
Academic performance	98	-0.0158	-0.1553	0.8769

*$P<0.05$

ASSOCIATION BETWEEN COGNITION AND ACADEMIC PERFORMANCE: (Table 3):

	Correlation between Standardized mini mental state examination with			
	N	Spearman R	t-value	p-level
Academic performance	98	0.3375	3.5133	0.0007*

*$P<0.05$

COMPARISON BETWEEN MALE AND FEMALE: (Table 4)

Variables	Male			Female			Z-value	p-level
	Mean	SD	Rank Sum	Mean	SD	Rank Sum		
Age	13.03	1.14	827.00	14.88	1.29	4024.00	-5.4048	0.0001*
BMI	24.93	4.31	995.00	28.05	4.36	3856.00	-4.1214	0.0001*
Spence child anxiety	44.77	10.08	1266.50	47.78	10.02	3584.50	-2.0473	0.0406*
Spence child anxiety (T)	64.61	3.31	1922.50	63.12	4.74	2928.50	-2.9641	0.0030*
Standardized mini mental state	24.97	4.42	1203.50	27.27	3.10	3647.50	-2.5286	0.0115*

Results

Statistical Analysis:

Statistical Package for Social Sciences (SPSS version 20.0) was used to analyze the data. Non-parametric Spearman's rank correlation method was used to find the correlation between all the variables. Level of significance was set at $P<0.05$.

ASSOCIATION BETWEEN OBESITY AND COGNITION: (Table 1)

Summarizes the association between Obesity and Cognition using the Chi-square test. Majority of adolescents, 81.63% had no cognitive deficits. Whereas 5.10% showed severe cognition impairment and 13.27% had mild cognition impairment.

ASSOCIATION BETWEEN BMI, ANXIETY, COGNITION AND ACADEMIC PERFORMANCE: (Table 2)

Table 2 shows the correlation between age with BMI, Spence child anxiety, Spence child anxiety (T-score), Standardized mini mental state examination and Academic performance by Spearman's rank correlation method. There is a significant positive correlation between age and BMI ($P=0.0001$). There is a significant negative correlation between age and Anxiety ($P=0.0030$). There was statistically significant correlation between age with cognition and academic performance.

ASSOCIATION BETWEEN COGNITION AND ACADEMIC PERFORMANCE: (Table 3)

Table 3 shows the Correlation between Standardized mini mental state examination scores with Academic performance by Spearman's rank correlation method. There is a positive statistically significant correlation between Cognition levels and academic performance of the subjects ($P=0.0007$).

COMPARISON BETWEEN MALE AND FEMALE: (Table 4)

Table 4 shows the comparison of male and females with age and BMI, Spence child anxiety, Spence child anxiety (T-score), Standardized mini mental state examination and Academic performance by Mann-Whitney U test. Females have significantly higher scores in comparison with their male peers, except for in academic performance.

Discussion

The present study investigated adolescent obesity associations with anxiety, cognition, and scores of academic performances. To our knowledge this is the first study to assess the association between cognitive and academic levels in overweight/obese adolescents with anxiety. We found that obesity was associated with significantly higher age and anxiety rates in adolescence.

The present study included the pubertal age group and cognition and academic achievement as outcomes. Obese adolescents showed to have more severe cognitive deficits compared to overweight adolescents. [Table 1] Majority of adolescents with severe cognitive deficits were obese whereas high numbers of adolescents with mild cognition were overweight. However, the total sample population showed to have more adolescents having normal cognition. This shows that majority of the obese/overweight adolescents had no cognitive deficits. The reason for such a result could have been as this study relied on BMI (i.e., BMI-for-age) as the primary measure of obesity, neglecting the influence of body composition or fat distribution. This is a significant limitation, as body composition in children differs by age, gender, and stage of sexual maturity. The findings of the present study are similar to a study done by John Gunstad et al where 6-19 year olds were tested for cognition using a computerized test method and the study resulted that elevated BMI is not associated with cognitive function in children and adolescents. [21] Such a finding points to a maladaptive relationship between obesity and aspects of cognition.

When taken age into consideration, in the current study, BMI ($p=0.0001$) and anxiety ($p<0.003$) showed significant correlation. This suggests that as age progresses BMI increases and as age progresses anxiety reduces. [Table 2] This could be due to adolescent's evaluations of threat which are not only determined by external information (i.e., exposure to potential threat cues) but also by internal information, such as the experience of anxiety-related bodily sensations, for example emotional reasoning which is the cognitive process of inferring danger on the basis of a physical anxiety response.[20] Another reason supporting the

association between increased weight and anxiety could be the dynamic-equilibrium model of well-being and psychological distress. According to this model, a person's levels of well-being and psychological distress tend to be stable over time and get influenced by personality traits. While positive or negative life events can affect well-being and psychological distress, people will tend to return to their equilibrium levels. They will also adapt to long-term adverse situations (e.g. being obese, poorer physical health), so that these do not disturb the equilibrium levels of wellbeing and psychological distress. In a study done by Aziz et al. on 6-17 year olds, the prevalence of anxiety disorder was found to be 31% in children and adolescents at risk of overweight/obesity and 16% of children are already overweight.[18] Similar to our study Esposito et al. 69 male school-aged children and found that anxiety scores are higher in obese children than in normal weight controls. [19]

The current study resulted that there is no association seen between obesity and cognition [Table 2]. Contrary to our findings, the findings of a study done by Muris & Field suggest that cognitive health may be profoundly affected by weight status and obese children have shown to exhibit lower performance on cognitive control tasks. [7] The current study also resulted in no association between BMI and academic performance. A study done by Khan et al., assessed changes in weight status in children over the first 4 years of schooling. Their findings indicated that children who moved from normal to overweight status were likely to score lower on academic tests than their normal weight peers. However, there were no differences between girls who were never overweight and those who remained overweight. [22] This could be the reason for the present study proving that there is no association between obesity and lower levels of academic performance. However, a cross-sectional study done by Cole et al. indicated a negative association with obesity and academic achievement [25].

This study showed positive correlation between cognition and academic performance (p=0.0007) [Table 3]. This states that as cognition reduces the academic performance tends to decrease too. The reason of this cognitive distortion in poor academic performance could be attention bias, which refers to anxious children's tendency to display hyperattention towards potentially threatening material/situation. Other studies have reported similar effects, in non-clinical children and adolescents with high anxiety levels whose results indicate that highly anxious adolescents had poor recalling capacity in turn lowering their academic performance. These findings suggest that poor performance in school is due to the various types of cognitive deficits that occur in anxious children and adolescents.[7] One such study was done by Li et al., where they documented association between Academic Performance and cognitive impairment in 8-16 year olds, they also stated that overweight was a marker but not a cause of poor Academic Performance.[14]

When gender related comparison was done, the results showed that female adolescents showed greater scores in all variables compared to their male counterparts. However, the academic performance scored remained almost the same for both groups [Table 4]. A study done by Daniels et al., have resulted in similar conclusion in which there were no significant findings for boys on the measure of academic performance and adolescent girls showed to have greater percentage of weight than their male counterparts.[28]

Obesity is not a psychological disorder, but some researchers and clinicians argue that it should be considered a mental or behavioral issue.[23] Recent literature has concluded that majority of studies find a prospective relationship between obesity and anxiety[24]. It has previously been hypothesized that the association of obesity with anxiety may be due to the physical health consequences of obesity. However, the present results are inconsistent with this hypothesis. In the present study, it was seen that there was a positive significant correlation between age and BMI and negative significant association with anxiety. On the contrary, the current study proved no significant association between obesity and cognition or academic performance.[15]

Conclusion

Anxiety rates in adolescents who are overweight / obese are not directly proportional to levels of cognition and academic performance. However, age rise has a correlation with BMI rise and level of anxiety. The research also showed that cognition levels are associated with academic performance. In summary, based on the results of this analysis, the levels of anxiety and elevated weight of adolescents do not impact cognition and

academic performance. Reducing the level of anxiety, however, can boost academic performance.

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Reliability and Validity of the Kannada Version of the Parental Stress Scale

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Abstract

Background: Parental Stress Scale (PSS) is a self report scale of 18 items which represents positive and negative components of parenthood. Administration of scale doesn't require any specific training but as it is self report scale it is important that parents should be able to read it by themselves for better understanding of questions. Therefore it is necessary to translate and validate the tool in local language.

Objective: Objective of this study was to translate the Parental Stress Scale in Kannada language and check its reliability in comparison with original English tool.

Methods: Translation procedure was followed according to WHO guidelines for translation and adaptation of instruments. The original English version of PSS was translated by two translators into Kannada. It was further subjected to expert panel opinion. Amendments were done in the Kannada version as per the panel's opinion. A reverse translation of the amended tool was then done by a translator back to English from Kannada. The translated scale was later tested for reliability and validity.

Results: The Cronbach's alpha value of translated version of PSS was found to be 0.915 with an ICC value of 0.82. The translated version of tool was found to be reliable and culturally acceptable in North-Karnataka region.

Conclusion: The translated version of PSS has an excellent internal consistency and good reliability. It can be used to measure parental stress scores among the population from North-Karnataka region.

Key words: *Stress; Parental Stress Scale; Kannada; Reliability; Validity.*

Introduction

Parental stress is defined as "parental perceptions of an imbalance between the demands of parenting and available resources." It is one of the many factors that contribute to the effectiveness of parenting. Parents of children with disabilities often experience higher levels of parental stress than parents of children without disabilities and are more likely to have a higher risk of emotional and psychological distress.[1]

Various instruments are available to evaluate the parental stress like Parenting Stress Index (PSI), Global inventory of Stress, Cleminshaw-Guidubaldi Parent Satisfaction Scale, Family Inventory of Life Events and Changes, Coping Resources Inventory For Stress, Short Form of the Questionnaire on Resources and Stress (SFQRS), Stress Index for Parents of Adolescents, Parenting Daily Hassles Scale and Parental Stress Scale.[2,3]

Parental stress scale was basically intended to be used for assessment of parental stress for both, mothers and

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fathers of children with and without clinical problems.[4] Parental stress scale focuses specifically on the stress generated by the parenting role, as compared to the large number of instruments that fail to separate parenting stress from the stress that may result from other roles and situations, such as marital or financial difficulties.[2] Parental stress scale is easy for administration as opposed to other instruments due to its less number of items and simplicity. It is an 18 items self reporting questionnaire. Self-report questionnaires can be administered to large populations without much effort and in less time. Also the information respondents tend to give is more accurate as they are the ones who are closer to the issue in the question than other individuals.[5]

As it is a self administered scale, it is very important that parents should be able to read and understand on their own. Original scale is available in English language. Hence the need to translate the tool in local languages and further also check for the reliability and validity of the translated tool

Objective

Objective of this study was to translate the Parental Stress Scale in Kannada language and check its reliability in comparison with original English tool.

Methodology

Permission from author was obtained for the translation and subsequent use of the scale. Subsequent permission was obtained from the Institutional Ethical Committee for the same. Informed consent was obtained from all the participants in the study. The original tool was evaluated for Cultural acceptability by two psychiatrists with an experience of minimum five years. Translation procedure was followed according to WHO guidelines for translation and adaptation of instruments.[6] The scale was translated into Kannada by two bilingual translators. Group discussion was conducted and opinions were obtained on the translated version by an expert panel of four people. All four panelists consented for their participation and had received education in both Kannada and English languages. They also possessed postgraduate degree in their fields and had never used the tool before. Amendments were done in the Kannada version as per the panel's suggestions. Reverse translation of this Kannada version was done by another translator back into English. The reverse translated scale was compared with the original English tool for appropriateness. Final version of translated tool was tested for reliability and validity. The face validity of the translated tool was assessed by an expert who had an experience with the tool for more than five years and also had knowledge of both the languages.

The tool was further distributed to ten participants for assessing reliability. Participants were those who had at least one typically developing child and consented for duly filling the forms. Two participating parents were graduates and eight were postgraduates in their respective fields. The English tool was administered once and the Kannada tool was then administered after ten days. The Kannada tool was again administered for the second time after four weeks, with randomly shuffed questions so as to prevent any bias.

The scales once returned by the participants were scored according to the procedure given in the tool.

Procedure of scoring the tool: Parental stress scale is a Likert type of self reporting scale. Scoring of the tool was done after collecting the scales back from the participants. The scoring was done as per the instructions given in the tool. To compute the parental stress score, items 1, 2, 5, 6, 7, 8, 17, and 18 should be reverse scored as follows: (1=5), (2=4), (3=3), (4=2) and (5=1). The item scores are then summated. Overall possible scores on the scale range from 18 – 90. The higher the score, the higher the measured level of Parental stress. [7]

The scores obtained were subjected to statistical data analysis. Cronbach's alpha was calculated to check the internal consistency of translated scale. ICC value was calculated for test-retest reliability of the Kannada version of PSS.

Results

Kolmogorov - Smirnov statistics showed that the data of PSS scores obtained were normally distributed. As data was normally distributed, it was subjected to the parametric tests.

Mean age of the participating parents and their children were 42.3 (±9) and 13.3 (±9.5) years respectively.

The internal consistency of the instrument was examined by means of Cronbach's alpha. Table 1 shows Item-Total statistics for Kannada version of Parental Stress Scale and Cronbach's alpha if the item is deleted. No significant differences were found among scale means of each item. Item number 10 (ten) showed a negative correlation with the total of scores on all other items.

Cronbach's alpha of the Kannada version of PSS, on analysis, was found to be 0.915 for the total scale (Items 1-18), which means the tool has an excellent consistency, as a Cronbach's alpha value more than 0.9 is regarded as a measure of excellent internal consistency. An item-total correlation (Pearsonian correlation) lower than 0.3 means the item is little correlated with the overall scale. In our study only one item was found to have a score lower than 0.3, which was item number 10 (ten). Cronbach's alpha after dropping item number 10 would increase to 0.926 from 0.915.

Table 1: Item-total Statistics for Kannada version of PSS

Q.No.	Scale Mean if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	37.90	0.757	0.910
Q2	37.10	0.733	0.907
Q3	35.80	0.502	0.912
Q4	36.10	0.471	0.914
Q5	37.70	0.668	0.908
Q6	37.70	0.755	0.906
Q7	37.60	0.688	0.907
Q8	37.50	0.815	0.908
Q9	37.30	0.903	0.902
Q10	**35.90**	**-0.118**	**0.926**
Q11	37.40	0.882	0.905
Q12	37.10	0.658	0.909
Q13	37.30	0.834	0.903
Q14	37.00	0.318	0.918
Q15	37.20	0.696	0.909
Q16	37.00	0.617	0.911
Q17	37.40	0.812	0.905
Q18	37.10	0.351	0.922

Table 2 shows the Mean scores along with the standard deviation for English and 1st administration and 2nd administration of Kannada version of PSS. Mean scores obtained from English and 1st administration and 2nd administration of Kannada version of PSS were compared item wise. A comparison of the scores of the English and 1st administration of the Kannada version of the tool, the English and 2nd administration of the Kannada version of the tool and the 1st and 2nd administration of Kannada version of the tool showed statistically non-significant difference in the item wise scores at a p value of 0.49, 0.95 and 0.36 respectively. The ICC value for test-retest reliability of the tool was calculated to be 0.82.

There was also no statistically significant difference between individuals scores of English and 1st and 2nd administration of Kannada within the same participants.

Table 2: Mean and SD of both English and Kannada scales

Q.No.	ENGLISH		KANNADA 1st administration		KANNADA 2nd administration	
	MEAN	SD	MEAN	SD	MEAN	SD
1	2	1.0	1.6	0.5	1.4	0.5
2	1.7	0.9	1.4	0.5	2.2	1.6
3	4	1.1	3.5	1.0	3.5	0.8
4	3.9	1.2	3.2	0.9	3.2	1.1
5	1.5	1.5	1.5	1.0	1.6	1.0
6	1.5	1.6	1.3	0.5	1.6	1.1
7	1.4	1.9	1.4	0.5	1.7	1.3
8	1.7	2.2	2	0.9	1.8	0.6
9	2.1	2.5	1.8	0.8	2	1.1
10	2.6	2.7	2.8	0.9	3.4	1.0
11	1.5	3.2	1.8	0.8	1.9	0.7
12	1.9	3.5	2.3	0.8	2.2	0.9
13	1.6	3.9	2.1	1.1	2	1.2
14	2.4	4.2	2.1	0.9	2.3	1.2
15	3.7	4.2	2.2	0.8	2.1	0.7
16	2.3	4.8	2.1	0.7	2.3	0.7
17	1.8	5.1	1.5	0.5	1.9	1.0
18	1.4	5.5	1.2	0.4	2.2	1.6
TOTAL	39	17.5	35.8	6.7	39.3	12.2

*p value ≤0.05 was statistical significant with 95% CI.

Discussion

Total ten participants were included in the study according to the inclusion criteria. The English tool was administered to the participants on day one. Later the Kannada version of the tool was administered to the participants after ten days as part of 1st administration of the translated tool. The Kannada tool was administered again to the same participants after a gap of four weeks with the sequence of questions being changed as part of 2nd administration of the tool. The results showed that the mean scores were not significantly different for each question. Thus inferring that, the translated tool was as effective as the original English tool. A comparison between the 1st and 2nd administration of the Kannada tool also showed no significant differences in the mean scores. Thus concluding that, the Kannada version of the tool had good test-retest reliability, which shows that the translated version of the PSS was as effective as the English one.

An excellent Cronbach's alpha value (0.915) suggests a really good internal consistency of translated version of the PSS. Although dropping question number 10 (ten) increases the Cronbach's alpha value marginally, we do not want to consider dropping the question number 10 (ten) from translated version of PSS. The ICC value for test-retest reliability of Kannada version of PSS showed a good reliability of translated tool. The internal consistency and test retest reliability of the original English tool as provided by the authors is 0.83 and 0.81 respectively. The Kannada version of the tool can be hence considered at par with the original English tool.

Conclusion

Owing to the excellent Cronbach's alpha coefficient and good ICC value of the Kannada version of PSS, the translated tool is reliable and valid for identifying parental stress. The English version of PSS is reported to be valid for application or usage among parents of normal children as well as those with medical conditions. Thus the Kannada version of PSS can be used by health professionals in their clinical practice and/or for research purpose. This Kannada version of the tool has been validated for populations from North-Karnataka; hence generalizing it for the whole state may not be possible due to a number of variations in the local language across the various zones of the state.

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Comparison of Postural Stability between Sports Playing Versus Non -Sports Playing Adolescent with BMI > 85Th Percentile

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Abstract

Obesity in adolescent is a world- wide epidemic in developing as well as developed countries. Obesity has a overall effect on various body systems and can lead to atherosclerosis, hypertension, stroke, cancers, hormonal changes, degenerative joint changes, respiratory diseases,it is also associated with various functional problems like pain, joint stiffeness(lower extremities), affected muscle strength and postural deformities.It also has an effect on postural stability, that is the ability to maintain the COG within the BOS. **Aim and objective of the study -** To compare the postural stability of sports playing versus non-sports playing adolescent with BMI > 23rd adult equivalent(BMI > 85th percentile) using Balance Error Scoring System (BESS) scale. **Study Design -** 21 subjects each in sports playing and non sports playing in the age group 12-15 years and with BMI >85th percentile were evaluated for their balance using the BESS score. **Results and analysis** – Data analysis was done using Graphpad instat demo version. Unpaired 't' test was done to analyse the data. The analysis showed signi f cant difference between the BESS score of sports playing and non sports playing individuals . Mean and SD of sports playing individuals was 8.52 (+_2.83) . The Mean and SD of Non sports playing individuals was 14.85 (+_4.041). The mean difference +_ SEM was 6.33 +_1.078.The t value was 5.877. **Conclusion -** Overweight and obese adolescent who play Regular sports that is for more than 6 week , 3 times a week and for 1 hour , show a signi f cantly better postural stability in the BESS scale with a lower value as compared to those obese and overweight individuals who are not indulged in any sports activity on regular basis, showing a increased score on BESS scale .

Key words *– overweight, obese, BESS score, sports*

Introduction

Obesity in adolescent is a world- wide epidemic in developing as well as developed countries. Obesity has an overall effect on various body systems and can lead to atherosclerosis, hypertension, stroke, cancers, hormonal changes, degenerative joint changes, respiratory diseases, it is also associated with various functional problems like pain, joint stiffness (lower extremities), affected muscle strength and postural deformities. It also has an effect on postural stability, that, is the ability to maintain the COG within the BOS.

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Previous studies have shown that obese individuals are at a greater risk of falling and thus reduced functional ability as compared to the normal weight individuals of same age .This can be due to altered body mechanics or due to desensitization of mechano -receptors.

Obese and overweight individuals do not join any sports with the same ease, as compared to non-obese and normal weight individuals.

Also as postural stability is seen to be affected in overweight and obese individuals ,it can lead to further decrease in functional ability and participation in physical activities, further causing increase in weight due to lack of activity.

Balance problems can further increase in future as the weight increases in adulthood, leading to increased chances of fall .

The aim of the study was to compare the postural stability of sports playing versus non-sports playing adolescent with BMI > 23rd adult equivalent(BMI > 85th percentile). The objectives being comparing the postural stability in sports playing and non-sports playing overweight and obese adolescent using Balance Error Scoring System scale (BESS).

The experimental hypothesis was that Overweight and obese adolescent, indulged in sports have a better postural stability as compared to those not indulged in sports . The null hypothesis was that there was no signi f cant difference in postural stability of sports playing and non -sports playing obese and overweight adolescent.

Material and Methodology

This is a comparative cross sectional study conducted on 12-15 year old boys and girls with BMI >85th percentile. There were 21 participants in each group – group A sports playing and group B non-sports playing. Participants in group A were playing sports for more than 6 weeks, 3 times a week for more than 1 hour a day. (cricket, basketball, tennis ,football ,volleyball ,kabbadi, badminton , long jump, martial arts). Group B included participants who did not play any sports. All those who were indulged into dancing, swimming were excluded from the study. Also, those who were a known case of visual disorder, vestibular disorder, any musculoskeletal condition or foot deformity and on chronic medications were excluded.

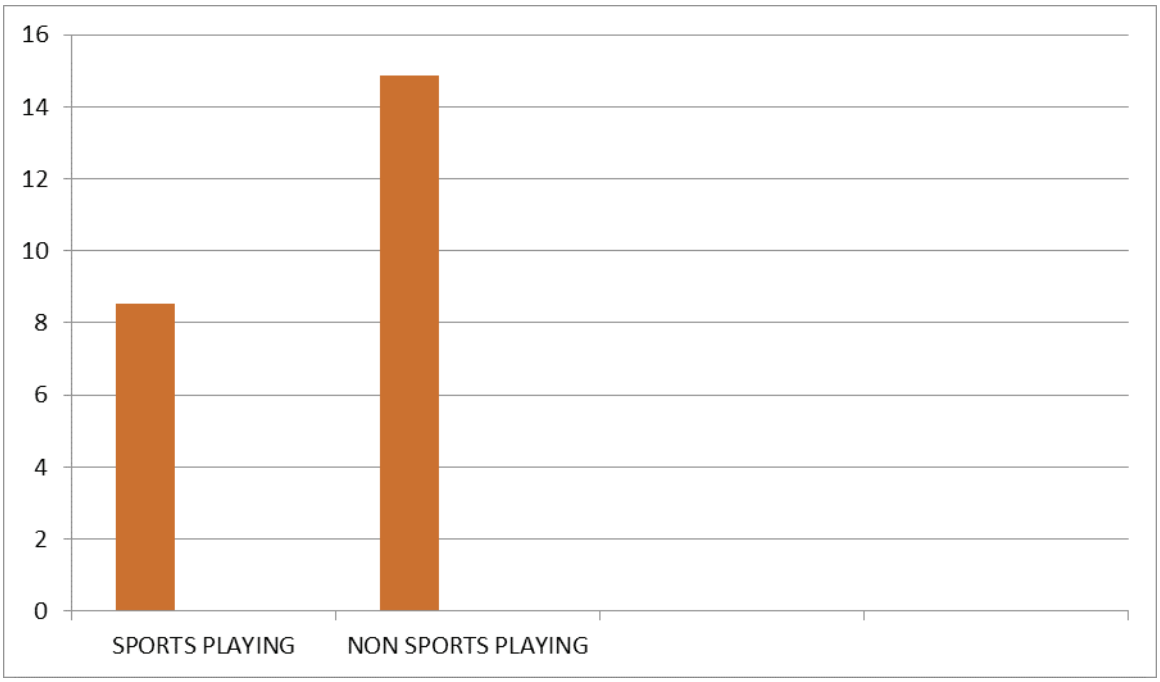
Consents were taken from the ethics committee, school and parents of subjects.

Balance was assessed for all the participants using the BESS scale.

Results and Statistical Analyis

Data analysis was done using Graphpad instat demo version. Since the Data passed the test of normality **unpaired t test** was used for the data analysis .

The analysis showed signi f cant difference between the BESS score of sports playing and non sports playing individuals . Mean and Standard deviation of sports playing individuals was 8.52 (+_2.83) and that of Non sports playing individuals was 14.85 (+_4.041). Higher the mean score , poor is the balance. It showed that the difference was highly signi f cant with the p value <0.0001



GRAPH 1- MEANS OF BESS SCORE OF TWO GROUPS

Discussion

The study was to see the effect of regular sports playing on postural stability and balance of obese and overweight adolescent. Thus postural stability was compared between sports playing obese and overweight individuals with non-sports playing obese and overweight individual. Out of 42 participants, 50 percent were boys and 50 percent girls.

In this study the mean BESS score of sports playing individuals was 8.52(+-2.83) and that of Non-sports playing individuals was 14.85(+-4.041) . The mean difference between the two groups was 6.33. Unpaired t test was used to analyse the data. The study showed extremely significant results with a p value < 0.0001. Thus sports playing obese and overweight individuals show a significantly better postural stability as compared to the non-sports playing obese and overweight individuals.

Balance or postural stability is a complex task that is carried out due to combined actions from various system. Somatosensory /proprioceptive system, vestibular system and visual system provide input regarding body's equilibrium ,thus receiving feedback of body's orientation in space. The CNS receives information and the generates a corrective responses from the musculoskeletal system by generating the corrective torque by the muscles.[1]

Standing is a fundamental part of daily activities and is characterized by swing about the ankle joint to maintain a neutral stable posture. Neutral posture is maintained primarily by calf muscle that counteracts the destabilizing effect of gravity. Obese and overweight show a reduced postural stability as compared to the individuals in normal BMI. Thus a strong relationship between weight and postural stability is observed .Studies also suggest a faster sway velocity in obese and overweight as compare to normal.

The possible reason for affected postural stability in non sports playing participants could be due reduced plantar sensitivity due to **hyperactivation of mechanoreceptors** of plantar area due to constant pressure from a larger mass . These individuals also show a deficit in proprioception of knee, they also show less strength during isokinetic testing. Postural stability can also be affected due to greater **mechanical demand** due to larger body mass around the axis of rotation (Ankle joint)causing a greater gravitational torque, thus to maintain a stable posture , the gravitational torque should be counteracted by a strong muscular torque .[2]

Abdominal endurance and strength , lower extremity power and strength are low in these muscle groups, possibly due to collection of fat between the muscle fibre or due to inactivity causing possible muscle fibre atrophy. Larger body size, larger body mass index, abnormal fat distribution has and a possible neuromuscular disadvantage of obese can contribute to postural instability in them .Thus it is important to know whether a regular sports playing affects postural stability in these individuals.[3]

Sports playing (cricket, basketball, tennis, football, volleyball, kabaddi, badminton, long jump, martial arts) includes Stretching at various joints of lower limb causing increased activation of muscle spindles which is carried to spinal cord via sensory nerves causing increased activation of alpha motor neuron. Strengthening of muscles may occur due to constant repetitions of various intensity and various durations thus improving the tone of the muscle along with providing a better muscle torque around a joint overcoming the gravitational torque.

Sports playing and exercise also affects the Proprioceptive and Neural inputs from muscle spindles and golgi tendon organ in joint capsule, tendon and muscle. Physical activity or sports playing would also stimulate the **sensory receptors (pressure, touch)** at various changing surfaces thus challenging balance further .Sports playing also challenges the **vestibular system** thus altering the inputs from vestibular system to the cerebellum through the vestibulospinal tracts, which in turn change the motor signals sent to muscle and joint thus increasing the tone for maintaining appropriate balance during a destabilizing activity.

Sports playing also include changes in speed and training for agility, this too might challenge the visual, vestibular, somatosensory and neuromuscular system causing change in input from each system. Thus after appropriate motor learning has taken place after 4-8 weeks [4], the body might start showing changes in balance and postural stability.

Thus proved in the study that regular sports playing has a better postural stability in obese and overweight adolescent. Hence an early counselling to indulge in sports, not only with the aim of weight loss but to gain good postural stability (by muscle strengthening and core activation) and balance can be made in schools.

However the study had the limitation that participants with all kinds physical activities could not be studied in the project (eg ;dancing , swimming)

Conclusion

Overweight and obese adolescent who play regular sports that is for more than 6 week , 3 times a week and for 1 hour , show a signi f cantly better postural stability in the BESS scale with a lower value as compared to those obese and overweight individuals who are not indulged in any sports activity on regular basis, showing a increased score on BESS scale .

Conflict of Interest – Nil

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Effect of Repetitive Task Training to Improve Sit to Stand Performance and Activities of Daily Living Skills in Patients with Stroke

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Abstract

Introduction: Stroke is an acute neurological dysfunction and the second leading single cause of death, with 5·8 million fatal cases per year, 40% of which are in people younger than 70 years, with problems in voluntary movement, sensation, language, emotional and intellectual functioning. Task oriented approach practice of Repetitive Task Training (RTT) is a treatment in which you repeat a series of specific movements over and over again, exercises are categorized as either blocked practice or random practice.

Aims and Objectives: To find out the effects of repetitive task training to improve sit to stand performance and Activities of Daily Living (ADL) skills in stroke patients. To evaluate sit to stand performance and ADL performance and to train Repetitive task training activities.

Materials and Methods: The raw scores of pre intervention and post intervention of Modified Ashworth Scale (MAS) and Functional Independence Measure (FIM) were added and summed up into final scores. Within experimental and control groups were analyzed using Wilcoxon Sign Ranks Test. Mann–Whitney U Test was performed for knowing the significance between the groups.

Conclusion: The results of this study suggest that sit to stand activities which is based on activity intervention is strongly grounded in repetitive task training is a promising intervention for improving sit stand activity performance of ADL in stroke patients.

Key Words: *Stroke, Repetitive Task Training, Sit to Stand Performance.*

Introduction

Stroke is an "acute neurological dysfunction of vascular origin with symptoms and signs corresponding to the involvement of focal areas of brain".[1]

Stroke is the second leading single cause of death, with 5·8 million fatal cases per year, 40% of which are in people younger than 70 years. About 15 million new acute stroke events arise every year, and about 55 million people have had a stroke at some time in the past, either with or without residual disability; the prevalence of stroke in India varies in different regions of the country and, ranges from 40 to 270 per 100000 populations. Approximately 12% of all strokes occur in the population <40 years of age.[1]

Major risk factors identified in India are hypertension (blood pressure >95 mm Hg diastolic), hyperglycemia, tobacco use, and low hemoglobin levels (<10 gm %). The National Commission on Macroeconomics and Health has projected that cases of stroke would increase from 1,081,480 in 2000 to 1,667,372 in 2015 (stroke surveillance of India 2005).[1]

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There may be disturbances of voluntary movement, sensation, language, emotional and intellectual functioning. A stroke often leaves a person with problems in using their arms and legs.

Task oriented approach is assumed that normal movements emerges as an interaction among many systems, each contributing its own aspects of control. In addition, movement organized around a behavioral goal and is constrained by the environment.[2]

Task oriented approach intervention assume that, patients learn by actively attempting to solve problem, in a functional task rather than repetitively practicing normal pattern of movement.[3]

Task-oriented approach among the physical interventions for stroke patients is based on the recognition that the goal of motor control is the control of the movement required to approach a particular task, and this includes the acquisition of motor skills as a consequence of repetitive practice.[4]

Repetitive Task Training (RTT) is a treatment of repeating a series of specific movements over and over again. Repetitive practice of the action to be learned can therefore have dual benefits; enable the patient to practice the action as well as increasing muscle strength (Rutherford 1988).[5]

One way of increasing intensity is to include task repetition. Repetitive task training (RTT) therefore combines elements of both relevance to functional activity, and intensity of practice.[6]

Trials of repetitive activity were required to involve complex multi-joint movement with measurement of functional activity as an outcome. Trials were included only if the amount of practice could be quantified, either in terms of duration or number of repetitions (Beverley French 2010).[7]

Repetitive Task Training exercises are categorized as either blocked practice or random practice.

Blocked Practice is practicing one task for a block of trail then moving to on the next task you may presume that it would be easier to learn each task in a block design (Anne cook). The same movement is repeated over and over - for example, always using the same movement pattern to reach for a glass of water.[8]

Random Practice appears to be most effective when used with skills that use different patterns of coordination and thus for different underlying motor problems (Magill & Hall). In addition, characteristics of the individual, such as level of experience and intellectual abilities, may also influence the effectiveness of random practice (Rose, 1997). Any movement necessary to achieve a goal for example, using any movement that have to try to reach for a glass of water.[8]

The research studies conflict as to whether Repetitive Task Training of the legs and trunk can improve walking and trunk stability following a stroke. Repetitive activity alone is not enough to produce increased motor cortical representations (Nudo et al. 2003). Instead, an element of skilled motor learning is required in addition to repetition for cortical reorganization / plasticity to occur.[9]

There is growing evidence that the cortex adjacent to the stroke-damaged region is important to recovery but only if stimulated and trained in the lost function (Hallet et al. 2001). Directed, task-specific therapy appears important to maximize recovery of lost function.[10]

The Proponents of task-specific training site that intense training is not always necessary for positive outcomes in stroke patients, but instead suggest that therapy designed to be more task-specific within normal contact time (30 to 45 minutes per session) could be more efficacious (Page 2003).[11]

Hoses et al. (2003) notes that, "Task-specific therapy can enable hemiplegic patients to practice walking repetitively, in contrast to conventional treatment in which tone-inhibiting maneuvers and gait-preparatory tasks during sitting and standing dominate".[12]

Clinically, repetition plays a major role in inducing and maintaining changes within the cortex. However, repetition of a task in the absence of new, meaningful skill learning is unlikely to induce cortical changes of significance. Less intense task-specific training regimens, of 30 to 45 minutes in length, with the more affected limb can produce cortical reorganization and associated meaningful functional improvements. This correlates well with clinical experience and the maximal "use it or lose it".[13]

Sit to stand (STS) is one of the most mechanically demanding of everyday tasks and crucial to independence (Colleen G canning et al 2003).[14]

Standing up is one of the most mechanically demanding daily activities, requiring greater range of the motion at the knee and higher moments of the force at hip and knee then gait or stair climbing.[15]

STS can be practiced repetitively from lower seat heights, and at increasing speed. If done repetitively with sufficient load, such training provides a means of strengthening the lower limb muscles and increasing endurance, as well as control over the dynamics (Carr & Shepherd 1987).[13]

Rationale of the study:

The task-related training has not traditionally been a significant part of therapy after stroke, which has been dominated by the Bobath approach. This specifically minimizes repetitive active movement, and relies on therapist-guided restoration of "normal movement" patterns, rather than the purposeful, but possibly unnatural, movement that could occur as a result of a more pragmatic approach within RTT, which has the potential to be a resource efficient component of stroke rehabilitation.

Aims and Objectives:

Aims:

To find out the effects of repetitive task training to improve sit to stand performance and ADL skills in stroke patients.

Objectives:

To evaluate sit to stand performance and ADL performance.

Hypothesis:

Null hypothesis:

- There is no significant change in sit to stand ability
- There is no significant improvement in ADL performance

Alternative hypothesis:

- There is significant change in sit to stand ability
- There is significant improvement in ADL performance

Data Analysis

The raw scores of pre and post intervention of all the outcome measures (MAS and FIM) were added and summed up into final scores.

As this was 2- tailed, non-parametric study, the changes in outcome measures (MAS and FIM) within experimental and control groups were analyzed using Wilcoxon Sign Ranks Test.

Mann–Whitney U Test performed for knowing the significance between groups.

Results

Table – 1: Descriptive characteristics

S. No.	Baselines Characteristics	Group A (Control)	Group B (Experimental)
1.	No of subjects	15	15
2.	Age range (years)	34-65	34-65
3.	Mean age (±Std Dev.)	55.8 (±8.351)	55.8 (±8.351)

Table 2: Descriptive statistics of STS outcome measures

Outcome Measure	Mean test score (Group A) Control (N=15)		Mean test score (Group B) Experiment (N=15)	
	Pre test	Post test	Pre test	Post test
MAS	4.13	8.38	4.25	10.13
FIM	83.20	95.73	85.33	102.93

Table 3: Results of Wilcoxon Sign Rank Test for MAS STS within the groups.

Groups	z (2 tailed)	P (2 -tailed)
Experimental	-3.573	.001
Control	-3.342	.001

Graph 1: Bar Graph showing Mean score changes in STS of both groups

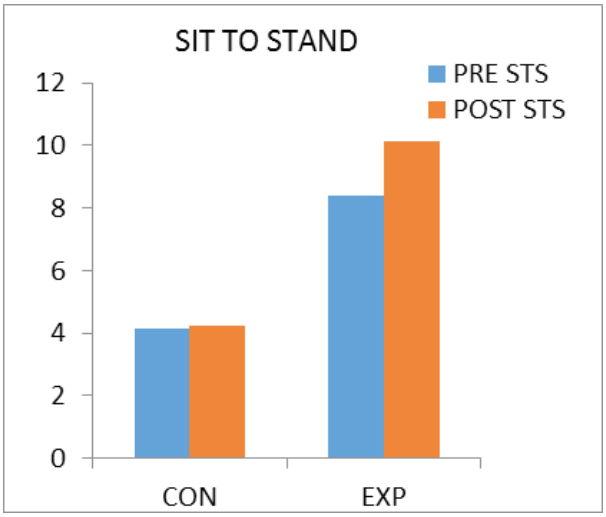

Table – 4: Mann-Whitney U Test result for STS between the groups

Outcome Measure	Z (2 tailed)	P (2 tailed)
SIT TO STAND	-2.513	.019

Table –5: Showing results of Wilcoxon Sign Rank Test for ADL within the groups

Groups	z (2 tailed)	P (2 -tailed)
Experimental	-3.414	.001
Control	-3.423	.001

Graph 2: Bar graph showing mean score changes in ADL of both groups

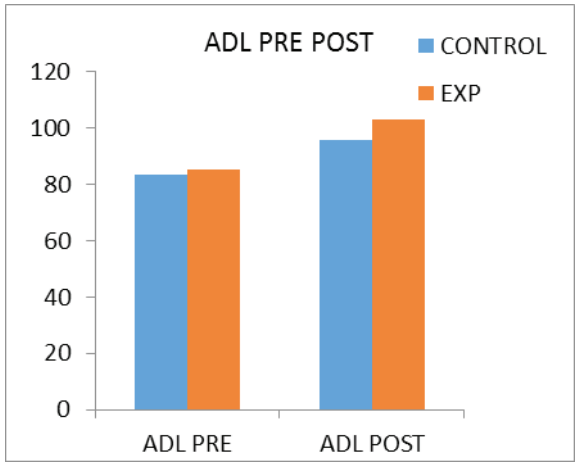

Table – 6: Mann-Whitney U test result for ADL between the groups

Outcome measure	z (2 tailed)	p (2 -tailed)
ADL	-4.456	.000

Discussion

The purpose of the study was determining effect of repetitive task training on sit to stand performance and ADL in stroke patients.

The results within group Wilcoxon test shows improvement in the sit to stand performance on MAS scale for both the group, but there is more signi f cant difference in experimental group in comparison with control group.

As shown in the table 2, 3, 4 shows the repetitive task training on sit to stand performance enhancing the sit to stand performance between evidence

There is also signi f cant improvement in ADL within the group as shown in table 5,6. There is signi f cantly more improvement in ADL performance in experimental group in comparison to control group.

The present study provides evidence that repetitive task training program can be bene f cial in improving sit to stand performance and activity daily living when it is incorporated into conventional occupational therapy treatment approach without having any detrimental change in daily routines.

However, the experimental group, but not the control group, improved signifcantly on sit to stand & activity of daily living. More intensive therapy may improve ADL (Kwakkel 2004).[16,17]

The exercise effect transferred into improved walking speed which was not itself specifcally trained. There is evidence in the motor learning literature that transfer of training can occur in able – bodied subjects across actions which share similar dynamics (Magil RA 1998).[18]

Sit to stand and step-ups are both weight bearing actions which involve the production of lower limb extensor forces across three lower limb joints with the feet fexed. Stance phase of walking also involves the lower limb kinetic chain and increased strength in extensor muscles has been linked to increase in speed of walking (SharpSA1997).[19]

Conclusion

The results of this study suggest that effect of sit to stand activities which is based on activity intervention is strongly grounded in repetitive task training is a promising intervention for improving sit stand performance and ADL in stroke.

These activities intervention also tolerable and convenient for most of the stroke patients and is also safe and practical.

This study concludes that repetitive task training program can be included along with conventional occupational therapy treatment approach to improve sit to stand performance and activity daily living.

Limitations:

- Sample size was small.
- There was no control over the extraneous factors such as natural recovery.
- Follow-up could not be done on the subjects in both the groups.
- The study duration was also short.

Recommendation for further studies:

- Further study with a large sample with long duration.
- Further study can be done with upper extremity function of motor assessment scale.
- Repetitive task training activities can be comparison with other methods.

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Declaration of patient consent:

The authors certify that we have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal the identity, but anonymity cannot be guaranteed.

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A Study to Compare The Effects of Unilateral Arm Training Versus Bilateral Arm Training in Post-Stroke Patients with Motor Impairment of Hand

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Abstract

Background of The Study: Motor function deficits are life changing and devastating consequences of stroke[9]. It affects the patient's mobility, daily life activities, participation in society. The most common manifestation of upper extremity motor impairment includes muscle weakness, changes in the tone and impaired motor control. Both unilateral and bilateral arm training found to be an effective strategy for the recovery of upper limb motor function after stroke.

Aim of The Study: The aim of the study is to compare the effects of unilateral arm training versus bilateral arm training in post-stroke patients with motor impairment of hand.

Objective Of The Study:

Ø To assess the effects of unilateral arm training in post-stroke patients with motor impairment of hand.

Ø To assess the effects of bilateral arm training in post-stroke patients with motor impairment of hand.

Ø To compare the effects of unilateral arm training versus bilateral arm training in poststroke patients with motor impairment of hand.

Method: 30 post stroke patients were recruited for the study based on the inclusion criteria and were divided into group A and group B consisting of 15 subjects each. Group A were treated with unilateral arm training and Group-B were treated with bilateral arm training. Pretest and posttest scores assessment was done.

Result: It showed significant improvement in functional ability of the upper limb as measured by ARAT and CAHAI-13. The p value of both the group is <0.05. This study showed that Group-B subjects who were treated with Bilateral arm training proved to be more effective than Group-A who were treated with unilateral arm training in post stroke patients with motor impairment of hand.

Conclusion: This study showed that bilateral arm training is more effective than unilateral arm training in improving the overall motor function of hand in post stroke individuals.

Key WordS*: Post-stroke, unilateral, bilateral arm training, chedoke arm and hand activity inventory.*

Introduction

Stroke represents a clinical syndrome rather than a specific disease. Stroke is a common, serious, and disabling global health-care problem, and rehabilitation is a major part of patient Care.[1]The World Health Organization (WHO) defined stroke as "rapidly developed clinical signs of focal (or global) disturbances of cerebral function, lasting, more than 24 hours or leading to death, with no apparent cause other than of a vascular origin[2]. About 1.2% of deaths in India are due to stroke, the incidence is 105 per 1 lakh population in

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urban community and 262 per lakh in rural community[3]. Stroke is the leading cause for long-term disability[4]. Approximately, 20% of stroke are due to cerebral haemorrhage. The remaining 80% are due to ischemic stroke which is sub divided into: large artery disease, cardio-embolism and small vessel diseases. Common problems after stroke are impaired motor functions including balance, trunk control and gait disturbances.[6] In stroke patients, it is known that the initiation of the trunk muscles is delayed, because the muscles involved in reach arm are activated earlier than the trunk muscles.[5] Impaired trunk balance and increased risk of falling toward the paretic side is found to be signi f cantly correlated with locomotor function, functional abilities and length of stay inpatient rehabilitation facilities.[7]

Unilateral arm training is a common rehabilitative strategy used in patients with stroke which includes repetitive task-related training, which is focused on rehabilitating the affected arm. Bilateral arm training has shown ef f cacy, not only with stroke survivors with mild impairments, but also for individuals with moderate and severe motor impairments[8]. Bilateral arm training incorporates task oriented motor relearning strategies including intense practice, intrinsic feedback, bi-manual coordination and goal-focused movements that improve upper extremity function[15]. A basic assumption of bilateral arm training is that the symmetrical bilateral movements activate similar neural networks in both hemispheres when homologous muscles are simultaneously activated[11], which been established in stroke that even if one limb is activated with moderate force, it can produce motor over f ow to the other limb such as both arms are engaged in the same or opposite muscle contractions, although at different levels of force [12,13]. Both unilateral arm training and bilateral though representing conceptually contracting approaches, serves an ultimate goal and is found to be and effective strategies for the recovery of upper limb motor function after stroke[10]. These arm training exercises were performed on trunk and speci f cally aimed at improving trunk performance and balance.[14]

Aim of The Study

The aim of the study is to compare the effects of unilateral arm training versus bilateral arm training in post-stroke patients with motor impairment of hand.

Objective of the Study

The objectives of the study are as follows:

Ø To assess the effects of unilateral arm training in post-stroke patients with motor impairment of hand.

Ø To assess the effects of bilateral arm training in post-stroke patients with motor impairment of hand.

Ø To compare the effects of unilateral arm training versus bilateral arm training in poststroke patients with motor impairment of hand.

Research Design and Methodology:

An experimental study design was conducted with 30 patients who ful f lled the inclusion criteria. The samples were divided into group A and Group B consisting of 15 samples each.

Inclusion Criteria:

Ø Hemi-paretic patients with 40-70 years of age

Ø Stroke at least six months to three years prior

Ø No signi f cant range of motion limitations in hemi-paretic upper limb

Ø Mini-mental status examination score >24

Ø Voluntary movement control to perform the task

Exclusion Criteria:

Ø Perceptual disorders

Ø Recurrent stroke

Ø Symptomatic cardiac failure

Ø Patients who are not able to follow the commands

Outcome Measures:

CHEDOKE ARM AND HAND ACTIVITY INVENTORY (CAHAI-13)[7]

The CAHAI-13 is a performance test using 13 functional items which evaluates the functional ability of the paretic arm and hand to perform tasks

ACTION REACH ARM TEST[7]

The action research arm test is a 19 item measure divided into four sub-types (grasp, grip, pinch, gross arm movement). This test is used to assess the upper limb functioning using observational method.

Procedure:

In this experimental study, 30 post stroke patients who have met the inclusion criteria were selected for this study, and were grouped into two groups: Group-A and Group-B, consisting of 15 subjects each. Group-A patients were treated with unilateral arm training which includes six task-specific activities performed with the affected arm. Each activity was repeated for 30 times, progression is done once in two weeks as 30 repetitions in the first two weeks with 2 sets, 45 repetitions in the next two weeks with 3 sets, 2-5 minutes of rest time was provided between each task. Group-B patients were treated with Bilateral arm training which includes six task-specific activities which were performed with both the hands simultaneously. Each activity is repeated for 30 times, progression is done once in two weeks as 30 repetitions in the first two week, 45 repetitions in the next two weeks with 3 sets. 2-5 minutes of rest time was provided between each task. Duration of the treatment is 4 weeks. Pre and post-test assessment was done by means of CAHAI-13 and ARAT.

Intervention:

1.UNILATERAL ARM TRAINING:

Ø Wiping the table

Ø Reaching and placing objects

Ø Moving an object from table to shelf with affected arm

Ø Elbow extension during horizontal reach

Ø Grasp an empty glass, take it to mouth and return to starting position

Ø Cup stacking

2.BILATERAL ARM TRAINING:

Ø Wiping the table with both hands

Ø Reaching and placing objects with both hands

Ø Moving an object from table to shelf with both arms

Ø Bilateral Elbow extension during horizontal reach

Ø Grasp an empty glass, take it to mouth and return to starting position with both hands

Ø Cup stacking with both hands

DATA ANALYSIS:

The collected pre and post test data were analysed. For the descriptive statistics, the mean and standard deviation were calculated. The results were tabulated.

- Intra Group Analysis – Paired Samples t-test
- Inter Group Analysis – Independent Samples t-test

Intra-Group Analysis - Treatment A

Null Hypothesis, H_0: $\mu_d = 0$, Alternate Hypothesis, H_1: $\mu_d > 0$, (μ_d = mean difference between Pre and Post-test scores)

Level of significance, $\alpha = 0.05$, Test to be applied: Paired Sample t-test

Testing the effect of Treatment A in increasing CAHAI Score

H_0: There is no significant effect of Treatment A in increasing CAHAI score

H_1: There is significant effect of Treatment A in

increasing CAHAI score

The above hypothesis is tested by the use of Paired t-test:

Output of Paired t-test:

TABLE :1 OUTPUT OF PAIRED T-TEST – GROUP-A(CAHAI)

t-Test: Paired Two Sample for Means		**Pre**	**Post**
Mean		31.73	33.47
SD		6.57	6.09
Variance		43.21	37.12
Observations		15.00	15.00
Pearson Correlation		0.99	
Hypothesized mean difference		0.00	
df		14.00	
t Stat		6.98	
P(T<=t) one-tail		0.000	
t Critical one-tail		1.76	
P(T<=t) two-tail		0.000	
t Critical two-tail		2.14	

Result: Test Statistic: t = 6.98, p value = 0.000 < 0.05

Testing the effect of Treatment A in increasing ARAT Score

H_0: There is no signi f cant effect of Treatment A in increasing ARAT score

H_1: There is significant effect of Treatment A in increasing ARAT score

The above hypothesis is tested by the use of Paired t-test

Output of Paired t-test:

TABLE 2: OUTPUT OF PAIRED T-TEST GROUP-A(ARAT)

t-Test: Paired Two Sample for Means		Pre	Post
Mean		39.87	41.47
SD		4.22	4.52
Variance		17.84	20.41
Observations		15.00	15.00
Pearson Correlation		0.99	
Hypothesized mean difference	e	0.00	
df		14.00	
t Stat		8.41	
P(T<=t) one-tail		0.000	
t Critical one-tail		1.76	
P(T<=t) two-tail		0.000	
t Critical two-tail		2.14	

Result

Test Statistic: t = 8.41, P-value = 0.000 < 0.05

Intra-Group Analysis – Treatment B

Testing the effect of Treatment B in increasing CAHAI Score

H_0: There is no significant effect of Treatment B in increasing CAHAI score

H_1: There is significant effect of Treatment B in increasing CAHAI score

The above hypothesis is tested by the use of Paired t-test

Output of Paired t-test:

TABLE 3: OUTPUT OF PAIRED T-TEST- GROUP-B (CAHAI)

t-Test: Paired Two Sample for Means	**Pre**	*Post*
Mean	35.67	42.00
SD	3.29	3.12
Variance	10.81	9.71
Observations	15.00	15.00
Pearson Correlation	0.91	
Hypothesized Mean Difference	0.00	
df	14.00	
t Stat	17.55	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.76	
P(T<=t) two-tail	0.000	
t Critical two-tail	2.14	

Result

Test Statistic: t = 17.55, P-value = 0.000 < 0.05

Testing the effect of Treatment B in increasing ARAT Score

H_0: There is no significant effect of Treatment B in increasing ARAT score

H_1: There is significant effect of Treatment B in increasing ARAT score

The above hypothesis is tested by the use of Paired t-test

Output of Paired t-test:

TABLE 4: OUTPUT OF PAIRED T-TEST- GROUP-B(ARAT)

t-Test: Paired Two Sample for Means	**Pre**	**Post**
Mean	37.93	42.13
SD	4.32	4.00
Variance	18.64	15.98

***Cont...* TABLE 4: OUTPUT OF PAIRED T-TEST- GROUP-B(ARAT)**

Observations	15.00	15.00
Pearson Correlation	0.97	
Hypothesized mean difference	0.00	
df	14.00	
t Stat	16.04	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.76	
P(T<=t) two-tail	0.000	
t Critical two-tail	2.14	

Result:Test Statistic: t = 16.04, P-value = 0.000 < 0.05

Inter-Group Analysis

Comparing the effect of Treatment A and B in terms of CAHAI

H_0: There is no significant difference between Treatments A and B in terms of improvement in CAHAI.

H_1: There is significant difference between Treatments A and B in terms of improvement in CAHAI.

The above hypothesis is tested by the use of **Independent Samples t-test.**

TABLE 5: OUTPUT OF INDEPENDENT SAMPLES T-TEST

t-Test: Two-Sample Assuming Equal Variances		**A**	**B**
Mean		1.73	6.33
SD		0.96	1.40
Variance		0.92	1.95
Observations		15.00	15.00
Pooled Variance		1.44	
Hypothesized mean difference		0.00	
df		28.00	
t Stat		10.50	
P(T<=t) one-tail		0.000	
t Critical one-tail		1.70	
P(T<=t) two-tail		0.000	

t Critical two-tail		2.05	

Result

Test Statistic: t = 10.50, P-value = 0.000 < 0.05

Comparing the effect of Treatment A and B in terms of change in ARAT

H_0: There is no significant difference between Treatments A and B in terms of improvement in ARAT

H_1: There is significant difference between Treatments A and B in terms of improvement in ARAT

The above hypothesis is tested by the use of **Independent Samples t-test.**

t-Test: Two-Sample Assuming Equal Variances		**A**	**B**
Mean		1.60	4.20
SD		0.74	1.01
Variance		0.54	1.03
Observations		15.00	15.00
Pooled Variance		0.79	
Hypothesized mean difference		0.00	
df		28.00	
t Stat		8.03	
P(T<=t) one-tail		0.000	
t Critical one-tail		1.70	
P(T<=t) two-tail		0.000	
t Critical two-tail		2.05	

Result

Test Statistic: t = 8.03, P-value = 0.000 < 0.05

Since the p-value (0.000) of the test statistic is less than 0.05, we reject the null hypothesis at 5% level of significance (t = 8.03, p < 0.05). In addition, the mean improvement in ARAT score by Treatment B (4.20) is more than that of Treatment A (1.60). Hence, it is concluded that Treatment B is effective than Treatment A in increasing ARAT score.

Discussion

The main aim of the study is to assess the effects of unilateral arm training and bilateral arm training in improving motor function of the hand in post stroke patients with motor impairment of hand. The study included 73% of male and 27% of women in Group-A, and 80% of male and 20% of women in Group-B who have satisfied the inclusion and exclusion criteria. The oldest patient in Group-A is patient-1 (male aged

70), and the youngest patient is patient-13 (male aged 48). The oldest patient in Group-B is patient-12 (male aged 70), and the youngest is patient-8 (male aged 49). There is not much significant difference between the improvement in the outcome values between these two groups to prove the influence of age on functional recovery, which lead to the hypothesis that age has insignificant or less significant impact on the functional recovery of the patients. The inability to perform the activities of daily living is the most common deficits that results due to hemiparesis[10], both the Groups who underwent the therapy have improved upper limb functioning ability as measured by ARAT and functional ability as measured by CAHAI and are able to perform the functional activities better. The usage of the affected arm during the activities has been improved in both treatment groups. However, the usage of the affected arm is higher in bilateral arm training group than the unilateral group in the amount of usage of the affected extremity in bilateral extremity training group. They believed that a strong coupling exits between the arms when they act together which could have resulted in better amount of use of affected arm in bilateral training group than the unilateral training group.

Conclusion

The analysis clearly showed that both the treatments (A and B) are effective in terms of improvement in CAHAI and ARAT. However, the inter-group analysis showed that Treatment B is more effective than Treatment A in terms of improvement in CAHAI and ARAT.

Conflict of Interest : Nil

Source of Funding : Self

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Effectiveness of Combined Balance and Step Training versus Task-Oriented Exercises with Sensory Input on Balance in Older Adults – A Comparative Study

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Abstract

Aim: To compare the effectiveness of CBST with Task-Oriented Exercise with Sensory Input to improve balance in older adults.

Objectives: To study the effectiveness of CBST versus Task-Oriented Exercise with Sensory Input following 8 weeks of intervention on Balance in older adults.

Method: Older adults with balance issue (mild-moderate) were taken. All 40 patients were assessed as per the evaluation format. They were randomly divided into two groups. Group (A) subjects received combined balance and step training (CBST) for eight weeks and group (B) subjects received task-oriented exercise with sensory input for eight weeks.

Result: CBST and Task-Oriented Exercise with Sensory Input are equally effective in improving balance. But, Task-Oriented Exercise with Sensory Input showed higher mean difference 8.3 than CBST 7.05 and MDC 8.3, which suggest that altering sensory input while balance training proves to be more effective clinically to improve balance in older adults than challenging the base of support.

Conclusion: CBST (Combined Balance and Stepping Training) and Task-Oriented Exercise with Sensory Input are equally effective in improving balance.

Key Wored: *Combined balance and step training, Task-oriented exercises with sensory input, Balance, Older adults.*

Introduction

Falls are an important health problem among elderly populations world-wide, with reported global incidences ranging from 224 to 809 per 1000 person-years.[1-3] They are impairing functional activities of daily living[4-7] and quality of life. Studying falls in the Indian population is important in view of the current demographic transition in the country that is leading to a rapid increase in the elderly population.[8]

A recent cross-sectional study among older adult men and women aged 60 and above in northern India reported that 52% of subjects fell in the past year[9], suggesting a high burden. The prevalence of falls in hospitalized or institutionalized Indian women was also very high, 45% to 64%.[10]

Most falls by the elderly are likely due to complex interactions between multiple risk factors. Clinicians are encouraged to follow published guidelines for the prevention of falls by older persons when prescribing fall prevention interventions.[11] Declines in all sensory systems (somatosensory, vision, vestibular) and all three stages of information processing (i.e., sensory processing, sensorimotor integration, motor output) are found with aging.[12,13] In comparison to young adults, older adults have more dif f culty maintaining balance.[14,15]

Elderly individuals who have experienced one or more falls may develop fear of falling, which leads to a loss of con f dence in a person's ability to perform routine

tasks, restricted activity, social isolation, functional decline, depression, and decreased quality of life.[16,17]

Various protocols used to improve balance in older adults are Tai Chi,[18] supervised strength and endurance training,[19] and home exercise prescribed by a physiotherapist,[20,21] enhanced balance training exercises,[22] functional training,[23] task-oriented exercise programs,[24-27] Combined Balance and Stepping Training (CBST).[28]

Combined Balance and Stepping Training were designed to focus on improving dynamic balance responses, increasing step length and speed, and responding safely to posturally challenging situations.[29] Using a motor-skill training approach,[29] CBST participants worked on dynamic balance and stepping responses through structured practice with a focus on speed of step initiation and appropriate toe clearance and step length.

Exercise interventions, in the form of task-oriented exercise programs, are now recognized as a new strategy to improve the functional status of chronic stroke individuals.[24-27] The adaptation of regular exercises with the use of surface and vision manipulation to challenge balance could improve the process of somatosensory integration and have a positive effect on postural stability. This type of intervention has further shown to be effective at improving postural stability in neurologically intact elderly people.[30-31]

Materials and Methodology

Ethical clearance was taken from institutional ethical committee. The purpose of this study was explained and a written informed consent and demographic details was obtained from all the subjects. Subjects were preliminary screened based on the inclusion and exclusion criteria. They were allocated into two groups A and B. On the frst day of frst week and last day of eight week, pre-test and post-test measurements of Balance was taken by Berg balance scale.

Population: Older adults

Study design: An Experimental Study

Sample size: 40 (20 in Group A – CBST & 20 in Group B – Task Oriented Exercise with Sensory Input)

Sample technique: Non probability sampling

Source of data: Old age home, surrounding societies and various Outpatient department of Ahmedabad.

Outcome measure: Berg Balance Scale

Inclusion criteria:

* Age group 65-85 years
* BBS >20 and <50
* One error in 10 step tandem walk
* Degenerative- non symptomatic

Exclusion criteria:

* Unstable cardio-pulmonary symptoms
* Severe pain with weight bearing activities
* Receiving physical therapy for musculoskeletal, neuromuscular or functional mobility or balance impairment
* Subjects who are not having any other neurological conditions

GROUP A: COMBINED BALANCE AND STEP TRAINING (2days/week)

GROUP B: TASK – ORIENTED EXERCISE WITH SENSORY INPUT (2days/week)

Before starting exercise warm up and cool down exercise was performed

Warm up: Duration 10 minutes. Exercises include stretching of hamstrings, calf and triceps 3 repetitions and 30 seconds hold for each; free active range of motion exercise of all joints of upper limbs and lower limbs.

Cool down: Duration 5 minutes. Exercises include stretching of hamstrings, calf and triceps 3 repetitions and 30 seconds hold for each; diaphragmatic breathing for 2-3 times

GROUP A (COMBINED BALANCE AND STEP TRAINING): 45 minutes[34]

* Narrowing the base of support
* Tandem stance

* Turning and Bending

* Providing external challenges to balance that required a response

* Narrowing the base of support while responding to the external challenge

* Stepping on and off curbs

* Increasing the complexity of ambulatory tasks

* Walking while carrying a ball

GROUP B (TASK ORIENTED EXERCISE WITH SENSORY INPUT): 45 minutes[30-33]

* Stepping

* Stepping over blocks

* Standing up from a chair – stool touch

* Standing up from a chair – stepping variant

* From a sitting position on a 65-cm Swiss ball

* Performing double-legged stance for 10 s

* Performing tandem stance for 10 s

* Rising from a chair without the use of the arms

* Walking forward and backward with a tandem walking pattern

* Performing single legged stance for 10 s

All the exercises was conducted for 1 hour/day and 2 days/week

Statistical Analyses

Statistical analysis was done by the SPSS (Statistical Package for the Social Sciences) v20. Shapiro-Wilk test was applied to check the normality of the data. All the quantitative data of this study follows the normality ($p \geq 0.05$). Baseline characteristics were compared to check homogeneous between intervention groups. Independent t-test was used. Wilcoxon signed rank test was used to analyse the differences between pre and post treatment within each group and mannwhitney test for between group comparisons.

Result

In this study 40 subjects with age 65 years or more were taken and divided into two groups. Group A (Combined Balance and Step Training) and Group B (Task Oriented Exercise with Sensory Input). All the subjects completed the study program without any complications. The baseline characteristics were similar between the groups.

Table 1.1.Within group Comparison of Pre-and Post BBS in Group A and Group B

OUTCOME	GROUP	MEAN±SD		Z VALUE	P VALUE
		PRE	POST		
BBS	GROUP A	30.45±6.39	37.5±5.99	3.966	0.001
	GROUP B	32.1±7.06	40.4±7.21	3.927	0.001

Table 1.2.Between Group Comparison of Mean difference of BBS group A and group B

OUTCOME	GROUP	MEAN DIFFERENCE	U VALUE	P VALUE
BBS	GROUP A	7.05±2.09	139.000	0.09
	GROUP B	8.3±2.52		

Discussion

As per statistical analysis of this study showed positive finding with clinically and statistically significant improvement in BBS score within Group B as p value is <0.05 and minimal detectable change (MDC) is 8.3 but no clinical improvement within group A although there is statistically significant improvement in BBS score within group A as p value is <0.05 and minimal detectable change (MDC) is 7.05.

When comparison was done for Group A from pre to post intervention level for BBS score, it was found that there was significant improvement in values of BBS. Pre Test mean of BBS score 30.45 was compared with the post Test mean of BBS score 37.5 after 8 week of intervention which show that Combined Balance and Step Training is effective in improving balance in older adults as the p value is <0.05 (Table 1.1).

This finding of our study matches with the previous study done by Joseph O.Nnodim et al. in 2006. He conducted a study on Dynamic Balance and Stepping Versus Tai Chi Training to Improve Balance and Stepping in At-Risk Older Adults. They found that greater improvement in the stepping measures (MSL, RST) was found in CBST than TC, because the training in CBST was clearly task specific.[32]

CBST consist of dual task activities and exercise that challenge the Base of support. Similar study was done by Alexandra Halvarsson et al. in 2014 which justifies that how the balance is improved by dual tasking. Training balance during dual-task conditions appears to be necessary to improve balance control under situations with divided attention, as balance training with single-task exercises have shown to not transfer to dual-task performance.[33]

When comparison was done for Group B from pre to post intervention level for BBS score, it was found that there was significant improvement in values of BBS. Pre Test mean of BBS 32.1 was compared with the mean of BBS 40.4 after 8 weeks of intervention. Which shows that Task-Oriented Exercise with Sensory Input is effective in improving balance in older adults as the p value is < 0.05 (Table 1.1).

This finding of our study matches with the previous study done by Shrikant Bhimrao Darade et al. in 2017. He conducted a study on Effectiveness of Sensory Motor Training Program in Community Dwelling Elderly Individuals with History of Fall. They found that the sensory motor training program affect proprioception more than classic traditional exercise program as sensory motor training program improves sensory input to central nervous systems thus improving sensory motor function of sacroiliac joint, knee joint and ankle joint. Kinesthesia and balance training were reported to improve proprioception and functional performance of elderly patients and helps to reduce fall risk.[34]

Anna Hafstrom et.al in 2016, concluded that improvements in balance in older adults was found (e.g., one-leg standing) with both EO and EC, first on solid surfaces, and, with increasing balance proficiency, progressing to completing the exercises on compliant surfaces. This was facilitated by the sensory reweighting process that is indeed necessary when one tries to balance without visual information when vibrations are causing perturbations or even more so when standing on compliant surfaces.

Between group comparision shows p value is >0.05 that means null hypothesis is accepted, "There is no significant difference between CBST and task-oriented exercise with sensory input on balance in older adults." Therefore, CBST and Task-Oriented Exercise with Sensory Input are equally effective in improving balance. But, Task-Oriented Exercise with Sensory Input showed higher mean difference 8.3 than CBST 7.05 and, which suggest that altering sensory input while balance training proves to be more effective clinically to improve balance in older adults than challenging the base of support.

Conclusion

Combined Balance and Stepping Training and Task-Oriented Exercise with Sensory Input are equally effective in improving balance in older adults.

Ethical Clearance: Taken from Institutional Ethical committee

Source of Funding: Self

Conflict of Interest: NIL

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Validity and Reliability of the Marathi Translation of the International Physical Activity Questionnaire (IPAQ) in rural Area in Maharashtra

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Abstract

The International Physical Activity Questionnaire is known as a validated tool to measure physical activity all across the world. The questionnaire has been translated and validated in many languages however there is exists no Marathi translated version of this questionnaire till date. Hence the purpose of this study was to translate the IPAQ-SF into Marathi language and to check the validity and reliability of the translated Marathi IPAQ.

A simple random sampling of 100 healthy individuals from Dr. A.P.J. Abdul Kalam College of Physiotherapy, PIMS, Loni. The participants included were between age group of 18-65 years and were screened according to inclusion and exclusion criteria. The participants were asked to take the IPAQ Marathi. Responses were changed to metabolic equivalent task minutes per week. The validation was done using the uniaxial accelerometer watch.

The data regarding the time spent doing vigorous, moderate and light activities done by the participants was collected with the help of Misfit smartphone application. The correlation between the total amount of time spent and the total IPAQ score was seen to be highly significant. (Pearson's correlation coefficient, p= 0.65) and the reliability was found to be good. (Cronbach's alpha r =0.7)

The translated Marathi version of the IPAQ showed acceptable validity and reliability for the assessment of physical activity among rural area population of Maharashtra.

Keywords: *Accelerometer watch, International Physical Activity Questionnaire, physical activity, sedentary lifestyle.*

Introduction

In terms of definition physical activity is often outlined as any bodily movement performed by the skeletal muscles which requires energy expenditure, this includes activities done while working, doing household work, playing a sport or during travelling. [1]

The term "physical activity" is often confused with the term "exercise", while in exercise is a subdivision of physical activity which is planned, repetitive and aims to improve the one or more than one physical components. Beyond these planned exercise protocols, any other physical activity that is done during travelling or as a individual's work, also shows health benefits.[2]

Sedentary lifestyle is an issue of great concern because of its deleterious health consequences in developed as well as developing countries. It is associated with limited physical activity, prolonged sitting at work, in cars, at religious places, work sites, schools, homes and public places have been restricted in ways that minimize human movement and muscular activities. People sit more and move less. Compared to earlier days, demand of physically active lifestyle has drastically changed to reduced physical activities which brings the mankind to the greater risk to develop various

health hazards such as hypertension, obesity, various types of cancers and many cardiac conditions.[3]

Sedentary lifestyle and reduced physical activity are now a leading cause for global mortality. The high-risk factor is adding burden of noncommunicable disorders and is affecting the overall health worldwide. According to a WHO report it is estimated that physical inactivity causes around 6% of the burden of disease from coronary heart disease, 7% of type 2 diabetes, 10% of breast cancer, and 10% of colon cancer. Insuf f ciently active individuals show 20% to 30% high risk of death compared to physically active individuals. A total of 56 million deaths happened worldwide during 2012. Out of this, 38 million were due to NCDs, principally cardiovascular diseases, cancer and chronic respiratory diseases. [4]

Prevention of diseases is considered as the best strategy especially in developing and under developed countries, where the disease burden is very high and the cost of secondary and tertiary health care are unreachable to most of the population. Many studies have shown that increase in physical activity decreases the incidence of cardiovascular diseases, type 2 diabetes, stroke, and improves psychological wellbeing.[5] Encouraging physical activity plays an important role in reducing the burden of Non-Communicable Diseases (NCDs). In 2013, Global NCD Action Plan 2013-2020 was endorsed in World Health Assembly, to promote healthy diets and physical activity, and to attain nine voluntary global targets for NCDs including ones on diet and physical activity to be achieved by 2025.[6]

In research studies, there are many methods that can be followed for data collection. These methods can range from traditional, simple methods such as face-to-face interviews to more complex methods such as document and record analysis. The commonly used data collection methods are Interviews, Questionnaires and surveys, Oral history, documents and records, Observations and Focus groups. Interviews are considered to be expensive data collection tool due various factors. Observation involves collecting the information without asking the subject any questions. This can further lead to bias as this method is more subjective. Documents and records are can be considered as incomplete data sources as the researcher himself has less control over the result. The researcher takes data from the already existing information. However, this method is inexpensive. Focus groups consist of showing a presentation and then discuss the content before answering the questions. Focus group generally use open-ended questions and therefore ground the research in a certain state of mind, eradicating external interference. Oral history is basically any research related to a particular phenomenon which is mainly based on collecting the information, recording, preservation and interpretation totally based on the information collected from the people who were actually involved in that particular event.[7] In research studies, questionnaires are the most commonly used instruments to measure physical activity(PA), because of their low cost, simplicity and briefness. Many developing countries such as India don't have enough data on physical in activity. [8]

The ability to measure physical activity behaviour is useful, not only to understand the association between physical activity and health, but also for many other reasons, such as to monitor secular trends in behaviour and to evaluate the effectiveness of interventions and programs. The accelerometer is a widely used tool to measure the physical activity in the form of step counts, calories and the distance covered by the person. The method is effective and accurate to collect data regarding physical activity. Although there are certain limitations while using it such as These challenges include a lack of understanding about exactly how a monitor functions, how to select the appropriate instrument, how to interpret accelerometer data, and how to manipulate and analyse the data produced by accelerometer output.[9]

The world health organization made the Global physical activity questionnaire as an NCD risk factor surveillance. The questionnaire asks questions about the time spent by an individual doing day to day activities while travelling, at work, work done as a part of recreational activities and sedentary behaviour questions ask about the time spent while sitting. Similarly, physical activity scale for elderly (PASE) was created by New England research institute in 1991 for the individuals above 65 years of age to measure the physical activity as well as to check the effectiveness of the exercise intervention.[10]

In 1997, a group of public health and physical activity researchers from 16 countries, with support of the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC), gathered in Geneva, Switzerland, to identify a common method to assess physical activity for the purpose of population surveillance.[11] The outcome of the meeting was the development of the International Physical Activity Questionnaire (IPAQ), as an instrument for cross-national monitoring of physical activity. The IPAQ has then been examined for validity and reliability in several populations and international studies are deemed acceptable to use the IPAQ in physical activity research and surveillance activities. [11-16]

There are two versions of the IPAQ (long and short forms). In each version, there are two formats: self-administered and telephone or face-to-face interview. Although the face-to-face interviews are often used by the researchers because they allow for more in-depth data collection and comprehensive understanding.

The questions will ask the people about the time they spent being physically active in the last 7 days. Such as, the time taken by the individual to perform vigorous physical activities which take maximum physical efforts to perform and make them breath harder than normal. The questionnaire asks about time taken to perform activities which take moderate physical efforts and make them breathe somewhat hard. Lastly the questionnaire asks about the time spent by the person in sitting. This is done to measure and assesses the types of intensity of physical activity and sitting time that people do as part of their daily lives are considered to estimate total physical activity in MET- min/week and time the individual spent sitting.

Although the results from the former studies are promising, however there is no available Marathi-language version which is culturally adapted and validated for Indian habits and lifestyle, especially in Rural areas in Maharashtra. Most of the population residing in rural areas of Maharashtra speaks Marathi language in day to day life. It is difficult for the people from rural areas to understand English, let alone speak the language. Hence the IPAQ will be translated to Marathi-language first and then assessment will be done by taking samples from the Indian population to check for the validity and reliability of the questionnaire. The questionnaire was translated by following the guidelines given by the authors which includes forward-backward translation to eliminate errors.

Method

International Physical Activity Questionnaire was translated into Marathi from English using forward-backward-forward translation method using the instructions given in the International Physical Activity Questionnaire manual for reliability and validity. Two independent bilinguals translated the questions into Marathi, and subsequently the preliminary version was back translated into English following careful cultural adaptation. Then a third bilingual translator provided a final version.

All the patients referred to Physiotherapy Department were screened according to Inclusion and exclusion criteria. All the participants were briefed about the purpose and procedure of study and written consent form were obtained from the participants. Initially the participants were asked to take the IPAQ-SF (IPAQ- Short form) and IPAQ-M (IPAQ- Marathi) questionnaires in order to check the correlation between two versions. The participants were provided with the accelerometer watches which they had to wear for a week. All the activities were monitored through the wrist worn accelerometer with the help of a smartphone application for a period of a week and data was collected. After data collection participants were again asked to take the IPAQ-M on the 8th day to check the reliability. The data was analysed by using appropriate statistical test to check if there is correlation between the scores obtained from the two questionnaires by the participants.

Result Interpretation

TABLE NO. 1: Demographic Profile of all participants

Demographic characteristics	
AGE	18-65 years
GENDER	Males & Females
MALES	49
FEMALES	51

Result No.1: The above diagram shows that there were 100 participants in which 51% were female and 49% were male.

Table No.2: TABULAR REPRESENTATION OF AGE GROUP

AGE GROUP	AGE GROUP (%)
18-30	63
31-50	28
51-65	9

Result No. 2: 18-30 age group was the predominant age group which participated in this study.

Results and Discussion

There were 100 participants in which 51% were female and 49% were male. The study shows that18-30 age group was the predominant age group which participated in this study. By using appropriate statistical analysis methods, we found that the values among IPAQ-SF and IPAQ-M showed positive correlation. The reliability of the questionnaire was also found to be good.

To our knowledge this is the first study done to check the validity and reliability of Marathi translation of International Physical Activity Questionnaire. There are very few validated questionnaires present to assess the amount of physical activity an individual is performing. Physical activity has been shown to reduce the morbidity rate and increase the quality of life. International physical activity questionnaire is short self-administered questionnaire which has been used widely all over the world to assess the physical activity however there is no Marathi translation available. Hence the questionnaire was translated into the Marathi language following the guidelines given by the respective authors. The participants were asked to take the IPAQ-M short form questionnaire and were asked to use the Misft accelerometer watch for a week. This way the data was collected through the smartphone application

In this study, the IPAQ-M short form was validated against uni-axial accelerometer measurement. The data regarding the time spent doing vigorous, moderate and light activities done by the participants was collected with the help of Misft smartphone application. The correlation between the total amount of time spent and the total IPAQ score was seen to be moderately significant. (Pearson's correlation coefficient, p=0.65) and the reliability was found to be acceptable as well. (Cronbach's alpha r=0.7) The results indicated that Marathi version IPAQ-SF had good acceptance properties for assessing physical activities in healthy individuals.

Similar study was done by et al. Min Young Chun in Seoul, Korea where he studied the validity and reliability of Korean version of IPAQ in elderly people. Over 55 participants over 65 years of age were selected to administer Korean IPAQ version and were given uniaxial accelerometer watches as a measure for validation of the questionnaire. he test-retest method was performed over a two-week interval to examine the reliability of the IPAQ. They found that more physically active by the IPAQ short form, the higher the measured value of the accelerometer ($P < 0.001$). Pearson's correlation coefficient was 0.43 for the correlation between the results of two measurements. The validity of the IPAQ short form was proven, but the reliability was found to be low. Health conditions in the elderly could have been a factor that affected the reliability. Nevertheless, the Korean IPAQ short form seems to show good validity and reliability and can be used as tool to measure physical activity.[17]

Conclusion

In conclusion, the translated IPAQ-M shows acceptable validity and reliability. Nonetheless the IPAQ-M can be used to measure the physical activity level in rural population of Maharashtra, India.

Ethical Clearance- Ethical clearance obtained from Institutional ethical committee of Dr. APJ Abdul Kalam College of Physiotherapy, PIMS-DU.

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Conflict of Interest- Nil

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Comparison of Task Oriented Therapy and Modified Constraint Induced Movement Therapy along with Functional Electrical Stimulation to Improve Hand Function In Sub Acute Stroke survivors: a Randomized Control Trial

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Abstract

Background: The study aims to investigate the effectiveness of 6 weeks of two-channel functional electrical stimulation assisted hand training along with Task Oriented Training and Modified Constraint Induced Movement Therapy on the restoration of hand function in subacute stroke patients. **Trial design**: A Multi–group pre test–post test design randomized controlled study was conducted with 30 individuals with upper-limb motor impairment after stroke. **Method**: Participants was randomly assigned into three groups FES-TOT, FES- mCIMT and FES-Ctrl groups. All participants were treated for 90 minutes a day, 5 times a week for 6 weeks. Hand function was assessed by Action Research Arm Test score (primary outcome), Grip strength, Pinch strength and Stroke Impact Scale (secondary outcome). **Result**: There was statistical significance ($p<.05$) between the groups for ARA and Grip strength outcome measures. It was found that subjects in both experimental groups (but FES-TOT > FES-mCIMT,) showed more improvement in ARA score and grip strength (lateral pinch and three jaw chuck pinch) as compared to control group (FES-CTRL). **Conclusion**: It is concluded that training with FES along with TOT is more effective in improving Hand function and grip strength as compared to mCIMT and conventional hand rehabilitation. However studies with large sample size are required for generalizability of the finding based on statistical analysis.

Trial registration: Clinical Trial Registration India CTRI/2019/06/019940 dated 28 June 2019.

***Keywords**: Stroke, Functional Electrical Stimulation, hand function, dexterity, rehabilitation.*

Introduction

Stroke causes hand function impairment, which consists of two complementary characteristics: strength as in a power grip and control of individual finger movements as in piano play. [1, 2] Difficulties in opening the hand willingly, extending the wrist and fingers against resistance, and generating powerful grip are frequently noted after stroke. [3,4] Loss of finger control is an inability to either move one finger while maintaining the other fingers immobile or to create complicated hand gestures that impairs the capacity to execute duties such as typing or buttoning a shirt. [1,2,5] When strength recovers after stroke, control is often impaired, causing permanent impairment. [6,7]

Conventional hand rehabilitation methods are efficient in decreasing the individual's disability, but there are constraints in improving and recovering upper limb activities. The two most popular techniques for enhancing hand function used are modified constraint induced movement therapy (mCIMT) & Task Oriented Therapy (TOT). The mCIMT is a unilateral, manual and repetitive intervention training in which the normal limb is restricted and the patient is forced to recruit the affected hand to carry out various repetitive activities.

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Task oriented training is a goal oriented program where different activities that could be functional or imitating functional activities are performed bilaterally by the patients. Nowadays, technology is emerging as an adjunct to therapy in rehabilitation. FES is a promising therapy which has shown to improve arm and hand function in individuals with stroke, but evidence is mostly limited.

The International Classification of Functioning, Disability and Health (ICF) is a classification system , which indicates complex interactions between a person and his/her physical, social and psychological environment and addresses the influence of such system on person's health status.[8] The ICF, introduces a paradigm shift in how disability is conceptualized and, at the same time, provides a classification based on this understanding to describe relevant aspects of health and its determinants to be used for standardized reporting of information on health and disability in clinical practice and research. Body function, body structures, activities, participation, and environmental factors are classified based on ICF categories. [9] Thus, the purpose of this randomized controlled trial (RCT) is to follow the ICF guidelines and therefore hand function is assessed by means of ARA test to measure the activity level .The body structure and function level of ICF was examined by Hand grip and pinch strength. Stroke impact scale is used to measure the impact of treatment on participation.

Objectives

The study aims to investigate the effectiveness of 6 weeks of two-channel functional electrical stimulation assisted hand training along with Task Oriented Training and Modified Constraint Induced Movement Therapy on the restoration of hand function in subacute stroke patients.

Methods: Participants, interventions and outcomes

Study setting and ethical clearance

The present study is a randomised controlled three-armed parallel design recruiting 30 individuals with upper-limb motor impairment after stroke. Participants were recruited after discharge from hospital and up to 6 months post-stroke. The study was carried out neurological physiotherapy OPD of the institute. The ethical approval for the study was taken from the Ethical committee of the RIMT institute.

Eligibility criteria

Participants were included in this study if they:

· are unilateral /first time ischemic stroke /right or left

· Between 6 weeks and 6 months post stroke

· Age group between 40-75 years

· MMSE more than 23, Modified Ashworth scale score >1and <3.

· Voluntary extension of wrist and fingers of at least 10 degrees from the resting position. Functional level (FMA-UE score >22 to 58).

· Brunnstrom stage of motor recovery of 2 to 5.

Participants were included in this study if they:

· are above 75 years of age

· Wrist and/or finger contracture or joint stiffness

· Presence of implanted electronic devices, epilepsy, respiratory insufficiency, pregnancy, peripheral neuropathies, cutaneous ulcers at the stimulation zone.

· Brunnstrom stage of motor recovery of 1

· Neuropsychiatric disorder, pain in wrist and hand

Recruitment

The subjects who fulfilled the inclusion and exclusion criteria and written informed consent, were randomly assigned one of the three groups .To reduce selection bias effect model of random allocation sequentially numbered opaque sealed envelope (SNOSE) was used. Patients entered into either the intervention group or the control group based on the study group allocation

Interventions

Subjects were informed about the study and a written informed consent was taken . The duration of treatment session was 90 min which included FES (30 min) , mCIMT (30 min) or TOT (30 min) and conventional

physiotherapy (30 min) treatment for 5 days a week for 6 weeks .

In Control Group (FES with Conventional Physiotherapy)

Subjects were treated with a combination therapy of conventional physiotherapy and functional electrical stimulation for a total duration of 60 minutes. FES was applied on the wrist extensors of affected upper limb for 30 min. The subject was instructed to perform task specific grasping and releasing of a half-litre bottle. Rest period was given for every 15 repetitions**.** Subjects was treated with a conventional physiotherapy for 30 mins Conventional exercises included are Range of motion exercises , gait training , and cycling[10]

In Experiment Group A (FES with TOT)

Subjects were treated with a combination therapy of task oriented therapy (30 min), functional electrical stimulation, consisting of two tasks (30 min) and conventional therapy (30 min), for a total duration of 90 minutes. The task-oriented training was bilateral arm training which included eating (using a cup and spoon), dressing (wearing and taking off a kurta, tying turban), personal hygiene (using a towel, combing, tooth brushing), and standing up and sitting down (standing up from and sitting down on a chair,car).The treatment protocol was made according to the Indian culture and occupational habits for Indian stroke population. The training was carried out for 30 min per day for 5 days per week for 6 weeks.[11]

In Experiment Group B (FES with mCIMT)

Subjects were treated with a combination therapy of Modified constraint movement therapy (30 min), functional electrical stimulation (30 min) and conventional therapy (30 min), for a total duration of 90 minutes.

Shaping and adaptive and repetitive task practice techniques will be used during the training sessions. Therapy consists of gross arm movement, grasp/grip and in hand manipulation will concentrate on the affected limb during the 6-week period, the patients' unaffected hands and wrists were placed in mitts with self-adhesive (Velcro) straps every weekday for 6 hours identified as a time of frequent arm use. [12]The training was carried out for 30 min per day for 5 days per week for 6 weeks. .

Participant received 30 training sessions, each 1.5 hour long, with a physiotherapist over 6 weeks to give a total of 45 hours of training time per participant.

Outcomes

Primary Outcome Measures included the activity level of ICF Hand function which was assessed by means of Action research arm (ARA) test. Secondary Outcome Measures included the body structure and function level of ICF which was examined by Hand grip and pinch strength by dynamometer three times and the mean of each value was scaled in kilogram.[13-15] Stroke impact scale was used to measure the impact of treatment on participation sub part of ICF. The participants underwent clinical evaluation of ARAT, Grasp and Pinch Strength and SIS before treatment and at 3wk and 6 week after treatment to evaluate the difference between groups

Statistical Methods and Results

Sample characteristics

The data was analyzed by SPSS Version 20.0. Normality of the collected data was analyzed with Shapiro Wilk test .Normally distributed continuous variable were summarized as mean and standard deviation. Repeated measure ANOVA was used to establish the statistical significance among baseline, 3wk and 6 wk. P value ≤ 0.05 was considered as statistically significant.

The demographic and clinical features of the 30 patients with post-treatment evaluation are shown in Table 1. The mean age of the subjects at the baseline visit was 59.17(± 12.54) years and mean time since stroke of 6.07(±3.07) months. Males predominated in all the groups, and ischemic stroke was the most common type.

Table1: Demographic characteristics of sample

Demographic dimensions	FES-mCIMT gp	FES-TOT gp	FES-CTRL gp
Age	55	53.8	68.7
Sex	M>F(2)	M	M>F(3)
Onset of stroke	7	5.5	5.9
Dominance	Rt>Lt	Right	Rt>Lt
Side of stroke	5 Lt,5Rt	5 Lt,5Rt	6Rt,4Lt
Type of stroke	Hemorrhagic& Ischemic	Hemorrhagic& Ischemic	Hemorrhagic& Ischemic
No. of subjects	10	10	10

The sample was compared for outcome measures- ARA test, SIS test and Grip Strength on baseline with 3wk and 6 wk post intervention variable using repeated measure ANOVA to establish the statistical signi f cance. P value ≤0.05 was considered as statistically signi f cant

Table2; Comparison of outcomes between Baseline, Post intervention 3 and 6 week (T0,T1 and T2)

Outcome measures	Groups	T0	T1	T2	P -value
ARA	FES-mCIMT	22.5(±15.2)	25.6(±15.44)	30.7(±16.33)	.000
	FES-TOT	34.3(±9.7)	39.6(±10.0)	45.9(±9.89)	.000
	FES-CTRL	28.7(±16.35)	31.1(±15.9)	34.2(±16.4)	.000
SIS	FES-mCIMT	38.61(±17.34)	40.25(±17.7)	42.36(±19.06)	.000
	FES-TOT	44.12(±13.51)	50.02(±13.90)	55.14(±13.00)	.000
	FES-CTRL	38.58(±13.57)	42.0(±14.91)	44.10(±15.42)	.000
Grip Strength	FES-mCIMT	4.71(±5.99)	6.75(±6.6)	9.56(±7.5)	.008
	FES-TOT	14.96(±11.07)	17.43(±10.55)	20.58(±10.56)	.001
	FES-CTRL	6.25(±5.61)	7.34(±5.36)	9.47(±5.31)	.001

p- value is signi f cant at<.05

The sample was then compared between the 3 groups for outcome measures- ARA test, SIS test and Grip Strength using one way ANOVA to establish the statistical signi f cance. P value ≤0.05 was considered as statistically signi f cant.

Table3: Comparison of outcomes between the three groups

ARA	P-value	SIS	P-value	Grip strength	P-value
Baseline(T0)	.111	Baseline(T0)	.633	Baseline(T0)	.016*
PI -3Wk(T1)	.000*	PI -3Wk(T1)	.323	PI -3Wk(T1)	.008*
PI -6Wk(T2)	.000*	PI -6Wk(T2)	.194	PI -6Wk(T2)	.006*

PI:Post intervention,*p- value is significant at <.05

There was statistical significance(p<.05) between the groups for ARA and Grip strength outcome measures, but no improvement was seen in SIS score. ARA showed statistical significance (p=.000) and Grip strength showed significant improvement (p=.006).It was found that subjects in both experimental groups(FES-mCIMT,FES-TOT) showed more improvement in ARA score and grip strength (lateral pinch and three jaw chuck pinch) as compared to control group (FES-CTRL).

Discussion

The study showed that all the three groups had significant improvement in hand function, the proportion of clinically meaningful improved subjects, denoted as an improvement of 5 points or more on the ARA test. The mean difference between TO and T3 for ARA outcome was found 8.2 points in the FES-mCIMT group (3.2 points higher than MCID),11.6 points in the FES-TOT group(6.6 points higher than MCID) and 5.5 points in FES-CTRL group(.5 points higher than MCID).

These finding are in accordance with review of literature done on the influence of FES on hand motor recovery in persons after stroke. The general conclusion is that , while these are indication of benefit for hand function, strong evidence is still missing especially when compared to other valid therapies such as TOT and mCIMT, used in the present study[16-18](Nudo et al.,2001;Pomeroy et al.,2006; Quandt & Hummel,2014)

Table 4: Number of Improved Patients T0-T2 (Pre-Post Treatment)

			FES-Mcimt(n=10)	FES-TOT (n=10)	FES-CTRL(n=10)
ARA (0-57)	T0 (Pre score)	<10 points	1	0	2
		<20 points	3	1	1
		>20 points	6	9	7
	T2 (Post score)	<15 points	0	0	1
		15-30 points	4	1	2
		30-57 points	6	9	7

Further, while at baseline FES-mCIMT group with a median Pre assessment ARAT score of 28.5 (FES-mCIMT) , 38.5(FES-TOT),15.5 (FES-CTRL) can be described as having good arm and limited hand capacity as classified by Nijland et al.,2010, and the post assessment the ARA score of 42.50(FES-mCIMT) , 44.50(FES-TOT),23.50 (FES-CTRL) indicating that from being a group with limited hand capacity they had arrived at being a good arm-hand capacity group.

There was also a signi f cant reduction in hand de f cit in three groups as denoted by the grip strength with a change in group median score from 2.26 points to 9.5 points in (FES-mCIMT) , 14.74 points to 23.12 in (FES-TOT),2.26 points to 6.12 (FES-CTRL) There was thus a trend for bigger change in favor of the (FES-mCIMT) and(FES-TOT), group indicating that adding mCIMT and TOT to a conventional protocol may have greater effect at the neuromotor level of arm and hand function than usual care.

Subacute patients are, however, more likely to have an improvement in response to whichever treatment, due also to concomitant spontaneous recovery [19-20](Langhorne, Coupar & Pollock ,2009; Veerbeek et al.,2014). In the present study there appeared to be a further bene f cial effect of adding electrical stimulation to the treatment protocol for the subacute participants, with approximately 21% (N = 7/30) improving 12 points or more on the ARAT ,73.3% (N = 22/30) improving 5 points or more on the ARAT and 0.3%(N = 1/30) scored less than 5 points on ARAT scale.

Conclusion

It can be concluded that training with FES along with Constraint Induced Movement therapy, Task oriented therapy and Conventional therapy showed clinical improvement in hand function in sub acute stroke .It was also found that mCIMT and TOT is effective in improving Hand function and grip strength as compared to conventional hand rehabilitation. However studies with large sample size are required for generalizability of the f nding based on statistical analysis.

The outcomes of this study will help us the design of a fully powered randomized controlled trial to evaluate the effectiveness of FES with traditional hand rehabilitation techniques in improving power grip and f nger individuation. As it is found to be effective, potentially, we might get an ideal hand rehabilitation technique to be used along with FES for improving motor hand function in stroke.

Conflict of Interest : Nil.

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Ethics approval and consent to participate :

Ethical approval for the study was taken from the Institutional Ethical Committee (IEC) RIMT university,Mandi Gobindgarh,Punjab-147301.Ref /No/ Phd/Gen/2019/21 dated 10 May 2019.

The consent form includes information sheet and certi f cate of consent for participation and publication of data will be f lled by the participants .

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Review Article

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Classifications of Adolescent Idiopathic Scoliosis in Relation to Physiotherapy

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Abstract

Idiopathic scoliosis is a complex abnormal lateral curvature of the spine more than 10°, with no evidence of underlying physical or radiographic pathology. A normally aligned spine is stable platform for performing static and dynamic activities of life with appropriate recruitment of spinal muscles. Stability and alignment of vertebrae in spatial planes will influence selection of biomechanical strategies for functional movements and activities of daily living. There are different classifications and schools of scoliosis specific physiotherapy like Side shift, Dobomed and BSPTS, SEAS. There is a need to understand different classifications used in different approaches. This review article is intended to provide overview of different classification systems to physiotherapists so that they can integrate with the views of surgeon in relation to spinal surgery, interact and work with orthotists in brace design and to plan corrective program for prevention of further progression or maintenance or correction of scoliosis.

Key words: *Scoliosis, Rigo classification, Lyon classification, Side shift spinal curves classification. PSSE, Physiotherapy scoliosis.*

Introduction and background

Idiopathic scoliosis is a complex abnormal lateral curvature of the spine with no evidence of underlying physical or radiographic pathology. As per scoliosis research society "Scoliosis is lateral deviation of the normal vertical line of the spine which, when measured by x-ray, is greater than 10°". The term "scoliosis" derived from the ancient Greek word "skolios" meaning "curved, crooked". Hippocrates first introduced the terms kyphosis and scoliosis[1] and explained about diagnosis and treatment including axial traction as corrective method. It can be structural and non-structural (functional). Subjects with structural scoliosis present with morphological changes of the vertebral bodies with rotation in three spatial planes, where as in functional scoliosis, spine appears to have deviations which are reversible and structurally normal. Overall prevalence of scoliosis is 0.47–5.2. Approximately 80% diagnosed scoliosis cases are idiopathic. A normally aligned spine is stable platform for performing static and dynamic activities of life with appropriate recruitment of spinal muscles. Stability and alignment of vertebrae in spatial planes will influence selection of biomechanical strategies for functional movements and activities of daily living.

Physiotherapists are actively involved in non-surgical management of scoliosis. As the curve progresses vertebrae may undergo modification in its morphology in three spatial planes and creates deviations in spinal alignment leading to adaptations in recruitment of Para spinal muscles and postural reflex mechanism[2]. Galen described scoliosis, lordosis and kyphosis along with aetiology and its implications. Galen used similar methods of management given by Hippocrates[3]. If untreated persons may experience curve progression, deformity, hump in the back, progressive functional limitations because of limited mobility or restricted mobility in spine, pain in back, shoulders, neck, buttock and back. Severe curves may cause lung

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function variations, neural symptoms because of nerve pinching in the leg, painful menstruation because of a secondary pelvic tilt, decreased quality of life, and cosmetic deformity, constipation due to tightened organs from curvature, depression and handicap. Progressive functional limitations may result in secondary effect on limbs and pelvis. Cosmetic variation in posture and visible disability might create impact on impact on social involvement, depression and handicap. Hence stake holders of scoliosis are interested in interventions for prevention of further progression or maintenance or correction of curve as early as possible. As per available literature, there are different schools of scoliosis specific physiotherapy methods [4] and different classification systems.

This article is intended to provide overview of Ponseti& Friedman, Lyon, King and Moe, Lenke, Dr. Rigo and side shift classification systems which are more relevant while planning physiotherapy management in relation to adolescent idiopathic scoliosis.

Classification systems:

First classification on adolescent idiopathic scoliosis is given by Schulthess , Different classifications are given by others after schulthess, they are James (1954)-nine types of curves, John Cobb(1948), Ponseti and friedman(1950), Harrington (1970s), Goldstein& Waugh(1973), King & Moe (1983), land mark classification scoliosis Lenke classification (2001), Rigo classification system(2010), side shift (2013).

Authors have given their classification systems mainly for various reasons, for example to document and describe the curvature, to expect pattern of progression, to choose surgical procedure and to plan curve specific exercise program by understanding the curve mechanics. Aauthors also classified spine curves based on 2 dimensional and 3Dimensional views for surgical fusion, spinal implant density selection, or correction manoeuvres, bracing and planning of individual curve specific physiotherapy planning.

Schulthess[5] classification of curves: Curves are classified according to location of spine deformity. They are Lumbar, Thoracolumbar, Thoracic, and Cervico-thoracic and combined curves.

Based on the age: structural scoliosis may be categorised as infantile, juvenile and adult scoliosis[6,7]. As per the age of onset this condition is categorized as Infantile idiopathic scoliosis (children: 0 to 3 years), Juvenile idiopathic scoliosis (children: 4 to 10 years), Adolescent idiopathic scoliosis (adolescents: 11 to 18 years) and Adult idiopathic scoliosis (patients older than 18 years).

Fundamental curve patterns of AIS are: 1. single major curves, 2. Double major curves and 3. Triple major curves[8].

1. Single major curves means only one curve is located at any one region of spine. Single major curves are located at Thoracic or Thoraco lumbar or lumbar region of spine.

2. Double major curve means two curves are located on spine , common patterns are Double thoracic curves, double thoracic and lumbar curves

3. Triple major curves: Three curves are visible on spine i.e Double thoracic and Thoraco –Lumbar curves.

Ponseti and Friedman classification:

This classification was given based on location of curve in 1950 by Ponseti and Friedman. With knowledge of this classification therapist can use similar terminology and identify curve location. Curves are classified into 6 types.

1. Single major lumbar curve: Curve is in lumbar region with apex at L1-2.

2. Single major thoracolumbar curve: located between T6-7 to L1-2, apex at T12 or L1.

3. Combined thoracic and lumbar curves (double major curves): this type of curve not visible because they are balanced. Thoracic curves between T5-6 or T10-11 with apex at T7-8, Lumbar curve between T10-11 to L3-4 with apex at L1-2.

4. Single major thoracic curve: seen mostly between T5-6 to T11-12 with apex at T8-9. This curve produces the rib prominence on the convex side.

5. Single major high thoracic curve: curve may extend from C7 or T1 to T4 or T5, apex may be at T3.

6. Double major thoracic curve: Thoracic region shows two curves, upper curve may extend from T1 to T5 or T6, lower curve may extend from T6 to T12 or L1.

Lyon Approach: Lyon method is one of the oldest method which combines scoliosis specific physiotherapy with bracing. Lyon was a place in France to have first orthopedic Physiotherapy center established by Dr. Gabriel Pravez. A non-surgical method to treat scoliosis and later on Lyon brace was developed by Dr. Pierre Stagnara. The head of Lyon school of physiotherapy for scoliosis is Dr. Jean Claude de Mauroy, Head of Orthopaedic medicine. Classification used in Lyon approach considers vicious cycle hypothesis of pathogenesis in development of scoliosis.

Vicious cycle hypothesis of pathogenesis: International federated body on scoliosis aetiology (IBSE) introduced EFG (electronic focus group) for an online Delphi discussion for widening the understanding of scoliosis aetiology[9]. This discussion lead to assumption that a pre-existing scoliosis curve or any initial triggering event initiates mechanically–modulated alteration of vertebral body growth that in turn causes worsening of the scoliosis, while other structures are normal anatomically and physiologically. Initially they thought about only vertebral body and not the disc. Later on Dr. Stokes incorporated vertebral discs also and stated that growth modulation process in the vertebral body can be seen as the biologic phenomenon of mechanotransduction caused by mechanical strain on chondrocyte metabolism.

Lyon approach classification:

This approach considers following classification to determine the treatment[4]. 1. Chaotic scoliosis 2. Linear scoliosis. Lyon approach also use classifications provided by Ponseti and The Lenke system. Lyon method utilises physiotherapy as preparation for effective bracing and corrective program within brace.

1. Chaotic scoliosis: This type is dynamic, true, structural, asymmetrical spinal curve. It is difficult to predict the growth of curve as it is sensitive and influenced by various nervous system inputs. Based on asymmetrical load on spine, nervous system is always engaged in continuous adaptive and corrective activity when the curve is below 20°. This type of curves are approximately seen in 2.5% of adolescents with curves <20° Cobb angle. Growth of this type of curves is unpredictable.

2. Linear scoliosis: Linear progression of spinal curve was described by Duval Beaupère in cases with poliomyelitis. A triggering event (example longitudinal growth of apical ribs on one side in adolescent right thoracic convexity in girls) initiates asymmetrical loading of vertebral segments thereby vicious cycle of curve progression. This type of curves might have asymmetric growth and progression in Cobb angle.

King and Moe classification:

This classification was developed with experience of surgical treatment of scoliosis with Harrington instrument fixation. This classification helps the surgeons to determine area of fusion. They explained concepts like stable vertebra, structural and compensatory curves. King and Moe classified spinal curvatures into 5 types[10] (Figure 1).

1. Primary lumbar curve greater than the compensatory thoracic curve
2. Primary thoracic curve with compensatory lumbar curve
3. Short pure thoracic curve
4. Long C-shaped thoracolumbar curve
5. Double thoracic curve with extension into cervical spine and compensatory lumbar curve

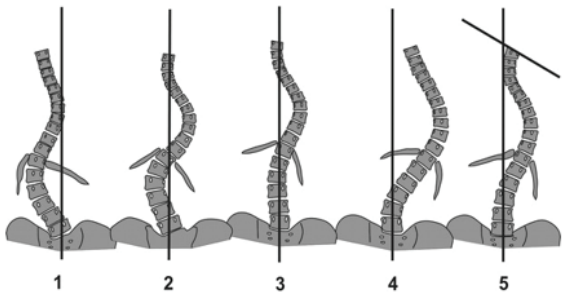

Figure 1King and Moe classification

Figure 1: King and Moe classification

Primary lumbar curve greater than the compensatory thoracic curve

3. Primary thoracic curve with compensatory lumbar curve

4. Short pure thoracic curve

5. Long C-shaped thoracolumbar curve

6. Double thoracic curve with extension into cervical spine and compensatory lumbar curve

Lenke classification:

This classification widely used by spinal surgeons for performing selective fusions. This "Lenke classification (2001)" is considered as gold standard, this is based on radiographic assessment. Postero anterior (PA), Latero lateral (LL) and PA lateral bending X rays of spine are taken into consideration for the classification purpose. Based on this classification spinal curves are categorised into 6 types[11]. These curves are further differentiated into subtypesA, B and C based on Lumbar Modifer and Thoracic -(Hypo) or N (Normal) or + (Hyper) kyphosis based on thoracic sagittal modifer[12] (Figure 2).

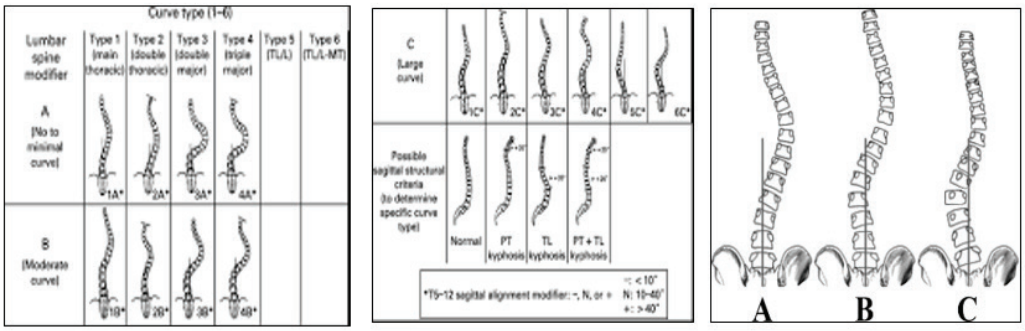

Figure 2 Lenke classification

Rigo classification system:

This classification was developed by Dr. Manuel d Rigo to correlate with scoliosis specifc treatment and brace design. He has emphasised specifc principles of correction for brace design, fabrication. He has combined radiological as well as clinical criteria while developing this classification[13]. Cheneau correction principles are redefned by Dr. Rigo using biomechanical principles and known as Rigo system Cheneau (RSC) brace. This classifcation helps in planning the brace design and treatment for working on spinal curves in coronal and transverse plane while preserving the sagittal profle. Classifcation is based on 1. Clinical observation and 2.Radiological correlation. Basic categories of Rigo classifcation are Group-1 (sagittal plane deformities), Group-2 and Group 1-2 (coronal plane deformities).

A direct dorsal and forward bending view clinical observation of group 2, group 1-2 curves allows clinical diagnosis of curves into 4 basic types: 1. three curve (3C), 2. Four curve (4C), 3. Non three –Non four (N3N4) and 4. Single lumbar or thoracolumbar. These four basic types are further sub divided based on radiological criteria. Three curve types are subdivided into A1, A2 &A3, four curve type into B1, B2, Non three Non four type into C1, C2 and single lumbar into E1 thoraco lumbar into E2. Upper thoracic structural curve presence is known as D modifer. This D modifer can be seen in A, B and C type curves(Figure 3).

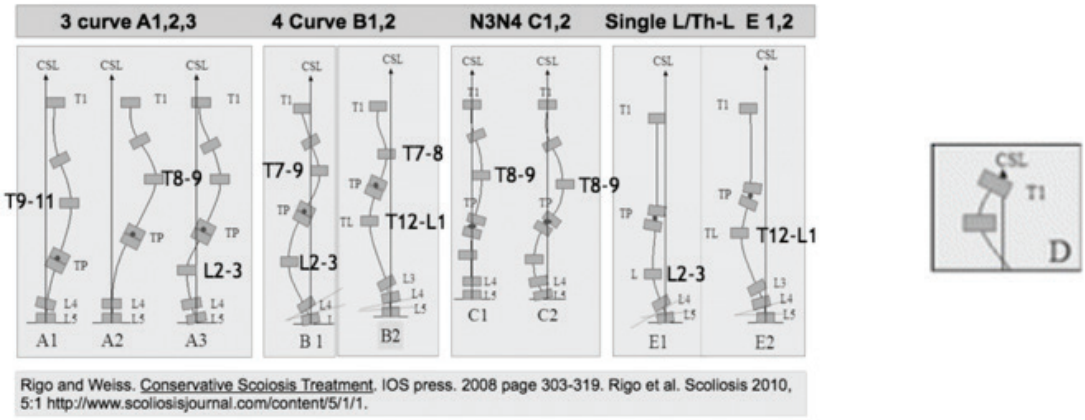

Figure 3 Dr.Rigo classification

Side shift classification:

1. Type I (Very flexible curve)
2. Type II (Stiff -moderately flexible curve),
3. Type III (Rigid curve- severe structural curve)

Figure 4 Side shift Classification

Figure 4 Side shift Classification

This approach was developed by Mrs Min Mehta[14]. This is simplest form of categorisation of spinal side shift. Three types of side shifts were given in scoliosis (1) (figure 4).

1. Type I (Very flexible curve)

2. Type II (Stiff -moderately flexible curve),

3. Type III (Rigid curve- severe structural curve)

Type I: A curve pattern where shifting of the trunk beyond the mid coronal line to the opposite side of the curve.

Type II A curve pattern where shifting of the trunk is possible only up to the mid coronal line aligning the spine with pelvis. Limited derotation of vertebrae.

Type III vertebral derotation is not possible, curve cannot come to even mid coronal line during side shift. Remains shifted to convex side.

Discussion and conclusion:

Classification systems helps physiotherapists to understand the location, type, pattern of curve to plan curve specific corrective program. These classification systems are useful for 1. Surgical decision making for surgeons 2. Curve specific corrective exercise program for physiotherapists and 3.Bracing for orthotists.

Knowledge of all these classification systems like Ponseti& Friedman, Lyon, King and Moe, Lenke, Dr. Rigo and side shift, enables physiotherapists to align themselves and to integrate with the views of surgeon in relation to spinal surgery, interact and work with orthotists in brace design and work efficiently with individuals with scoliosis, to plan corrective program for prevention of further progression or maintenance or correction of scoliosis.

Ethical Clearance: NIEC (Nizam's Institute of Medical Sciences

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Purposeful Occupational Therapy Intervention for Behavioural Competencies in Preschoolers for Transit from Home to School: A Randomized Controlled Study

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Abstract

Background: Transits are when children move from one activity to another. Everyday transits include arriving at an educational setting from home, moving from dinner to playtime, finishing playtime and cleaning up, brushing teeth and then taking a bath, and going from bath time to bedtime. Transits can be difficult for some parents, particularly when taking their young children out into the community, picking them up from educational settings, or moving between activities and routines at home. For some children, transits may be frustrating or may provoke anxiety, and it may lead to challenging behaviours.

Objective: The purpose of this study was to assess the impact of occupational therapy intervention on inappropriate behaviour of a child in preschool, while transit.

Study Design: Experimental, randomized, intervention-controlled study design was chosen for the research.

Methods: Preschoolers were divided into two groups based on randomized controlled study design. Control group were given the usual classes as provided by the school, where as experimental group were provided with occupational therapy, and early intervention program. They were assessed using the Preschool Behaviour Questionnaire (PBQ). Behaviours, attitude, signs, languages and amount and type of intermediation of the pre-schoolers and their activities needed for learning, were observed during focused group playing tasks and evaluated by the PBQ.

Result: Sixteen pre-schoolers in control and sixteen pre-schoolers in experimental group were assigned (8 females and 24 males). According to the result the experimental pre-post analysis (P=0.00; 95%CI: 18.96, 22.90) were statistically lower than the control group pre-post analysis (P=0.201; 95%CI: -8.23,35.98) and showed a significant improvement in behaviour of a pre-schooler while transit from home to school which was the principal focus area of occupational therapy.

Conclusion: The study reflected significant improvement in behavioural and emotional issues in pre-schoolers with occupational therapy and early intervention program.

Key Words: *Behaviour, Occupational Therapy, Preschool, Transit*

Introduction

What greater stress does a child experience than separating from the adults who love and care for them to preschool/kindergarten? The preschool years refer to the period of life between the ages of 3 to 5 years. The transit from home to school environment in initial phase makes the child stressed and enhances his/her emotional and behaviour issues like restlessness, irritability, fussy nature and many more. Transit planning makes these changes narrow and child adaptability to unfamiliar environment.[1] The role of occupational therapy practitioners in the school system is evolving.

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Preventive strategies in the school systems are addressed through mechanisms such as early intervening services (EIS) and response to intervention. An individual with Disabilities Education Act (IDEA) allows occupational therapy practitioners to consult with and sometimes provide direct services for students in general education; especially for students struggling with learning or behaviour. This expanded role for practitioners fosters both a consultative and collaborative environment between practitioners and teachers. Occupational therapists have served this group through a variety of programs, in medical and educational settings, for many years.[2] Intervention for planning for transit factors and provides tips and ideas to parents, teachers, and providers on smoothing the preschool and kindergarten transit process for our children, thus creating a positive experience for our children and setting them up for high.

The study was to assess the impact of occupational therapy intervention on emotional and behaviour issues of a pre-schoolers while transition and determine the effectiveness of occupational therapy intervention on behaviour of children whilst transit activities.[3,4]

Method

Thirty-two pre-schoolers were selected for the study based on the randomised control trial. The sample was drawn from Bal Bharti Public School. Pre-schoolers of age range 3 to 5 years (both male and females) were assessed and teachers filled the Preschool Behavior Questionnaire (PBQ) scale. After assessment those pre-schoolers who scored more than 17 percentile rank in scale, were recruited in the study. Written permission was obtained from the head of the primary school to conduct convenient randomized intervention study. Verbal consent and written informed consent were obtained from every pre-schooler's guardians and teachers, who picked to participate in the study. The study was conducted adhering to the principles of 'Declaration of Helsinki'.

The Preschool Behaviour Questionnaire

The Preschool Behavior Questionnaire[5] is a screening tool to identify preschoolers who show symptoms, or constellations of symptoms, that suggest the emergence of emotional and behavioral issues. The PBQ is designed to be a short screening instrument. This instrument not only shows validity in discriminating between normal and deviant populations, but also both inter-rater and test-retest reliability. To be applicable to all preschoolers, it seemed the scale should be standardized across a range of preschoolers, age three to six. The PBQ is a modification of items in the Children's Behavior Questionnaire, a checklist standardized by Michael Rutter in England in 1967 for use with elementary school-aged boys. The scale has four dimensions of emotional and behavior disturbances; total 'behavior disturbed', scale 1 'hostile-aggression', scale 2 'anxious' and scale 3 'hyperactive-distractible'. It has 30 items to score marked as doesn't apply scored as '0', applies sometimes scored as '1' and certainly applies scored as '2'. Usually, the PBQ is used by professionals who observe a child for a period ranging from 1-2 months.

First, teacher rated the children using the PBQ after a minimum contact of 3 months secondly, the questionnaire was randomly ordered to control for response bias regarding the expected development of behavioural and emotional issues. Third, children aged 5 and above were not included as per exclusion criteria.

Procedure

Pre-schoolers were recruited for the study as per the inclusion criteria (pre-schoolers(age 3-5 years with poor emotional and behavioural issues documented in school files and who scored more than 17 percentile rank) and exclusion criteria (pre-schoolers with visual or hearing loss and mentally retarded due to less percentile rank). They were divided into two groups experimental group (n=16) and control group (n=16). Experimental group was given early intervention protocol such as Fine and gross motor activities, brain game, self help skills [6] and social skill training[7] whereas control group continued with the same services provided by the school. Total 12 sessions were offered for 50 minutes/session. After completion of 12 sessions, data were analyzed of both the groups, based on PBQ scores.

Data Analysis

SPSS statistical software was used of 14.0 version and paired *t*-test was used for analysis for within group analysis for control and experimental behaviour scores and unpaired *t*-test was used for analysis of behaviour scores between the groups. Signicifance level value was

set at $P<0.05$ at the outset of the study and 95%CI values were computed.

Results

Children in the experimental group were predicted to have significantly higher levels of aggressiveness and distractibility than children in the control group. Mean scores and standard deviations for the PBQ are presented in Table 1 and Table 2. Mean scores across groups are presented graphically in Figure 2. The PBQ scores in the domains of total behaviour disturbed, hostile aggressive, anxious and hyperactive distractible were compared using a paired t-test to determine group differences. Results indicated significant differences within group analysis ($p \leq .000$, 95% CI= 18.96, 22.90) in all domains of the PBQ (Table 1). Secondary analysis comparing between the groups indicated that children in the experimental group had significantly higher levels of total behaviour disturbed and significantly higher scores on all subscales of the PBQ than control group ($p \leq 0.791$) (Table 2).

Table 1: Comparison of Pre and Post Intervention PBQ Score Analysis in Experimental and Control Group (Within Group Analysis)

Total behavior disturbed	N	PBQ Score Mean ± SD	t	P (2-tailed)	95%CI Lower Limit	95%CI Upper Limit
Experimental group (pre) Experimental group (post)	16	20.9±0.9	22.65	0.000	18.96	22.90
Control group (pre) Control group (post)	16	31.8 ± 41.4	35.98	0.201	-8.23	35.988

PBQ: Preschool behaviour questionnaire

SD: Standard deviation

CI: Confidence interval

Table 2: Comparison of Pre and Post Intervention PBQ Scores in Experimental versus Control Group (Between the Group Analysis)

Total behavior disturbed	N	PBQ Score Mean ± SD	t	P (2-tailed)	95% CI Lower Upper	95%CI Upper Limit
Experimental group (pre) Control group (pre)	16	-2.93±43.48	-2.70	0.791	26.11, 20.23	20.23
Experimental group (post) Control group (post)	16	-10±4.81	-8.30	0.000	-12.56, -7.43	-7.43

Discussion

There is an increasing need to understand the linkage between external (environmental) and internal (individual) factors to understand behavior. Behavioural competencies may contribute to a collective group of early identifable factors, both within the child and within the environment, which could be used to predict future development of internalizing behaviour disorders, such as anxiousness, hostile aggressive and distractibility across many diagnostic groups. The current study was not predictive in nature, but it demonstrated relationships that lend themselves to future predictive analysis. Although some people may be physiologically predisposed to react to sensations in a certain way (e.g., overresponding to sensation), it will ultimately be a combination of their inherent genetic predisposition and their environmental experiences that determine functional outcomes and potential manifestation of adult and adolescent psychopathology (Kendler & Prescott, 2006). There is still much to learn about intervention for the birth to 3 age group. Social stories were effective in improving coping skills as well as in enabling the strategies application of learned coping skills (performance) during bullying situation.[8] Myers (2006) possible interventions to support families and children during the transition process were illustrated with an emphasis on occupational therapists' unique contribution to transition planning. The results of this study suggest that occupational therapists are participating in the transition process through strategies that incorporate both these recommended practices and the evidence-based practices identified in the literature, such as conferring with the receiving therapist to provide information about the child (i.e., current goals, participation in the sending environment), attending transition meetings and IEP meetings, and helping to develop IEPs in both early intervention and preschool. In addition, sensory integration theory suggests that the neural mechanisms of sensory modulation are adaptable (Lane, 2002), so that with direct treatment of the child, sensory reactivity may be diminished, potentially blocking causal pathways leading to the development of more severe psychiatric disorders. Chandler 1975 work suggests that a secure child mother attachment predicts competence in problem solving in toddlerhood and in the peer group in preschool and that activity level in pre-schoolers predicts activity level at school entry[9,10].

Despite these limitations, group differences were found. In addition, *p* values for mean group differences were generally moderate. This finding suggests that the groups identified in this study differed meaningfully on parameters of interest. Thus, although these results must be considered preliminary, they warrant additional investigation

Conclusion

Intervention was given to experimental group and analysis of the result reflected improvement in experimental group as compared to control group which reflects decrease in behavioural and emotional issues. The study carried out, can be considered a boon from the perspective of occupational therapy. The results show a significant improvement in behaviour of a child which is the principal focus area of occupational therapy. Hence occupational therapy intervention has proved in creating a positive experience for children while transition to school from home and setting them up for high.

In the end, the more we understand the complexity of children involved in treatment, the more effective treatment can be. Consequently, future research should assess both the effectiveness of and client satisfaction with occupational therapy interventions for children with behavioural competencies. Such studies should further consider the impact of total behaviour disturbed in moderating treatment outcomes.

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Effect of Core Stability Exercise in Patients with Neckpain

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Abstract

Background: Pain is the most common symptom of which the human kind complaints. Neck pain is the second common condition cause of time off work after low back pain. According to 18% of the responders, the cause of their symptoms was unknown. The most frequently reported causes were ascribed to working conditions (29%), tension: stress (29%) and a poor posture (21%). Sitting at work for more than 95% of the working time seems to be a risk factor for neck pain.

Aims and Objectives: To study the effectiveness of conventional physical therapy in patients with neck pain and to study the additive effect of core stability exercises on conventional physical therapy in patients with neck pain.

Materials and Methods: Study included 30 (Thirty) patients with chronic case of non-specific neck pain between age group of 18-40 years. They were divided into 2 groups: Group A (Conventional therapy + Core stability exercises group) included 15 patients and Group B (Conventional therapy group) included 15 patients by random sampling. The patients were treated for a period of 1 month. Pain was assessed by Visual Analogue Scale, neck function was measured by Neck Disability Index and deep neck flexor strength was measured by craniocervical flexion test.

Results: Results showed that there was significant difference in VAS (P< 0.0001), NDI (P=0.002) and deep neck flexor strength (p< 0.0001) between Group A and B.

Conclusion: Core stability exercise along with conventional physiotherapy was found to be more effective in patients with chronic non-specific neck pain. So, these interventions can be applied in clinical setup in combination with conventional treatment for the better and long term improvements.

Keywords: *Non specific neck pain, core stability exercise, neck disability index, craniocervical flexion test.*

Introduction

Pain from musculoskeletal system is very common in modern sedentary society[1]. Neck pain was defined as pain located between the occiput and the third thoracic vertebra. The growing interest in neck pain is mainly linked to the escalating disability burden and compensation costs associated with neck pain related to automobile collisions and occupational injuries[2]. Overall, 66.7% (95% CI; 63.8-69.5) of the subjects reported that they had experienced neck pain during their lifetime and 22.2% (95% CI; 19.7-24.7) suffered from neck pain on the day of the survey. Overall, 58.8% (95% CI, 54.8-62.7) of women and 47.2 (95% CI, 42.4-51.5) of men had experienced neck pain in the previous 6 months[3]. Many patients come to physiotherapy department with complaint of pain caused by cervical spine dysfunction as neck pain is reportedly affecting 70% of people within their life time[4]. Neck pain is considered as chronic neck pain if it has lasted for more than 3 months[5]. With an increasing sedentary population, especially with reliance on computer technology in the workplace, it is predicted that the prevalence rate of non specific neck pain will continue to rise[6]. Sitting at

work for more than 95% of the working time seems to be a risk factor for neck pain and there is a trend for a positive relation between neck flexion and neck pain[7]. Obviously, what is often viewed as a simple clinical problem can rapidly develop into a complex disorder where physical, psychological, compensation, legal and other societal forces all interact to cause disability[2]. The causes may vary from trauma (especially motor vehicle accidents), infections, tumors, congenital disorders and inflammation. In the large majority of cases, however, no specific underlying pathology can be established and the complaints are labeled as non-specific neck pain. Patients with neck pain had demonstrated greater activation of accessory neck muscles during a repetitive upper limb task compared to asymptomatic controls. Greater activation of the cervical muscles in patients with neck pain may represent an altered pattern of motor control to compensate for reduced activation of painful muscles[8]. Muscles respond to dysfunction in two ways: by becoming inhibited or by weakness[9]. If there is pain for whatever reason, these muscles will become inhibited & there will be selective weakness, a decrease in force production and a decrease in tonic stabilizing capacity or endurance capacity of the muscle. In the cervical spine, segmental stability is provided by the deep neck flexors (DNF) particularly in mid range positions. The DNF muscles demonstrate predominately tonic activity whereas sternocleidomastoid primarily functions in torque production[8]. Commonly used physical therapy modalities for non specific neck pain include application of heat and ice, ultrasound, cervical traction, acupuncture and electrical stimulation and some times Exercises, Manipulation and Mobilization as specific treatment[10]. DNF muscles endurance training is effective in reducing pain by increasing in pressure pain threshold[11]. DNF training in chronic neck pain patients demonstrated an improved ability to maintain a neutral cervical posture during pro longed sitting[12]. DNF muscles endurance training is given using air filled pressure Bio-feedback instrument in incremental stages as muscle function and endurance improves. Till now many researchers have done studies on efficacy of different treatments in neck pain including conventional therapy and stabilization exercises, but very few studies have been done on efficacy of deep cervical muscles training (core stabilization) in neck pain, so need of this study is to find out the effect of core stability exercises along with conventional therapy in patients with neck pain.

Materials and Methods

A total number of 30 patients with chronic non-specific neck pain were selected for study after giving informed written consent with due consideration to inclusion and exclusion criteria. Inclusion criteria for the study are patients with chronic non specific neck pain in age group 18 to 40 years. Both male and females were included. Patients with Vertebra-Basilar Insufficiency (VBI), Radiating pain with weakness, paraesthesia and decreased deep tendon reflex in upper limb, any surgery around neck, ankylosing spondylitis, any structural deformity of spine and any history of recent trauma around neck were excluded from the study. They were divided into 2 groups: Group A (Conventional therapy + Core stability exercises group) included 15 patients and Group B (Conventional therapy group) included 15 patients by random sampling. On the first visit, a complete Orthopedic Assessment was done. Pre-participation evaluation form consisted of VAS, NDI and assessment chart which included Age, sex, chief complain, presence of symptoms in one or both sides of neck etc. study duration is of one year. Outcome measures used were Visual analogoue scale (VAS), Neck Disability Index (NDI) and Deep Neck Flexor Strength. Study participants were requested to continue normal activities and avoid other forms of treatment for the duration of the study, apart from routine physician management. Subjects were not permitted to administer any other forms of electrotherapy during the intervention period of the trial.

Fig.1 Core muscle activation in supine with pessure biofeedback

Fig 2 upper limb loading with core muscle activation

Fig 3. upper limb loading with core muscle activation in sitting position

Fig 4. upper limb loading with core muscle activation in standing position

Results

In this study all the tests were performed manually as well as with the use of demo version of Graph pad software. To analyze the effect on outcome measure VAS before and after treatment in Group A and in group B, non-parametric Wilcoxon matched pair test was used and for VAS between group non-parametric Mann Whitney U test was used. To analyze the effect on outcome measure NDI and DNF strength before and after treatment in Group A and group B, parametric paired t test was used and for between group A and group B, parametric unpaired t test was used. The mean age of Group A patients is 27.60 ± 6.73 years and mean age of Group B patients is 27.93 ± 4.59 years.Table 1 shows means of VAS, pre treatment and post treatment in Group A and Group B. in which Non-parametric Wilcoxon matched pair test was performed for both the Groups.

Table 1: Means of VAS, pre treatment and post treatment in Group A and Group B

Group	Pre treatment Mean± SD	Post treatment Mean± SD	W-value	P-value
Group A	7.33±1.11	0.86±0.83	120	0.0003
Group B	7.26±0.79	3.46±1.50	120	0.0003

For Means of differences in VAS between Group A and Group B Non-parametric Mann Whitney U test was used (Table-2). P< 0.0001 was extremely signi f cant at 5% level of signi f cance.

Table 2: Means of differences in VAS between Group A and Group B

Group	Mean± SD	U-value	P-value
Group A	6.46±0.63	5.0	p < 0.0001
Group B	3.80±1.08	5.0	p < 0.0001

For means of NDI, pre treatment and post treatment in Group A and Group B parametric-paired t test was used (Table 3). In both the groups, P < 0.0001 was extremely signi f cant at 5% level of signi f cance.

Table 3: Means of NDI, pre treatment and post treatment in Group A and Group B

Group	Pre treatment Mean ± SD	Post treatment Mean ± SD	t-value(df)	P-value
Group A	31.08±9.00	11.39±6.51	10.68(14)	p < 0.0001
Group B	33.26±9.79	22.07±8.58	5.37(14)	p < 0.0001

For means of differences in NDI between Group A and Group B, Parametric, Unpaired t test was used (Table 4). P= 0.002 < 0.05 was signifcant at 5% level of signifcance.

Table 4: Means of differences in NDI between Group A and Group B

Group	Mean± SD	t-value(df)	P-value
Group A	19.69±7.14	3.05(28)	0.002
Group B	11.19±8.06	3.05(28)	0.002

For means of DNF strength, pre treatment and post treatment in Group A and Group B (Table 5) Parametric-paired t test was used

Table 5: Means of DNF strength, pre treatment and post treatment in Group A and Group B

Group	Pre treatment Mean± SD	Post treatment Mean± SD	t-value(df)	P-value
Group A	20.53±0.91	25.33±1.44	18.33(14)	p < 0.0001
Group B	20.57±0.93	20.93±1.28	1.87(14)	p = 0.08 > 0.05

For means of differences in DNF strength between Group A and Group B (Table 6) Parametric-Unpaired t test was used.

Table 6: Means of differences in DNF strength between Group A and Group B

Group	Mean± SD	t-value(df)	P-value
Group A	4.80±1.01	13.02(28)	P < 0.0001
Group B	0.40±0.82	13.02(28)	P < 0.0001

Discussion

There are evidenced risk factors for the onset and maintenance of non-specifc neck pain includes both, individual and work-related psychosocial factors. Management with specifc treatment is required for chronic neck pain patients. The study was conducted on thirty subjects with chronic non-specifc neck pain. The patients were randomly divided into two groups; Group A (conventional + core stability exercises), Group B (conventional therapy) with mean age (mean ± SD) of 27.60±6.73 and 27.93±4.59 respectively. Several studies have supported the fndings of our results. One of the possible reasons for reduction in pain in both the groups might have been the effect of

application of hydrocollator pack which was given for initial10 days of treatment. It has been suggested that such responses might be explained on the basis of the pain gate theory, in that the transmission of thermal sensations may take precedence over nociceptive impulses[13]. In our study, we found that core stability exercises along with conventional physiotherapy were more effective in reducing chronic pain and disability, and also signi f cantly improved performance of crania-cervical f exion test. Lehmann and de Lateur (1990a) described work which demonstrated that heating tissue to therapeutic temperature results in reduction of spasm and stimulation of skin in neck region could result in increased muscle relaxation[14]. Shaun O"leary et al. determined that crania-cervical f exion provided more speci f c training to activate deep neck f exor muscles[15]. DNF training is effective in reduction of pain and disability in patients with chronic non speci f c neck pain as suggested by results of our study this can be com pared with the study done by Jari ylinen et al. (2003) and, Falla D (2007). In the present study, we found that DNF training was also effective in improvement in stages of CCFT after 4 weeks of training which is same as described by Jull G et al. (2002)[16]. Comerford & Mottram (2001) suggested that Motor control and recruitment are the main priority and principal of DNF training, not strength and f exibility. The DNF training with low-load is paramount for rehabilitation of motor control de f cits. High perceived effort was permissible initially; but as control and functional integration return, low effort activation dominated. The re-training of motor control dysfunction is a cognitive process requiring afferent feedback (Visual feedback in DNF training)[17]. The present study had demonstrated that conventional physiotherapy effective in relieving pain and disability but not effective for improving core muscle strength where as core stability exercise along with conventional physiotherapy was found to be more effective in patients with chronic non-speci f c neck pain. So, these interventions can be applied in clinical setup in combination with conventional treatment for the better and long term improvements.

CONCLUSION:

An experimental study to f nd out the effect of core stability exercises with conventional therapy in patients with neck pain was conducted on 30 patients. Signi f cant difference was found between these groups on outcome of pain and neck disability and core muscle strength. So from the study it can be concluded that "Core stability exercises along with conventional therapy are highly ef f cient in relieving pain and disability and in improving core muscle strength in patients having neck pain."

Limitations: The small sample size of 15 in each group may limit generalization of the results of this study to all the patients with neck pain and long term follow up was not done.

Conflict of Interest: None Declared.

Source of Funding: Nil.

Ethical Clearance: Informed written consents were taken from all volunteer participants of the study.

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Y Balance Normative Data of Dynamic Balance for Collegiate Soccer Players

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Abstract

Background: Balance is a vital component of physical fitness wherein athletes have to stay in control of their body's position. Poor balance has often been associated with the risk of sustaining injuries among participants of competitive sports. Y balance test (YBT) has been found to be a reliable and valid tool to assess balance. Establishing a normative data for different sports based on their level of competition could be beneficial for screening, ruling out balance deficits. It could as well help coaches or trainers make decisions about athlete's fitness level, risk of injuries and return to sports after any injury.

Objectives: To find out the normative data of lower extremity using Y Balance test among collegiate soccer players and to compare the Y balance scores between the legs.

Study Design: A cross sectional study.

Methods: Thirty three soccer players aged between 17-26 were selected from Yenepoya (Deemed to be University) soccer team. A standardized protocol was followed to record Y balance test scores. Reach distances of each participant was then normalized with limb length of respective side. Mean and standard deviation was used to find the normative distribution of Y balance reach score in all the three directions and paired t-test was used to compare the reach scores between the legs.

Result: Normative values of anterior reach distance right and left were 70.93 and 70.79 respectively, posterolateral right and left were 107.95 and 107.74 respectively, posteromedial right and left were 105.52 and 106.26 respectively and composite scores of right and left were 94.82 and 94.86 respectively. There were no statistically significant difference between the legs in anterior, posterolateral, posteromedial and composite scores.

Conclusion: Normative data of dynamic balance of lower extremity among collegiate soccer players have been established using Y balance test kit.

Key Words: *Normative data, Balance, Soccer players, Y balance test*

Introduction

Balance plays an important role in all kinds of sports, whereby the player has to maintain their balance to move the required body parts in different directions in order to complete a task. Balance can be categorized into static balance and dynamic balance. The ability to maintain the body segments within the available base of support with minimal movement is termed as static balance and the ability to perform a task while maintaining the stable position is termed as dynamic balance.[1] Balance of an individual is maintained by inputs from vestibular, somato-sensory and visual systems and motor responses that affect coordination, joint range of motion, strength and other factors such as age, height, neuromuscular diseases, drugs, etc.

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Dynamic balance has been found to have an influence over a player's skill and performance and a poor balance has often been associated with injuries among players.[2] Dynamic balance of the soccer players differ according to their level of competition, i.e., balance scores differed for high school, college and professional soccer players.[3] A research done on the epidemiology of collegiate injuries participating in 15 sports activities have revealed that the incidences of injuries both during practice and competitions while playing soccer were on the higher side.[4] The injuries sustained may include contact injuries occurring as a result of contact between the players, or non-contact injuries, which are often linked to certain factors such as neuromuscular disorders, faulty training, faulty footwear, training overload, etc. Factors such as poor balance, altered motor control, or lack of neuromuscular control have all been listed as predictors of injury risk in athletes and researchers have supported the fact that balance assessments prior to games or practice sessions could help to prevent some injuries.[3] Inefficient neuromuscular stabilization leads to compensations and substituted movement patterns that may result in excessive mechanical loading thereby increasing the risk of injuries.[5] Gonel AC had performed a study in among 74 soccer players and had established that there was a relationship between YBT scores and the incidences of injury sustained. The author had noted that among the players who demonstrated a test score difference of 4 cm or more in the posteromedial direction of the YBT between their their left and right limbs were more prone to sustain injury.[6] These results were suggestive of the fact that coaches and health care professionals could team up and and plan an appropriate training programmes so as to help to improve the efficiency of their team players. Several studies have been performed in populations like professional, high school level soccer players, cricketers, baseball players and have suggested that normative values of dynamic balance for each competition level and age group could help in predicting injuries, as well as in evaluating the pre-competition conditioning, fitness level and recovery from injury.[3, 7, 8] The purpose of this study was to establish normative data of dynamic balance of lower extremity using YBT in soccer players.

Materials and Methods

This cross-sectional study included 33 university soccer players between the age group of 17 to 26 who represented the Yenepoya (Deemed to be University) soccer team. The players were excluded from the study if they had musculoskeletal system pain, deformities in lower limb, neurological deficits, history of any surgery to the lower limb within 6 months, history of any mental or psychological illness, history of alcohol abuse or any history of usage of drugs. The ethical approval for the study was obtained from Yenepoya University ethical committee. Participants were explained about the purpose of the study and an informed consent was taken from all the participants who were included in the study.

The Y Balance Test scores were taken by using the Y Balance Test Kit™ (FMS). Once the general details of the participants were collected, a demonstration of the YBT was given for all participants in the study and a video of the testing procedure was shown for a better understanding. The test was initiated among the participants only after they were comfortable in performing the test. Initially lower limb length of each of the players was recorded by using inch tape and was measured in centimeter (cm). Dynamic balance of the lower extremity was assessed using YBT. Standardized Y Balance Testing procedure was used. The maximum reach distance a player could achieve in three different directions anterior, posterolateral and posteromedial were recorded. Relative reach distance and composite scores were calculated for each side of every player.

Findings

Statistical analysis was done using SPSS version 22. Paired t-test was used to compare the mean scores of YBT between the legs to find the significant differences. The level of significance was set at < 0.05. A total of 33 soccer players from Yenepoya (Deemed to be University) were enrolled for the study. Majority of the players were playing in position of forward (34%) and midfeld (30%).

Table 1: Normative values of Y balance reach distance

Reach Directions	Mean	Standard Deviation	Minimum score	Maximum Score
Anterior right	70.93	5.32	62.40	81.60
Anterior left	70.79	5.14	63.40	79.60
Posterolateral right	107.95	5.19	93.90	115.80
Posterolateral left	107.74	7.12	93.20	120.40
Posteromedial right	105.52	6.00	94.00	115.70
Posteromedial left	106.26	7.39	93.90	120.60
Composite right	94.82	4.65	85.20	102.50
Composite left	94.86	5.88	85.40	103.60

Table 1 shows the mean, standard deviation, minimum and maximum reach distance scores of Y balance test in different directions. Mean values of anterior reach distance right and left are 70.93 and 70.79 respectively, posterolateral right and left are 107.95 and 107.74 respectively, posteromedial right and left are 105.52 and 106.26 respectively and composite scores of right and left are 94.82 and 94.86 respectively.

Table 2: Comparison of the YBT scores of right and left leg

Reach Direction	Extremity	N	Mean	Standard Deviation	Paired Differences		t value	df	P value
					Mean Difference	Std. Deviation			
Anterior	Right	33	70.93	5.32	0.136	4.043	0.194	32	0.85
	Left	33	70.79	5.14					
Postero-lateral	Right	33	107.95	5.19	0.209	4.919	0.244	32	0.81
	Left	33	107.74	7.11					
Postero-medial	Right	33	105.51	6.00	-0.742	4.698	-0.91	32	0.37
	Left	33	106.26	7.38					
Composite Score	Right	33	94.82	4.65	-0.036	2.991	-0.07	32	0.94
	Left	33	94.85	5.87					

Table 2 shows the comparison of reach scores in all three directions and composite scores between right and left leg by using paired t- test. On comparison of the mean values of anterior right and anterior left the mean values of anterior right is higher with a difference of 0.1363636 which is statistically not significant (p value = 0.848). On comparison of the mean values of posterolateral right and posterolateral left the mean values of posterolateral right is higher with a difference of 0.2091 which is statistically not significant (p value = 0.809). On comparison of the mean values of posteromedial right and posteromedial left the mean values of posteromedial left is higher with a difference of 0.7424 which is statistically not significant (p value = 0.371). On comparison of the mean values of Composite Score Right and Composite Score Left the mean values of Composite score left which is higher with a difference of 0.0364 is statistically not significant (p value = 0.945).

Discussion

YBT is a portable, reliable and valid device which may be used to assess dynamic balance. YBT is relatively easy to administer and does not require any additional training. A brief video demonstration of the test procedure was sufficient to make the participants comfortable in performing the tests. In the present study, the dynamic balance of 33 soccer players was measured and the normative data for each reach distance was arrived at. The reach distances included- anterior reach distance right and left were 70.93 and 70.79 respectively, posterolateral right and left were 107.95 and 107.74 respectively, posteromedial right and left were 105.52 and 106.26 respectively and composite scores of right and left were 94.82 and 94.86 respectively.

Over the years several researchers have studied the influence of balance and performance of athletes. Researchers also explored the effect of the level of competitions and the on field poisitions among sportsmen on the balance abilities. Buttler R J in his study among baseball players had found that the level of competition had an effect on the balance performance.[8] Similarly, Buttler R J and colleagues, in their study among soccer players had reported that balance performance differed according to the level of competition among soccer players and the authors had also suggested that it could be beneficial to establish a normative data of balance taking into consideration various sports and for different levels competition as well.[3] There were also studies that had tried to compare the balance scores of individuals involved with different sports and the results were suggestive of the fact that soccer players often displayed a superior balance compared to other sports.[1] Buttler R J, Queen RM and colleagues in their study to compare the dynamic balance scores of soccer players from Rwanda and United states had concluded that players from Rwanda were having greater scores than United states players and they suggested that athletes from different countries of origins may have different reach scores which should be considered during the assessment of normative data of Y balance test.[2] Similar to their results Rwandan players were having greater reach scores than the current scores of university soccer players.[2]

Normative values of all three reach directions and composite scores of both lower extremities could be helpful for the coaches and trainers during their training sessions, screening and selection of players before the season begins and could thereby reduce the risk of injuries. The pre-season evaluation could also help to predict the sport related performance of the individual player which could help to pick on players who could deliver superior performances. Studies have also proven that an earlier evaluation of the players could help to identify those at risk of injuries which could moreover help to reduce the expense related to this injuries.[9, 10] The normative data for collegiate level soccer players could be established in this study. Similar studies could be planned for athletes and players involved in other sports activities which could be helpful in arriving at a normative data for the specific sports activities.

Conclusion

The reference value of dynamic balance of lower extremity using Y balance test is established in a sample of university soccer players. The results also demonstrated that there was no significant reach asymmetry between right and left lower extremity. These values may be useful for coaches and trainers for selection of players by screening their injury risk, fitness level and also during return to sports after any injury before the match begins.Moreover the YBT kit is portable and can be easily administered, it could be carried and on field assessments could be performed.

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Stem Cell Therapy& Its Application in Neurological Conditions A Review

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Abstract

Stem cells have the ability to build every type of tissues in the human body; hence they have great potential for future therapeutic uses in tissue regeneration and repair. In order for these cells to fall under the definition of "**stem cells**", they must display two essential characteristics. First, stem cells must have the ability of unlimited self-renewal to produce progeny exactly the same as the originating cells. Second, stem cells must have the ability to differentiate into a specialized adult cell type. Stem cells with their unique and facile potentialities, offer building blocks for organ development and tissue repair. Regenerative therapy or Stem cell therapy is aimed at 'reviving' existing malfunctioning cells, repopulating the organ by new cells from exogenous or endogenous sources, altering the extra-cellular matrix, or increasing blood supply by enhancing vasculogenesis. This review summarizes the current concepts in stem cell biology its application in neurological conditions and important advancements, limitations with respect to their prospective use in regeneration therapies in various human diseases.

Keywords- *Stem Cell, Neurological Conditions, Autism, Cerebral palsy, Muscular dystrophy, Spinal cord injury, Stroke*

Introduction

A stem cell is defined by two distinct properties of self-renewal and differentiation into various cell types. This trait is also true of cancer cells that divide in an uncontrolled manner whereas stem cell division is highly regulated. Regenerative Medicine or Stem Cell Therapy refers to the application of stem cells either exogenous or endogenous to facilitate regeneration of injured organs(1)

CLASSIFICATION OF STEM CELLS:

ü **Totipotent/Omnipotent stem cells** can differentiate into any types of cells in the body.

ü **Pluripotent stem cells** can differentiate into a variety of cell types, but not all types.

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ü **Multipotent stem cells** can differentiate into more than one type of cells. It is more limited than Totipotent and Pluripotent stem cells.

ü **Unipotent/Monopotent stem cells** can differentiate into only one type of cell.

ü **Oligopotent stem cells** can differentiate into closely related types of cells.(2)

FATE OF STEM CELLS:

Based on their two unique characteristics, stem cells have four outcomes or fates:

1. Multipotent stem cells remain inactive without dividing or differentiating, maintaining its place in the stem cell pool.

2. Symmetric self-renewal in which two daughter stem cells, exactly like parent cell, arise from cell division. This doesn't result in differentiated progeny but does increase the stem cell pool from which specialized cells can develop in subsequent divisions.

3. Asymmetric self-renewal results in the generation of differentiated progeny required for natural tissue development/regeneration while also maintaining the stem cell pool for the future.

4. Stem cell divides to produce two daughter cells, both different from the parent cell. This results in greater proliferation of differentiated progeny with a net loss in the stem cell pool.

Research is still being carried on to determine the factors that determine the fate of the stem cells.[3]

MECHANISM OF ACTION:

Naturally occurring stem cells in the organs constantly repair the daily wear and tear of tissues through multitude of mechanism. The different chemo tactic factors direct the stem cells to the injured or damaged site through signalling pathways. So far, stem cells are known to possess the following mechanisms of actions:

· **THE PARACRINE EFFECT:**

The paracrine effect was an unexpected mechanism for tissue regeneration from stem cells but has led to new possibilities for the treatment of different diseases. After the application of stem cells, they remodel and regenerate the injured tissues, improve functions and protect the tissues from further damage. Stem cells transplanted into the injured the tissues express paracrine signalling factors including cytokines and other growth factors (vascular endothelial GF/VEGF, hepatocyte GF/HGF and fbroblast GF/FGF2) which are involved in the organization of the stem cell-driven repair process through increasing angiogenesis, deceasing inf ammation, preventing apoptosis, releasing chemo tactic factors, assisting in extra-cellular matrix tissue remodelling and activation of resident cell. [4,5]

· **INCREASED ANGIOGENESIS:**

The stem cells produce paracrine effect by local signalling of molecules like the growth factors that may improve the perfusion and enhance angiogenesis to chronically ischemic tissues. Stem cell enhances angiogenesis by increasing endogenous levels of VEGF. HGF exerts bene f cial effects on neovascularisation and tissue remodelling. FGF2 is involved intimately with endothelial cell proliferation.. [4,5,6]

· **REDUCTION IN INFLAMMATION:**

Stem cells are capable of reducing the effect of local in f ammation. When stem cells are transplanted into the injured tissues, they face a nutrient de f cit in f ammatory environment where they remove the in f ammatory exudates through activating the anti-in f ammatory paracrine effect to limit the local in f ammation. [4,5,6]

· **REMYELINATION:**

Remyelination involves reinvesting demyelinated axons with new myelin sheaths. Remyelinating effect of stem cells may be via one or more mechanisms, including the immune modulatory effect and promotion of differentiation of endogenous cells. More research to understand these mechanisms is yet to be conducted. [4,5,6]

· **ANTI-APOPTOTIC & CHEMOTACTIC SIGNALING:**

Stem cells appear to activate an anti-apoptotic signalling which effectively protects ischemia-threatened cells from apoptosis. HGF have the ability not only to improve cell growth but also to reduce cell apoptosis. [4,5,6]

· **ACTIVATION OF RESIDENT STEM CELLS:**

Resident stem cell refers to the stem cell-like populations found in the adult hearts, livers, brain and kidney. These resident stem cells possess growth factor receptors that can be activated to induce their migration and proliferation and promotes restoration of the ischemic tissues and improves the function in the injured tissues. [4,5,6]

· **REMODELLING OF THE EXTRA-CELLULAR MATRIX:**

Stem cell transplantation alters the extra-cellular matrix, resulting in post-infarct remodelling, strengthening of the infarct and in prevention of deterioration in organ function. Stem cells improve the functions by increasing the cellularity and decreasing production of extra-cellular matrix protein which results in positive remodelling and functioning. [4,5,6]

APPLICATION OF STEM CELL:

NENEUROLOGICAL CONDITIONS:

The applications of neural stem cells are indicated for the treatment of the following conditions:

1. Autism
2. Cerebral palsy
3. Muscular dystrophy
4. Spinal cord injury
5. Stroke

Research is still being carried on for further application of stems cells in various diseases/conditions.

CLINICAL APPLICATION OF STEM CELLS IN NEUROLOGICAL CONDITIONS:

AUTISM:

Autism is a range of neuro-developmental disorders characterized by persistent de f cits in social interactions, communication, language and behaviour. It is assumed that neural hypo perfusion and immune dysregulation are the two core underlying pathologies associated with autism. Reduced blood supply to the brain (medial temporal and cerebellum) could contribute to the cause of reduced functioning of that particular area. In patients with autism, hypo perfusion leads to hypoxia, reversal of hypoxia will lead to may lead to self-repair and neural proliferation. [7,8]

Procedure:

Stem cells are administered through the intrathecal route. The transplanted stem cells will reach the central nervous system through cerebrospinal f uid Stem cells are administered via the intrathecal route at the level between L3-L4 or L4-L5 vertebral space [7,8]

Post-op management:

After the application of stem cell therapy, conventional therapy in the form drug therapy and physical therapy must still be carried on along with special schooling. Medications must be administered to reduce hyperactivity. Medications are administered upto 10 days after the application of stem cells.

Rehabilitation program includes:

1. Bear crawls- to strengthen core muscles and trunk muscles, to increase shoulder and hip mobility, to improve cardiovascular endurance and to improve coordination.
2. Medicine ball slams- to strengthen core muscles, to improve balance and improve coordination.
3. Star jumps- to improve cardiovascular endurance, strengthen legs and core muscles.
4. Mirror exercises- to improve interaction and social skills [9,10]

CEREBRAL PALSY:

Cerebral palsy is a term used to describe a non-progressive group of brain or malformation disorders resulting from a lesion or developmental abnormality in foetal life or early infancy affecting a person's ability to move. It is characterized by poor motor control, adaptive length changes in muscles, skeletal abnormalities and intellectual abnormalities. The causes of cerebral palsy are grouped under: prenatal, prenatal and postnatal causes. [11]

Procedure:

Stem cells are administered via the intrathecal route at the level between fourth and f fth lumbar vertebrae. Simultaneously, 20mg/kg body weight methyl prednisolone in 500ml ringer lactate is administered intravenously to enhance survival of the injected cells. [12]

Post-op management:

A multidisciplinary approach is followed after the application of stem cells. It includes medications, physiotherapy and speech & swallowing therapy. Medications are administered to manage symptoms such as seizures, pain, drooling, etc. Medications are administered upto 10 days after the application of stem cells. Speech therapy aims at improving oral motor skills, speech and language skills. A speech therapist also provides guidance regarding hearing aids if hearing de f cit is the cause of delayed speech. They also teach children and caregivers swallowing techniques, appropriate positioning and oro-motor exercises, making dietary changes as in the consistency of food (soft/

liquid/mashed), etc. Physiotherapy helps to increase the strength of weak muscles, encourage movement, stretch the tight muscles, prevent contractures of muscles, thereby enhancing mobility and maximizing independence.

Rehabilitation program includes:

1. Positioning- Supine lying, prone lying and standing position.

2. Floor sitting- Corner sitting, side sitting and long-leg sitting.

3. Chair sitting

4. Prone development- Prone position placement, head control and turning the head from side to side.

5. Supine development- Stabilization of head, postural fxation of shoulder girdles & pelvis and rising to sit & stand.

6. Development of sitting- Supine to sitting, side lying to sitting and spinal extension exercises.

7. Development of gait- Correction of abnormal postures during standing and walking, improve dynamic stability, weight shifts & development of stepping, weight distribution of weight, train lateral sway, train to stop while walking, train to walk on uneven supporting surface and train to climb & descend stairs. [13]

MUSCULAR DYSTROPHY:

Muscular dystrophies are genetically determined progressive disorders of the muscles characterized by cycles of muscle fbres necrosis, regeneration, eventual fbrosis and replacement with fatty tissues. It is characterized with progressive weakness and wasting of affected muscles. Each type of muscular dystrophy is associated with a distinct genetic mutation. Congenital myopathies are associated with morphological muscle abnormalities without necrosis. Metabolic myopathies present with pain, weakness or fatigue. [14]

Procedure:

Stem cells are administered via the intramuscular route. Intramuscular transplantation is performed on the motor points of the muscle.

Post-op management:

Conventional therapy in the form of drug therapy and rehabilitation must be followed after the application of stem cells. Anabolic steroids are administered to slow down the progression of muscle wasting while preserving pulmonary functions, delaying the loss of ambulation and stabilizing muscle strength. Corticosteroids for enhancing myoblast proliferation and promote muscle regeneration. Prednisolone for reducing muscle damage and necrosis through its immuno-suppressive and anti-inf ammatory effects. Medications are administered upto 10 days after the application of stem cells. [15,16]

Physical rehabilitation program includes:

1. Exercises- Endurance exercises with repetitions and minimal resistance exercises to the affected muscles till point of muscle fatigue.

2. Balance training.

3. Mat exercises.

4. Breathing Exercises- To improve vital capacity and oxygenation.

5. Stretching of tightened muscles.

6. Gait training.

SPINAL CORD INJURY:

Spinal cord injury (SCI) is def ned as injury to the spinal cord or the nerves at the end of spinal canal. The cause for spinal cord injury can be traumatic or non-traumatic. This affects the conduction of the sensory and the motor signals across the site of lesion. A severe cervical spinal damage results in quadriplegia, whereas an injury to the thoracic or lumbar spine leads to paraplegia. The demyelination of axons may to lead to permanent loss of sensory & motor functions. Other symptoms include muscle weakness, respiratory impairments, circulatory impairments, spasticity or faccidity of muscles, pain, depression, etc. Affected sensations, loss of bladder & bowel control, spinal shock, postural hypotension, etc are some of the major complications in SCI patients. Stem cell therapy is a potential treatment for SCI patients. [17,18,19]

Procedure:

The stem cells are administered through 3 routes: intra-arterial, intra-venous and intrathecal route. Intra thecal routes have shown more improvements in patients when compared to those of intra-venous and intra-arterial route. [20,21]

Post-op management:

Physical rehabilitation for SCI consists of:

1. Breathing exercises- Gloss pharyngeal breathing and deep-breathing exercises.

2. Respiratory muscle training- Improving the strength and endurance of inspiratory and expiratory muscles via Normocapnic hyperpnoea.

3. Manual stretching of the tightened muscles.

4. Strengthening of the affected muscles- Application of electrical stimulator, active assisted & active movements and resisted exercises.

5. Bed mobility- Turning on bed on his own or with minimal assistance.

6. Mat exercises.

7. Postural control.

8. Balance& coordination training.

9. Gait training

STROKE/CEREBRO-VASCULAR ACCIDENT:

Stroke or CVA is the sudden loss of functions caused by an interruption of blood flow to the brain leading to reduced oxygen and nutrients supply to the brain. It is of 2 types: Ischemic stroke and Haemorrhagic stroke. Ischemic stroke results when a clot impairs the blood flow, depriving the brain of essential oxygen and nutrients. Haemorrhagic stroke occurs when blo od vessels rupture, causing leakage of blood in and aro und the brain 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. The permanent change in the structure of CNS leads to long lasting physical impairments, seen as residual problems, which translates gradually into activity limitation and restricts these individuals to participate in the community. Symptoms include lack of coordination, imbalance while sitting or standing, loss of vision or dimming, muscle weakness, severe headache, behavioural issues, etc. Stem cells impersonate the natural process of recovery after stroke, which is mobilization of stem cells to the area of injury in the brain resulting in initiation of the process of neuro-restoration. [22]

Procedure:

The stem cells are administered through 4 routes: intra-arterial, intra-venous, intrathecal and intracranial route. Intrathecal and intracranial routes have shown more improvements in patients when compared to those of intra-venous and intra-arterial route. [22]

Post-op management:

Physical rehabilitation program for stroke consists of:

1. Manual stretching of the tightened muscles.

2. Strength training- To improve the strength and functions of affected upper limb and lower limb muscles.

3. Mirror therapy- To improve motor control and functions.

4. Bed mobility- Turning on bed on his own or with minimal assistance.

5. Mat exercises.

6. Postural control.

7. Transfers- From bed to chair and vice versa.

8. Balance & coordination training.

9. Gait training

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Assessment of Balance in Individuals Suffering from Chronic Obstructive Pulmonary Diseases

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Abstract

Background: COPD being a common preventable and treatable disease, in spite of which half a million people die every year in India. COPD being one of the leading cause of death in Maharashtra, compared to deaths due to ischemic heart diseases, stroke and diabetes all put together.

Method ; 62 subjects suffering from COPD were screened, and 30 subjects meeting the inclusion - exclusion criteria were selected to be a part of the COPD group. 60 healthy subjects were screened and 30 subjects meeting the inclusion - exclusion criteria were selected to be a part of the control group. Informed consent was acquired from both of them. Basic personal and demographic data was recorded with a written consent.

Conclusion; Study suggested that balance assessment and treatment should be incorporated in the treatment plan of the COPD patients. Treatment should concentrate on both (static and dynamic) the component. Thus helping the patient to improve their balance and quality of life.

Key words*: COPD- Chronic obstructive pulmonary disorder , BESS –Balance Error Scoring System, SEBT – Star Excursion Balance Test*

Introduction

Chronic obstructive pulmonary disorder (COPD), being a common treatable and preventable disease. Characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in airways and the lung to noxious particles and gases. Exacerbations along with co morbidities contribute to the overall severity in individual patients. (1)

COPD kills more than 3 million people every year, thus it is the 4th largest cause of death. In India half a million people die every year due to COPD, which is 4 times the number of people who die with COPD in Europe & USA. A report published by the Maharashtra State Health resource Centre, the leading cause of death in Maharashtra is due to COPD, when compared to deaths due to ischemic heart disease, stroke and diabetes all put together. (2)

Assessment of COPD traditionally focused on lung function, but the wide range effects on the body, such as reductions in peripheral muscle performance, functional mobility and exercise capacity are now gaining attention

Emerging evidences suggest that there are deficits in functional balance control in individuals with COPD.(3)

Deficits of functional balance control in COPD can be.

· Power, muscle strength and endurance are considerably reduced in people with COPD compared to healthy controls. Atrophy of fast twitch type II fibers in the lower limb muscles causes decreased ability to perform activities which need fast and powerful muscle contractions.

· Postural control is regulated by interaction of three major sensory systems: vestibular, somatosensory and visual. Imbalance in any can cause loss of balance.

· Some studies have found strong dose-dependent associations between inhaled and oral corticosteroid use and the risk of cataracts increase. Cataracts and glaucoma causes reduce visual acuity, impair postural

control, further increasing the risk of falls.

· Improper nutrition very common among people with COPD, causes weight loss, (more of muscle mass). Loss of muscle mass in COPD population is associated with increased mortality, impaired muscle function, further reduced exercise capacity and affecting quality of living.

· COPD shows number of psychiatric disorders, including depression and anxiety, the prevalence of depression being between 2%–57% and anxiety being between 2%–51% in them.

· Medications commonly used in COPD have drawn special attention for their potential adverse effects on fall risk. Corticosteroid use in people with COPD has been estimated to be 61.5% and 8.3% for inhaled and oral corticosteroids respectively which increases the fall risk.

· Dyspnea is the most common symptom of COPD, causes limitation in activity. As level of dyspnea is strongly correlated to the intensity of activities, people with COPD have shown reduced activities of daily living and even for that matter exercises. [3]

Defcits in balance are an important secondary impairment in individuals with COPD. Clinical and laboratory measures shown abnormal balance in individuals, with different degrees of COPD, which increased the risk of falling in this population.[4]

Maintaining balance requires integration and coordination from sensory, motor and central nervous system, to maintain the centre of gravity with respect to the base of support. Sensory system is responsible for detection of body position and motion through vision, somatosensory and vestibular stimuli. Motor system is responsible for execution of motor responses through body biomechanics, range of motion, strength and fexibility. Central nervous system for integration process of motor and sensory systems[5]

Thus the aim of the study was to evaluate, which type of balance is affected more in COPD patients. This will help the therapist in formulating a treatment plan and include balance training program for COPD.

Balance Error Scoring System (BESS) is used for measuring static balance.

Star Excursion Balance Test (SEBT) is used for measuring dynamic balance.

Functional balance in COPD was assessed by few researchers, using clinical assessment tools. Bergs Balance Scale, Functional Reach Test, Time Up and Go test, etc, they found that balance was impaired in patients suffering from COPD [6,10] . However, they have not found which components of balance will be affected the most in COPD.

Thus, the need of this study arouse to evaluate and identify which component of balance is affected the most in individuals suffering from COPD because of which they tend to have impaired functional balance as compared to their age matched controls .

Materials and Methods

1. Study design : Observational study

2. Population : COPD patients and normal healthy population

3. Target population : COPD patients from tertiary health set up

4. Sample size : 60 people (30 COPD , 30 NORMALS)

5. Sampling technique : Convenience sampling

Results

Data was analyzed using SPSS 16.0 and Microsoft excel 2010. Assuming that the data was following normal distribution (n=30), Independent – sample t test was used.. A p value of < 0.05 was taken as signifcant.

Balance Error Scoring System (BESS)

Table 1: Comparison of BESS Scores in COPD group and normal group.

	Normal Individuals	COPD	P Value
FIRM SURFACE	5.4 ± 0.894	7.833 ± 1.341	0.00
FOAM SURFACE	7.433 ± 1.278	9.166 ± 1.288	0.00

Inference: Table 1 shows that there was a statistically signi f cant difference ($p < 0.05$) seen in COPD group when compared to normal group. The number of errors performed by the COPD group was more than the normal group.

Star Excursion Balance Test (SEBT)

Table 2. Comparison of SEBT in COPD group and normal group for right leg.

	NORMAL	COPD	Unpaired t-test (p value)
RT ANT	98.8 ± 5.46	57.766 ± 9.44	00.0
RT ANT MED	101.666 ± 3.35	60.466 ± 8.63	0.00
RT MED	97.733 ± 4.66	60.733 ± 9.35	0.00
RT POST MED	93.966 ± 6.49	57.833 ± 8.01	0.00
RT POST	90.166 ± 10.20	55.6 ± 8.27	0.00
RT POST LAT	83.466 ± 11.64	47.266 ± 9.92	0.00
RT LAT	71.466 ± 13.53	37.133 ± 9.98	0.00
RT ANT LAT	93.533 ± 4.16	48.766 ± 8.27	0.00

Table 3: Comparison of SEBT in COPD group and normal group for left leg.

	NORMAL	COPD	Unpaired t-test (p value)
LT ANT	99.133 ± 4.717	59.666 ± 8.868	0.00
LTANT MED	99.833± 4.086	60.3 ± 8.404	0.00
LT MED	96.683 ± 4.724	59.1 ± 7.617	0.00
LT POST MED	95.033 ± 6.014	57.533 ± 6.699	0.00
LT POST	92.833 ± 8.304	57.266 ± 7.422	0.00
LT POST LAT	83.0333 ± 18.261	49.233 ± 9.216	0.00
LT LAT	72.166 ± 14.044	37.333 ± 7.326	0.00
LT ANT LAT	93.666 ± 4.67	52.6 ± 10.029	0.00

Inference: Table 2 and 3 shows that there was a statistically significant difference ($p < 0.05$) seen in COPD group when compared to normal group. The distance reached on the Star excursion Balance Test in all the directions were significantly lesser in the COPD group, as compared to normal group.

Discussion

30 COPD and 30 Normal population individuals were assessed for static and dynamic balance using the BESS and SEBT respectively.

Significant reduction of balance (static and dynamic) seen in the COPD population as compared with the normal population. This can be attributed to the ongoing pathological disease process further explained.

Table 1. Compares the BESS scores between COPD group and Normal age matched individuals. Number of errors made on the firm and foam surface was much higher in the COPD group as compared with the health group. When visual feedback is cut and the individual stands on firm and foam surface, the feedback remains majorly from proprioception of the lower limbs. Studies show proprioception is affected in COPD population ansd is one causes for postural affection in individuals suffering from COPD. [9]

Decreased tidal volume is seen in COPD individuals. Increased tidal volume in the lungs, lesser is the postural sway.

Positions for single leg stance on firm and foam surface challenge the person's capacity to maintain its centre of mass (CoM) within the base of support. To maintain this the muscle activation and contraction increases. Compared to healthy controls muscle endurance is reduced in people with COPD. Reduced muscle endurance causes increased muscle fatigability, which is associated with impaired postural control [29]. Quadriceps weakness which occurs in COPD due to increase in pro inflammatory cytokines which further increases activity of the ubiquitin proteasome pathway, a proteolytic pathway that causes muscle wasting. Stable postural base on which the intended movement can take place is not allowed. Studies show quadriceps strength is decreased on average by 30% in moderate to severe COPD patients. [24]

Table 2 and 3 shows that the distance reached on the SEBT in all the direction is significantly less in COPD group as compared with the health group. Lower limb muscles are important for maintaining balance. In COPD, functioning of these muscles is affected therefore affecting the score of dynamic balance as well.

In COPD, there is greater reduction in muscle mass, intramuscular fat, muscle fiber atrophy (most notably in fast twitch type II fibers).Capillary density decreases mitochondrial dysfunction and there is lower proportion of oxidative enzymes. These abnormalities together indicate an overall decline in both oxidative capacity, and the contractile properties of lower limb muscles. [25]

In COPD, excessive respiratory muscle recruitment causes mechanical abnormality in the thoracic cage. Body is a closed kinematic chain, this influences the overall body mechanics and functional balance. The postural attitude of the hyper inflated thorax can lead to a series of spinal column, shoulder, and pelvic girdle compensations. Spinal column deformities, such as increased thoracic kyphosis and lumbar lordosis, are common in adults with COPD. [26].

Stability in the anterior-posterior direction is affected more in COPD individuals. Reduced flexibility of the muscles in back and lower limb and decreased ROM at the spine [27]. For lateral reach outs, body is more dependent on trunk movement due to poor efficiency of the ankle muscles. Increased mediolateral displacement of the centre of gravity in COPD population,as the stability provided by the trunk muscles is decreased. Trunk muscles work to aid in respiration in COPD patients this reduce the contribution to control balance causing decreased lateral reach out .[28].

Multisystem involvement of COPD causes a broad range of functional limitations. Emerging evidence draws attention to the fact that balance is affected in individuals suffering from COPD as compared to their healthy peers.

Impairments in higher cognitive functions and complex perceptual-motor integration which were attributed to cerebral hypoxia associated with their COPD, increased postural sway. It has also been suggested that balance and coordination deficits are correlated with measures of severity of airflow obstruction (FEV1) and

consequent reduced physical activity levels in patients with COPD [18]. Absence of visual input in patients with COPD demonstrate impaired static postural control (i.e. increased sway) following a six-minute walk test and was hypothesized that the increased postural sway following exercise was related to reduced peripheral muscle endurance and strength as well as, the increase in ventilation following exertion [6].

Malnutrition is common in people with COPD. Reports suggest that people with COPD show low levels of circulating vitamin D. Vitamin D deficiency in some studies has been associated with an increased risk for falling,. [6, 19]

Medications commonly used in the management of COPD include: bronchodilators (anticholinergics, β2-agonists, methylxanthines), oral and inhaled corticosteroids, and theophylline. Other less frequent pharmacologic treatments include: vaccines, mucolytics, antioxidants, antitussives, α-1 antitrypsin augmentation therapy immunoregulators, vasodilators, narcotics, and antibiotics in cases of acute infection.[20]. Some medications show adverse side effects, including dizziness, postural hypotension, altered vision and long-term cognitive changes. Long term use of corticosteroids in COPD population is associated with metabolic disorders like osteoporosis and osteopenia and a subsequent increased risk of bone fracture in some.[21].

Exacerbation known as "a sustained worsening of the patient's condition, from the stable state and beyond normal day-to-day variations, requiring change in regular medication in COPD patients "[22]. Exacerbations usually require hospitalization, along with prolonged bed rest. Aggressive pharmacological interventions (e.g., high doses of oral corticosteroids),leads to muscle atrophy and weakness. Negative effects of exacerbations on muscle function and physical activity levels, gait and balances cannot be missed. Increased risk for falls secondary to exacerbations is possible. [23]. Postural activity of trunk muscles is altered where respiratory demands increases.

Conclusion

· Compared with age matched control, individuals with COPD have statistically significant reduced performance in static and dynamic component of balance which was tested using the BESS and SEBT respectively ($p < 0.05$).

· The static component of balance assessed by BESS using the firm and foam surface was significantly reduced ($p = 0.00$, $p < 0.05$).

· The dynamic component of balance assessed by SEBT was significantly reduced ($p = 0.00$, $p<0.05$).

Conflict of Interest : NIL

Source of funding : Self

Letter of Ethical Approval : attached

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Scapular and Pelvic PNF Pattern for Female Physical Education Students with Low Back Pain

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Abstract

Background: - Physical education students are at greater risk of low back pain due to physical activity that put a lot of stress on the lumbar spine, such as gymnastics, wrestling, rowing, diving, and football. PNF training is one of the interventions that are less investigated in the management of LBP.

Purpose: - The purpose of this study was to determine whether exercises using proprioceptive neuromuscular facilitation (PNF) scapular and pelvic patterns might decrease the pain index and increase the lumbar flexibility of female physical education students with low back pain.

Subjects & Methods: - A total of 40 female undergraduates with low back pain who meets the inclusion and exclusion criteria are recruited for the study.

Methodology: - 20 were allotted to Experimental group who received scapular and pelvic pattern of PNF along with conventional strengthening exercises and another 20 was allotted to Control group who received conventional strengthening exercises alone.

Outcome Measures: - Numerical Pain Rating Scale (NPRS), Modified-Modified Schober Scale (MMST) and Oswestry Disability Questionnaire (ODI).

Results: - results showed that both the groups improved almost equally in lumbar flexion and extension ranges but the improvement was considerably significant on NPRS and Modified Oswestry Disability Index was found to be significantly effective in experimental group which was $p<0.001$.

Conclusion: - This study showed that PNF can be used to improve pain index rating and lumbar flexibility. The findings indicate that the experimental group experienced greater improvement than the control group by participating in the PNF lumbar stabilization.

Keywords: *- PNF, Physical education, NPRS, ODI, MMST, Lumber stabilization*

Introduction

Low back pain is a very common health problem worldwide and a major cause of disability - affecting performance at work and general well-being. Low back pain is classified as acute, sub-acute, or chronic according to the duration of symptoms[7]. The 'low back' was defined as the area on the posterior aspect of the body from the lower margin of the 12th ribs to the lower gluteal folds[9] Chronic low back pain is normally consistent back pain experienced for more than 12 weeks[16]. More than 80% of the world population experiences low back pain at least once, and 15% of that 80% suffer from chronic low back pain due to unrecovered symptoms[8]. Though several risk factors have been identified (including occupational posture, depressive moods, obesity, body height and age. The lifetime prevalence of non-specific (common) low back pain is estimated at 60% to 70% in industrialized countries. LBP prevalence in young undergraduates (< 30 years) approximating 30–40%, with up to60% of LBP events in this age group result from work-related injuries[9].

Although back pain is not the most common injury, it is one of the most challenging for the sports physician to diagnose and treat. Factors predisposing the young athlete to back injury include the growth sport, abrupt increases in training intensity or frequency, improper technique, unsuitable sports equipment, and leg-length inequality. Poor strength of the back extensor and abdominal musculature, and inflexibility of the lumbar spine, hamstrings and hip flexor muscles may contribute to chronic low back pain. Excessive lifting and twisting may produce sprains and strains, the most common cause of low back pain in adolescents. The relationship between sports and LBP in adolescents appears to be curvilinear, and all levels of physical activity are associated with an increased risk of LBP in adolescents and special risks are posed by activities that put a lot of stress on the lumbar spine , such as gymnastics, wrestling, rowing, diving, and football[10-13].The biggest problem of low back pain is lumbar instability[14]. Unbalanced mobilization order among stability muscles and mobility muscles, as well as muscle length, causes low back pain[15].

For patients with low back pain, deep muscle exercise is required to counteract muscle atrophy and damage to the deep muscles[16]. It was found that patients with low back pain experienced a mobilization delay in their deep muscles, which generates activation and contraction before the movement of the limbs[17].

For lumbar region stability, strengthening and co-contraction of the multifidus and transverse abdominis (TA), which are deep stability muscles, and the erector spinae (ES) and abdominal muscles, which are superficial stabilizer muscles, are required.[18]

In recent years, the trunk stability approach has been widely used as a method of spine treatment, and many efforts have been made to objectively prove the effect. Among the exercises for trunk muscle activity of patients with low back pain, the effect of ball exercise has been reported to comprehensively improve muscle strength, endurance, and flexibility, as well as strengthen body reflexes, sense of balance and proprioception[19]. In addition, Stanton et al.[20] reported that the Swiss ball exercise is an effective stability exercise for trunk core muscles.

PNF has been recommended for sensory-motor control training, as well as for stimulating lumbar muscle proprioception[21]. Proprioceptive neuromuscular facilitation is a concept of treatment whose underlying philosophy is that all human beings, including those with disabilities, have untapped existing potential (Kabat 1950)[1]. PNF involves stretching, resisted movement, traction and approximation to ameliorate muscle decline, disharmony, atrophy and joint movement limitations. Recently, it has been used in orthopaedic diseases of bones and joints (like lower back, neck and shoulder pain), sports related trauma. The scapular muscles control or influence the function of the cervical and thoracic spine. Proper function of the upper extremities and trunk requires both motion and stability of the scapula. Pelvic motion and stability are required for proper function of the trunk and the lower extremities. Anterior depression and posterior elevation of scapula helps in activating trapezius, levator scapulae, rhomboids, serratus anterior, pectoralis minor and major, whereas anterior elevation and posterior depression of pelvic helps in activation of internal and external oblique abdominal muscles, contralateral internal and external oblique abdominal muscles[2].

Previous studies recommended PNF, which may stimulate the proprioceptive senses of the lumbar region muscles and is useful for training sensory-motor regulation and balance[22]. When PNF exercises are performed correctly, the client will eventually adapt them into their everyday movements, thereby altered postures and habits putting chronic strain on the muscles, causing soreness, stress and eventually leading to injury will be corrected[23].

Methodology and Findings

Source of data

YMCA College of Physical Education, Nrapathunga road, Bangalore, India.

Method of collection of data:

Population : Female Collegiate students

Sampling : Convenience sampling

Sample size : 40

Type of study : Pre- post experimental study

Duration of study : 6 months

Inclusion criteria:

- Subjects with LBP
- Age 18 - 30 year
- Undergraduate female students of sports and physical education institute are included in this study

Exclusion criteria:

- Acute traumatic injuries of vertebrae, pelvic and scapula
- Rotator cuff tear
- Shoulder complex fractures
- Neurological disorder
- Vertebral fxation
- Surgery of spine, pelvic and shoulder

Materials Required

- Pen
- Paper
- Couch
- Inch-tape

Data Interpretation

Table-1: Range, mean and SD of age of the female undergraduate students of sports and physical education.

Sno	Variable	Group-A		Group-B		Unpaired t-test
		Range	Mean ± SD	Range	Mean ± SD	
1	Age in years	18-27	22.05±3.06	18-28	22.30±2.77	t=0.270, p=0.788, NS

NS-Not signifcant. i.e.>0.05.

The table 1 presents the outcomes of age in years of female undergraduate students of sports and physical education. In group-A the subjects were ranging within the age of18-27 years with mean 22.05 and SD of 3.06. In group-B the subjects were ranging within the age of 18-28 years with mean 22.30 and SD of 2.77. The unpaired t-test was carried to compare the means, which was found to be not signifcant at 5% level (i.e., p>0.05). It revealed that the baseline characteristic of age was similar in both the groups.

Table-2: Range, mean and SD of outcome measures in group-A (control).

Sno	Outcome measures	Group-A(Control)				Paired t- test/ Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	NPRS	5.50-8.25	6.73±0.77	2.25-500	3.81±0.760	z=3.923*	p=0.001

Cont... **Table-2: Range, mean and SD of outcome measures in group-A (control).**

2	ODI	22-40	30.00±6.42	14-22	18.50±1.05	z=3.628*	p=0.001
3	Flexion	5.20-6.40	5.74±0.37	5.5-6.5	6.00±0.35	t=9.133*	p=0.001
4	Extension	2-3.50	2.70±0.43	2.4-3.6	2.91±0.38	t=2.633*	p=0.016

Note: * denotes –Significant (p<0.05). z- Wilcoxon test, t-paired t-test

The above table-2 shows the outcomes in group-A (control). In pre-test numerical pain rating scale score was ranging 5.50 to 8.25 with mean 6.73 and SD of 0.77 but in post-test, it was ranging within 2.25-5.00 with mean 3.81 and SD 0.76. The non -parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant at

p=0.001 (p<0.05). On other hand regarding the outcome measure of Oswestry Disability Index (ODI) was ranging within 722-40 with mean 30.00 and SD 0.37 in pre-test. But, in post-test it was ranged within 5.5-6.5 with mean 6.00 and SD 0.35. The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant at p=0.001 (p<0.05).

In pre-test, the flexion ranging from 5.20-6.40 with mean 5.74 and SD of 0.37 but in post-test, flexion was ranging within 5.5-6.5 with mean 6.00and SD of 0.35. The parametric test for comparison of dependent outcomes, the paired t-test was carried out and it was found to be significant at p=0.001 (p<0.05). On other hand regarding the outcome measure of extension was from 2-3.5 with men 2.70 and SD of 0.43 but, in post-test it was ranging within 2.4-3.6 with mean 2.91 and SD 0.38. The parametric test for comparison of dependent outcomes, the paired t-test was carried out and it was found to be significant at p=0.001 (p<0.05).

It evidenced that the subjects in control group administered with conventional treatment strengthening exercise reduced the pain, disability and increased the flexion and extension.

Table-3: Range, mean and SD of outcome measures in group-B (Experimental).

Sno	**Outcome measures**	**Group-B(Experimental)**				**Paired t- test/ Wilcoxon test**	**p-value**
		Pre test		**Post test**			
		Range	**Mean ±SD**	**Range**	**Mean ±SD**		
1	NPRS	3.5-6.25	4.87±0.90	1-3	2.11±0.58	z=3.927*	P<0.001
2	ODI	24-40	31.90±5.56	10-18	12.70±2.36	z=3.928*	P<0.001
3	Flexion	5.20-6.40	5.69±0.41	5.5-6.8	6.08±0.34	t=5.940*	P<0.001
4	Extension	2.20-3.40	2.67±0.23	2.4-3.5	2.93±0.29	t=6.504*	P<0.001

Note: * denotes –Significant (p<0.05). z- Wilcoxon test, t-paired t-test

The above table-2 shows the pre and post-test outcomes in group-B (experimental). In pre-test numerical pain rating scale score was ranging 3.5-6.25 with mean 4.87 and SD of 0.90but in post-test, it was ranging within 1-3 with mean 2.11 and SD 0.58. The non -parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be signi f cant at p=0.001 (p<0.05). On other hand regarding the outcome measure of Oswestry Disability Index (ODI) was ranging within 24-40 with mean 31.90 and SD 5.56 in pre-test. But, in post-test it was ranged within10-18with mean 6.08 and SD 0.34. The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be signi f cant at p=0.001 (p<0.05).

In pre-test, the f exion ranging from 5.20-6.40 with mean 5.69and SD of 0.41 but in post-test, f exion was ranging within 5.5-6.8 with mean 6.08 and SD of 0.34. The parametric test for comparison of dependent outcomes, the paired t-test was carried out and it was found to be signi f cant at p=0.001 (p<0.05). On other hand regarding the outcome measure of extension was from2.20-3.40 with men 2.67and SD of 0.23 but, in post-test it was ranging within 2.4-3.5with mean 2.93 and SD 0.29. The parametric test for comparison of dependent outcomes, the paired t-test was carried out and it was found to be signi f cant at p=0.001 (p<0.05).

It evidenced that the subjects in experimental group administered with scapular and pelvic PNF with conventional treatment signi f cantly reduced the pain, disability and increased the f exion and extension

Table-4: Comparison of pre and post-test outcome measures in between the groups

Sl.no	Outcome measures	Pre-test		Post-test	
		Group-A	Group-B	Group-A	Group-B
		Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
1	NPRS	6.73±0.77	4.87±0.90	3.81±0.760	2.11±0.58
2	ODI	30.00±6.42	31.90±5.56	18.50±1.05	12.70±2.36
3	Flexion	5.74±0.37	5.69±0.41	6.00±0.35	6.08±0.34
4	Extension	2.70±0.43	2.67±0.23	2.91±0.38	2.93±0.29
Between group comparison Unpaired t-test		· NPRS z=1.401, p>0.05 NS · ODI: z=1.027, p>0.05, NS · f exion: t=0.401, p>0.05, NS · Extension: t=0.318, p>0.05, NS		· NPRS: t=5.074, p<0.001 S · ODI: t=4.660, p<0.001, S · Flexion: z=0.715, p>0.05, NS · Extension: z=0.133, p>0.05, NS	

S-denotes signi f cant (p<0.05); NS – not signi f cant (p>0.05)

The above table-4 presents the outcomes of between group comparisons of outcome measures in between the two groups. The outcome measures were more or similar in pre-test in both groups. The post test scores of numerical pain rating scale sores and Oswestry Disability index were comparably less in experimental group than control group but in case of post-test fexion and extension in experimental group were not signifcantly different.

Result

It evidenced that though both experimental and control group were individually effective in reducing the pain, disability and improving the function of fexibility and extension, the experimental group is better than control group.

Conclusion

Objective of the study was to fnd out the effcacy of scapular and pelvic PNF pattern on low back pain and fexibility among female undergraduate students of sports and physical education institutes. This study showed that PNF can be used to improve pain index rating and lumbar fexibility. The fndings indicate that the experimental group experienced greater improvement than the control group by participating in the PNF lumbar stabilization. Hence, the alternate hypothesis is accepted, and null hypothesis is rejected. Both the techniques are almost equal in their clinical effectiveness for improving lumber fexibility and that either of the techniques may be used in clinical practice for improving lumber fexibility.

Ethical Clearance : - **Taken from The Oxford College of Physiotherapy**

Source of Funding – Self

Conflict of Interest – Nil

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Effect of Arch Index of Foot on Dynamic Balance in Healthy Young Adults

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Abstract

Foot is the most distal segment in lower extremity chain and represents a relatively small base of support upon which body maintains balance. There are three types of foot postures which are seen 1) Pes planus 2) Pes cavus 3) Neutral. So, it is likely that these deficits in foot posture may impair the foot function and predispose to loss of balance.

Aim:- The aim of the study was to find the effect of Arch Index of foot on dynamic balance.

Method:-It was a cross sectional study on 175 healthy young individuals in the age group of 18-25yrs. Individuals were assessed for Inclusion and Exclusion criteria. Arch index was calculated for both the feet using foot prints with the help of software Auto Cad 2014. Dynamic balance was assessed using Star Excursion Balance Test (SEBT) for both the feet. Normalised SEBT distances were calculated by dividing reach distances in all eight directions by limb length.

Results:-. Arch index was found to be negatively correlated with normalised SEBT distances in Posterolateral (r= -0.341,p= 0.01) and lateral(r= -0.369,p= 0.01) directions and positively correlated in Anterior(r= 0.296,p= 0.01),and medial (r= 0.296,p= 0.01)directions in pronated foot group. There was no correlation found between Arch index and normalised SEBT distances in any direction for normal arched foot and supinated foot group.

Conclusion:- Increased Arch Index (i.e. >0.26) implies pronated foot posture which affects dynamic balance in Postero lateral and lateral directions of Star Excursion Balance Test (SEBT).

Key words- *Arch Index, SEBT, Dynamic Balance*

Introduction

The foot consists of three arches, Medial, Lateral longitudinal arches and a Transverse arch, of which the medial longitudinal arch is the largest. Foot can be classified into Pes cavus (Supinated foot or High arched foot), Pes planus (Pronated foot or low arched foot) and Normal arched foot depending on height of medial longitudinal arch.

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The arches of the foot are considered as a twisted osteoligamentous plate, with the metatarsal heads forming horizontally placed anterior edge of the plate, and the calcaneus forming the vertically placed posterior edge.[1]These plantar arches are also uniquely adapted to serve the demands of mobility and stability. [2]

The complex nature of human foot allows it to perform diverse functions. These all functions are accomplished through the deformation of the foot arches, which is controlled by intrinsic and extrinsic foot muscles.[3]Stability of these arches is necessary for the normal foot function. Recently, the application of core stability concepts to the foot, which was first proposed by Jam [4] was further expanded describing the subsystems

of foot core.[3] The foot core system consists of passive, active and neural subsystem.

The passive subsystem of the foot core consists of the bones, ligaments and joint capsules that maintain the arches of the foot[3]. The active subsystem consists of the extrinsic and intrinsic muscles and tendons that attach on the foot[3].The intrinsic foot muscles provide local dynamic support to the arches while extrinsic muscles indirectly help in supporting arches.[5]The neural subsystem consists of the sensory receptors in the plantar fascia, ligaments, joint capsules, muscles and tendons involved in the active and passive subsystems. Recently, it has been suggested that plantar intrinsic muscles might have a role in providing sensory information regarding foot posture via stretch response.[3]

There are various methods which are available to classify foot posture. Arch Index is one of the reliable and valid method to classify the foot [6,7,8,9,10]. Also, it was found to be strongly correlating with Gold standard radiological measures like Normalised Navicular height[6].

Dynamic balance involves stabilizing the body when the support surface is moving or when the body is moving on a stable surface[11].Dynamic balance is required for many day to day activities as well as in complex activities like sports. Dynamic balance is achieved by integrated action of the central and peripheral components of the nervous system[15,16].Peripheral components of nervous system consist of somatosensory, visual, and vestibular systems which provide perception of body orientation in space[11].Foot form a part of lower limb kinetic control chain which provide part of somatosensory input to maintain balance. The few studies available on this topic have contrasting results.[25,40] So, study was undertaken to understand effect of foot posture on Dynamic balance.

Method

Materials:- Black ink and sponge**,** Graph paper**,** Measuring tape**,** Marker pen**,** Stop watch**,** Auto Cad 2014

Study procedure :- 175 Healthy young individuals were chosen from Tertiary care center. Procedure explained to all individuals and written consent taken. Subjects assessed for inclusion and exclusion criteria.

Inclusion criteria : Asymptomatic young individuals in the age group of 18-25 years.

Exclusion criteria :Any past history of injury or treatment of the lower limb, Any neurological or vascular de f cit affecting balance, Pain and swelling near ankle and foot, Visual or vestibular impairment.

For calculating Arch Index foot prints were taken for both feet. While taking foot print subject was told to take equal weight on both the feet. Foot axis was drawn on the foot print from center of heel to tip of the second toe. Perpendiculars were drawn to the anterior and posterior aspects of footprint excluding toes. Then foot axis was divided into three equal parts[6,7]. Then these footprints were scanned using HP Inkjet scanner. Using Auto Cad 2014, areas of the three parts were calculated. Arch Index is obtained by dividing area of middle section by area of whole foot print. The foot was classi f ed as normal if AI lies between 0.21-0.26, pronated if AI was greater than 0.26 and supinated if AI was less than 0.21[6,7] .

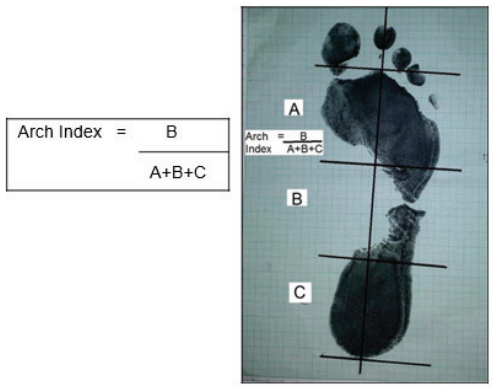
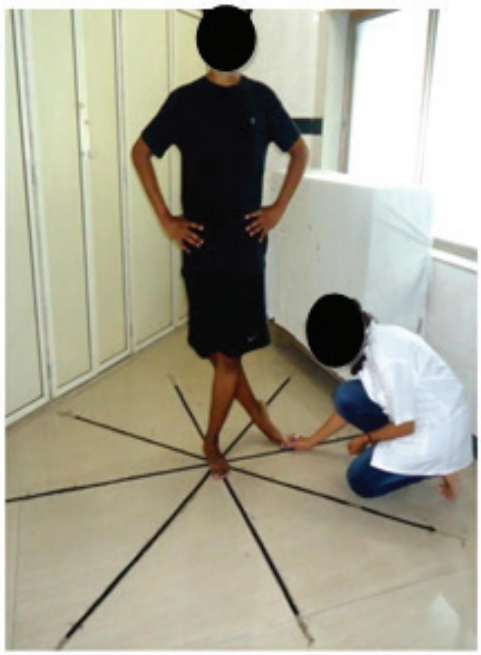


Figure 1

For SEBT, star shaped grid was prepared on the f oor using sticking tapes. The grid consists of eight lines of 1m extending out at 45 degrees from each other. Subjects were allowed to practice reaching in each of the eight directions three times with each leg before the actual trial. Then 5 minutes rest pause was given to avoid learning effect. Subjects were asked to stand in the middle of the grid with right foot f rst. Subjects began with anterior direction and progressed counter clockwise, Similarly, test for Left leg done. Three test trials given each leg and distance is noted. Normalised SEBT distances were found out by dividing each of the distance with limb length of respective leg[23]

SEBT FOR RIGHT LOWER LIMB

Figure 2



SEBT FOR LEFT LOWER LIMB

Figure 3

Findings

Each foot was taken as one individual subject making total of 350 (175 right,175 left feet).The Arch indices of stance feet correlated with SEBT reaching distances of contralateral reaching limb in 8 directions.

The data was assessed for normality using the Shapiro-Wilk's test. The data was not normally distributed. So, non parametric tests, i.e spearman's rho correlation test were used for all the analysis.

Table 1: CORRELATION BETWEEN ARCH INDEX AND NORMALISED SEBT DISTANCES:-

SEBT Direction	Supinated Foot	Pronated Foot	Normal Arched Foot
Anterior	Spearman Rho	Spearman Rho	Spearman Rho
	r = -0.260,	r=.296	r=.149
	p=0.033	p=0.01	p=0.66
Anteromedial	Spearman Rho	Spearman Rho	Spearman Rho
	r=-0.203	r=0.277,	r=0.171
	p=0.1	p=0.001	p=0.035

Cont... **Table 1: CORRELATION BETWEEN ARCH INDEX AND NORMALISED SEBT DISTANCES:-**

Medial	Spearman Rho	Spearman Rho	Spearman Rho
	r=-0.176	r=0.296	r=0.134
	p=0.153	p=0.001	p=0.099
Posteromedial	Spearman Rho	Spearman Rho	Spearman Rho
	r=-0.142	r= 0.041	r=0.168
	p=0.250	p=0.639	p=0.138
Posterior	Spearman Rho	Spearman Rho	Spearman Rho
	r= -0.093	r=0.041	r=0.202
	p=0.454	p=0.663	p=0.012
Posterolateral	Spearman Rho	Spearman Rho	Spearman Rho
	r=0.260	r= -0.341	r=0.207
	p=0.033	p=0.01	p=0.10
Lateral	Spearman Rho	Spearman Rho	Spearman Rho
	r=0.201	r= -0.369	r=0.266
	p=0.102	p=0.01	p=0.01
Anterolateral	Spearman Rho	Spearman Rho	Spearman Rho
	r=-0.209	r=0.156	r=0.208
	p=0.089	p=0.75	p=0.01

* Highlighted in Orange & yellow are the values referring to weak +ve & -ve correaltion respectively

Discussion

The study included 175 subjects (350 feet) in the age group of 18-25 yrs. Out of 350 feet in this study, 130 were pronated, 67 were supinated and 153 were normal arched.

A weak negative correlation was found between pronated foot of stance limb and reach distance by reaching limb in Posterolateral and Lateral direction. These findings are partially in consistence with the previous studies in which they have found that pronators reached farther SEBT distance compared to neutrals and supinators in Anterior direction and farther than neutral but not supinator in Anteromedial direction[24].

Another study comparing dynamic balance between normal and fat feet individuals found that SEBT reach distance was significantly less for the fat feet individuals in Lateral direction which is similar to our findings[25].

A recent study on relationship with balance, foot posture and foot size in students of physical education school found a small negative correlation between dynamic balance and foot posture[36].

Under normal conditions, somatosensory and visual systems are primary mediators of postural awareness and balance control[17]. Balance responses are task and context dependent and are triggered by CNS weighting based on availability, timing and accuracy of specific

sensory inputs[37].Reaching in posterior SEBT directions lacks visual awareness[18].Hence,as per sensory weighting theory in case of decreased contribution of visual system increased demand is put on somatosensory system.

Somatosensory afferents are provided by peripheral mechanoreceptors (ie skin, ligaments, muscles, and joints receptors)[19].Since,our study included healthy young individuals and also we had excluded subjects according our exclusion criteria, cutaneous afferents and proprioceptive afferents from ligaments and joints were normal. The possible altered afferent could be from mechanoreceptor of foot muscles.

In case of pronated foot posture, foot tend to collapse on the medial aspect. This affects the length tension relationship of intrinsic foot muscles, they become lengthened and weak.In the recent study, it is been stated that foot intrinsic muscles not only supports medial longitudinal arch but also provide immediate sensory information via stretch response about changes in foot posture[3].Thus, the lengthened intrinsic muscles possibly are unable to perform this sensory function effciently in pronated foot.

This study has also got negative correlation for only lateral and posterolateral and not for other posterior reach direction which also lacks visual awareness. The reason behind it could be balance strategies used for different task are different depending upon nature of task[17].In case of SEBT lateral and posterolateral reach direction, reach involves rotatory component of reaching limb which tend to displace center of gravity far outside base of support making task difficult as compared to other posterior reach direction which does not involve any rotatory component.

The small positive correlation was seen in Anterior and Medial directions for pronator group in this study. The reason behind it could be, pronated foot leads to widened base of support which might have some advantage. Thus, it was suggested in one of the study that mediolateral stability is slightly better in pronated foot as compared to neutrals[38].Additionally,in case of Anterior and Medial direction, visual system also contributes to balance through feedback mechanism[19].So,probably because of contribution of visual system, somatosensory system is not stressed to that extent for reaching in Anterior and Medial directions. Therefore, pronated foot might have affected less for these directions.

There is no correlation found between reach distance in any direction and Arch index for supinated foot group. This could be because of unequal number of pronated, supinated and normal arched feet. The finding of less supinated feet in this study can be attributed to the fact that slightly pronated foot posture is common in adult population[41].

Conclusion

Increased Arch Index (i.e. >0.26) i.e. Pronated foot posture affects dynamic balance in Posterolateral and lateral directions of Star Excursion Balance Test (SEBT)

Clinical Implication:- Foot posture should be considered while designing rehab protocol for even normal athletes. Balance training specific to foot posture specifically for pronated foot should be included.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: G.S Medical College Ethics Committee

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A Study on Prevalence of Musculoskeletal and Work Related Risk Factors among Fish Processing Industry Workers in Mangalore: - A Community based Survey

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Abstract

Background: Fishing and fsh processing in India is a major industry in coastal states. Job demand in fshing industry involves awkward work postures, repetitive or continuous stresses on a worker's musculoskeletal system which makes them vulnerable for various work-related musculoskeletal disorders (WRMSDs). Several risk factors at workplace and in the work related task have been identifed to be strongly associated with WRMSDs, however there is limited retrievable literature identifying these risk factors in people involved fshing and fsh processing industry. **Objectives:** To fnd out the prevalence and association between WRMSD and task related ergonomic risk factors in fsh processing industry. **Studydesign:** Cross sectional study design. **Methods:** This cross sectional study was conducted among (n=83) various workers involved in the fsh processing industries along the coastal region of Southern Karnataka. NMQ which is a valid and reliable self-administrated questionnaire commonly used to identify WMSDs was distributed among the workers at their worksite. Subjects who had completed the NMQ with more than 90% response rate were included for data analysis, and task analysis was done by using REBA which was evaluated through tripod mounted motion capture camera. **Results:** The prevalence data in this study was collected using Nordic musculo-skeletal questionnaire, in which it was found that musculo-skeletal issues pertaining to neck and upper back were the most prevalent (52.9% each) in the period of past 12 months followed by lower back (51.8%), knee (42.4%), shoulder (31.8%), elbow (20%), wrist (16.5%) , ankle (15.3%) and Hips (7.1%). Of all the occupational categories analysed, the mean REBA score was the highest for cutting (6.88+ .32), whereas all the other categories had an identical mean score of 6.0+0 and the difference was found to be very highly signifcant. **Conclusion:** This study fnding showed the link between adverse effects of inadequate work conditions and musculoskeletal injuries in fshery industry.

Key words: *Fishing, Fish industry, workers, musculoskeletal problems*

Introduction

Fish processing industries, which include occupational activities such as harvesting, processing and marketing sector, have experienced tremendous growth in recent years[1]. It is a major source of employment, foreign exchange and income for the livelihood for a large number of people in the coastal areas of India[2]. Fishing and related industries occupy a signifcant role in the national economy[3]. The fsh processing work involves varied tasks such as sorting (segregate different kinds of fshes), peeling (removing the shells and skins), ring cutting (cutting of processed fshes in the form of a ring). grading (segregate the fshes depending on their weight and sizes), and packing (wrapping either the whole

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fshes or the processed fshes by packing paper and put them in boxes) for delivery[4]. Most of the tasks related to fsh processing require manual exertion, involving high repetition, awkward postures, continuous force application, and use of various tools and instruments[5]. Other factors which have been found to signifcantly correlate to occurrence of WRMSD n general worker population are poor relationship with work mates, length of employment, gender, age, inadequate rest period, and various ergonomic stressors[6]. Studies done in India have shown a high prevalence (71%) of pains and discomfort in various areas of the body among female employees in fsh processing industries. Upper back was found to be the most vulnerable region followed by, knee, lower back, neck, hand and calf. Nature of the work, psychosocial factors, occupational hazards present in the work environment have been attributed to the occurrence of work-related musculoskeletal disorder among workers involved in fsh processing industry in India[7-8]. A study done among fsh trimmers of a fsh processing industry in Ghana showed the prevalence of musculoskeletal problems and sick leaves due to musculoskeletal injuries to be common in workers[9]. Another study done in Sweden to identify the association between various risk factors and disorders of neck and upper limbs among women in the fsh processing industries found 35% prevalence for neck and upper extremity conditions in exposed women. They also found a pronounced dose response relationship between disorders of neck or shoulders and duration of employment[10-11]. Though fsh processing, for local consumption as well as for export has been a major employment generator among people of either gender along the coastal regions, to date there have been no published literature studies on work related musculo-skeletal issues in these population[12-13]. Aim of this study to fnd the association between ergonomic risk factors and prevalent musculoskeletal conditions in fsh processing industry population.

Materials and Method

A Cross-Sectional was conducted among workers working in fsh processing industries for minimum of one year with age ranging from 19 to 60 years both male and female who are free from history of musculoskeletal problems based on validated kannada version of Nordic musculoskeletal questionnaire. Prior to data collection ethical clearence was obtained (IEC KMC MLR 11-16/295). Upon approval, a total of 5 fsh processing centres were approached for permission from the administrative authorities to recruit subjects for the study. On obtaining permission from authorities all subjects within each centre were explained about the study in detail. Those subjects willing to participate were screened based on inclusion and exclusion criteria upon signing a written informed consent, and those who were eligible were recruited for study. Inclusion criteria were: Age ranging between 19 to 60, both male and female, workers with one year of experience in fsh processing industries. Exclusion criteria were: Subjects with history of or diagnosed with musculoskeletal disorders not related to work, subjects who have undergone previous surgical interventions for musculoskeletal conditions.

Phase I :

Nordic musculoskeletal questionnaire

A validated kannada version of the Nordic musculoskeletal questionnaire were distributed among the participants and they were instructed on how to complete the questionnaire. Those subjects who are illiterate or fnding diffcult to comprehend the content of questionnaire were explained and delivered using therapists administered Nordic musculoskeletal questionnaire.

Phase II :

Rapid entire body assessment scale (REBA)

Each occupational task involving fsh processing was separately recorded using two tripod mounted motion capture cameras set at an optimal distance so as to capture the image of the entire body of the worker while the task was being performed from two different planes, i.e. Sagittal and Frontal. Photographs and videos obtained were analyzed using Kinovea software (v0. 8.15) and evaluated for risk factor using REBA scale.

SCORE LEVEL	LEVEL OF MSD RISK
1	Low risk, change may be needed
2-3	Negligible risk, no action required
4-7	Medium risk, further investigation, change soon
8-10	High risk, investigate and implement needed
11	Very high risk, implement change

Statistical Analysis: Chisquare test was used to check the strength of association. One way anova was used to check the REBA scores.

Finding

Table 1- Association between task type and prevalence of pathologies

SYMPTOMS	TASK TYPE				CHI SQUARE	p* VALUE
	MANIPULATIVE		MATERIAL HANDLING			
	YES	NO	YES	NO		
Neck	51.6%(33)	48.4%(31)	57.1 % (12)	42.9 % (9)	1.98	0.6
Shoulder	48.5%(31)	51.6%(33)	38.1% (8)	61.9%(13)	0.681	0.40
Elbow	65.6%(42)	34.4%(22)	71.4%(15)	28.6%(6)	0.241	0.620
Wrist /hand	65.6%(42)	34.4%(22)	71.4%(15)	28.6%(6)	0.241	0.620
Upper back	46.9%(30)	53.1%(34)	71.4%(15)	28.6%(6)	3.826	0.047
Lower back	59.4%(38)	40.6%(26)	28.6%(6)	71.4%(15)	6.009	0.02
Hips/thighs/buttocks	9.4% (6)	90.6%(58)	00	100%(21)	2.11	0.05
Knees	50%(32)	50%(32)	19%(4)	81%(17)	6.205	0.014
Ankle/feet	20.3%(130	79.7%(51)	00	100%(21)	5.036	0.014

* Signi f cant <0.05

Table 2. Prevalence of musculoskeletal problems among study participants

Region			% of population	Number of affected subjects
Neck	1 YR		52.9	45
	1 WK		21.2	18
Shoulder	1 YR	Rt	18.8	16
		Lt	3.5	3
		Bt	31.8	27
	1 WK	Rt	15.3	13
		Lt	1.2	1
		Bt	8.2	7
Elbow	1 YR	Rt	20	17
		Lt	5.9	5
		Bt	10.6	9
	1 WK	Rt	17.6	15
		Lt	1.2	1
		Bt	3.5	3
Wrist/Hand	1 YR	Rt	16.5	14
		Lt	3.5	3
		Bt	12.9	11
	1 WK	Rt	15.3	13
		Lt	2.4	2
		Bt	2.4	2
Upper back	1 YR		52.9	45
	1 WK		27.1	23
Lower back	1 YR		51.8	44
	1 WK		27.1	23
Hip/ Thigh /Buttocks	1 YR		7.1	6
	1 WK		7.1	6
Knees	1 YR		42.4	36
	1 WK		18.8	16
Ankle/Feet	1 YR		15.3	13
	1 WK		11.8	10

YR; year, WK;week, Lt; left, Rt; right, Bt; both

Table 3 - Prevalence of Musculoskeletal Pathologies In Various Type Of Work

REGION AFFECTED	NECK		UPPER BACK		LOWER BACK	
TYPE OF WORK	1 YEAR (n)	1 WK (n)	1YEAR (n)	1 WK (n)	1YEAR (n)	1 WK (n)
Loading and unloading	57.1% (12)	19.04% (4)	71.42% (15)	14.28% (3)	28.6% (6)	9.5% (2)
Cutting	92.30% (24)	23.07% (6)	57.7% (1)	30.8% (8)	69.2% (18)	34.6% (9)
Packing	20% (3)	13.33% (2)	26.7% (4)	26.75% (4)	46.7% (7)	26.7% (4)
Segregating	17% (6)	21.73% (5)	47.8% (11)	34.85 (8)	56.5% (13)	34.8% (8)

Table 4 - Prevalence of Musculoskeletal Pathologies In Various Type Of Work

REGION AFFECTED	SHOULDER					
	1 YEAR			1 WK		
TYPE OF WORK	R (n)	L (n)	B (n)	R (n)	L (n)	B (n)
Loading and unloading	4.76% (1)	14.28% (3)	42.85% (9)	00	14.28% (3)	4.76% (1)
cutting	11.53% (3)	00	50% (13)	11.53% (3)	0	11.53% (3)
Packing	66.66% (10)	00	13.3% (2)	60% (9)	0	10.33% (2)
Segregating	8.69% (2)	00	13.04% (3)	4.34% (1)	0	4.34% (1)

TABLE 5: ERGONOMIC RISK FACTOR AMONG TASK TYPE USING REBA ANALYSIS

	Group	Neck Position Score		Trunk Position Score				Legs		Look Up Posture		Force			Score A	
		+1	+2	+1	+2	+3	+4	+1	+2	+2	+6	+0	+1	+2	+5	+6
Number of Subjects	Manipulative	00	64	00	00	00	64	00	64	9	55	23	41	00	41	23
	Material Handling	00	21	00	00	00	21	00	21	4	17	00	21	00	21	00
	Total	00	85	00	00	00	85	00	85	13	72	23	62	00	62	23

	Group	Upper Arm Position			Lower Arm Position		Wrist		Table B Score		Coupling Force		Table C		Reba Activity Score		
		+1	+2	+3	+1	+2	+1	+2	+4	+5	+1	+2	+5	+6	+6	+7	
Number of Subjects	Manipulative	00	00	64	00	64	23	41	41	23	64	00	41	23	41	23	
	Material Handling	00	00	21	00	21	00	21	21	00	21	00	21	00	21	00	
	Total	00	00	85	00	85	23	62	62	23	85	00	62	23	62	23	

TABLE 6: Comparison of REBA Scores between Various Type Of Work

REBA COMPARISION BETWEEN TYPE OF WORK	Mean Difference	Significance
cutting v/s loading unloading	0.88462*	0.000
cutting v/s packing	0.88462*	0.000
cutting v/s segregating	0.88462*	0.000
Loading &unloading v/s segregating	0.88462*	0.00
Loading v/s packing	0.06119	1.00
Segregating v/s packing	0.06007	1.00
Packing v/s Loading	0.06119	1.00
Packing v/s Segregating	0.06007	1.00

Discussion

The prevalence data in this study was collected using Nordic musculo-skeletal questionnaire, in which it was found that musculo-skeletal issues pertaining to neck and upper back were the most prevalent (52.9% each) in the period of past 12 months followed by lower back (51.8%), knee (42.4%), shoulder (31.8%), elbow (20%), wrist (16.5%) , ankle (15.3%) and Hips (7.1%). (71.4%) of subjects involved in material handling had reported symptoms pertaining to elbow, wrist and hand and 57.1% reported symptoms of the neck[5].

In the manipulative task subcategory it was found that 65% of the subjects reported symptoms pertaining wrist and hand and 51.6% of them reported those pertaining to neck.

A statistically signi f cant association between upper back symptoms and occupational categories (p=0.047). It was found that 71.4% subjects in the material handling group reported upper back symptoms whereas only 40.6% of those involved in manipulative task reported the same. Lower back symptoms were surprisingly found to be signi f cantly associated (p=0.02) with manipulative tasks with 59.4% of subjects reporting low back pain symptoms compared to 20.6% in material handling category.

The median REBA score in this occupational category was found to be 6.0 (IQR 6,7), with 72.9% of the population having REBA f nal score of 6 and 27.1% of the subjects having a score of 7, meaning all the occupational categories had a score of 6 or higher. A REBA score of 4-7 is considered to be medium risk, which warrants further investigation, and recommends/ predicts changes in occupational practice patterns sooner.

Of all the occupational categories analyzed, the mean REBA score was the highest for cutting (6.88+0.32), whereas all the other categories had an identical mean score of 6.0+ 0.00 and the difference was found to be very highly signi f cant (p<0.001). Our statistical analysis found that individual REBA components showed highly signi f cant difference when cutting was compared with other type of works, but the differences were not signi f cant when other types of works were compared against each other[14].

Conclusion: From this study it could be concluded that among the workers involved in f sh processing works along the Dakshina Kannada coast, there is a high prevalence of musculo-skeletal disorders, with upper back, lower back, and neck being the most affected regions. Risk analysis using REBA revealed that all types of work expose the worker to a 'medium level' risk. Cutting was found to have a minimal but statistically signi f cant higher risk when compared to other tasks.

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Conflict of Interest: Nil

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The Efficacy of Sleeper's Stretch and Movement with mobilization on Pain, Range of Motion & Functional Capacity in Patients with Adhesive Capsulitis

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Abstract

BACKGROUND: The pathological changes in adhesive capsulitis occurs surrounding the intrinsic structure tightness. Movement with mobilization mostly works on intracapsular & sleeper's stretch mainly acts on capsule. There are some studies which supports that M.W.M. is more effective in patients with adhesive capsulitis. At the same time, some studies have been done which proves sleeper's stretch to be beneficial in capsular tightness. As a result, present study thought to determine the combined effects of M.W.M.& Sleeper's Stretch on adhesive capsulitis. OBJECTIVES: To find the effects of M.W.M. on R.O.M., pain and functional disability in populations with adhesive capsulitis. To find the effects of M.W.M. and sleeper's stretch on R.O.M., pain and functional disability in populations with adhesive capsulitis. To compare the effects of M.W.M. and M.W.M. with sleeper's stretch on R.O.M., pain and functional disability in populations with adhesive capsulitis. METHODOLOGY: A Randomized, controlled, single blinded study, 50 patients with adhesive capsulitis were selected based on the inclusion and exclusion criteria. Pre -assessment of pain, R.O.M. and disability index had been taken. The patients are randomly allocated into two groups. 25 patients in Group 'A' with adhesive capsulitis was treated with M.W.M. alone where as another 25 patients in Group 'B' with adhesive capsulitis was treated with M.W.M. plus, sleeper's stretch. Both the groups were given the conventional therapy which includes hot packs, pendular exercises, finger ladder exercises and active range of motion exercises. Post assessment was done. RESULTS: In total, 50 patients were randomized to the study interventions. The flexion R.O.M. in pre and post mean values of Groups 'A' and 'B' are 18.41 and 29.16, P value is 0.04. The internal rotation R.O.M. in pre and post mean values of Groups 'A' and 'B' are 7.72 and 14.44, P value is 0.09. The external rotation R.O.M. in pre and post mean values of Groups 'A' and 'B' are 13.72 and 16.85, P value is 0.39. In SPADI, Pre & Post mean values of Group 'A' & Group 'B' are 16.83 and 24.41 respectively, P value is 0.28. In NPRS, Pre and post mean values of Groups 'A' and 'B' are 2.72 & 2.88 respectively, P value is 0.02. CONCLUSIONS: Adding sleeper's stretch with M.W.M. to standard therapy for adhesive capsulitis may offer significant advantages.

***Keywords*:** *Adhesive Capsulitis, Range of motion, Disability, M.W.M., Sleeper's stretch & Pain.*

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Introduction

The shoulder complex consists of several anatomical joints & one physiological joint. The shoulder joint is the articulation between the head of the humerus & glenoid fossa of the scapula, which includes the structure contributes to the function of the joint: bones, ligaments, muscles, tendons & bursae[1]. It is a synovial joint of ball and socket variety. The shoulder is a unique anatomical

structure with an extraordinary range of motion that allows us to interact with our environment[2].

The term adhesive capsulitis was introduced by Nevaiser in 1945 to describe shoulder stiffness due to inflammation, fibrosis & capsular contracture[3].Adhesive capsulitis is an enigmatic condition characterized by painful, progressive and disabling loss of active and passive glenohumeral joint range of motion in multiple planes. It is often more prevalent in women, individuals 40 - 65 years old with an occurrence rate of approximately 2 - 5 % in the general population[2] and 10 - 20 % of the diabetic population. The condition is associated with synovitis and capsular contracture of the shoulder joint. The patients presenting with adhesive capsulitis will often report an insidious onset with a progressive increase in pain & gradual decrease in active and passive range of motion[4].

Physiotherapy management of patients with adhesive capsulitis may vary in many ways from management of patients with other shoulder conditions. Conventional physiotherapy for adhesive capsulitis includes hot packs, Codman's pendular exercises, finger ladder exercises and active range of motion exercises[5]. Manual Therapy had been demonstrated to reduce pain and improve function in patients with adhesive capsulitis. Joint mobilization techniques are assumed to induce various beneficial effects including neurophysiological, biomechanical and mechanical effects[6]. Mulligan's movement with mobilization have been proved to be more beneficial in adhesive capsulitis[7]. These techniques possess the sustained application of a manual "gliding force" to the joint in order to repositioning bone positional faults by enabling physiological movement. For shoulder joint, there are total 5 - 6 techniques in mulligan for increasing the range and to reduce the pain[8]. Recent research states that, sleeper's stretch and cross body stretch are used to stretch the posterior shoulder tightness in order to improve internal rotation of shoulder joint in posterior capsule tightness[9,10].

Movement with mobilization mostly works on intracapsular and sleeper's stretch mainly acts on capsule. So, present study is intended to find out the combined effects of movement with mobilization and Sleeper's stretch.

Methods

The study was a simple random sampling in experimental design. Trial was conducted at Health Centre in Savitribai Phule Pune university, Pune & Out Patient Department, Dr.D.Y. Patil College of Physiotherapy, Pune. Subjects with adhesive capsulitis stage 1 & 2 (David J Magee) were included between the age groups of 40 to 70 years with minimum 90 degrees of shoulder flexion and abduction. Subjects possess malignancy, neck pain with radiculopathy and recent shoulder injuries are excluded from the study. For the study purpose, goniometer and mulligan belt was utilized.

Procedure

***Movement with mobilization*:** The techniques of mobilization was administered as per as follows,

Glide to increase external rotation: Subject were made to supine lying with scapula stabilized at the edge of the plinth. Therapist was standing by the side of the patient. Patient's elbow and shoulder are placed 90 degrees of flexion. Therapist grasps the distal humerus with both hands. Mobilizing belt are kept close to the patient's shoulder line and secure around the therapist waist. Now, therapist pull the mobilizing belt by shifting his weight backwards in order to distract the joint laterally. Meanwhile, patient performs the external rotation and apply passive overpressure at the limit of the active range.

Glide to increase internal rotation: Subjects were made to supine lying with scapula stabilized at the edge of the plinth. Therapist was standing by the side of the patient. Patient's elbow and shoulder are placed in 90 degrees flexion & therapist grasps the distal humerus with both hands. Mobilizing belt are kept close to the patient's shoulder line and secured around the therapist waist. Now, therapist pull the mobilizing belt by shifting his weight backwards in order to distract the joint laterally. Meanwhile, patient performs internal rotation and apply passive overpressure at the limit of the active range.

Glide to increase flexion: Subject were made to stand with arms placed against the wall. Therapist stands behind the patient with both hands placed over the scapula for fixation. Mobilization belt were wrapped

over the patient's shoulder & therapist back. Now, therapist pull the mobilization belt by shifting his weight backwards in order to distract the joint posteriorly. Meanwhile, patient performs anterior pelvic tilt.

Sleeper's Stretch: The techniques of mobilization was administered as per as follows,

Stretch to increase internal rotation: Subject were made to supine lying. On the affected side, humerus was elevated to 90 degrees by supporting the surface. Then, subjects himself had to rotate the humerus internally by using other hand for 5 repetitions. Each repetition is for 30 seconds.

Pre and post interventional assessment for range of motion, pain & disability was measured

by goniometer, numerical pain rating scale (NPRS) and shoulder pain & disability index (SPADI) respectively. No funds are granted from funding agency for this study.

Findings

Table 1: Comparison of Pre-test and Post-test values within group for ROM Parameters

Group	Study Parameter	Pre- Test			Post-Test			P- Value (Within group)
		Mean	SD	SEM	Mean	SD	SEM	
Group `A'	Flexion	102.36	10.46	2.09	120.76	12.28	2.46	0.152
	Internal Rotation	44.28	8.64	1.71	52	8.64	1.73	0.081
	External Rotation	53.28	14.3	2.86	67	14.33	2.87	0.086
Group `B'	Flexion	101	10.36	2.07	130.16	13.89	2.78	0.002
	Internal Rotation	39.96	10.66	2.13	54.4	7.74	1.55	0.092
	External Rotation	47.2	8.61	1.72	64	7.51	1.5	0.002

Table 2: Comparison of Pre-test and Post-test values between groups for ROM Parameters

Study Parameter	Mean difference (Post – Pre)		SD		SEM		P–Value (Between Groups)
	Group 'A'	Group 'B'	Group 'A'	Group 'B'	Group 'A'	Group 'B'	
Flexion	18.41	29.16	13.58	11.47	2.72	2.29	0.04xx
Internal Rotation	7.72	14.44	6.15	10.81	1.23	2.16	0.09xx
External Rotation	13.72	16.85	16.31	7.32	3.26	1.46	0.393, NS

xx: Signifcant at 1% level of signifcance, NS: Not Signifcant

Table 3: Comparison of Pre-test and Post-test values within group for N.P.R.S. Parameters

Group	Study Parameter	Pre- Test			Post-Test			P- Value (Within group)
		Mean	SD	SEM	Mean	SD	SEM	
Group `A'	N.P.R.S.	6.8	0.866	0.173	4.08	0.997	0.199	<0.001
Group `B'	N.P.R.S.	7.04	1.62	0.324	3.96	1.675	0.335	<0.001

Table 4: Comparison of Pre-test and Post-test values between groups for N.P.R.S. Parameters

GROUP	Study Parameter	Mean difference (Post – Pre)	SD	P–Value (between groups)
Group 'A'	N.P.R.S.	2.72	0.78	<0.001XX
Group 'B'	N.P.R.S.	2.88	3.11	

Table 5: Comparison of Pre-test and Past-test values within group for S.P.A.D.I. Parameters

Group	Study Parameter	Pre- Test			Post-Test			P–Value (between groups)
		Mean	SD	SEM	Mean	SD	SEM	
Group 'A'	S.P.A.D.I.	57.26	18.723	3.745	37.8	14.758	2.948	<0.001
Group 'B'	S.P.A.D.I.	70.83	10.281	2.056	46.42	9.447	1.889	<0.001

Table 6: Comparison of Pre-test and Post-test values between groups for S.P.A.D.I. Parameters

GROUP	Study Parameter	Mean difference (Post – Pre)	SD	P–Value (between groups)
Group 'A'	S.P.A.D.I.	16.83	8.79	<0.001XX
Group 'B'	S.P.A.D.I.	24.41	12.89	

ROM

On range of motion Group 'A' shows all movements (i.e. fexion, internal rotation & external rotation) had increased signifcantly. Within that, fexion range had increased more signifcantly than internal & external rotation. P value is signifcant and same for all range of motion. Whereas in Group 'B' all movements had increased signifcantly & P value was same for all range of motion. While seeing the mean difference between the groups, group 'B' showed more increase in fexion and internal rotation as when compared to group 'A' with P value of 0.04 and 0.09 respectively. There was less difference in external rotation as when compared in both the groups with the P value of 0.393. Here unpaired

't' test was used.

NPRS

On NPRS, both groups showed significant improvement in pre and post treatment evaluation. While seeing the mean difference among group 'A' & 'B', Group 'B' patients had more significant improvement in NPRS with P value of 0.02 as whecompared to group 'A' patients.

SPADI

On SPADI, both groups showed significant improvement in pre and post treatmentevaluation. While seeing the mean difference among group 'A' & 'B', there was less difference notedwith the P value of 0.28. Here unpaired 't' test was used.

Group	Study Parameter	Pre- Test			Post-Test			P- Value (within group)
		Mean	SD	SEM	Mean	SD	SEM	
Group 'A'	Flexion	102.36	10.46	2.09	120.76	12.28	2.46	0.152
	Internal Rotation	44.28	8.64	1.71	52.00	8.64	1.73	0.081
	External Rotation	53.28	14.30	2.86	67.00	14.33	2.87	0.086
Group 'B'	Flexion	101.00	10.36	2.07	130.16	13.89	2.78	0.002
	Internal Rotation	39.96	10.66	2.13	54.40	7.74	1.55	0.092
	External Rotation	47.20	8.61	1.72	64.00	7.51	1.50	0.002

Discussion

Aim of this study was to investigate the combined effects of Sleeper's stretch and MWM in improving shoulder ROM, pain and disability in adhesive capsulitis over 5 days of treatment. There were two groups of 25 patients each with adhesive capsulitis. Group 'A' received MWM and Group 'B' received MWM along with sleeper's stretch. Both were given conventional treatment such as hot packs, pendular exercises and AROM exercises of shoulder. There was significant improvement in ROM, pain and SPADI scores in both groups.

In group 'A' ,25 patients with adhesive capsulitis were randomly treated by MWM for ROM, pain and disability. There was significant improvement in ROM, pain and disability. In group 'B', sleeper's stretch with MWM was added to check the combine effect. Patients in this group had significant improvement in ROM, NPRS and SPADI. Ranges were compared between the group 'A' and 'B' shows, significant improvement in flexion and internal rotation was seen in group B with p values 0.04 and 0.09 respectively. Whereas external rotation shows less improvement with p value of 0.393. Decrease in pain intensity was seen in group 'A' with p value of <0.001 and in group 'B' with p value of <0.001 was seen. This was observed due to MWM analgesic effect and hot pack application in both the groups. There was significant improvement seen in NPRS scores in group 'B' when compared to group 'A' with p values of 0.02. This may be because of sleeper's stretch is proved to have relaxation effect supported by study done

by Shaik Raheem Sahib et. al in year 2015. There was signi f cant difference in pre and post SPADI within the groups. This might be due to reduction in pain intensity and increase in stretch ability of soft tissues. There was no signi f cant difference seen in SPADI scores as when compared between group 'A' and group 'B'. This might be due to duration of intervention.

Gokhan Doner et al in his study "Evaluation of MWM for adhesive capsulitis of the shoulder'' in the year 2013 stated that MWM has advantage of increasing ROM in addition to providing analgesic effect. This study also supports the ROM and SPADI scale outcome measures. Ankita Mehta et. al in her study "Passive stretching exercises vs MWM for pain, ROM and disability of adhesive capsulitis" in the year 2018 stated that pain is due to minor positional faults of the joint resulting in movement restrictions. MWM provide a passive pain free range and corrective joint glide with an active pain free movement. According to her study, MWM group had signi f cant improvement when compared to passive stretching group. This study also supported the outcome measures such as NPRS, Goniometer and SPADI.

A study " Comparison of conventional therapy versus sleeper's stretch with conventional in adhesive capsulitis" done by Kedar Sule , Manisha Rathi reported that sleeper's stretch helped in improving f exion, extension, internal rotation, external rotation more as compared to conventional therapy alone , due to stretching of the posterior capsule and musculature thus increasing the ranges . Improvement in internal rotation was due to selectively stretching posterior soft tissue. David Linth et al in their study found that, internal rotation de f cit caused by soft tissues adaptations can be addressed by consistent participation in stretching program focused on internal rotation. Improvement in external rotation might be due to increase in strength of muscles. From the above study, it is recommended to include sleeper's stretch with MWM in regular physiotherapy treatment for adhesive capsulitis patients in order to improve ROM and reduce pain.

Conclusion

According to the results of the present study, both movement with mobilization and sleeper's stretch are effective in the treatment of adhesive capsulitis. The group which received sleeper's stretch with MWM shows high signi f cant in improving range of motions and NPRS scores. Further studies can be done with longer duration of treatment. Scapulohumeral rhythm can be considered in future studies.

Abbreviations & Symbols

ROM range of motion

AROM active range of motion

NPRS numerical pain rating scale

SPADI shoulder, pain & disability index

< lesser than

> greater than

% percentage

Conflicts of Interest: None declared.

Source of Funding: Self

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To Study the Combined Effect of Lumbar and Stabilization Exercises and Ift in Subjects with Chronic Low Back Pain- An Experimental Study

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Abstract

Background: IFT has been shown to be beneficial; in reducing pain and inflammation, hence in our study IFT is included as treatment modality

Methodology: Convenient sample of 30 patients diagnosed with chronic low back pain, were taken. Subjects were divided into two equal .Subjects in group A (STUDY GROUP) received combination of Lumbar stabilization exercises and IFT. Subjects in group B (CONTROL GROUP) received isometric Exercises for back extensors and IFT.

Conclusion: Combined therapy showed significant pain reduction and improvement in disability scores on oswestry disability index.

Keywords: *oswestry disability index, Combined therapy, interferential current, stabilization exercises*

Introduction

Spinal anatomy is a remarkable combination of strong bones, flexible ligaments, tendons, large muscles and highly sensitive nerves. Once we have back pain we're driven to know what's wrong and what it will take to relieve the pain and prevent a recurrence.[1]

The lumbar spine, If left uncorrected, these misalignments and faulty biomechanics of the lower spine can result in spinal injury and irreversible degenerative changes.[2]

Low back pain can be defined as "The pain in the spine or muscles of the low back". [3, 4]

Although acute LBP has a favorable prognosis, the effect of chronic LBP and its related disability on society is tremendous. Unlike acute LBP, chronic LBP serves no biologic purpose..[5,6]

In patients with low back pain in North India, 67% had psychosocial issues, 57% were in blue-collar jobs, 26% had to change/leave their profession, and 38% did not enjoy their present job. [7]

Back pain can be of various types depending upon the structures involved.[8,10,11]

Incidence/Prevalance:

Statistical surveys confirm that back pain in the community today is extremely common[57].

Most patients with back pain will respond to conservative treatment Recommendations for Treatment are[14]:

Bed Rest:

In a randomized, controlled study of patients with acute back pain and no neurologic deficits, the clinical outcome was no different in those treated with 2 days or with 7 days of bed rest, and the 2-day patients missed 45% fewer days of work .[16,17,18,19,20,21,22,23]

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Physical Therapy:

Rationale for physical therapy: The purpose of back exercises is to strengthen the trunk muscles, thereby stabilizing the spine.[24]

A better understanding regarding the extent of physiological and functional effects of more modern exercise techniques used in chronic low back pain rehabilitation, stabilization exercise training is considered an important area of research.[25]

Much of the rationale for using exercise to enhance lumbar stability is derived from the work of Bergmark and Punjabi.[26]

Richardson and Jull have described how joint protection and muscle control should ultimately lead to pain control.[27]

IFT has been shown to be beneficial; in reducing pain and inflammation, hence in our study IFT is included as treatment modality.[28]

Objective of the Study

To study the combined effect of lumbar stabilization and IFT in subjects with chronic low back pain.

Research Hypothesis:

Alternate Hypothesis: The group receiving Lumbar Stabilization with IFT will show significant improvement as compared to the group receiving IFT in subjects with chronic low back pain.

Null hypothesis: The group receiving Lumbar stabilization with IFT will not show significant improvement as compared to the group receiving IFT alone in subjects with chronic low back pain.

Methodlogy

A Convenient sample was carried out in S.D.M. College of Medical sciences and Hospital, Dharwad. Subjects were taken from physiotherapy, Outpatient department of the hospital.

Materials:

1. Data collection sheet.
2. Oswestry disability index.
3. Vectrostim Inteferential therapy unit.

Method of collection of data

Criteria for study

Inclusion Criteria:

1. Age group of 20 to 50 years.
2. Subjects with and Chronic back pain (more than 3 months) of either gender diagnosed and referred by the Orthopeadiscian

Exclusion Criteria:

1. Any history of severe trauma or medical condition
2. Contraindications for lumbar segmental exercises
3. Contraindications for IFT

Study Design: Experimental Study.

Study duration: 1 year.

Sample:

Convenient sample of 30 patients diagnosed with chronic low back pain and who were willing to participate in the study were taken.

Subjects were divided into two equal groups

Subjects in group A (STUDY GROUP) received combination of Lumbar stabilization exercises and IFT.

Subjects in group B (CONTROL GROUP) received isometric Exercises for back extensors and IFT.

“DO s” and “DONTS” were given to both the groups.

Procedure:

Ethical clearance was obtained from the insititutional ethical clearance committee prior to the study. All subjects with Chronic low back pain were assessed and those who fulfilled inclusion criteria were selected for study.

VAS and ODI These outcome measures were obtained on the 1st day before the treatment and at the 6th

week of treatment and were compared for analysis.

Procedure for IFT:

Testing, calibration of machine, position of patient and placement of electrodes.

IFT was given to both the groups at following parameters:

Carrier frequency: 4 KHZ.

Burst frequency: 1 to 10 hertz.

Vector Sweep: 90^0V.

Electrode arrangement: Quadripolar.

Electrode placement: Place around the area of pain in the back.

Treatment duration: 30 minutes.

After completion of IFT, lumbar stabilization were given.

Before starting with lumbar stabilization exercises subjects were asked to do warm-up for 10 minutes and CAT- CAMEL exercise were given.

PROCEDURE OF LUMBAR STABILIZATION EXERCISE

The goal is to reeducate the component missing in normal function and reduce activity of superficial muscles followed by reeducation of normal integration of activity of all trunk muscles into functions.

The treatment is given in 4 rehabilitation phases: [27]

Phase 1: Activation phase.

Here the patient is taught to cognitively perform skilled activation of deep muscle .we used the palpatory method for our study.[27]

Procedure to recruit Tranverse Abdominis.

Self-monitoring with palpation for desired response in the abdominal wall is essential in the learning process for cognitive control of Tranverse Abdominis, and this was thought to the patient.[27]

Feedback: Palpatory method.[27],Visual feedback.[27]

Procedure to recruit Lumbar Multifidus.[27]

Dosage for recruitment of Transverse Abdominis/ Lumbar Multifidus:

5-10 isometric contraction of Transverse Abdominis/ Lumbar Multifdus per session with 10 seconds hold time, done for 3 times per day.for twice a week.[27]

PHASE II: Skill Precision

Once the patient were able to perform independent contraction of local muscles the next phase was given to improve precision of task.[27]

Goals of Precision task:

1.Co activation of deep muscle.[27]

2.Coordination with breathing.[27]

3.Progression to static functional position

4.Progression to light dynamic tasks.[27]

PHASE III Superficial and deep muscle co activation:

Closed chain segmental control stage involves following procedures:

1. Training individual part of the antigravity weight bearing holding postures.

2. Weight bearing exercise in fexed postures.[27]

Open chain segmental control involves exercises like leg loading with hip fexion, extension, abduction or adduction in positions such as lying, side lying, sitting or standing.[27]

DOSAGE:

These exercises were given for 5-10 isometric contractions of repetitions with a hold of 10 seconds for twice a week. For 5 weeks a total program of 6 weeks was given[26, 27.] The exercises will be given as follows:

CURL UPS.

SIT UPS.

SIDE BRIDGE.

BIRD DOG EXERCISES.

PHASE IV: Functional reeducation

This is final phase of training and the patient is trained with lumbar stabilization exercises in the specific function which is based on the demands of the patient..[27]

GROUP B: was treated with Isometric exercises for back and IFT.

IFT will be given at above described parameters.

Isometric exercises for back extensors will be given as follows:

ISOMETRIC FOR BACK EXTENSORS.

Contraction will be held for 6-10 seconds, as a set of 20 repetitions per day for 6 weeks.

DO'S and Don't's were given to both the groups which included as follows:

1. Posture in sleeping
2. While rising from bed
3. Remaining in one position
4. Avoid sitting slouched on a chair
5. While driving in a car, the seat must be at comfortable distance from the pedals with your leg as straight as u can safely drive.
6. Do not carry too heavy weights
7. While lifting any object from the ground S bend your knees and pick up the object.

Results

Table1: Distribution of subjects according to gender in study groups

Group	Male	%	Female		Total
Control group	7	46.67	8	53.33	15
Study group	10	66.67	5	33.33	15
Total	17	56.67	13	43.33	30

Table 2: Comparison of control and study groups with respect to VAS scores by Mann Whitney U-test

VAS scores	Group	Mean	SD	Sum of ranks	U-value	Z-value	p-value
Pre test	Control group	7.5333	0.9904	228.50			
	Study group	7.5333	1.3558	236.50	108.500	-0.1659	0.8682
Post test	Control group	1.8667	0.8338	296.50			
	Study group	0.8667	0.8338	168.50	48.5000	-2.6546	0.0079*
Difference	Control group	5.6667	1.2344	184.00			
	Study group	6.6667	1.2910	281.00	64.0000	-2.0117	0.0443*

*Significant at 5% level of significance ($p<0.05$)

Table 3: Comparison of control and study groups with respect to ODI scores by Mann Whitney U-test

ODI scores	Group	Mean	SD	Sum of ranks	U-value	Z-value	p-value
Pre test	Control group	40.3180	16.8760	176.50			
	Study group	53.1333	12.1882	288.50	56.5000	-2.3228	0.0202*
Post test	Control group	14.5533	5.5008	296.50			
	Study group	8.3507	5.2396	168.50	48.5000	-2.6546	0.0079*
Difference	Control group	25.7647	15.7549	155.00			
	Study group	44.7827	10.4942	310.00	35.0000	-3.2146	0.0013*

*Significant at 5% level of significance (p<0.05)

Table4: Comparison of pre and post test VAS scores by Wilcoxon matched pairs rank sum test in study group

Test	Mean	Std.Dv.	Mean Diff.	SD Diff.	% of reduction in pain	Z-value	p-value
Pre	7.5333	1.3558					
Post	0.8667	0.8338	6.6667	1.2910	88.4956	3.4078	0.0007*

*Significant at 5% level of significance (p<0.05)

Table5: Comparison of pre and post test VAS scores by Wilcoxon matched pairs rank sum test in control group

Test	Mean	Std.Dv.	Mean Diff.	SD Diff.	% of reduction in pain	Z-value	p-value
Pre	7.5333	0.9904					
Post	1.8667	0.8338	5.6667	1.2344	75.2212	3.4078	0.0007*

*Significant at 5% level of significance (p<0.05)

Table 6: Comparison of pre and post test ODI scores by Wilcoxon matched pairs rank sum test in study group

Test	Mean	Std.Dv.	Mean Diff.	SD Diff.	% of reduction in disability	Z-value	p-value
Pre	53.1333	12.1882					
Post	7.2840	4.9750	45.8493	8.8627	86.2911	3.4076	0.0007*

*Signi f cant at 5% level of signi f cance (p<0.05)

Discussion

This study showed the results of two different types of interventions i.e. combined therapy and IFT alone in patients who were diagnosed to have chronic low back pain.

A total number of 30 subjects (n=30) with 15 subjects in each group were taken for the study. No attempt to randomization was done.

Table 1 depict the distribution of study subjects according to gender. Total males in control group were 7 and study group were 10, whereas, females in control group were 8 and study group were 5.

. Table 2 shows comparison of control and study group with respect to VAS scores, the VAS scores were taken at day 1 before the treatment and at the end of the 6th week after the intervention.

There was a signi f cant difference (p<0.05) seen in both the groups

When we compared the VAS (Table 4&5) and ODI(Table 6) scores in between the group, taking into consideration the pre and post values of intervention in both the groups, both these groups showed, reduction in pain after the intervention but, in the study group there was 88.49% reduction in pain on VAS(P<0.01) when compared to 75.22% (p<0.01) in control group, hence these reports state that there was highly signi f cant difference (p<0.01) seen in the form of reduction of pain in both the groups after the treatment, hence we assume that both forms of intervention have worked well in patients with chronic low back pain. When comparison was done with ODI scores within the group there was 86.29% reduction of disability on ODI scores (p<0.01) of study group, whereas in control group there was 63.90% (p<0.01) reduction of disability on ODI scores. Though there was highly signi f cant difference seen in the reduction of disability percentage (86.29%) when compared to study group pain. Hence lumbar stabilization exercises when added with IFT had shown more improvement when compared to conventional treatment of isometric exercises with IFT.

Almeida et al and G.C Goats quoted that IFT reduces pain by acting in the common aspects of theories proposed to explain the blockage of nociceptive stimuli in the dorsal horn of spinal cord which are by stimulation of Aβ myelinated f bers and the blockage of C amylinated nociceptive afferents, as well as increase the opioid release.

Paul W. Hodges, in his study shown similar changes in the activity. When people with CLBP catch a load that is predictable, however the earlier response of paraspinal muscles does not occur.

Hence we hypothesized that the coordinated activity of the deep spinal muscles play an important role in the f ne tuning of intersegmental motion of spine and pelvis.

Conclusion

Thus we conclude that:

1. Combined therapy treatment in subjects with chronic low back pain showed signi f cant pain reduction and improvement in activities of daily living on oswestry disability index.

2. Combined therapy showed significant pain reduction and improvement in disability scores on oswestry disability index.

Conflict of Interest – Nil

Source of Funding- Self

Ethical Clearance – Instituitional ethical committee

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Comparative Study of History Causes and Risk of Fall among Elderly People and People with Parkinson's Disease

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Abstract

Objective: This cross-sectional survey research compares history, causes, and risk of fall among normal ambulatory individuals and Parkinson's disease patients aged above 50 years during the last one year.

Materials and Method: This survey includes 100 participants, which were equally distributed into two groups. Both groups were interviewed during this research study. Non-probability, purposive sampling was used for data collection.

Results: The findings of this study show that extrinsic risk factors are the major cause of fall found in the normal ambulatory group and intrinsic factors are major causes of fall in Parkinson's disease group. Individuals of both groups reported the loss of balance and muscle weakness as their major cause of fall.

Conclusion: This study concluded that the causes of fall for both the groups were different which depends upon individuals lifestyle, presence of any disease or pathology and individuals self cares attitude while performing daily life's activities. External factors may greatly affect the risk of fall. So, there is a need to promote programs on preventable measures of fall to minimize the risk factors of fall.

Keywords: *Fall risk, Parkinson's disease, causes of fall, comparison of fall history*

Introduction

Approximately 6.5 million peoples around the world and about 450,000 peoples of Pakistan are suffering from Parkinson's disease [(1)]. About 44.9 percent of community-dwelling elderly persons experience a fall every year [(2)]. Fall is second most leading cause of accidents, injuries and, death [(3)]. Fall can significantly affect an individual's long term care facilities [(4)]. Parkinson is a chronic neurological state or condition which progressively affects brain cells [(5)]. Early-stage of Parkinson's disease patients are functionally independent with minimal impairments, as the disease progress, symptoms start getting worse with an independent slow gait and less efficient performance. A later stage of Parkinson's disease is more severe and leads to severe complications, the patient became dependent, and bed-bound and May wheelchair-bound [(6)].

The management of Parkinson's disease involves both medical treatment and physical therapy interventions [(7)]. An individual who experience single, two time or multiple times fall, which may lead to multiple injuries. A single time fall significantly affects the quality of life and functional status. An individual's developed fear of falling, loss of confidence, difficulty in ambulation overall decrease in activities can increase joint stiffness, muscle weakness and greatly affects mobility [(8)].

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Individuals with pre-existing co-morbidities (e.g. Osteoporosis), a fall can significantly affect their quality of life, functional status [9]. The use of medications can be the reason for an increased number of falls (E.g. Central nervous system Drugs) [10]. The risk factors for fall may be intrinsic including age, previous history of fall, fear of falling, weakness in muscle, balance and coordination problem, postural hypotension, vision problems, some chronic conditions like Parkinson's disease, stroke, arthritis, diabetes, dementia, and incontinence" And extrinsic risk factors for fall may be Environmental hazards, lightening problem, uneven and slippery surfaces, use of medications and improper use of canes and devices" [11].

Use of an assistive device (e.g. cane, walkers or wheelchairs) can improve a patient's overall lifestyle Physical therapists can help patients and properly guide patients to use such devices properly and problem-free [12]. Environmental modifications contribute an independent and active lifestyle for an individual with a history fall [13].

Therefore, to prevent an individual from future fall we should first identify the modifable risk factors, complications, and injuries related to fall to improve the patient's condition, functional/ mobility status, independence in activities of daily life [14]. So, this study aims to compare the history, causes, and risk of fall among normal ambulatory group and Parkinson's disease group aged above 50 years old, during last one year and to design Physical therapy programs to improve balance problems, increase in functional mobility status, to improve gait and intervention should be modified to manage specific needs and problems of patients [15].

Material and Methods

This cross sectional survey research design was used in this study. This study included two groups, one group of ambulatory elderly individual's age above 50 years old and the second group includes individuals with diagnosed Parkinson's disease. Both groups were interviewed during the study. The sample size has consisted of hundred elderly individuals. Non-probability, purposive sampling was used in this study. The participants were selected based on age, diagnosed Parkinson's disease, history of falls, intact cognitive functions, and Good communication. Participants having the pain of more than 5 out of 10 on the visual analog scale, uncontrolled hypertension, other signs, and symptoms such as dizziness, acute illness or injury, unstable heart disease (e.g. angina), age below 50 years, and Individuals who scored below 22 in mini-mental scale examination were excluded.

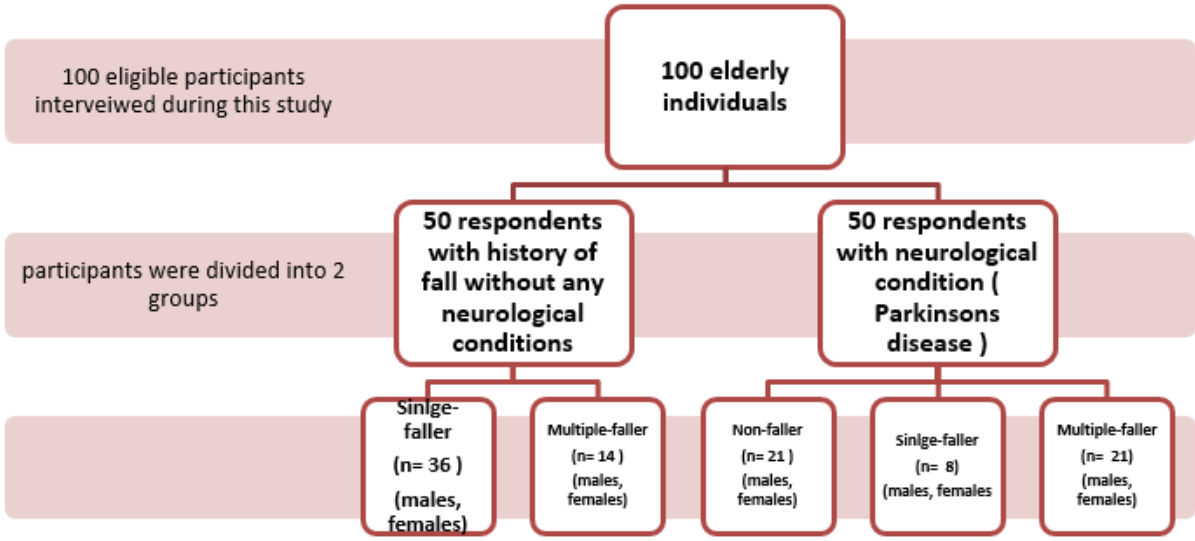
This study used a health status and fall questionnaire, which was adapted from a previous study (Thiwabhorn ThaweeWannakji et al, 2016) to interview and collect the data. The questionnaire was divided into 3 parts demographics, health status, and fall information. The questionnaire was based on multiple choice questions and scoring was based on the maximum number of each option selected by participants from each question.

After approval from The Institutional Review Board (IRB), data collection was started. The target population was selected from different hospitals and homebound individuals of province Sindh, Pakistan. Questionnaires were administered to eligible individuals only, objectives and aims of this study were explained to participants and consent forms were administered. Mini Mental state examination test (MMSE) was conducted to meet the inclusion criteria. And 10 to 15 minutes interview-based survey was conducted.

Descriptive statistics were applied to analyze the history causes and risk of fall information on falls among participants. All data were analyzed using the SPSS Statistic (version 17.0, IBM Corporation, Armonk, NY, USA)

Results

The data of 100 respondents were collected and two groups were formed. Out of 50 participants in Parkinson's group, 29 respondents had a previous history of fall. Further analysis is given below (Figure-1)



(Figure-1)

Most of the participants in Parkinson's disease group were males. A comparison of fallers versus non-fallers within this group shows fallers were more aged, using more medications, and had more visual problems than non-fallers, which might be the reason for fall in this group. Between both the groups Parkinson's group participants were on assistive devices compare to normal ambulatory grouped participants. Most of the participants between the groups were single-time faller among normal adults group while in Parkinson's disease group greater number of participants had multiple- time fall (Table 1).

The major cause of fall was "loss of balance" between both the groups and *21 (42%) individuals had joint dislocations after the fall in normal ambulatory grouped and individuals with Parkinson's disease group suffer loss consciousness after fall as consequences. External factors were found to be leading cause of fall among the individual group who do not have any disease and those participants who suffered from Parkinson disease found both internal and external causes responsible for fall (table 2).*

(Table-1 Number of fall)

	Non-faller	Single-faller	Multiple-faller
Normal elderly individuals n (%)	-	36 (72%)	14 (28%)
Parkinson's disease individual's n (%)	21 (42%) .	8 (27.6%)	21 (72.4%)
Total 100 participants			

(Table-2 Causes, physical consequence and risk of fall)

	Normal elderly individuals	*Parkinson's disease individual's*
Causes of fall n (%)		
Lower limb muscle weakness	14 (28%)	17(58.6)
Loss of balance	25 (50%)	19 (65.5%)
Decrease or altered sensations	1 (2%)	1 (3.4%)
Muscle fatigue due to over exertion	3 (6%)	6 (20.7%)
Visual de f cit	4 (4%)	3 (10.3%)
Dizziness	1 (2%)	3 (10.3%)
Medication side effects	-	2 (6.9%)
Alcohol consumption	-	-
Moving too fast	7 (14%)	1 (3.4%)
Less attention during movement	10 (20%)	9 (31%)
Improper foot wear	2 (4%)	1 (3.4%)
Wearing too long clothing	-	-
Insuf f cient light	2 (4.0%)	1 (3.4%)
Unlucky	8 (16%)	1 (3.4%)
Environmental hazards	8 (16%)	6 (20.7)
other	3 (6%)	-
Physical consequences n (%)		
None	*1 (2%)*	4 *(13.8%)*
Bruise	*1 (2%)*	2 *(6.9%)*
Sprain/strain	*12 (24%)*	6 *(20.7%)*
Joint dislocation	*10 (20%)*	2 *(6.9%)*
Fracture	*21 (42%)*	4 *(13.8%)*
Loss of consciousness	*1 (2%)*	2 *(6.9%)*
other	*4 (8%)*	9 *(31%)*
Risk factor of fall n (%)		
Intrinsic	6 (12%)	9 (31%)
Extrinsic	18 (36%)	5 (17.2%)
Both	26 (52%)	15 (51.7%)
Total 79	50	29

Discussion

This study compares the history, causes, and risk of fall among the normal ambulatory groups and Parkinson's disease group of age 50 years and above. Results show a signi f cant difference among both groups. Parkinson's disease group suffers a fall in the age range of seventy to seventy- f ve years, which indicates the risk of fall increases as the age advances and the disease progresses. A previous study showed that the severity of the disease, balance impairment, depression, and previous falling

were associated factors of fall [16]. The routine usage of medications had a profound effect on the number of falls. A previous study reported that modifable medical causes of falls in Parkinson's disease patients founds that antidepressant use was significantly associated with fall [17]. Compare to current study analysis, both the groups had visual problems in participants who experienced fall and comparatively within the sub-group of non-faller Parkinson's disease group who do not have visual issues, which can significantly indicate that visual problem might be the reason of fall. A previous study concluded that severe visual impairments can significantly increase the risk for future falls although mild or moderate visual impairment was not associated with falls [18]. The previous study has reported that a large proportion of canes and walkers users experience difficulties in ambulation and risk of fall may increase by using such devices [19]. By comparing it to current study findings does not substantially indicate that use of the walking device can cause fall, but its improper use after a single time fall can be the reason for multiple time falls. Analysis of this study shows that significant difference between number of fall between both the groups that disease affected person may experience greater number of fall as compare to normal ambulatory individual, The result of the previous study shows age, sex, and neurological problems greatly effects on the history and number of individuals experience [20]. The current study also shows that the cause of fall found in Parkinson's disease group is "lower limb muscle weakness", compare to normal ambulatory group and loss of balance were the major cause of fall found between both the groups. Previous findings of a study show that muscle strength (especially in the lower extremity) should be one of the factors that is assessed and treated in older adults at risk of fall [21]. Natalie El Haber (2008) explains the normal physiological aging process that muscle weakness, balance, strength, and activity decline with age and decline in overall health status can lead to fall [22].

The present study further demonstrates that physical consequences after a fall an individual may suffer e.g. fractures, dislocations, sprain and strain that leads to a long term hospital stay and requires medical care and need rest for a prolonged period. The results of a previous study explain that 50% of women and 20% of men aged over 50 years will experience an osteoporosis-related fracture after fall [23]. This study further interprets that normal ambulatory group experience fall due to extrinsic factor-like slippery foors, poor lighting, and uneven surfaces, while Parkinson's disease group individuals experience fall due to the intrinsic factor, which involves muscle weakness, gait and balance impairment, cognitive impairment, and confusion. A previous study confrms that fear of falling found to be the most common reason for fall among Parkinson's disease group [24]. Depending on the severity of disease current study explains that those patients who are having fall they do not get out in the community and that can cause short and long term complications that limit their interaction with society and leads to isolation, which may alter an individual's social life and cause depression and anxiety. A study confrms that as compare to the general population Parkinson's disease patients stay greater time in hospitals and skilled nursing facilities due to the progressive nature of the disease and it can lead a person to isolation and depression [25].

Conclusion

This study concluded that significant differences found in history, causes, and risk of falls between both groups. Increasing age increases co-morbidities which are specifc to gender and disease. Normal ambulatory individuals were more prone to have a fall due to less attention, environmental hazard and loss of balance while in Parkinson's disease group individuals having disease-related symptoms which can lead to falling e.g. muscle weakness. Physical and functional consequences of fall e.g. fractures lead a person to a bed or homebound, results in decreased ability to self-care which affect on and individual's personal, social and mental life. The results of this study can help in making preventable measures of fall for both groups. Moreover, the main limitation of this research was convenient sampling, as we cannot generalize the fndings to all participants were selected conveniently due to difculty in fnding patients with diagnosed Parkinson's disease.

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Relationship between Functional Impairment and Social Network in Adult Stroke Survivors- A Pilot Study

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Abstract

Introduction: Stroke is a massive public health problem, being the third most common cause of death in the developed world and the leading cause of adult disability. Stroke and associated functional, impairments affect capacity to work, many survivors have to leave their jobs, which may result in breakdown of social network. The objective of the study was to find the relationship between functional impairment and social network among adult stroke survivors.

Methodology: 20 adult stroke survivors (15 males and 5 females) were included for the study according to the inclusion criteria. Barthel Index Scale was used for assess functional impairment and Fillenbaum questionnaire was used to assess social network.

Result: Out of 20 stroke survivors 12 (60%) had haemorrhagic stroke and 8 (40%) had ischemic stroke**.** The mean age of the subjects was 54.50±8.90. The mean duration of the stroke was 8.35±5.63 months. Pearson correlation test was used to check the relationship between functional impairment and social network. The result showed that functional impairment had a weak correlation with social network (r = 0.34) which was however not statistically significant (p = 0.15).

Conclusion: Better functional independence was associated with good social network.

Keywords: *Stroke recovery, Functional impairment, Social network.*

Background

Among all the neurologic diseases of adult life, stroke ranks first in frequency and importance. The common mode of expression of stroke is a relatively sudden occurrence of a focal neurologic deficit [1]. Strokes are broadly categorized as ischemic or haemorrhagic. Ischemic stroke is due to occlusion of a cerebral blood vessel and causes cerebral infarction. The second broad category consists of hemorrhage, which occurs either within the substance of the brain, called intra-cerebral hemorrhage; or blood contained within the sub-arachnoid spaces, called sub-arachnoid hemorrhage. The second essential feature of stroke is its focal signature. The neurologic deficit reflects both the location and the size of the infarct or hemorrhage. Hemiplegia stands as the most typical sign of stroke, whether in the cerebral hemisphere or brainstem, but there are many other manifestations, occurring in recognizable combinations [2,3]. These include paralysis, numbness, and sensory deficits of many types on one side of the body, aphasia, visual field defects, diplopia, dizziness, dysarthria, and so forth.

Stroke cause significant physical, emotional, and cognitive disabilities among survivors, accounting for 3.6% of the total disability-adjusted life years (DALYs) and thus placing stroke within the 10 leading causes of disability irrespective of the development status of countries. Stroke may result in motor, sensory,

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perceptual or cognitive de f cits. Motor de f cits are among the most common de f cits that hinder a person's ability to complete their activities of daily living (ADLs) and can also affect the upper limb leading to poor functional use of the arm [4,5]. This leads to problems while engaging in ADLs and community activities. These limitations are not only for severe stroke because even after a mild stroke, ADLs and social roles may be affected and this may lead to participation restrictions [6].

Stroke is a leading cause of functional impairment. For patients who are ≥65 years of age, 6 months after stroke, 26% are dependent in their activities of daily living, and 46% have cognitive de f cits [7]. Stroke changes the lives not only of those who experience a stroke but also of their family and other caregivers. A major stroke is viewed by more than half of those at risk as being worse than death [8]. Stroke and associated disabilities affect capacity to work, many survivors have to leave their jobs (to retire or become unemployed), which may result in breakdown of social network. The social networks are the web of relationships that surrounds an individual [9] and social isolation may occur if the social network breaks down. Through social networks, one gains access to social support, which provides people who can potentially give assistance [10]. Social networks as being an interpersonal environment for the transmission of information and social in f uences [11]. Furthermore, stronger and closer social ties represent social resources in times of need [12], reduce sense of isolation, and increase the mental and physical functioning of older adults.

Knowledge of these issues may help stroke-survivors and their families to better understand the situation they f nd themselves in and facilitate efforts to f nd care, help and information. It may also help social and medical cares to establish the services, help and information needed by the subjects, especially rehabilitation, and to discuss issues with them in a patient-centred approach, which may reduce the stress of both patients and cares, and improve their co-operation. Further studies are Therefore a need was identi f ed to assess the relationship between functional impairment and social network in stroke survivors.

Materials and Methods

This cross-sectional study was conducted in medically stable adults with age ≥50 years to f nd the relationship between functional impairment and social networks. All participants having a diagnosis of either ischemic or haemorrhagic stroke at discharge referred by specialists and in selected tertiary hospitals. Study protocol was approved by institutional Ethics Committee. The study population was selected by convenient sampling method. The study was conducted in the course of 1 year. The subjects were enrolled according to the inclusion and exclusion criteria. The inclusion criteria were age ≥50 years old, including both gender, having a principal diagnosis of either ischemic or haemorrhagic stroke at discharge, stroke of more than one month, post-stroke functional status of the stroke survivor requiring assistance of at least one person to perform daily activities, stroke survivor residing with a primary caregiver (family member) at home. The exclusion criteria were post procedural stroke like CABG, angiography and post-operative stroke, global aphasia and/or unable to communicate, stroke survivor functionally dependent because of other pre-existing conditions (e.g.: amputation, fracture and dementia), stroke survivor without a primary caregiver, severe cognitive dif f culties (minimum average scoring ≥20 according to Montreal Cognitive Assessment (MoCA)), stroke survivor unwilling/unable to adhere to the study protocol. This study involved minimal equipment (Questionnaire, Pen, pencil, Paper etc.).

Outcome Measures

The Barthel Index: It is an assessment of patient's level of independence in ADL and is scored in increments of 5 points (highest possible total score = 100). The values assigned to each item are weighted according to the amount of physical assistance required if the patient cannot perform the activity independently. The 10 ADL items assessed in the Barthel Index are bowel control, bladder control, personal hygiene, toilet transfer, bathtub transfer, feeding, dressing, wheelchair transfer to and from the bed, walking (wheelchair management if patient is non ambulatory) and ascending and descending stairs.

Fillenbaum Questionnaire: To evaluate social networks, Fillenbaum' s f ve questions were used. The f ve questions on networks have been accessed for validity and reliability according to Fillenbaum.

Procedure

Ethical clearance for the study was obtained from the Institutional Ethical Committee. After clinical evaluation, subjects fulfilling the inclusion criteria were enrolled for the study. A brief explanation about the procedure was given to all the subjects following which a written informed consent was obtained from the subjects.

Result

The study comprised of a total of 20 older adults which included 15 males while remaining 5 were females. The mean age of the subjects was 58.81±6.67. The mean score of height, weight and BMI were 170.17±6.67, 62.21±4.67 and 21.47±1.44 respectively. The mean duration of stroke was 8.35±8.90. The mean value of Barthel index score was 58.00±9.15 and for Fillenbaum questionnaire it was 3.41±5.22.

Table 1: Distribution of age, height, weight, BMI and duration of stroke.

N = 20	Mean	Std. Deviation
Age	54.50	8.90
Height (m)	1.72	3.99
Weight (kg)	62.80	5.51
BMI	21.27	1.82
Duration of stroke (months)	8.35	5.63
Barthel index	58.00	9.15
Fillenbaum questionnaire	3.41	5.22

Pearson correlation test was used to find the correlation. Higher score in Barthel Index scale indicates better functional independence and higher score in Fillenbaum questionnaire indicates good social network. Functional impairment had a weak positive correlation (r = 0.34) with social network, which was not statistically significant (p = 0.15).

Table 2: Correlation between functional impairment and social network.

N = 20		Social network
Functional impairment	'r' value	0.34
	'p' value	0.15

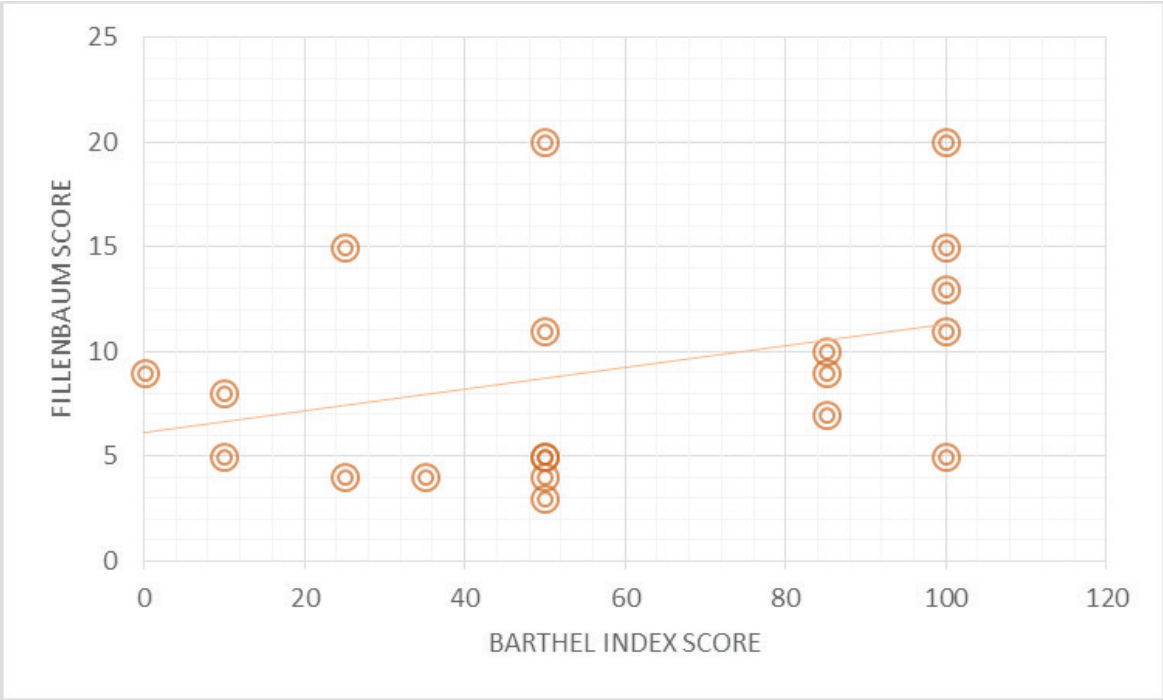

Figure 1: Correlation between functional impairment and social network

Discussion

A cross- sectional study design was used in the present study to fnd the relationship between functional impairment and social network among adult stroke survivors. Over a period of one year (total study duration), a total number of 24 stroke survivors referred by specialists were screened for the study. The commonest exclusion criteria encountered during the screening were global aphasia and MoCA score less than 20. Data from 20 subjects fulflling inclusion criteria were analysed.

The present study suggested that better functional independence was associated with good social network. The stroke survivors included in this study who could see friends and relatives as often as they wanted was associated with better functional independence. Social networks have been found in earlier research to constitute an essential component of successful aging. Lavasseur et. al. found that increased social engagement was associated with better QOL[13]. Stronger and closer social ties may also represent social resources in times of need, reduce any sense of isolation and improve physical and mental functioning[14,15]. There is also evidence that poor social networks are associated functional dependency[16]. Pino et al. and a national survey of British adults, social relationships were found to be the most important domain of better stroke recovery[17,18].

Success of stroke rehabilitation depends on its early commencement, as soon as the stroke survivors is medically stable and free from life threatening conditions. From fndings of this study it is clear that stroke survivors could not overcome the emotional consequence of stroke even after one year. Lack of fnancial and social support and more dependency due to functional impairment would be a reason for emotional consequences of stroke recovery. To make the health and social services freely available and accessible to all type of stroke survivors to avoid the emotional deterioration overtime.

Limitations

Sample size of the present study was limited; future studies with larger sample size may be necessary to substantiate the fndings. Stroke survivors with both ischemic and haemorrhagic type and a large range of post- stroke duration were included in this study, therefore the uniformity of the samples may have been compromised.

Conclusion

Better functional independence was associated with good social network. Functional impairment was significantly influenced by co-morbidities and duration of stroke. Haemorrhagic stroke survivors had poor functional independence and need maximal assistance to perform both motor and cognitive ADL compared to ischemic one.

List of Abbrevations

FI - Functional Impairment

MoCA - Montreal Cognitive Assessment

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

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A Comparative Study Effectiveness of Conventional Physiotherapy versus Yoga Therapy on Pain, Core Muscle Endurance, Lumbar Flexion Range of Motion and Functional Disability in Patients with Chronic Mechanical Low Back Pain

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Abstract

Introduction: Low back pain (LBP) is one of the most common and significant clinical, social, economic, and public health problem affecting people all over the world. Physical therapists deal with considerable number of patients with LBP on a daily basis. Yoga has also been a promising treatment option over years for LBP patients. Thus, this study will help to compare the effectiveness of conventional physiotherapy treatment versus yoga therapy with respect to pain, lumbar range of flexion, endurance of Transversus abdominis (TA) and functional disability in patients with chronic mechanical LBP.

Methodology: Fifty four participants were included in an experimental study after screening for inclusion and exclusion criteria. Pretreatment measures for pain by numerical pain rating scale, lumbar range of flexion by Modified Schober's test, Transversus Abdominis endurance by prone test with pressure biofeedback and disability level by Modified Oswestry Disability Index (MODI) were taken.

Conclusion: The findings of this study suggest that yoga therapy is more effective in reducing pain, disability and improving lumbar flexion range whereas physiotherapy is more effective in increasing core muscle endurance in patients with chronic mechanical LBP.

Key Words: *Yoga, physiotherapy, strengthening, LBP, core muscle endurance*

Background

LBP affects every 1 in 5 adults during their lifetime with its prevalence around 40%.[1] It also interferes with an individual's ability to work and overall quality of life (QOL).[2]LBP is usually defined as pain, muscle tension or stiffness localized below the costal margin and above the inferior gluteal folds, with or without leg pain.[3,4] LBP is typically classified as being 'specific' or 'nonspecific'. Specific LBP is caused by a specific pathophysiologic mechanism. Non-specific LBP or mechanical LBP which is defined as symptoms without a clear specific cause, that is, LBP of unknown origin may be because of inappropriate posture, weak muscles, lower cross syndrome etc.[4] Chronic LBP is defined as the pain that persists longer than seven weeks.[5] 37% of Chronic LBP is attributable to occupational ergonomic stressors, both physical and psychosocial.[6] Most common reasons for back pain are incorrect postures, inadequate trunk muscle strength and psychological and emotional strain. LBP can cause muscle atrophy and inhibit muscle firing. This leads to altered spinal mechanics which may exacerbate the pain-spasm-pain cycle leading to increased dysfunction and decreased muscle endurance. LBP is strongly related to the strength of lumbar core

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musculature.[6]

Although there is a range of conventional pharmacologic, non-pharmacologic and surgical procedures used for non-specific chronic LBP, most patients report only moderate relief, at best. Commonly, management for non-specific chronic LBP includes advice to remain physically active, education on back self-care, medication, and physical therapy.[7]There are various interventions that can reduce pain and disability in patients with chronic mechanical LBP.[8]

In physical therapy, it is seen that the most effective exercise therapy strategy for improving chronic mechanical LBP is supervised, individually-tailored, high-dose stretching and muscle strengthening exercise programs with homepractice.[7]Over the last decade, yoga has been immensely promoted for the treatment of LBP. It can be performed by anyone at any age and level of fitness.[2]Yoga is also cost-effective in improving health related quality of life for patients suffering from pain. It has been suggested that yoga creates inner, physical and emotional balance through the use of postures, called asanas, which are combined with breathing techniques or pranayama that are based mainly on isometric muscle contractions.[2]

Methods

In an Experimental study, 54 patients (Both males and females) between 25 - 45 years of age with mechanical low back pain for more than 7 weeks were selected.[5] Patients who have already participated in yoga or physical therapy in previous 6 months for conditions like LBP, pregnancy, chronic infections such as tuberculosis, compromised cardiovascular problems if recognized on history, spinal pathologies like spinal canal stenosis, spondylolisthesis, grade 3 prolapsed intervertebral disc, previous history of vertebral fracture or surgery, active malignancy, severe neurological deficits and those not willing to participate were excluded from the study.

Informed written consent was taken for participation in this study. Then patients were randomly assigned to Yoga group, Physiotherapy group and a Control group using chit method. The patients were then assessed for pain using Numerical Pain Rating Scale (NPRS), lumbar flexion ROM using Modified Schobers test, transversus abdominis muscle endurance using Prone test with pressure biofeedback and functional disability using Modified Oswestry Disability Index (MODI).[5] Outcome measures were taken pretreatment and post 6 weeks of treatment in respective groups.

Total exercise program was for 6 weeks. Duration of treatment session was 30 min for the yoga group and the physiotherapy group. Control group was not given any intervention. A supervised session was taken for the first 2 days of every two weekly program for yoga and Physiotherapy group, after which the participant was told to continue the treatment protocol at home. A new program was prescribed at the end of 2nd and 4th week.

YOGA Group

For, 0-2 weeks period, the hold time for each yoga posture was 30 seconds with 2 repetitions of each yoga posture, 60 seconds in 2-4 weeks period and 90 seconds in 4-6 weeks period with only one repetition of each yoga posture. A rest period of 30 seconds was given after each posture. Yoga postures included Padmasana, Ardh Matsyendrasana (right and left), Yog Mudra, Paschimotanasana, Bhujangasana, Naukasana, ArdhaChakrasana and Trikonasana (right and left). Breathing exercises and Shavasana was given at the start and the end of each session respectively.

PHYSIOTHERAPY Group

This group consisted of lumbar stabilization with progressive limb loading with emphasis on abdominals and trunk extensors.[9]All exercises were done for 10 repetitions with a hold time of 10 seconds. A rest period of 1 min was given between every consecutive exercise. All exercises to be performed with core activation.

For 0 – 2 weeks it included Level 1, multifidus activation, Level 2, Level 3A, quadruped – flex one upper extremity, quadruped – extend one lower extremity by sliding it along the mat, supine twist, press up on elbows and bridging.[9]

For 2 – 4 weeks, it included Level 1, Level 3B, Level 3C, quadruped – extending one lower extremity by lifting it off the mat, quadruped – flexing one upper extremity while extending contralateral lower extremity and then alternate to opposite extremities, press up on hands, unilateral cycling , bilateral cycling.[9]

For 4 – 6 weeks, it included Level 1, Level 4A, Level 4B, prone lying - extend one lower extremity, curl ups - hands by the side, curl ups – hands behind the neck, diagonal curl ups, superman's exercise, double knee to chest.[9]

Results and Discussion

Pre and post treatment measures were taken after 6 weeks on Numerical pain rating scale, Modified Schobers test, Prone test with pressure biofeedback and Modified oswestry disability index. There was significant improvement in both physiotherapy and yoga group in all the four outcome measures whereas there was deterioration in the control group in all the outcome measures.

Table 1: Comparison of mean difference (pre and post 6 weeks) of NPRS scores in all 3 groups using Anova test

	MEAN	P value	
Yoga	-4.1333	1.2 x 10-7	Significant
Physiotherapy	-2.8		
Control	0.235294		

Inference:

Yoga group has more improvement in pain compared to Physiotherapy group. Control group shows increase in pain ($P < 0.05$)

Table 2: Comparison of mean difference (pre and post 6 weeks) of Modified Schober's test scores in all 3 groups using Anova test

	MEAN	P value	
Yoga	0.933333	4.95 x 10-6	Significant
Physiotherapy	0.55625		
Control	-0.07778		

Inference:

Yoga group has maximum improvement in lumbar flexion ROM compared to Physiotherapy group and Control group shows decrease in lumbar flexion ROM ($P < 0.05$)

Table 3: Comparison of mean difference (pre and post 6 weeks) in core muscle endurance using Prone test scores in all 3 groups using Anova test

	MEAN	P value	
Yoga	-1.33333	4.95 x 10-7	Significant
Physiotherapy	-4.25		
Control	-0.22222		

Inference

It shows Physiotherapy group has maximum improvement in the lumbar core endurance compared to Yoga group and control group has least improvement ($P < 0.05$).

Table 4: Comparison of mean difference (pre and post 6 weeks) of Modified Oswestry Disability Index (MODI) in all 3 groups using Anova test

	MEAN	P value	
Yoga	-21.7333	2.69 x 10-7	Signi f cant
Physiotherapy	-17		
Control	2.666667		

Inference:

It shows yoga group has maximum improvement in the disability level due to low back pain compared to physiotherapy group and control group shows increase in disability level ($P < 0.05$)

Discussion

The aim of this study was to compare the effectiveness of conventional physiotherapy treatment versus yoga therapy for chronic mechanical LBP. The results of the study showed that there was reduction in pain, increase in lumbar f exion range of motion, increase in lumbar core muscles endurance and reduction in disability due to LBP in both physiotherapy and yoga group. However, control group shows deterioration in pain, lumbar f exion range of motion and disability due to LBP.

There is a signi f cant reduction in the pain in yoga group ($p < 0.05$) and physiotherapy group ($p<0.05$) post treatment whereas control group shows increase in pain. Both yogasanas and physiotherapy exercises stimulate stretch proprioceptors which send neural impulses to the higher centers. These neural impulses interfere and block impulses on the ascending pain pathway, by pain gate mechanism. They also stimulate the periaqueductal grey matter and raphe nucleus which are a part of descending pain suppression pathway. This leads to inhibition of pain information at the spinal cord.[1] When 3 groups were compared for pain (Table 1) yoga group shows maximum improvement in pain scores. Yoga's maximum ef cacy in pain reduction may be due to endorphin production at a cortical level, which is known to result from alternate stretch-and relax procedures of yoga asana practice.[1]This could also be because yoga involves muscle relaxation and it also has an emotional component to it. Yoga is found to reduce anxiety and lower depression levels.[1]It is stated as yoga is a combination of careful body movement together with active mindfulness and concentration. Thus this helps promote deeper relaxation and thus maximum pain relief.[1] Both yoga and physiotherapy also increase core muscle strength thus providing maximum support to the spine maintaining a better posture thus reducing LBP. Also other studies prove that yoga intervention is associated with longer lasting reductions in pain outcomes because yoga is a combination of postures, breathing exercises, relaxation, and meditation, thus enhancing parasympathetic tone and thus better effects.[2,10]

There is a considerable increase in the f exibility of the lumbar spine in both Yoga and Physiotherapy group ($p <0.05$). But control group shows reduction in range of the lumbar spine f exion. This could be because yoga involves holding a position for a particular duration leading to gradual lengthening. During the practice of yoga, the breath is regulated and mental focus is directed to it, resulting in physical and psychological bene f ts. Yoga increases f exibility and strength, tones the muscles and reduces muscular tension.[11]Yoga practice also increases proprioceptive ability and hence may help in adopting the correct posture to relax muscular tension. It is possible that the perceived decrease in pain and increase in f exibility may have been due to reduced tension in para-vertebral muscles.[11] Table 2 suggest comparatively a lower improvement in physiotherapy group with respect to f exibility because it concentrated more on lumbar core muscles and attaining and holding a particular position and it did not comprise more of

stretching exercises. On the contrary all yoga asanas includes stretching components and with maintenance of that posture, whereas physiotherapy focuses on attaining a posture and coming back to starting position. Studies also prove that yoga therapy increased hip flexion, spinal and hamstring flexibility[11] like any other stretching exercise, but the effects with yoga had long lasting effects for several months.[12] The fact that control group shows decrease in lumbar flexion range of motion is because due to pain subjects avoid end range of motion and further increase in soft tissue tightness.

It is known that core muscle activation is impaired in patients with chronic LBP and is thought to contribute to spinal instability[6], which may cause the patients symptoms to persist. There is a slight improvement in core muscle endurance in yoga group($p<0.05$) whereas a much more improvement is found in Physiotherapy Group ($p<0.05$).Table 3 compares yoga and physiotherapy group for core muscle endurance. Physiotherapy group was better than yoga group as it consisted mainly of exercises emphasizing on transverses abdominis and multifdus muscle activation which are main core stabilizers. It is well documented in the literature that total muscle activation is necessary to efficiently stabilize the spine and the no single muscle contributes greatest to lumbar stability.[6]The exercises for physiotherapy group recruited all muscles like obliques, upper abdominals, rectus abdominis along with core muscles. Drawing-in maneuver was chosen as an exercise in physiotherapy group for complete 6 weeks. It is a highly effective and specific technique that activates all of the core musculature with a low to moderate cost to lumbar spinal compression. Another study also states that exercises specific to transverses abdominis gives better benefit in patients of chronic LBP compared with general exercise.[13] Yoga group also showed mild improvement in core muscle as yogasanas are postures targeting the lower back, but no specific emphasis is given on core muscles, however, core muscles are continuously activated in all yogasanas. Taking into consideration the control group , it didn't show any significant change in core muscle endurance because they were not actively involved in any exercise intervention.

A significant improvement is seen in level of disability due to LBP in both yoga and physiotherapy group ($p < 0.05$). Disability level is dependent on pain, flexibility and core strength. As there is significant improvement in all the above parameters in both these groups, there is significant reduction in disability level as well. Control group shows significant increase in disability level in the period of 6 weeks ($p < 0.05$). Table 4 shows that there is more improvement in yoga group as yoga therapy caused a significant reduction in pain intensity and increase in flexibility. Also it was found in other studies that yoga intervention is associated with long lasting improvement in quality of life compared to physiotherapy exercise intervention.[2]This is because yoga therapy causes a marked improvement in balance, flexibility and depression leading to a greater reduction in disability level compared to physiotherapy group.[14]

Conclusion

The study concluded that Yoga therapy and physiotherapy, both are effective for patients with chronic mechanical low back pain however, yoga therapy is more effective in reducing pain and disability and improving lumbar range of flexion whereas physiotherapy is more effective in increasing core muscle endurance in chronic mechanical low back pain.

Conflict of Interest: None

Ethical Clearance: Ethical clearance was obtained from the institutional ethical committee

Consent: A informed written consent was taken from all the participants under study.

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Effect of Core Stability Exercises on Low Back Pain and Disability in Mother's of Cerebral Palsy

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Abstract

Background: In mothers with Cerebral Palsy children,higher prevalence of musculoskeletal disorders are seen due torepetitive bending, lifting, and twisting activity while taking care of the child.Reduced core muscle strength especiallyof Transverse Abdominis&Multifdusmuscle will lead to increase in low back pain and disability in this population. Hence, the purpose of this study was to fnd out the effect of Core Stability exercises on low Back pain and disability in mothers of Cerebral Palsy Children.

Method: Thirty mothers with chronic low back pain who fulflled the inclusion criteria were included in the study. Core muscle strength was assessed using pressure Bio-Feedback, pain was measured using Visual Analogue Scale and Disability was measured using Owestry Disability Index. Core stability exercises were given for 3 times a week for 6 weeks.

Result: The result showedthat there was signifcant improvement in Core muscle strength, and reduction in pain and disability in patients with Chronic Low Back pain.

Conclusion: The study concluded that there was signifcant improvement in the abdominal muscle strength, low back pain score and disability score post core stability exercises in mothers of cerebral palsy children having low back pain.

Keywords: *cerebral palsy mothers, Core Stability exercises, Pain, Disability.*

Introduction

Low back pain is defned as the pain that occurs in an area with boundaries between the lowest rib and the crease of the buttocks [1]. Patients with chronic low back pain present with altered psychomotor functioning such as delayed information processing for stimulus and poor postural control.[2,3]They also experience more frequent and severe pain leading to have poorer scores for physical and social functioning and it affects quality of life and there is fnancial burden.[4]The symptoms of chronic mechanical low back pain are usually worsened by activity like bending, extending, twisting, lifting and improved partially by rest.[5]Pain and muscle weakness are the most common obstacles in carrying out activities of daily living. [2]

Cerebral palsy is a non-progressive condition mainly with motor impairment. Mothers are mostly the primary caregivers. Children suffering from cerebral palsy are unable to do their daily activities and thus needs assistance. This activity involves frequent lifting and carrying of the child, carrying orthosis, assistive aids along with the child which may lead to musculoskeletal disorder. It was observed in a study by authers that the lumbar spine was the most common location of pain (n=104; 58.1%) and was followed by the cervical spine (n=58; 32.4%) and thoracic spine (n=32;17.9%). Intensity of pain in mothers of CP children depends on the functional ability of the child, the GMFCS level of

the child , body weight and age of the child and also the number of times the child is lifted by the mother.[6]

Several studies have shown that there is altered or delayed neuromuscular recruitment patterns in the core stabilizing muscles of the lumbar spine during active movement in individuals with low back pain. Recruiting the core muscles and training them to respond in co-ordination with the global muscles to various forces and demands helps to improve overall function. Core stability exercise can be defined as restoration or augmentation of the ability of the neuromuscular system to control and protect the spine from injury or re injury. [7]Activation of this stabilizing musculature is reinforced by progressing to muscular endurance and strength training. As the rehabilitation program progresses the muscle activation of the stabilizing muscles will become automatic during all the daily activities and functional tasks.[8] Hence core stability exercises are beneficial in patient with chronic low back pain. So purpose of this study was to assess effect of core stability exercises on back pain and disability in this population.

Materials and Method

Pre and Post experimental study with convenient sampling was done in Physically Handicapped Institute Pune and M.A. Rangoonwala college of Physiotherapy, Pune. Thirtysubjects i.e. mothers as primary caregiver of cerebral palsy child with medical certificate stating the diagnosis as cerebral palsy, age of mothers above 21 years having child between 3-15 years of age with Gross Motor Functional Classification System(III,IV,V) for cerebral palsywere included in the study subjects suffering with chronic low back pain for more than 3 months with Visual Analogue Scale (0-6). Patients suffering from Spondylolisthesis, Rheumatoid Arthritis, Neoplastic disorders, Disc degeneration facet joint,spondylarthosisand subjects involved in any exercise were excluded.

Patients were evaluated for core muscle strength using Pressure bio- feedback[9], pain using Visual Analogue Scale(VAS)[10] and Disability using the Oswestry Disability Index[11]. Before starting the exercisessubject did warm up exercises and cool down exercises after the session

Pressure bio- feedback

Subjects were asked to empty their bladder before the testand positioned supine crook lying with hip flexed at 45 degrees. Subjects were given proper instructions about activation of transverses abdominis muscle. It was confirmed with palpation. The inflatable cuff was placed under the hollow of the lumbar spine (between L1 and S1).The cuff was inflated to the baseline pressure of 40mmHg. The subjects were then asked to take a relaxed breath and while expiration to draw in the abdominal wall towards the spine so as to contract the deep abdominal muscles, raising the pressure up to 10mmHg and recommence the breathing and hold up to 10 seconds. The test was repeated three times and the maximum pressure was recorded.(12)

CORE ACTIVATION

(1st and 2nd weeks) **LEVEL 1:**	**Draw in and hold for 10 seconds**
LEVEL 2 : Hold for 5 sec. Repetition 10.	Opposite lower extremity on plinth; bent leg fall out
(3rd and 4th week) LEVEL 3 : Hold for 10 sec. Repetition 10.	Opposite lower extremity on plinth a)Lift bend leg to 90˚ hip flexion b)Slide heel to extend knee c)Lift straight leg to 45˚
(5th and 6th weeks) LEVEL 4 : Hold for 10 sec. Repetition 10	Hold opposite lower extremity at 90˚ of hip flexion with upper extremity a)Lift bend leg to 90˚ hip flexion b)Slide heel to extend knee c)Lift straight leg to 45˚

MULTIFIDUS

(1st and 2nd week) LEVEL 1: QUADRIPOD POSITION LEVEL 2:QUADRIPOD POSITION LEVEL 3:QUADRIPOD POSITION Hold for 5 sec. Repetition 10	Multifdus Activation Flexion of one upper extremity Extension of one lower extremity by sliding it along the plinth
(3rd and 4th week) LEVEL 4 :QUADRIPOD POSITION LEVEL 5:QUADRIPOD POSITION Hold for 10 sec. Repetition 10	Extend one lower extremity and lift 6-8 inches off the plinth Flexion of one upper extremity and extension of contralateral lower extremity
(5th and 6th week) LEVEL 6 :PRONE LYING POSITION Hold for 10 sec. Repetition 10	Extension of one lower extremity

Results

Table 1: Demographic characteristics of the study participants (N=30)

Variables	Sub-groups	N	%
Child GMFCS level	3	6	20.0
	4	15	50.0
	5	9	30.0
Age (Mean ± SD) years		33.23 ± 7.542	

	Pre	Post	t value	P value
VAS SCORE (Mean)	4.997(±0.78)	2.38(±0.68)	19.151	<0.001**

Table 2 shows comparison of VAS score of pre and post by unpaired T test. This shows statistical significant reduction post treatment in VAS score

	Pre	Post	t value	P value
PRESSURE BIO-FEEDBACK SCORE IN mmHg (Mean)	40.00(±2.53)	42.53(±1.04)	13.321	<0.001**

Table 3 shows comparison of the effect of core strengthening exercises on core muscle strength in mothers of cerebral palsy children using pressure bio feedback. It shows statistical significance which suggests oblivious strength improvement in core muscles.

Group	Pre	Post	t value	P value
ODI SCORE (Mean)	30.378(±5.33)	20.556(±3.7)	9.619	<0.001**

Table 4: Comparison of the effect of core strengthening exercises on disability in mothers of cerebral palsy children using the Oswestry Disability Index. This suggests statistical significance which suggests improvement in disability score of caregivers

Discussion

Low back pain contributes significantly to morbidity in general population and it has a high rate of disability associated with it. [13]Women, specially mothers have to do all such activities which results in persistent back pain in them. As children with CP have impaired motor function, sensory and intellectual impairments and limitations in self care such as mobility, this long term dependency places physical and psychological strain on the caregivers.[8]

Table 3 shows the effect of core stability exercises on low back pain in mothers of cerebral palsy children using Visual Analog Scale. There was significant reduction in pain measured by VAS.

Pain causes reduced motor control and also reduced motor control can cause pain.[13,14] Reduced motor control causes reduced stability in the spinal level and also in the proprioception. All these deficits in the motor control lead to delayed activation and loss of coordination in the abdominal musculature.[13] If not restored, this malfunctioning and regulation of dynamic movement leads to inappropriate muscle activity and lead to muscle tightness , imbalance, delayed activation , poor posture which lead to musculoskeletal pain in lumbar region.[13-15] Reduced motor control increases incidence of micro trauma to passive stabilisers leading to pain. This pain leads to functional disability which arises because of pain and fear of pain with functional task. Stability of spine is comprised of mainly 3 components, Neuromuscular control (neural elements) & Passive subsystem (osseous and ligamentous elements) & Active subsystem (muscular elements). In other words, stability of the spine is not only dependent on muscular strength, but also proper sensory input that alerts the central nervous system about interaction between the body and the environment, providing constant feedback and allowing refinement of movement. (9)Chronic low back pain is contributed by reduction in neutral zone, reduced active stability and delayed contraction of deep core muscles.

Motor control is required for joint protection and need to be addressed that pain is treated with exercises [13]. With core stability exercises sensory input arises from the affected tissues. These tissues are richly innervated with mechanosensory and nociceptive neurons, this lead to modulation of nociceptor activity in response to change in innervated tissues. At tissue level inflammatory mediators influence sensory inputs to nervous system.These activation carries information to CNS via sensory C fibers and enhances production of histamine and cytokines from mast cells, monocytes and endothelial cells causes pain. The mechanism behind is activation of descending nociceptive inhibitory mechanism and release of endogenous opioids. Core stability exercises triggers the release of endorphine from pituitary &hypothalamus & activating opioid receptors peripherally & centrally triggering the endogenous opioid system which results in analgesic effects via descending nociceptive inhibitory mechanism.[13, 14].The increase in tissue blood flow during lumbar stabilization exercise in patients with chronic non-specific LBP could be suggested as an integrated mechanism for releasing spasm, improving blood flow, and decreasing the inflammation of local tissues in the lumbar spine, which in return reduced pain.(16)As seen earlier these exercises increases the strength of the abdominal muscles which helps in reducing pain as it prevents injury by preventing buckling of the spine, help in balancing external loading to the spine and pain level is reduced. This is in consensus with previous studies (17, 18)

Table 2 shows the effect of core stability exercises on core muscle strength in mothers of cerebral palsy children having low back pain which was measured by using Pressure Bio- Feedback. There was statistically significant increase in abdominal muscle strength.(19) During core stability exercises muscle contraction happens at the level of sarcomere. This is when powered by nerve impulse; force is generated by sarcomere and there is entire muscle contraction. Active contraction of muscles begins with chain of actions that influences all tissues of joints. In response to activation of muscle fibre, the muscle tissue maintains its normal physiology. These exercises improves muscle fibre hypertrophy, increases capillary bed density, mitochondrial density and volume of muscles.. Repetitive contraction of muscles increases motor unit recruitment and synchronization of movement [19,20].This is in accordance to study done by VenuAkuthota et al , where they checked Tranverseabdominis and multifidus muscle thickness by ultrasound in subjects which were given the targeted exercises.(21,22)Rantanenet al. demonstrated 'moth eaten' type I muscle fibersin the multifidus muscle of patients with chronic back pain (23)

which plays major role in lumbar stability. So targeted muscle activation and strengthening helps in stability of spine.

In mothers repetitive task, like lifting disabled child dominates most of their activities. Long term repeated afferent inputs have a negative effect on the sensorimotor system.[15] It hampers the motor control system which causes poor control of joint movement micro-trauma and pain. There is a slow reaction time associated with it which causes further injury and pain.

In a study by Fabio Removato Franca et al named "Segmental stabilization and muscular strengthening in chronic low back pain" , both techniques lessened pain and reduced disability. Increased muscle strength of deep muscles leads to increased intersegment stability, leading to reduced physiological excursion in spinal segment leading to reduced pain. Reduction in pain essentially reduces disability by increasing ease of movement.

Table 4 shows the effect of core stability exercises on disability in mothers of cerebral palsy children using the oswestry disability index. There was a signi f cant reduction in the disability level in these mothers.Core stabilization exercises used in the study causes isometric contraction of the muscle of the spine which is required for functional activities.[26]

With core stability exercises higher demand are placed on the motor control system which is required for rehabilitation.[1] Motor control training causes deep intrinsic muscles of the spine to provide f ne tuning of the intervertebral movement whenever performing any activity.[9] Contraction of the muscles stimulated the muscle spindle and golgi tendon organ which has effects on spindle system activating the motor neurons that control slow twitch f bers. These changes in turn cause proper timely activation of the muscles and also increase muscle strength, hence creating a girdle around the spine which protects the spine from undue perturbations and improves f exibility and also coordination between super f cial and deep muscles.[1]Disability is also caused by pain and fear of pain . As pain reduced due to intervention, even disability improved. This improves quality of movement and reduced load on the spine. These exercises causes plastic changes in the motor cortex and in the motor system and hence improves the functional disability.[25] Also reduced pain allows the mothers to perform their functional activities with ease and they can also take proper care of their disabled child. Because of reduction in pain and increase in muscle strength there is reduced disability in this population.

Conclusion

This study showed signi f cant improvements in the VAS, ODI & PBF scores post core stability training in mothers of cerebral palsy children. So targeted exercises are recommended in this population.

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Prevalence of Compulsive Exercise in Physically Active Adults

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Abstract

Exercise is generally a healthy behavior that promotes fitness and well being. However, some physically active individuals become addicted to physical fitness and involved in excessive compulsive exercise. The present study aimed to assess the Prevalence of compulsive exercise among physically active adults. Purposive sampling was done to collect a sample size of 223 physically active adults within the age group of 18-29 years from West Delhi and Faridabad. Individuals who were doing physical activity more than an hour with no chronic diseases were included as participants. Exercise bulimia was measured by using standardized tool that was compulsive exercise test (CET). Statistical analysis was done by using SPSS 21 version. Samples of 223 subjects were assessed. Out of which 31% of subjects were from Faridabad (N=70) and 69% of subjects were from East Delhi (N=153). The results revealed that on the basis of CET scoring 44.3% of subjects were having mild exercise bulimia whereas 55.7% of subjects were having exercise bulimia. The study concluded that maximum number of subjects was suffering from exercise bulimia, which is an alarming situation for the young generation.

Key Words: *exercise, physical activity, Exercise bulimia, health*

Introduction

Physical activity plays valuable role in human health and wellbeing. Daily routine activity helps to boosting brain processes; immune system and prevent the body from many chronic diseases. However, some physically active individuals become addicted to physical fitness and involved in excessive compulsive exercise. A condition which develops with excess of compulsive exercise is also called as exercise bulimia[1]. Exercise bulimic individual were too much obsessed with excessive exercise and binge eating. The term binge is defined as a person eats huge quantity of food in a short duration of time. Normally individuals with bulimia purge after eating huge amount, but in the exercise bulimia they did not purge, instead of purging they focus on exercise and do excessive physical activity for weight loss and reduce the guilt of over eating[1]. Compulsive exercise is a term in which a individual performs excess of physical workout, above their body limit to burn out the calories of a body.

Exercise bulimia can have number of negative effects on human body. Researchers found that excessive endurance exercise can cause abnormal remodelling of the heart. It may also place patients at risk for arrhythmias. Excessive exercise can put stress on joints of the body as well as bones. Over exercise leads to weak immunity which can leads to further infections[2]. Women who don't have enough fat in their body can experience a shutdown of the reproductive system. This is known as amenorrhea. It could lead to infertility and other reproductive issues. A study was conducted on Exercise addiction on regular exercises which helps to overcome the emotional issues on subjects having injuries and 'non-injured' exerciser who exercise regularly. There were 1083 subjects' participants with injuries and 'non-injured' with recreational activity. The Exercise Addiction Inventory method was used. The study concluded that individuals doing exercise on daily basis were incorporates with excessive exercise, showed symptoms such as highly effected emotional issues and depression. For addressing emotional distress counselling and Psychological assessment were useful to somatic injury interventions[3]. Therefore the present study was designed to assess prevalence of exercise bulimia in Physically Active Adults.

Material and Methods

The present study was done to assess exercise bulimia on physically active subjects. A sample of 223 subjects was assessed within the age group of 18-29 years. The sample was selected from East Delhi (153 subjects) and Faridabad (70 subjects). Both males and females were included with no chronic illness and doing physical activity more than 60 minutes. Compulsive Exercise was assessed by using standardized tool that was Compulsive Exercise Test. Compulsive Exercise test was consist of 5 major categories - rule driven and avoidance behaviour , weight control exercise, lack of exercise enjoyment, mood improvement and exercise rigidity. Linkert scale was used to point 6 such as 0 for Never True, 1 for Rarely True, 2 for Sometimes True, 3 for Often True, 4 for Usually True and 5 for Always True. Criteria for CET scoring was that the question 8 and 12 were on reverse score form. For mean score sum all the scores and divide with number of items. Sum the mean of all subscales for total scoring of CET [4,5,6,7,8]. Consent form was used to take permission from the participants to participate in the study. The data was analyzed by using SPSS 21 Version.

Findings

The present study was done to assess exercise bulimia on physically active subjects by using Compulsive Exercise Test. The data was distributed on the basis of five categories- Rule Driven and Avoidance, Exercise to control weight, Mood Improvement, Lack of Exercise Enjoyment, and Exercise Rigidity. 47.05% of males and 52.95% of females were part of this study.

Compulsive Exercise Test:

Table 1 depicts the distribution on basis of rule driven and avoidance behavior of the subjects. Out of 153 subjects 32% of East Delhi subjects often feel low or depressed if they do not exercise on the other hand in Faridabad population, 53% of East Delhi subjects reported that they always feel low & depressed. 27.4% of East Delhi subjects sometimes feel extremely guilty, whereas 57% Faridabad subjects reported that they always feel extremely guilty if they miss the exercise. 26.7% of East Delhi subjects usually do exercise during the minor illness whereas 19% Faridabad subjects reported that they always continue their exercise even they fall ill or have injury. 41.8 % of East Delhi subjects usually miss exercise and try to cover in the next session whereas 51% Faridabad subjects reported that they always cover it in next session of exercise if they skip there exercise. 59.4% of east Delhi subjects and 33% of Faridabad subjects reported that they often and always feel irritated when they miss an exercise session respectively. 50.3% East Delhi subjects reported that they feel sometimes anxious on the other hand 50% of Faridabad subjects always feel anxious if they miss an exercise session.

TABLE 1: DISTRIBUTION OF SUBJECTS BASED ON RULE DRIVEN AND AVOIDANCE BEHAVIOUR:

NO. OF OPTION	ALWAYS TRUE		USUALLY TRUE		OFTEN TRUE		SOMETIMES TRUE		RARELY TRUE		NEVER TRUE	
No exercise feel low and depressed	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)
	16 (10.4)	37(53)	34 (22.2)	0(0)	49 (32.0)	0(0)	30 (19.6)	6(9)	4 (2.61)	5(7)	20 (13.0)	22(31)
Miss exercise feel extremely guilty	24 (15.6)	40(57)	30 (19.6)	0(0)	19 (12.1)	0(0)	42 (27.4)	23(33)	36 (23.5)	1(1)	2 (1.3)	6(9)
Continue exercise in injury & illness	16 (10.4)	13(19)	41 (26.7)	0(0)	22 (14.3)	0(0)	31 (20.2)	8(26)	29 (18.9)	15(21)	14 (9.1)	24(34)

Miss exercise try cover in next session	0(0)	36(51)	64 (41.8)	0(0)	89 (58.1)	0(0)	0(0)	23(33)	0(0)	0(0)	0 (0)	11(16)
No exercise, feels irritable	0(0)	23(33)	0(0)	0(0)	91 (59.4)	0(0)	57 (37.2)	15(31)	5 (3.2)	1(1)	0 (0)	31(44)
Miss exercise, feels themselves down	0(0)	20(29)	0(0)	0(0)	0(0)	0(0)	43 (28.1)	11(16)	85 (55.5)	4(6)	25 (16.3)	35(50)
Not enjoy exercise	0(0)	26(37)	0(0)	0(0)	0(0)	0(0)	14 (9.1)	25(36)	69 (45.0)	6(9)	14 (9.1)	13(19)
No exercise, feels anxious	0 (0)	35(50)	0 (0)	0 (0)	17 (11.1)	0(0)	59 (38.5)	14(20)	77 (50.3)	4(6)	0 (0)	17(24)

Table 2 stated the distribution of subjects based on weight control exercise. Out of 223 subjects, 80.3% of East Delhi subjects usually do exercise to improve their appearance whereas in Faridabad, 76% subjects reported the same. 80.3% East Delhi subjects reported that they its rarely true if they eat too much then they do more exercise on the other hand 46% of Faridabad subjects reported that its always true. 20.2% of East Delhi subjects and 41% of Faridabad subjects always do exercise to be slim. 83% of East Delhi subjects often do exercising for weight loss and burning out the calories other hand 68% of Faridabad subjects reported that it's always true. Majority number of subjects (30% east Delhi subjects; 70% Faridabad subjects) always feel worry that they will gain weight if they do not exercise.

TABLE 2: DISTRIBUTION OF SUBJECTS BASED ON WEIGHT CONTROL EXERCISE:

NO. OF OPTION	ALWAYS TRUE		USUALLY TRUE		OFTEN TRUE		SOMETIMES TRUE		RARELY TRUE		NEVER TRUE	
Do exercise to improve appearance	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)
	18 (11.7)	53(76)	123 (80.3)	0(0)	12 (7.8)	0(0)	0(0)	11(16)	0(0)	0(0)	0(0)	6(9)
Feel eat too much if do more exercise	0(0)	32(46)	0(0)	0(0)	0(0)	0(0)	10 (6.5)	11(16)	123 (80.3)	3(4)		24(34)
Do not exercise to be slim	31 (20.2)	29(41)	24 (15.6)	0(0)	24 (15.6)	0(0)	38 (24.8)	6(9)	24 (15.6)	4(6)	12 (7.8)	31(44)
Exercise to burn calories & lose weight	0 (0)	60(68)	1 (0.6)	0 (0)	127 (83.0)	0 (0)	25 (16.3)	3(4)	0 (0)	1(1)	0 (0)	6(9)
No exercise, worried to gain weight	0(0)	49(70)	0(0)	0 (0)	7(4.5)	0 (0)	46 (30.0)	2(3)	89 (58.1)	1(1)	11 (7.1)	18(26)

TABLE 3 depicts the distribution of subjects based on mood improvement. 81.6% East Delhi subjects reported that they usually feel happier or positive after exercise whereas in Faridabad, 100% subjects reported that they always feel happier or positive after exercise. 79.7% of subjects of East Delhi and 86% of Faridabad subjects reported that they usually and always feel less anxious after exercise respectively. 83.6% of subjects of East Delhi and 86% of Faridabad subjects reported that they usually and always observe less tenses/stressed after the exercise. 64% of subjects of East Delhi and 94% of Faridabad subjects reported that they usually and always feel that exercise improve their mood respectively.

TABLE 3: DISTRIBUTION OF SUBJECTS BASED ON MOOD IMPROVEMENT:

NO. OF OPTION	ALWAYS TRUE		USUALLY TRUE		OFTEN TRUE		SOMETIMES TRUE		RARELY TRUE		NEVER TRUE	
Feel happier or positive after exercise	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)
	28 (18.3)	70(100)	125 (81.6)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
Feel less anxious after exercise	7 (4.5)	60(86)	122 (79.7)	0(0)	20 (13.0)	0(0)	4 (2.6)	6(9)	0(0)	0(0)	0(0)	4(6)
Feel less stressed or tense after exercise	0 (0)	63(90)	128 (83.6)	0(0)	25 (16.3)	0(0)	0(0)	2(3)	0(0)	0(0)	0(0)	5(7)
Exercise to improve mood	55 (35.9)	66(94)	98 (64.0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	4(6)
Feel less depressed after exercise	37 (24.1)	62(89)	82 (53.5)	0(0)	82 (53.5)	0(0)	0(0)	5(7)	0(0)	0(0)	0(0)	3(4)

TABLE 4 depicts the distribution of subjects based on lack of exercise enjoyment. Out of the 223 subjects 73.8% of East Delhi subjects feels it's often true that exercise is a chore for them on the other hand in Faridabad, 50% subjects reported that its usually true that exercise is a chore for them. 28.7% subjects of East Delhi reported that it is often that they enjoy exercising on the other hand 91% of Faridabad subjects feel it's always true. Similar results were presented by a study conducted by Taranis et al[7] but in eating disorder subjects.

TABLE 4: DISTRIBUTION OF SUBJECTS BASED ON LACK OF EXERCISE ENJOYMENT:

NO. OF OPTION	ALWAYS TRUE		USUALLY TRUE		OFTEN TRUE		SOMETIMES TRUE		RARELY TRUE		NEVER TRUE	
Exercise a chore	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)
	1 (0.65)	35(50)	26 (16.9)	0(0)	113 (73.8)	0(0)	13 (8.49)	16(23)	0(0)	1(1%)	0(0)	18(26)
Enjoy exercise	13 (8.49)	64(91)	12 (7.84)	0(0)	44 (28.7)	0(0)	24 (15.6)	1(1)	25 (16.3)	2(3%)	35 (22.8)	3(4)
Not enjoy exercise	0(0)	16(23)	0(0)	0(0)	5 (3.2)	0(0)	61 (39.8)	4(6)	86 (56.2)	2(3%)	1 (0.65)	48(69)

TABLE 5 depicts the distribution of subjects based on exercise rigidity. 92.8% of subjects of East Delhi and 86% of Faridabad subjects reported that they usually and always true that their day become organized and structured with an exercise routine respectively. 62% of subjects of East Delhi and 46% of Faridabad subjects reported that they usually and always true that their weekly pattern of exercise is repetitive respectively.

TABLE 5: DISTRIBUTION OF SUBJECTS BASED ON EXERCISE RIGIDITY:

NO. OF OPTION	ALWAYS TRUE		USUALLY TRUE		OFTEN TRUE		SOMETIMES TRUE		RARELY TRUE		NEVER TRUE	
Day to be organized & structured with exercise	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)	Delhi N (%)	FB N (%)
	11 (7.18)	60(86)	142 (92.8)	0(0)	0(0)	0(0)	0(0)	3(4)	0(0)	3(4)	0(0)	4(6)
Weekly pattern of exercise is repetitive	47 (30.7)	32(46)	95 (62.0)	0(0)	11 (7.18)	0(0)	0(0)	24(34)	0(0)	7(10)	0(0)	7(10)
Follow a set routine of exercise	16 (10.4)	47(67)	34 (22.2)	0(0)	49 (32.0)	0(0)	30 (19.6)	9(13)	4 (2.61)	2(3)	20 (13.0)	12(17)

TABLE 6 depicts the distribution tables based on CET scoring. Out of 223 subjects, 44.3% of subjects were having mild exercise bulimia whereas 55.7% of subjects were having exercise bulimia.

TABLE 6: DISTRIBUTION OF THE TABLES ON THE BASIS OF CET SCORING:

CET SCORING	CATEGORIES	N (%)
0-15	NO EXERCISE BULIMIA	0 (0)
15-70	MILD EXERCISE BULIMIA	99 (44.3)
70-100	EXERCISE BULIMIA	124 (55.7)

Conclusion

The study revealed that more than half of the subjects were doing Compulsive Exercise. Till now in our knowledge very few studies has be conducted to assess Compulsive Exercise in physical active population. Most of the studies are done on assessment of physical activity in Anorexia Nervosa and Bulimia Nervosa subjects.

The study concluded that maximum number of subjects was suffering from Compulsive Exercise disorder, which is an alarming situation for the young generation.

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Ethical Clearance: Consent form was used to take permission from the participants to participate in the study.

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Prevalence of Carpal Tunnel Syndrome among Third Trimester Pregnant Women – An Institutional Based Study

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Abstract

Background: Carpal tunnel syndrome is a most common type of upper limb compression neuropathies. Carpal tunnel syndrome is common during pregnancy and the symptoms are mostly high in the third trimester. Various physiological and electro diagnostic tests are used to detect carpal tunnel syndrome in this stage. Though it is common during pregnancy; there are limited studies done in India to find out the prevalence. Thus this study was aimed to find the prevalence of carpal tunnel syndrome among third trimester of pregnant women.

Method: A cross-sectional study including 371 pregnant women who visited OBG Department of Yenepoya Medical College Hospital Mangalore. They were assessed subjectively through Flick sign and Katz Hand Diagram and objectively using clinical tests including Tinel's test, Phalen's test, Carpal compression test and Abduction strength test to confirm the carpal tunnel syndrome.

Results: Among 371 pregnant women, 34 (9%) women were found to be positive of carpal tunnel syndrome. 3.6%, 6.9% and 11.3% of carpal tunnel syndrome were found in 7th, 8th and 9th month of their pregnancy respectively. Tests were found to be higher in 9th month as compared to 7th and 8th month but Tinel's sign was significantly higher in the 9th month.

Conclusion: In this study the prevalence of carpal tunnel syndrome among third trimester pregnant women was found to be 9%.

Keywords: *Carpal tunnel syndrome, Third trimester, Tinel's sign, Phalen's test, Flick sign*

Introduction

Carpal tunnel syndrome (CTS) is a most common type of upper limb compression neuropathies[1]. CTS occur due to the median nerve within the carpal tunnel at the wrist and it accounts for nearly 90% of all the entrapment neuropathies[2]. It is also an important cause of functional impairment and pain in hand[3]. General population being diagnosed with CTS is only about 0.5%. Only few affected patients consult clinicians and population based studies reveal that about 3% of adults with CTS are electro-diagnostically confirmed[4].

Various diagnostic tests are used to detect CTS such as Tinel's sign, Phalen's test, Square wrist sign, Katz hand diagram, Tethered Median nerve stress test, Pressure provocation test, Tourniquet test and the motor examination includes Abduction strength tests. CTS will be confirmed through electrophysiological findings like Nerve conduction velocity and Ultrasound[2]. Nerve conduction test and Electromyography investigations are the diagnostic gold standard tests but if the Tinel's test and Phalen's tests are positive which have the specificity of >98%, then it is unnecessary to do electro diagnostic tests prior to the referral.[5] The symptoms includes tingling and numbness in the thumb, index and

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middle finger and also lateral half of the ring finger, loss of grip strength and dexterity, sensation of burning and dysesthetic wrist pain, radiating pain proximally along the volar forearm, medial arm and shoulder. Symptoms may be exacerbated by activities, wrist positions and are often worse at night[6]. The symptoms may subsequently be exaggerated to include, hyperesthesia or hypoesthesia, and weakness. CTS can be diagnosed with detailed history and physical tests[7].

During pregnancy and postpartum period of women the compression neuropathies such as CTS are very common. CTS is seen as a complication of pregnancy[8]. Approximately about 2.3% to 4.6% of patients with CTS are pregnant women[9]; up to 50% of all pregnant women have nocturnal hand symptoms, mostly in the third trimester. Hormonal changes and edema and gestational diabetes are likely the main causes of CTS[10]. After child birth Carpal tunnel syndrome may decrease spontaneously within few weeks as seen in 95% of women[11].

There are studies done to find out the prevalence of CTS in pregnant women[7, 12-17]. A Study by Wand J S et al, observed that all the cases of CTS that developed in pregnancy occurred in the third trimester and resolved within two weeks of delivery. CTS which develops in pregnancy appeared to be a separate clinical entity to that developing in the puerperium[9]. Bahrami MH et al, in 2005 did a study on prevalence and severity of CTS during pregnancy among 100 pregnant women with hand symptoms. They used CTS provocation tests like Tinel's and Phalen's tests and for definite diagnosis electro diagnostic tests were used. Results indicated that prevalence of CTS is significant in pregnant women and this study highlighted that hand symptoms provide useful information in pregnancy related CTS[13].

A study on 333 women with CTS by Sapuan J et al used diagnostic processes as patient history, physical examinations and severity with Boston Carpal Tunnel Questionnaire (BCTQ) and 82 pregnant women presented with CTS and majority were Malay women who also were at higher risk of developing the syndrome in the third trimester[15]. A study was done on 639 Dutch pregnant women with prevalence, course and determinants of CTS by Meems et al, who assessed baseline characteristics at 12 weeks of gestation and its symptoms using BCTQ at 32 weeks and BCTQ at first postpartum period about last week of pregnancy. 34% reported CTS symptoms during pregnancy. BCTQ was found to be significantly higher after 32 weeks than before 32 weeks[16]. A systematic review by Luca Padua et al concluded that symptoms may persist in a substantial number after one or more years of delivery[17].

Most of the studies specifically mentioned the prevalence of CTS in pregnancy is two times higher in third trimester than the first and second trimester of pregnancy[7, 18-20]. But there are limited studies done in India to find out the prevalence.

Methodology

This is a cross sectional study which included 371 third trimester pregnant women who visited Inpatient and Outpatient Department of OBG at Yenepoya Medical College Hospital, Mangalore. Any history of neuropathies other than carpal tunnel syndrome and history of carpal tunnel syndrome prior to pregnancy were excluded from the study. Study period was one year (Feb 2019 to Feb 2020).

Procedure: An informed consent was obtained from the pregnant women who fulfilled the criteria. In this study CTS was diagnosed through subjective examinations including, Katz Hand Diagram[3] which is a self-administered diagram and diagnosis is graded as classic, probable, possible or unlikely to be carpal tunnel syndrome based on the hand pattern in the diagram and the flick sign[3], where the subjects were asked 'Will you shake your hand when the symptoms are at their worst at night?'

Subjects were objectively examined through physiological tests including Tinel's test[6], by lightly tapping over the site of the median nerve at the distal wrist crease of the subject and any tingling and discomfort in the fingers complained by the subjects was considered a positive sign. Phalen's test[6] was assessed by asking the subjects to hold the forearm vertically with the elbow resting on the table and then allowing both the hands to drop with complete wrist flexion for approximately one minute and the test was positive if paresthesia developed in less than one minute. Carpal compression test[6] was done by applying a direct thumb pressure over the median nerve at the carpal tunnel in wrist and the

subjects who developed paresthesia within 30 seconds were considered positive. For Abduction strength test[7] the subjects were asked to raise the thumb perpendicularly to the palm; a pressure was applied on the distal phalanx where the abductor pollicis bevis is innervated only by the median nerve, which isolates the strength. The subjects who found positive in these tests were diagnosed with CTS.

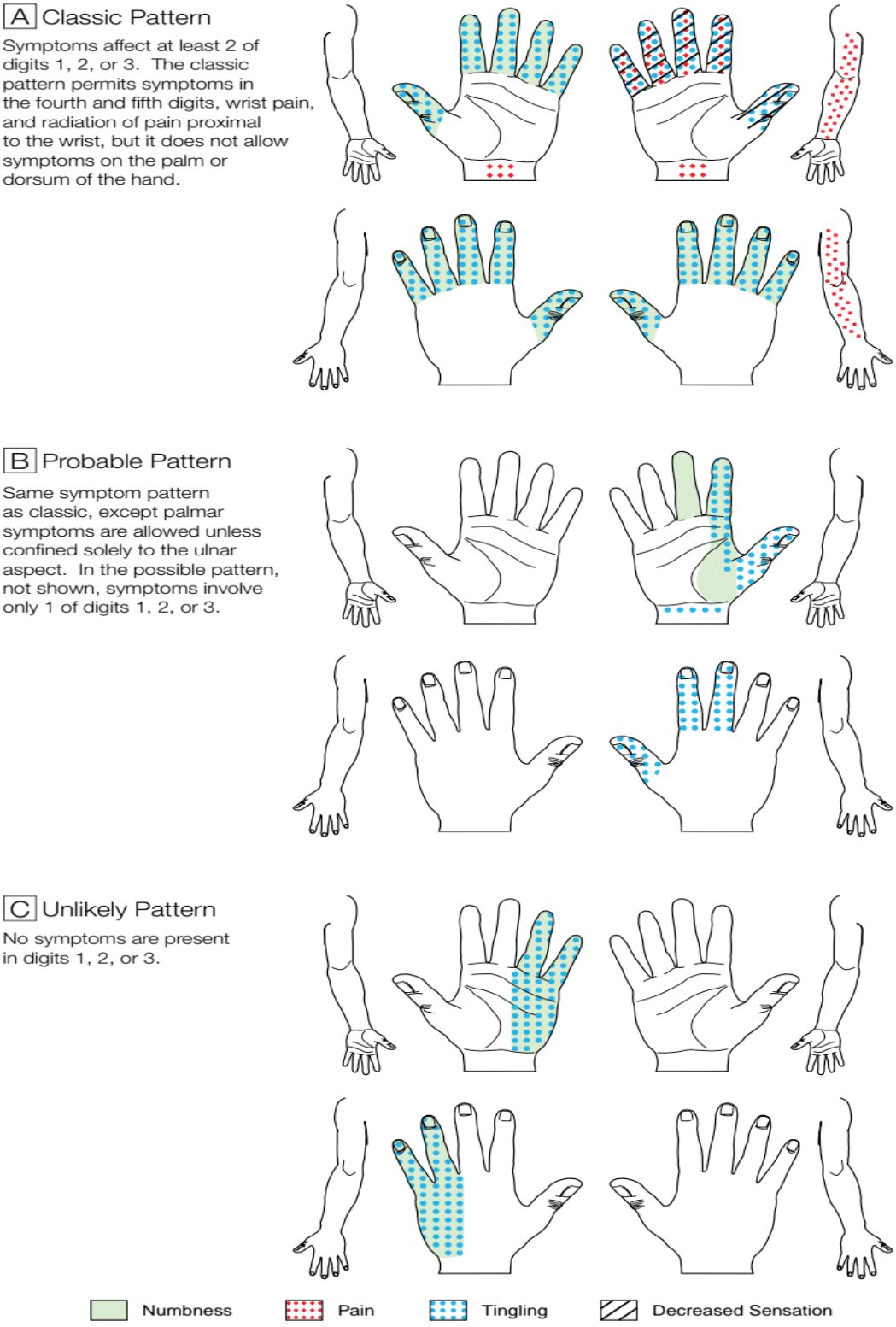

Fig 1: Katz Hand Diagram[3]

Findings

Table1: Frequency distribution

		Number of pregnant women	Percentage
Age	<=20	27	7.3%
	21-25	125	33.7%
	26-30	135	36.4%
	31-35	65	17.5%
	36-40	17	4.6%
	>40	2	0.5%
Month of pregnancy	7th month	28	7.5%
	8th month	131	35.3%
	9th month	212	57.1%
Katz hand diagram	A	47	12.7%
	B	46	12.4%
	C	278	74.9%
Flick sign	N	310	83.6%
	P	61	16.4%
Tinel's sign	N	312	84.1%
	P	59	15.9%
Phalen's Test	N	315	84.9%
	P	56	15.1%
Carpal Compression Test	N	333	89.8%
	P	38	10.2%
Abduction strength test	N	341	91.9%
	P	30	8.1%

*Katz hand diagram **A, B** and **C** are representing Classic, Probable and Unlikely pattern of symptoms in hands respectively. **N**- Negative and **P**- Positive.*

Table 1 shows the frequency distribution of age, months of pregnancy in third trimester, subjective (Katz hand diagrams and fick sign) and objective (Tinel's test, Phalen's test, carpal compression test and abduction strength test) respectively.

TABLE 2: Comparison between the months in third trimester

		Number of pregnant women (No. PW)	Month of pregnancy						Chi square	P value
			7th month		8th month		9th month			
			No.PW	%	No.PW	%	No.PW	%		
Age	<=20	27	2	7.10%	10	7.60%	15	7.10%	7.709	0.657
	21-25	125	9	32.1%	43	32.8%	73	34.40%		
	26-30	135	12	42.9%	39	29.8%	84	39.60%		
	31-35	65	4	14.3%	29	22.1%	32	15.10%		
	36-40	17	1	3.60%	9	6.90%	7	3.30%		
	>40	2	0	0.00%	1	0.80%	1	0.50%		
Katz hand diagram	A	47	1	3.60%	11	8.40%	35	16.50%	8.876	0.064
	B	46	3	10.7%	21	16.0%	22	10.40%		
	C	278	24	85.7%	99	75.6%	155	73.10%		
Flick sign	N	310	25	89.3%	114	87%	171	80.70%	3.109	0.211
	P	61	3	10.7%	17	13%	41	19.30%		
Tinel's sign	N	312	27	96.4%	116	88.5%	169	79.70%	8.167	0.017*
	P	59	1	3.60%	15	11.5%	43	20.30%		
Phalen's test	N	315	26	92.9%	115	87.8%	174	82.10%	3.555	0.169
	P	56	2	7.10%	16	12.2%	38	17.90%		
Carpal compression test	N	333	26	92.9%	122	93.1%	185	87.30%	3.347	0.188
	P	38	2	7.10%	9	6.90%	27	12.70%		
Abduction strength test	N	341	27	96.4%	125	95.4%	189	89.20%	5.112	0.078
	P	30	1	3.60%	6	4.60%	23	10.80%		

*Katz hand diagram **A, B** and **C** are representing Classic, Probable and Unlikely pattern of symptoms in hands respectively,*

***N**- negative and P- positive, * - p value showing statistical significant (<0.05).*

Table 2, shows the comparison between months in third trimester using chi square test. All tests were higher in 9th month as compared to 7th and 8th month but Tinel's sign was signi f cantly higher in the 9th month.

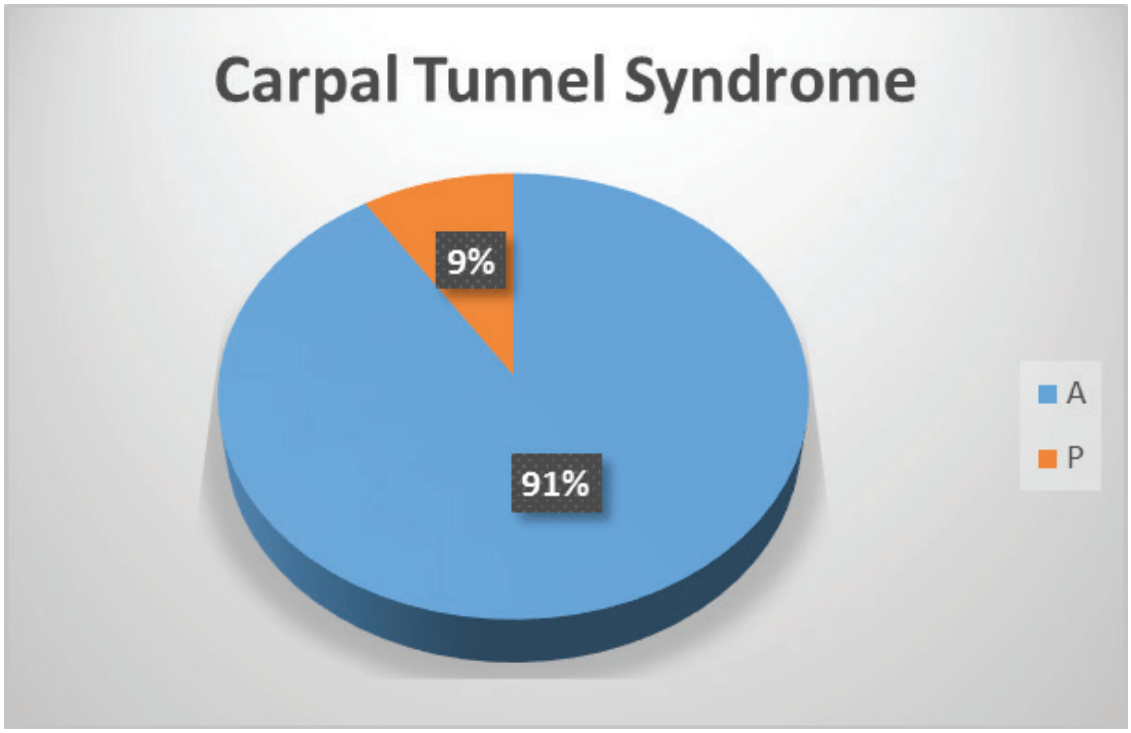

Fig 2: Prevalence of carpal tunnel syndrome

The diagram shows the prevalence of CTS among 371 pregnant women in their third trimester.

Table 3: Comparison of frequency and percentage of CTS between the months of third trimester

			Month of pregnancy			Total
			7th month	8th month	9th month	
Carpal Tunnel Syndrome	Negative	Number of pregnant women	27	122	188	337
		Percentage within Month of pregnancy	96.4%	93.1%	88.7%	90.8%
	Positive	Number of pregnant women	1	9	24	34
		Percentage within Month of pregnancy	3.6%	6.9%	11.3%	9.2%

Table 3 shows the comparison of total number and percentage of CTS between the months of pregnant women in third trimester. CTS showing higher in the 9th month as compared to 7th and 8th months. Among 371 pregnant women, 337 (90.8%) found negative and 34 (9.2%) found positive of CTS.

Discussion

In this study among 371 third trimester pregnant women, 34(9.2%) women found to be positive with the physiologic tests. 3.6%, 6.9% and 11.3% of CTS found in 7th, 8th and 9th month of pregnancy respectively. The prevalence of Carpal tunnel syndrome (CTS) among pregnant women was found to be as high as 62% [21] and as low as 0.23%[6]. No previous study has clearly stated the actual prevalence of CTS during the third trimester of pregnancy alone. All tests found to be higher in 9th month as compared to 7th and 8th month. Further CTS and its symptoms were increased after 30 weeks of pregnancy. The clinical findings of this study also agree with the other studies[7, 9, 15, 16, 19, 20].

During the present study period most of the pregnant women neglected their symptoms and failed to highlight their problems to attending doctors during routine check-ups, as they regarded these symptoms to be insignificant and completely normal during pregnancy. Similar observations were also found in previous studies[7, 15]. However, most of the physicians do not record this diagnosis in the institution's diagnostic indexing system if symptoms are not a chief complaint. Although most of the studies used only electro diagnostic tests or physiological tests and electro diagnostic tests together. Our study included only physiological provocative tests in the subjective and objective forms as diagnostic criteria for CTS in pregnancy. It is widely accepted and recognized that CTS is a syndrome whose accurate diagnosis requires a combination of both signs and symptoms[15].

According to some of the previous studies[13, 15, 21] clinical examinations, provocative tests and history taking alone could not diagnose all cases, and their sensitivity and specificity are much less than electro-diagnostic tests and it is important to combine both clinical examinations and electro-diagnostic tests to confirm CTS. But one of the previous study of Szabo et al[5] supports the present study that, if the Tinel's test and Phalen's tests are positive which have the specificity of >98%, then it is unnecessary to do electro- diagnostic tests prior to the referral. Giving justice to this statement, in the present study the most common signs were found to be Tinel's and Phalen's signs which were similar to the conclusions of some of the previous studies[16, 18].

In contrast, a study by Mondelli et al [22] stated that the Tinel's test found to be least accurate among several such tests and also known to be present in poly neuropathies besides Carpal Tunnel Syndrome. However in the present study we have included the Tinel's test, which was found to be significant than other provocative tests so it can be considered as an evaluation test and one of the previous study[18] also supports this criteria.

This study was not without limitations. One shortcoming was perhaps the Katz Hand diagram, being a subjective and patient-oriented is associated with the possibility of patients overestimating or underestimating the severity of their condition. This study focused only on the Prevalence of carpal tunnel syndrome through the physiological tests, and thus does not identify the severity and depth of the condition.

Conclusion

In this study the prevalence of carpal tunnel syndrome among third trimester pregnant women was found to be 9%.

Conflict of Interest: No conflict of interest

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Ethical Clearance: Yenepoya University Ethics Committee approved this study.

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Effect of Sub Occipital Release, Myofascial Release with Iastm Tool on Cervicogenic Headache

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Abstract

Background: Headache referred to upper cervical vertebra i.e. (c2, c3) along with soft tissues termed as cervicogenic headache. Difficult to diagnose and treat as the cause is not clear. It is accompanied by neck pain and stiffness.

Objective: This study is to evaluate the effect of sub occipital release and myofascial release with IASTM tool on cervicogenic headache.

Methodology*:* In this randomised controlled study (RCT) 153 subjects were approached individuals who fulfilled inclusion criteria n =34 subjects were taken for the study. The demographic data of subjects along with the pain (Visual analogue scale (VAS)), headache intensity (Headache disability index), cervical flexion rotation test (CFRT) and cervical range of motion was evaluated. The subjects were assigned randomly by chit method in experimental group (N=17) and conventional group (N=17). In the experimental group: sub occipital release, MFR with IASTM and exercises and in conventional group: sub occipital release, MFR manually and exercises were given for twelve sessions i.e. three sessions in a week to each group.

Results: In the present study experimental and conventional group showed significant changes in post intervention ($p<0.05$).when compared between the groups none of the outcome measures was significant statistically but showed clinical significance in both the groups in pain, range of motion headache intensity and CFRT

Conclusion: This study showed that sub occipital release and myo fascial release with IASTM tool was effective on cervicogenic headache.

Key Words: *Cervicogenic headache, sub occipital release, CFRT, IASTM*

Introduction

Cervicogenic headache (CGH) refers to the headache in the cervical region. Individuals experience limitations in day to day activities, social restriction and lot of trouble due to cervicogenic headache. Patients with cervicogenic headache score low in the category of physical functioning when matched with the patients suffering with other kinds of headaches. CGH are hard to diagnose and treat because the source and pathophysiology is not clear. Even today, decision-making of CGH stays a challenge[(1,2)] Studies suggest that cervical spine adds on to various types of headaches for example CGH and strain type cerebral pain. Studies say that only 14–18% of continuous headaches that is CGH results from the musculoskeletal dysfunction in the cervical spine. As of recent studies, 2.2% population are influenced with CGH.[(2)]

The mechanism that triggers cervicogenic pain causes converging of the spinal nerves C1, C2 and C3, and a part of the fifth cranial nerve (trigeminal nerve). This pathophysiology of CGH results from the merging of sensory input from the higher region of cervical spine to the trigeminal spinal canal, including upper cervical aspect, upper cervical muscles of C2-C3. CGH can also develop due to dysfunction of the joints, muscles, ligaments, and tendon structures of the neck.These

musculoskeletal dysfunctions are responsible for reduced cervical range of motion.[3]The cervicogenic headache patients have a high probability of having myofascial trigger points particularly from the sternocleidomastoid muscle(SCM),upper trapezius and temporalis .Myo fascial trigger points of SCM have a similar referred pain pattern in CGH(posterior to frontal).In fact Jaeger et al found that 12 out of 12 CGH patients had at least 3 myofascial trigger points on their symptomatic side which reproduce headaches over 50% of the time.[3)]

Fascia is an important and overlooked tissue that often contributes to musculoskeletal pain. Several fascial layers exist in the cervical region. Fascial connection exists between sub occipital muscles and cervical dura which attaches to cranial fossa and c2 vertebra. Adhesions in these fascial connections restrict normal movements between fascial lines. Many treatments are advocated for CGH including medical, Surgical and physiotherapeutic treatment.[(3)]

Instrument assisted soft tissue mobilization (IASTM): In olden days the instrument called strigil was utilized for helpful purposes which are utilized in shower houses. Such an instrument called today (IASTM) helps to address the soft tissue restriction and pain in the cervical region particularly in the muscles like sub occipitals, SCM, upper trapezius and levator and improves the flexibility of soft tissues by treating limitations. Sub occipital release that helps in relieves tension at the sub occipital region restore optimal length and reduces severity of the pain and to accelerate release of fascial tension caused by stress, strain and repetitive use. Pain and stiffness at sub occipital myofascial structures reduces the deep neck flexors muscle strength .Releasing the neck stiffness is the way for improving deep neck flexors.[(4)]

Strengthening exercises which help in reducing pain or even eliminate pain and restore normal function for neck muscles of patient's withCGH.Therapeutic exercises should start for postural care. Neck isometric exercises which help in strengthening all the neck muscles. And isometric exercise for deep neck flexors in supine position. In addition lower trapezius, scapular muscle strengthening is given.[(3,4)]

Methodology

All the subjects were assessed fulfilling their inclusion and exclusion criteria. The purpose of the study was explained and written consent was taken from the patients. Ethical clearance for the study was granted by the institutional ethical committee from the institution Dr.D.Y. Patil Physiotherapy College. Participants were recruited for this study from Dr. D.Y Patil Physiotherapy College and Dr.D.Y Patil College of physiotherapy opd Vidyapeeth, pimpri pune. A total of 34 participants were randomly assigned to any of the two groups by chit method as group-A (Experimental group) and group-B (Conventional group) after recruitment in to the study pre assessment score had taken of VAS,CFRTand HDI .Both the groups were given conventional treatment like neck isometric exercises, lower trapezius ,serratus anterior muscle strengthening are given.

Inclusion Criteria:

1 Pain confned to frontal, temporal, occipital, and orbital region. Unilateral headache without side shift and pain may occasionally bilateral when there is bilateral involvement.

2. Headache is activated by neck movements sustained or abnormal neck posture. Restricted passive neck range of motion reduces cervical flexion rotation test (CFRT) an average of 17 degree less rotation.

3 Deep and non-throbbing pain, Neck stiffness

Exclusion Criteria:

1Congenital conditions of cervical spine. Recent fracture, osteoporosis instability of cervical spine any known case of psychological patient with headache

2 Headache not of cervical origin which includes migraine .In ability to tolerate (CFRT) cervical flexion rotation test

3 Open wound, infection, tumour, cervical carotid sinus and Burns.

Outcome measures used:

Cervical flexion rotation test: Patient in supine lying head towards at the edge of the couch. Therapist holds the patients head and flexes the neck at c1, c2 region with

the head supported behind by the therapist. The therapist rotates the head right and left rotation and checks for the range of motion, pain and stiffness while performing the movement. Normal range of rotation motion in end range fexion is 44 degree to each .In contrast; subjects suffering from headache with C1-C2 dysfunction have an average of 17 degree less rotation.[5,6]

Pain scale VAS: it is used to know the pain intensity of the patient mild, moderate and severe.

Headache disability scale: It is a questionnaire that the subject answers like (yes, sometimes, no) by the end of all questions answered by the subject. Therapist calculates the score that is gained by the subject states the severity of the headache mild, moderate and severe.

Procedure

Individuals have been taken into the 20-40 years age group. Patients were assigned randomly by chit method into two groups: group -A (n=17 mean age =26.82) and group-B (n=17 mean age=26.2) . Assessment was done by cervical fexion rotation test (CFRT) to check the range of motion of upper cervical region C1-C3. And the cervical range of motions with the help of a goniometer. Group-A experimental group Sub occipital release, IASTM for release of upper trapezius, temporalis fascia, sternocleidomastoid muscle, Conventional exercises - Isometrics exercises to neck fexors and extensors, Scapular strengthening exercises are given.

Initially patients in the experimental group were treated by sub occipital release (SOB) in the upper cervical region followed by regimen described in different literatures. In this regimen, before the commencement of the main intervention for reducing tension of cervical myofascial structures, therapist fex the MP and extend the IP joints, and by placing them under the middle joints of cervical (C4-C5), by extending these joints and holding them for 1-2 minute thus the cervical segment was moved passively with some rotation by the therapist. For the application of the main technique, subjects lied down in supine with knee fexion and two or three rolls of towel were placed under the head of the subjects to the trunk with head at the same level. Therapist sat on a stool at the head of the table. Elbows and supinated forearms were on the table. The subjects were asked to lift their head off the table. Therapist positioned the tips of the frst three fngers into the soft tissue immediately inferior to the arc of atlas. The fngers were stabilized in a fexed position - around 45° at the MP and PIP joints. The subjects were asked to rest their head back down so that the fngertips are in the sub-occipital soft tissues and the fnger pads rest frmly against the inferior aspect of the atlas. Once the position is perceived to be comfortable, a series of soft tissue responses will occur, characterized by local softening sensations followed by an increase in the weight of the head. (There is no superior traction during this phase and it takes about 3 minutes). This phase is repeated 3 times in each session. At the end, for more release at the sub occipital region. The subject lies supine with head supported and the therapist places the three middle fngers just caudal to the nuchal line, lifts the fnger tips upward while resting the hands on the treatment table, and then applies a gentle cranial pull, causing a long axis extension for 2 to 3 times. And release tightness of fascia by moving the fnger clockwise and anticlock wise direction for a couple of times. So that the fascial tension gets relieved.[1] And MFR with (IASTM) tool used to release the trigger points at the sternocleidomastoid muscle, trapezius and temporalis muscles .Subject in supine lying or sitting according to patient comfort and therapist by changing to the perpendicular direction for another 20 seconds for a total. Instrument placed at the particular muscle at 45degree angle applied for 20 seconds in a direction parallel to muscle fbres followed immediately 40 seconds had been given.[4]

GROUP –B Sub occipital release, Manual MFR for upper trapezius, temporalis fascia, sternocleidomastoid muscles by using the frst three metatarsophalangeal joints [7] and conventional exercises are given. Isometrics exercises to neck fexors and extensors, Scapular strengthening exercises used for low endurance exercises to train muscle control of the cerviocoscapular region. Isometric exercise for deep cervical fexor muscle performed in supine lying, aimed to deep neck fexor muscles longus capitus and coli. All exercises performed for 7 seconds and subjects were instructed to perform all exercises daily with 15 repetitions each (twice a day) had been given. Sub occipital release and MFR also given to upper trapezius using with Meta carpo phalangeal joints, release of temporal fascia and sternocleidomastoid muscle (SCM) for three sessions per week for four weeks and also taught self-stretching

exercises to address any tightness assessed to be present.[1,3]

Statistical Analysis and Interpretation

The data was summarized in the form of two way tables to show similarities and dissimilarities between and within the groups. Simple bar charts were used to compare between before and after treatment test scores of both the groups. .The data is normative for visual analogue scale (VAS), headache disability index scale (HDI) and cervical flexion rotation test (CFRT) so paired t test was used for analysis in the pre and post analysis within the group and T- test is used for analysis between the groups

Table-1 Intra group analysis of Group-A pre and post values of all the three outcome measures.

outcome measures	Group-A				
		MEAN	SD	T,VALUE	P VALUE
VAS	PRE	8.06	0.09109	19.86	0
	POST	2.5	1.228		
HDI	PRE	45.93	8.111	15.133	0
	POST	24.6	8.333		
CFRT	PRE	14.6	7.65	39.143	0
	POST	39	39.143		

Intra group analysis pre and post value shows the p value significant in all the three outcome measures

TABLE-2 Intra group analysis of Group-B pre and post values of all the three outcome measures.

outcome measures	Group-B				
		MEAN	SD	T,VALUE	P VALUE
VAS	PRE	8.26	1.137	9.932	0.00
	POST	3.45	1.425		
HDI	PRE	52.27	12.12	16.437	0.00
	POST	29.27	9.583		
CFRT	PRE	15.8	0.9411	26.458	0.00
	POST	38.13	4.257		

Intragroup analysis of pre and post values of three outcome measures shows p value significant.

Table: 3 Between group analysis of all the three outcome measures.

out comes	post values between groups A,B				
		MEAN	SD	T VALE	P VALUE
VAS	Group-A	2.5	1.288	1.963	0.6
	GROUP-B	3.453	1.475		
HDI	Group-A	24.6	8.331	1.526	0.138
	Group-B	29.6	9.568		
CFRT	Group-A	39	2.138	0.705	0.487
	Group-B	38.13	4.257		

Between groups analysis of Group-A and Group- B post values shows p value is not statistically signi f cant.

Results

The Study aims to f nd out the effect of IASTM tool along with conventional exercise on cervicogenic headache. A. IASTM tool (MFR) + Sub occipital release +Conventional exercises. B. Manually (MFR) + Sub occipital release + Conventional exercises. Each group consists of 17 subjects that are randomly allocated. In the present study with in the group analysis of Group- A showed that p value signi f cant immediately after the post intervention in all the three outcome measures of VAS, HDI and CFRT (Table1) In the same way within the group analysis of Group-B shows the p value signi f cant immediately post intervention in all the three outcome measures of VAS, HDI and CFRT (Table-2) The results that are found in within the group analysis of pre and post clinically and statistically signi f cant. Table: 3 between the group analysis of post values of the three outcome measures of VAS, HDI and CFRT. Both the groups are effective but when compared between the groups none of the outcome measures shows signi f cant statistically. Clinically shows that signi f cant improvement in pain, headache intensity and cervical range of motions.

Discussion

The objective of the study is to know the effect of the IASTM tool on cervicogenic headache. A total of 34 subjects, suitable for this study according to the inclusion criteria were taken. They were randomly divided into two groups, each group comprising 17 subjects. There were 2 dropouts each in both the groups. Positive effects for pain, headache frequency and cervical f exion rotation test were found for both therapeutic methods used. The pre-post treatment analysis done for the 4-week protocol showed a signi f cant improvement in pain, headache intensity and range of motion in both the groups. The mechanism of pain relief can be justi f ed by gate control system and afferent inputs which resulted by MFR with tool, sub occipital release, exercises may stimulate inhibitory systems in different levels of the central nervous system. According to a study conducted by Jull, manual therapies cause decrease in EMG activity of sub-occipital muscles in C1C2 level.

Group-A (VAS) In this group the pain intensity decreased by using the tool (IASTM). It helps in f nding the adhesions and trigger points particularly at deep inside in the muscle and can easily release the adhesions by giving stroking for 20 to 40 with an angle of 45 degree or according to muscle f ber orientation. With the use of the IASTM tool good results appeared in group –A patients. Group-B (VAS) In this group the pain intensity

decreased by manually (MFR) release of trigger points by palpating with the fngers and apply pressure over the trigger point region and releasing triggers and adhesions. But compared to group –A slight decrease in reduced pain intensity because with the hand the adhesions deeper in the muscles cannot locate exactly hence manual treatment does not give better than group –A.

Group –A (HDI) In this sub occipital release at c1, c2 region is given. With IASTM it is not possible to work on temporalis region to release fascial tightness as good as manually. Hence group-A the headache intensity does not show good improvement. Group-B (HDI) In this group headache pain has been reduced and showed good results on HDI score. Release of fascia with manually on temporalis muscle helps for the patient much relaxing and soothing effect. Hence showed good results compared to group –A.

Group-A(CFRT) By using IASTM the adhesions, trigger points that restrict the neck movements B released and results in pain free range of motion. Hence showed good improvement in cervical range of motion. Group-B By manual treatment release of trigger points and adhesions that restrict neck movements have got to be released and improve range of motion but compared to group-A group-B shows slightly less improvement. In all the outcome measures clinically showed good improvement and better results seen in patients on VAS, HDI, CFRT but statistically not signifcant in all the outcome measures.

In our study, we found no signifcant difference in VAS, HDI and CFRT between the two groups. MFR done manually or with an IASTM tool showed almost the same improvement in VAS, HDI and CFRT at the end of treatment sessions in both the groups. This fnding is in accordance with other studies showing effects of manual therapy in patients with CeH. In the 21st century headaches are a very common cause of substantial pain and disability. Now a day's most common type of headache seen in clinical practice is tension type headache and cervicogenic headache. According to the world health organization 47% of the adults have suffered from this type of headache. Cervicogenic headaches are reoccurring in nature and arise from the musculoskeletal dysfunction of the cervical spine.it lasts for a period of one hour to one week typically occur mostly unilateral side associated with added stiffness.

Eventually, it was proposed that a combination of non-invasive treatments (manual therapy and Exercises) is more effective for treatment of CeH. These results would support the hypothesis that, in patients with CeH in which the referred pain Tightness in the sub-occipital muscles and upper cervical joint dysfunctions reproduces the headache pain pattern, the application of MFR can be an effective approach for these subjects.[8]

Possible mechanisms about physiological effects of MFR include a restoration of the length of the muscle sarcomeres, temporary elongation of the connective tissue, or reduction of sensitization mechanisms associated with TrPs and tight myofascial bands. The restoration of length and integrity of the myofascial tissue will take the pressure off the pain sensitive structures such as nerves and blood vessels, as well as restoring alignment and mobility of the joint. Joint tenderness is a prominent feature of CeH. These fndings are in agreement with other studies that reported that dysfunctions of myofascial or upper cervical joints are the main pain generators of CeH. Further investigations with long time of treatment, double blind RCT and follow up period need to be done MFR is being used to treat patients with a widespread variety of conditions, but there are few studies to support its effcacy.[9,10]

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Effect of CDT and IPC in Secondary Upper Extremity Lymphedema in Women Post Breast Cancer Surgery on Anxiety, Depression and Quality of Life

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Abstract

Objective: To study the effect of complex decongestive therapy and intermittent pneumatic compression on the secondary upper extremity lymphedema in women post breast cancer surgery on anxiety, depression, and quality of life.

Methodology: 15 women with unilateral lymphedema post breast cancer surgery with the age of 18 years were included in the study. Women have observed pre-intervention and measured for lymphedema, they were provided with the CDT and IPC as the intervention which was followed on the 1st, 7th ,and 14th day of intervention and measured post-intervention on the basis of questionnaires for quality of life, anxiety ,and depression. The subjects were excluded with bilateral lymphedema, men with breast cancer ,and no lower extremity lymphedema. The improvement was calculated with measurement of arm, LYQLI ,and HADS questionnaire.

Results: There was a signifcant improvement that was seen in from pre-intervention and the 14th day of intervention followed with CDT and IPC. The LYQLI was measured in the physical, psychological and practical concerns where the signifcant improvement was seen on the 14th day and no difference on 1st day whereas the HADS having parameters of anxiety and depression shows improvement on the 7th and 14th day of intervention and no difference on 1st day.

Conclusion: The statistical analysis software was used for all the analyses and result s were found for all the analysis and results were found to be signifcant at 5% level The result came to be signifcant in the case and useful on the 14th day of the intervention.

Keywords: *CDT, IPC, lymphedema, LYQLI, HADS*

Introduction

Lymphedema is the recurring and persisting for the longer time and increases if not controlled, this occurs due to improper fltration and abrupt transport capacity leading to lymphedema.[1]

Breast cancer -related lymphedema is defned as the long term complication occurred post-surgery of the breast cancer can be with the axillary lymph node dissection and tumor removal, radiation ,and chemotherapy leading to the accumulation of the fuids causing after removal of lymph nodes or the scarring of lymph nodes, it is measured with the circumferential measurements and water displacement method [2,3]. There are 4 grades from 0 to 3 varying with the difference from the amount of edema, nature of skin, pitting and non- pitting.[4] clinical features presented by the patients are like increased in girth, the volume of limb, heaviness of limb, sensation of pins and needle and fatigue in the affected limb [3]

According to the American cancer society the breast cancer is defned as the malignant tumor present in the breast tissue. The tumor occurs as the gene mutation of the BRCA gene and tumor may spread to the lymph

nodes near such as supraclavicular, axillary ,and in the breast tissue.

Complete decongestive therapy is the non-invasive phase which is the gold standard for lymphedema, inclusive of intensive phase with the aim to reduce the lymphedema and the maintenance phase to maintain the reduced limb. This therapy is inclusive of the manual lymphatic drainage, compression bandaging, skincare, exercises for upper limb and deep breathing.[5]

Intermittent pneumatic compression is the inflatable device with the different compartments which is inflated and deflated according to the pressure required in the limb, this is worn around the chest wall and the affected arm, the pressure alters intermittently, this device assist in the circulation of the lymphedematous fluid to be circulated in the right direction with a high gradient in the lower par and low gradient in the upper part, due to limited part of circulation it cannot be stand -alone for the treatment of the lymphedema.[6]

Need of The Study

The breast cancer-related lymphedema is the secondary lymphedema which is in turning into the severe complication and can be prevented if approached early with a physiotherapist with the help of CDT and IPC.

Methodology

The Study design was pre and post-experimental design. 15 women above the age of 18 with the unilateral post breast cancer-related lymphedema participated in this study

Women who were participated were having breast cancer-related lymphedema post breast cancer surgery experiencing, heaviness in the affected limb, pain at the surgical site, and increased girth of the limb, numbness in the affected limb ,and at the surgical site. The women were not having communication disabilities .[7,8]

Women were excluded with bilateral lymphedema, no lower limb lymphedema and no males in the study .[7]

The dependent variables was the functional status and quality of life. The independent variable was CDT and IPC. The questionnaire followed was lymphedema quality of life inventory 9 (LYQLI) and hospital anxiety and depression scale (HADS)

Procedure

Informed consent from the women was taken. The assessment of the patient was done prior. Pre-intervention readings i.e measurements, questionnaire filling were recorded.

The intervention i.e CDT and IPC was given as the 1st day of intervention and then the questionnaire, measurements were recorded again.

The CDT and IPC were followed till the 7th day of intervention and the readings were recorded again.

The CDT and IPC were followed till the 14th day of intervention and the questionnaire was refilled and measurements were taken.

The complete intervention too 1.5 hours as this was inclusive of intermittent pneumatic compression which was provided on the affected limb crossing the chest wall and given for 40 minutes.

Manual lymphatic drainage part of the complex decongestive therapy which was done for 30 minutes which was followed by the exercises and then for the compression bandaging was carried out in the last phase of the complex decongestive therapy.[9]

Every time a fresh questionnaire was provided to women.

All the outcome parameters were recorded and quantified later post 14 days of intervention.

Result and Data Analysis

Table 1. - Comparison of the pre intervention with 1st day of intervention on all outcome parameters

s.no	Baseline characteristics	Pre-intervention Mean ± SD	1st day of intervention Mean ± SD	t- value	p- value
1.	LYQLI physical concern	1.21±0.25	1.20±0.24	0.78.	Insignificant
2.	LYQLI psycho-social concern	0.77±0.56	0.79±0.5	0.68.	Insignificant
3.	LYQLI practical concerns	0.62±0.30	0.60±0.31	0.23	Insignificant
4.	LYQLI 44-45	2.73±0.96	2.73±0.96	1.0	Insignificant
5.	Hospital anxiety and depression scale	21.06±6.0	20.93±5.78	0.43	Insignificant

Table 2. - Comparison of the pre intervention with 7th day of intervention on all outcome parameters

s.no	Baseline characteristics	Pre-intervention Mean ± SD	7th day of intervention Mean ± SD	t- value	p- value
1.	LYQLI physical concern	1.21±0.25	0.82±0.14	1.25	Insignificant
2.	LYQLI psycho-social concern	0.77±0.56	0.53±0.40	0.001	Insignificant
3.	LYQLI practical concerns	0.62±0.30	0.41±0.27	2.74	Significant
4.	LYQLI 44-45	2.73±0.96	4±0.37	2.23	Significant
5.	Hospital anxiety and depression scale	21.06±6.0	14.6±4.17	2.26	Significant

Table 3. Comparison of the pre intervention with 14th day of intervention on all outcome parameters .

s.no	Baseline characteristics	Pre-intervention Mean ± SD	14th day of intervention Mean ± SD	t- value	p- value
1.	LYQLI physical concern	1.21±0.25	0.41±0.10	2.43	Significant
2.	LYQLI psycho-social concern	0.77±0.56	0.25±0.25	7.99	Significant

Cont.. **Table 3. Comparison of the pre intervention with 14th day of intervention on all outcome parameters .**

3.	LYQLI practical concerns	0.62±0.30	0.20±0.18	4.89	Signi f cant
4.	LYQLI 44-45	2.73±0.96	5.6±0.63	2.23	Signi f cant
5.	Hospital anxiety and depression scale	21.06±6.0	7.33±2.63	8.08	Signi f cant

Discussion

The study was to understand the effect of CDT and IPC as a combination intervention in a short span of 14 days and to be evaluated on the quality of life and anxiety and depression.

As lymphedema leads to embarrassment to the patient while facing it personally on the physical appearance, coming to the social world affects the psychological status of the patient and the practical measure such as f nance and coping with the activity of daily living leading to anxiety and depression.

According to the study says that the complex decongestive therapy is the safest and the reliable method of reducing the limb circumferential difference with the decrease in the limb volumes which leads to a decrease in the pain, fatigue increased range of motion, neuropathic pain, strength, and endurance. The CDT is the method which is the 45- 60 minutes of protocol followed with the inclusion of the exercise, manual lymphatic drainage, multi-layer bandaging and skincare.[10]

In this study, the women were followed with the complex decongestive therapy as the intervention which resulted in the signi f cant improvement with 14 days of intervention

According to a study by the Engine tastaben et al in 2019, described the effect of intermittent pneumatic compression in breast cancer-related lymphedema and drawn that the IPC works signi f cantly in the reduction of heaviness and tightness of the pitting edema thus leading to an increased range of motion by decreasing limb volume, but the intermittent pneumatic compression alone does not work. [11]

In this study the women were provided with intermittent pneumatic compression for 40 minutes which helped in the reduction of the girth of limb.

According to the study, the patient goes through the breast cancer-related lymphedema that leads to embarrassment and the sense of anxiety and depression which further lead to the disrupted quality of life, hence a study given

by Mottari et al suggested that there were patients who were provided both complex decongestive therapy which gave the signi f cant result in the betterment of the quality of life. [8]

The other study included that the complex decongestive therapy was quanti f ed on the outcome measure of the various quality of life scales such as EORTC QLQ-30, ULL- 27, SF-36 .[10,12,7]

In this study the outcome measure for quality of life was LYQLI and for anxiety and depression, the HADS was followed.

According to the review of literature done by Cornelissen et al, where they compare the ef f cacy of the different questionnaires supportive for the lymphedema and they found that Lymph- ICF, and LYQLI were more ef f cient than the other scales. Therefore the evaluation was done based on LYQLI a Swedish questionnaire for measuring the quality of life in case of the lymphedema. [13]

Usage of the anxiety and depression quanti f cation as the patient of post-cancer feels anxiety and depression almost every time visiting the hospital hence by counseling and the correct treatment it can be reduced, the reason of anxiety is the follow-up or the continuation

of the chemotherapy, radiation and the complication occur as lymphedema is also dangerous if not managed early as said in the literature by Gençay et al said that the early detection and management in lymphedema can reduce the chances of the complications that can occur due to the lymphedema and cannot be returned to the normal state, as said that early intervention decreases the results in the quantification of HADS and better quality of life.[14]

In this study, there was the significant effect of the Complex decongestive therapy and intermittent pneumatic compression on post breast cancer surgery upper extremity lymphedema on the anxiety, depression, and the quality of life scale in the 14 days of intervention.

Conclusion

Complex decongestive therapy and intermittent pneumatic compression as the combination therapy concluded with a significant improvement in a short span of 14 days on the quality of life, anxiety, and depression.

Conflict of Interest: There is no conflict of interest in this study.

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Correlation between Psychological Status and Fatigue in Patients with Head and Neck Cancer after Chemotherapy- A Pilot Study

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Abstract

Background: Fatigue and depression are among the most pervasive symptoms experienced by the patients with cancer which might have a influence on the quality of life. This study aimed to find out the correlation between fatigue and psychological status in patients with head and neck cancer who have undergone chemotherapy

Material & Method: This was a non probability sampling method study conducted on 23 participants after obtaining the informed consent who is receiving treatment for head and neck cancer in the oncology department of Yenepoya Medical College Hospital after obtaining the institutional ethics clearance. Patients with head and neck cancer aged 18-65 years receiving chemotherapy were included in the study. Patients suffering from other cancers were excluded. A standardised validated questionnaire of Fatigue Severity Scale (FSS) and Hamilton Depression scale (HAM-D) was used measure the outcome of the study.

Result: Total of 23 patients with head and neck cancer were included in present study after obtaining the informed consent. Among them 83% were males and 17% were females, with mean age of 54.83±14.58 yrs. A significant positive strength of association between the scores of the FSS and HAM-D among the patients with the head and neck cancer

Conclusion: The head and neck cancer patients have a clear positive association between fatigue and depression. Awareness of this can be useful in further evaluating fatigue and psychological problems and in appropriate preparation to reduce these symptoms for patients.

Keywords: *Fatigue Severity Scale (FSS); Hamilton Depression scale (HAM-D); Head and Neck Cancer; Cancer; Quality of Life.*

Introduction

The head and neck squamous cell carcinoma involves upper aerodigestive tract carcinomas.(1) The head and neck cancer (HNC) accounts for 30-40 percent of India's cancers with the most prominent being oral cancer. Cancer is the sixth common cause of death in males, and the seventh in females. The multiple factors responsible for the cause of cancer of the head and neck include tobacco use, alcohol intake, obesity, lack of good diet and hygiene and lack of awareness.(2)

One of the most common and treatable symptoms of cancer is cancer-related fatigue that affects the cancer patient's quality of life.(3) In literature, fatigue has been identified as a feeling of fatigue, depression, weakness, mental state impairment and lack of motivation. Fatigue linked to cancer has both physical and psychological causes. Physical symptoms include the numerous metabolic disorders, anaemia, poor nutrition due to diarrhea, anorexia or gastrointestinal obstruction. Psychological factors include sleep loss, anxiety and depression.

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Fatigue is the most common side effect of the chemotherapy and radiotherapy. Over the course of the operation, 82-96 per cent of those undergoing chemotherapy experience exhaustion. Fatigue is believed to be associated with the severity of treatment.[4] According to previous research, the incidence of fatigue in patients with advanced cancer and others who have undergone cancer therapy is more than 50 per cent. The prevalence of tiredness is also found in cancer survivors. It has a huge effect on the patient's quality of life, and can also raise the likelihood of suicide.[5]

Depression is one of the most common mental illnesses in young people, resulting in serious psychosocial and academic performance disturbances. Hamilton Depression Rating Scale (HAM-D) is the widely most used scale for depression.[6,7]

Depression and fatigue both are relevant to the quality of life of patients.[8,9] There are evidence showing that the introduction of physical exercises can treat depression.[10] Fatigue, though, can become a barrier between depression and exercises and the cycle can continue. This study can aid in the development and provision of special fatigue treatment or therapy facilities for patients with psychological conditions.

Study aimed to find out the correlation between fatigue and psychological status in patients with head and neck cancer who have undergone chemotherapy.

Material & Method

This was a non probability sampling method study conducted on 23 participants after obtaining the informed consent who is receiving treatment for head and neck cancer in the oncology department of Yenepoya Medical College Hospital after obtaining the institutional ethics clearance. Patients with head and neck cancer aged 18-65 years receiving chemotherapy were included in the study. Patients suffering from other cancers were excluded. A standardised validated questionnaire of Fatigue Severity Scale (FSS) and Hamilton Depression scale (HAM-D) was used measure the outcome of the study.

The Microsoft excel was used to enter the data collected from the participants and analysis of the statistics using SPSS v21 operating on windows 10. All the qualitative variables were reported as frequency and percentage, continuous variable by mean and standard deviation. The strength of association between the fatigue and depression among patients was assessed using the Pearson's correlation, with $p<0.05$ considered statistically significant.

Result

Total of 23 patients with head and neck cancer were included in present study after obtaining the informed consent. Among them 83% were males and 17% were females, with mean age of 54.83±14.58 yrs.

Cancer of the buccal mucosa (17.4%) was most common followed by cancer of base of tongue (13%) and the cancer of oesophagus (13%) among head and neck cancer in our present study, with the distribution og the other cancer location in table 1.

Among the participants, 39.1% were with stage 3 cancers, followed by 13% with stage 2 and stage 4 patients and only 1 patient in stage 1 head and neck cancer. (Table 2)

The Mean of FSS was 50.65±12.79 and HAM-D was 16.91±5.63 among all the participants. We found a significant positive strength of association between the scores of the FSS and HAM-D among the patients with the head and neck cancer. (Table 3)

Table 1. Shows the frequency of the type of cancers with percentage

Type of Cancer	Frequency	Percent
Base of tongue	3	13.0
Buccal mucosa	4	17.4
Epiglottis	1	4.3
Glioblastoma	1	4.3
Hard Palate	1	4.3
Larynx	1	4.3
Lip	1	4.3
Nasopharyngeal	1	4.3
Oesophagus	3	13.0
Oligodandroglia	1	4.3
Supraglottis	2	8.7
Tongue	2	8.7
Tonsil	1	4.3
Vocal Cords	1	4.3
Total	23	100.0

Table 2. Shows the frequency of the stage of cancer with percentage

Stage of Cancer	Frequency	Percent
Stage 1	1	4.3
Stage 2	3	13.0
Stage 3	9	39.1
Stage 4	3	13.0
T2N0M0	1	4.3
T2N1M0	2	8.7
T2N2M0	1	4.3
T3N0M0	1	4.3
T3N2M0	1	4.3
T4N0M0	1	4.3
Total	23	100.0

Table 3. Shows the Mean and SD of the Fatigue score and depression score.

Score	Mean	SD	Pearson correlation r (p-value)
Fatigue	50.65	12.79	0.651 (0.001)
Depression	16.91	5.63	
p-value <0.05 is considered statistically significant.			

Discussion

The current pilot study aimed to identify the connection between depression and exhaustion in patients with cancer of the head and neck. A total of 23 patients were screened using FSS and HAM-D, composed of both male (n=7) and female (n=16). Depression was present in most patients suffering from head and neck cancer. Depression commonly occurs in cancer patients with symptoms such as fatigue and pain, and the prevalence of depression among cancer patients also increases with severity of disease.

There is evidence that providing psychosocial support may help to alleviate pain, depression, and anxiety.[11,12] Of all patients with oncology, the highest levels of major depressive disorder are reported by patients with head and neck cancer who may develop

after the initial diagnosis and therapy.[13] During the questionnaire filling process, most participants understood that what they felt was due to depression.

Early detection of depression in specific cancer populations, such as older male patients, may help identify those at the highest risk of suicide, and may be directed to seek assistance for the same.[14]

We observed a strong link between depression and fatigue. This suggests a correlation between exhaustion and depression. If this loop can be broken then both depression and fatigue can be easily treated. Exercises can also increase serotonin and dopamine levels in the body that can boost mood and decrease depression.[15,16] The most significant effect is found when exercisers participate in aerobic exercise.[17] Exercising preparation can be implemented to enhance physical health, quality of life and minimize fatigue.[18]

We find that patients with head and neck cancer must be monitored on a regular basis for depression and fatigue, so that the required assessments can be taken as soon as possible. Such patients' recovery needs to be in holistic approaches that include both physical and mental health.

Conclusion

The head and neck cancer patients have a clear positive association between fatigue and depression. Awareness of this can be useful in further evaluating fatigue and psychological problems and in appropriate preparation to reduce these symptoms for patients. It may also enable patients with psychiatric problems to build and have special services for the treatment of fatigue or therapy.

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The Effect of Guided Motor Imagery on Functional Gait Performance in Post Stroke Patients

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Abstract

Purpose: Restoration of independent walking is the major goal of rehabilitation after stroke. Walking difficulty hinders community level participation of an individual, affecting quality of life. Earliest activation of locomotion concerned cortical areas is important to achieve near normal locomotion after rehabilitation. Motor imagery (MI) is a process of imagination of body part movement without actually moving it and it is found that MI activates same cortical areas which are activated during actual movement. MI enhances motor planning, causes neural adaptations to improve voluntary skeletal muscle strength and increases firing at local interneurons as well. There is limited evidence available regarding the effect of guided motor imagery (guided MI) on functional gait performance in post stroke patients. Hence, purpose of this study is to see the effect of guided MI on functional gait performance in post stroke patients. **Aim:** To study effect of guided MI on functional gait performance in post stroke patients. **Objective:** To assess and compare functional gait performance in post stroke patients with and without guided MI. **Method:** Prospective, Experimental Randomized Control Trial. **Result:** Study results showed that functional gait performance has improved in post stroke patients due to guided MI reflected by significant *p* values during analysis. **Conclusion:** The above study concludes that application of guided MI improves functional gait performance in post stroke patients as compared to conventional treatment alone, enhancing their functional independence and quality of life.

Key Words: *Functional gait performance, Post stroke patients, Guided motor imagery*

Introduction/ Background

Stroke is the sudden focal neurologic syndrome that results in altered blood flow in cerebral vessels. Stroke is commonest leading cause of death and disability in India, highest being 42% in Kolkata.[1] Though, major goals of rehabilitation in stroke patients are improving balance and gait ability, more than 30% of patients who had a stroke don't achieve complete motor recovery after rehabilitation process; contributes significantly to reduce gait performance as control of gait involves planning and execution from multiple cortical areas.

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Post stroke patients have impaired interlimb coordination and spatiotemporal characteristics (except stride width), thus they rely on unaffected limb to do adjustment to maintain steady state walking, results in poor dynamic balance and increase fall risk.[2]

In post stroke patients, ground reaction forces demonstrate substantial asymmetries between 2 limbs which are nullified by compensatory generation of propulsion by unaffected leg or by increased hip flexor activity in paretic leg to help to advance leg in pre and early swing. Inappropriate muscle activity (e.g. tibialis anterior, plantarflexors) in affected leg reduces its propulsion due to decreased force production.[3]

In post stroke patients, cerebral cortex impairment leads to walking difficulties. Thus, it's necessary to use advanced treatment approaches for cortical reorganisation for gait reeducation, one of them is Motor imagery (MI).[5] It's believed that through medium

of imagination vast untapped pool of rich sensory experiences in one's memory can be tapped with the help of tacit knowledge. Tacit knowledge covers surprising amount of knowledgelike attention, recognition, retrieval of information, perception and motor control. Efficiency and recovery speed of damaged brain depends partly on availability of (sensory) information provided by motor activity. 5 sources of sensory information can be identified in relation to motor (re-)learning:

(*i*) proprioceptive information; (*ii*) tactile information;(*iii*) vestibular information; (*iv*) visual information; (*v*) auditory information.

MI can be defined as 'the covert cognitive process of imagining a movement of your own body (-part) without actually moving that body (-part)' [7]

Two kinds of mental representations of motor acts can be generated by normal subjects: an "internal" (subjects feel themselves executing movements), and an "external" (visual representation of actions).[9] When MI is carried out under supervision, it's called as guided motor imagery (Guided MI). Guided MI is carried out in relaxed, quiet, distraction free setting for maximum 20 min. The task imagined during guided MI is same for pre and post assessment and should be part of patient's daily activity to enhance the performance. In an early stage of recovery, MI allows patients to mentally practice a task which they cannot yet carry out physically due to motor impairment.[10] The rationale behind using MI is that brain areas that are normally involved in movement planning and execution are also active during the imagination of a movement. It's known that imagination of movement activates more or less same brain areas as actual execution of movement which are prefrontal cortex (PFC), premotor cortex, supplemental motor area (SMA), cingulate cortex, parietal cortex and cerebellum. Some studies suggested that primary motor cortex is involved during imagination of movement while some don't, suggesting that MI is primarily involved in planning phase of motor control and not in execution phase. It could be that these differences are due to methodological differences in research designs. The one cortical network that appears to be equally shared between motor planning and learning involves SMA whose function is to suppress motor output via motor cortex. The most striking difference between imagery and execution is the discharge via corticospinal tract that produces movement and sensory feedback.[11] Earlier studies on MI training and muscle strength had shown that mental practice with MI actively enhances neural adaptation for maximal voluntary contraction.[12]MI thought to cause local hemodynamic changes inside brain that alters synaptic activity which may increase firing in local interneurons and afferent fibres. There are various articles which suggest that MI stimulates same cortical areas as that in actual movement and effects of MI are also seen at musculoskeletal as well as hemodynamic level. However, there is dearth of literature available which suggests MI enhances gait performance in post stroke patients. The evidence for the same is ambiguous.

Material and Methods

Study Type: Prospective, Experimental

Study Design: Randomized Control Trial

Sample Size: 82 post-stroke patients.

Sample size was determined with 5% level of significance and 90% power value.

Sampling Technique: Blocked random sampling method

Duration: 18 months

Sampling frame: Samples were collected from OPD and IPD of corporation and tertiary care hospitals in Mumbai and Navi Mumbai.

82 patients who had single onset of ischaemic or haemorrhagic stroke (41 experimental group, 42 control group) were involved voluntarily. Participants with voluntary control grade 3 to 4 according to Brunnstorm criteria which all were having score ≥ 24 on mini mental state examination and who can walk and stand independently more than 10 meters were included in study. Subjects with presence of any other neurological/ musculoskeletal/ cardiopulmonary disease which interferes with mobility of participants and subjects with cognitive/ auditory/ visual problems were excluded.

Materials Used:

Fig. 1 and fig. 2 material used: Stopwatch, Stepper, headphones, audio tape, writing material, staircase

Initially functional gait performance of patients was assessed using outcome measures. Conventional protocol of rehabilitation for lower extremity was followed, which included,

- Stretching
- Strengthening
- Weight bearing activities
- Balance training

Experimental and control group received conventional exercises before gait training. The experimental group received gait training for 20 minutes/day with guided MI for 10 minutes/day, 3 days/week for a period of 4 weeks, the control group received manual gait training for 30 minutes/day. Before gait training, MI was implemented in subjects of experimental group in an isolated, quite room. The MI was given via an audio recording which was recorded by physical therapist using standard Indian languages i.e. Hindi, Marathi and English. The participants performed MI in comfortable condition, sitting in a comfortable seat with an armrest and backrest. Before 10 minutes of MI,participants were guided to state of relaxation by deep breathing for 2 minute. This protocol was continued for 4 weeks. Reassessment of functional gait performance with outcome measures were done at the end of 4 weeks. These pre and post-scores were calculated and assessed.

Findings

Statistical calculations and analysis of data was performed using software package SPSS for windows, version 19.0 and results were calculated at 0.05 level of signi f cance. Normal distribution of data was tested for all baseline parameters using **Shapiro Wilk test.**

Table 1: Descriptive characteristics

		Groups	Category	Total	Mean	Std. Dev.
1	Age	Control			63.49	+9.50
		Expt.			61.93	+9.08

Cont... **Table 1: Descriptive characteristics**

2	Gender	Control	Male	22	-	-
			Female	19	-	-
		Expt.	Male	20	-	-
			Female	21	-	-
3	Dominance	Control	Right	30	-	-
			Left	11	-	-
		Expt.	Right	31	-	-
			Left	10	-	-
3	Type of stroke	Control	Ischemic	21	-	-
			Hemorrhagic	20	-	-
		Expt.	Ischemic	20	-	-
			Hemorrhagic	21	-	-

Table 2- Measures of parameters in control group

Parameters	**Control group**							
		Test	**N**	**Mean**	**SD**	**Paired T test**	**p value**	**Significance at 5 % level**
FGA		Pre	41	4.9756	2.196	-9.242	0.000	Yes
		Post	41	6.5854	2.167			
		Test	N	Mean	SD	Wilcoxon signed rank test	p value	Signi f cance at 5 % level
10 m walk test	SSV	Pre	41	28.161	4.278	-3.952	0.000	Yes
		Post	41	29.421	4.338			
	FV	Pre	41	31.3449	5.092	-4.203	0.000	Yes
		Post	41	34.3256	6.019			

Table 3- Measures of experimental group

	Experimental group							
		Test	**N**	**Mean**	**SD**	**Wilcoxon signed rank test**	**p value**	**Significance at 5 % level**
FGA		Pre	41	11.097	4.482	-5.119	0.000	Yes
		Post	41	19.707	5.523			
10 m walk test	SSV	Pre	41	33.884	6.117	-5.585	0.000	Yes
		Post	41	45.322	9.427			
	FV	Pre	41	41.473	9.074	-5.584	0.000	Yes
		Post	41	59.023	14.471			

Table 4: Measures of control and experimental group

Parameters		**Post Study Experiment**						
		Post Study	**N**	**Mean**	**SD**	**Mann Whitney test**	**P-value**	**Significant at 5% level**
FGA		Control	41	6.585	2.168	-7.382	0.000	Yes
		Experiment	41	19.707	5.524			
10 m walk test	SSV	Control	41	29.421	4.339	-6.826	0.000	Yes
		Experiment	41	45.323	9.428			
	FV	Control	41	34.326	6.020	-6.821	0.000	Yes
		Experiment	41	59.023	14.471			

Discussion

The main aim of this study was to found out effect of guided MI on functional gait performance in post stroke patients and compare it with conventional physical therapy. The results show that there is signi f cant improvement in functional gait performance as re f ected by signi f cant *p* values of respective tests. Improvement in functional gait performance is assessed using functional gait assessment scale and 10 meter walk test.

10 Meter Walk Test:

This test is used to assess walking speed in meters per second over short duration. Walking velocity is calculated as preferred velocity and fast velocity.The result showed improvement in post values in experimental group after 4 weeks. There was statistically signi f cant improvement (p= 0.000) found in post values when compared with control group as well as pre experimental values.

Walking is a complex whole body task which results in activation of cortical networks, thus suggesting that overlapping among neural substrates during real and imagined movements also applies tocomplex body movements.The observed improvement in walking speed can be due to learning effect that was induced by MI approach and took place at high levels of the CNS. [13]

Author Lacourse et al had already stated the ef f cacy of MI practice for activating cerebral and cerebellar sensorimotor networks and its potential to produce functional reorganization in contralesional brain side in post stroke hemiplegic subjects is explained by presence of regional cerebral activity during MI in the SMA, PMC, premotor area, superior parietal lobule and cerebellum studied on neuroimaging techniques. MI increases corticospinal excitability which is similar to execution of movement. MI tends to increase activation of striatal circuit of basal ganglia which may lead to long term storage of movement sequences prior to actual motor execution. [14]

Author Miyai et al had explained the potential role of mental practice in enhancing plastic CNS changes that accelerate functional recovery in patients with CNS lesions. There are three ways by which CNS plasticity can be enhanced i.e.

1. Expansion of focal primary motor area or primary somatosensory area activation believes to cause changes in movement or limb presentation.

2. Selective inhibition of unnecessary muscular activity.

3. Shift in functional activation loci that may be explained by transition from controlled to automatic processing structures.[15]

Functional Gait Assessment

This is 10 item scale in which each item is scored from 0- 3 and used to assess postural stability during walking tasks. The result showed improvement in post values in experimental group after 4 weeks. There was statistically signi f cant improvement (p= 0.000) found in post values when compared with control group as well as pre experimental values. FGA is consist of items like gait on level surface, change in gait speed, gait with horizontal and vertical head turns, gait and pivot turn, step over obstacle, gait with narrow BOS, gait with eyes closed, ambulating backwards, step.As explained earlier, gait on level surface and change in gait speed is due to learning practice that had taken place at high level in CNS due to motor imagery. Components like gait and pivot turn, step over obstacle and step mainly place demands on postural balance which is broadly classi f ed as intentional balance control and reactive balance control as per author Savitha S et al., intentional balance control is maintain by brainstem which receives collaterals from descending cortical pathways originating from PMC and SMA for controlling voluntary motor movements which also have extensive connections with frontal and prefrontal area. Reactive balance control required during step over obstacle involves feedback mechanisms mediated by brainstem and spinal cord, which include monosynaptic, long-latency and triggered re f exes and forms “automatic” balance control system. One of the components of FGA is ambulating backwards places more demands on proprioceptive and somatosensory system as visual cues are eliminated. Somatosensory system receives higher control from primary somatosensory area which is activated by MI. [16]

Authors Dodakian L, Stewart JC et al concluded that MI during movement activated similar brain regions as

movement alone but also engaged additional regions to play role in motor planning and MI, especially inferior parietal lobule and dorsolateral prefrontal cortex. [17]

Author Silasi and Murphy states that degree of regaining motor skills varies among patients depending on location and extent of lesion. The degree to which motor ability is regained depends on size of neuronal population that are thought to reorganize during intervention period and also on intensity of post stroke therapy of which MI is a part.

Thus, previous researches suggested that motor recovery following rehabilitation could either be:

1) True motor recovery, which comes into play when alternative connections that are undamaged send commands to the same affected muscles to execute the motor commands

OR

2) Compensatory motor recovery which involves sending neuronal commands to alternative but unaffected muscle.

Conclusion

From the results obtained it can be concluded that guided MI improves functional gait performance in post stroke patients as compared to conventional treatment alone. Addition of this technique to locomotor rehabilitation protocol for post stroke patients can lead to enhancement of functional independence and quality of life.

Conflict of Interest:none

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Ethical Clearance: Permission and approval to carry out research work was obtained from institutional ethical committee and head of the institute.

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Relationship between Anthropometric Parameters and Throwing Velocity among Male Undergraduate College Students: A Cross-Sectional Study

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Abstract

Background: For any persons to have an effective throw, it needs the maximum speed at which the ball is released, as well as precision targeting. Specific body types and throwing velocity can have a correlation which can be measured by anthropometric measurements and contrasted with the velocity thrown by individuals. This study is aimed to assess the relation between anthropometric parameters and throwing velocity.

Material & Method: It is a cross-sectional study conducted among 60 undergraduate male students aged 18-25 yrs at Yenepoya Physiotherapy College. The participants were included in present study after obtaining the informed consent. The study was approved by ethics committee of Yenepoya University. The participants were included in present study after obtaining the informed consent. The study was approved by ethics committee of university. Male undergraduate students aged between 18-25 yrs were included in present study. BUSHNELL radar device was used for evaluation of throwing velocity. ISAK protocol was used to evaluate the participant's anthropometric parameters.

Result: Among baseline parameters, age shows a positive correlation, in the age group 18-25 years. Weight and BMI shows a negative correlation. There is a positive correlation between the shoulder internal and external rotation strength and throwing velocity. The skinfold thickness of biceps, triceps, forearm, subscapularis, iliac crest, abdomen, and front thigh showed a negative coreelation with p value <0.05.

Conclusion: This study concludes that, with the exception of age, weight, BMI, internal and external rotator strength of the shoulder, skin fold thickness, middle thigh girth, acromio-radial length, and femoral width, none of the other anthropometric parameters had a significant relationship with the velocity of throwing among male undergraduates.

Keywords: *Bushnell Radar, Throwing Velocity, Anthropometry, ISAK, Skinfold.*

Introduction

Throwing involves launching an object into flight using either one or both arms. There are different types of throwing and not all of the sports are the same. There is side arm and overhead throwing. Throwing in a competitive handball team is considered one of the most important technical skills.[1] Throwing efficiency can be calculated in different ways, but throwing velocity is the most common measurement. The maximum voluntary speed is required for proper throw execution.[2,3] Throwing speed is an important aspect that we can alter. It has an effect on the game's achievements. So a player should throw with his maximum velocity. This speed is an essential aspect of success, since the faster the ball is thrown, the less time-keeper and defenders have to save the shot.[4]

Throwing is the sequential movement of the body from the larger, slower moving trunk to the quicker,

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distal movements of the comparatively smaller segments of the hand and neck. The highest speed of ball release in combination with targeting accuracy is required for an effective throw. So some aspects of the player's body type may affect throwing velocity.[5]

Anthropometric parameters can be used to measure this association of body type with the throwing velocity. Anthropometry is the science of the measurement of human bodies and their parts. The anthropometric parameters are calculated using the International Society for the Advancement of Kineanthropometry (ISAK) protocol. A weighing machine, a stadiometer, a skin fold caliper and a measuring tape can be used to measure it.[6]

The throwing velocity can be determined with a radar device that operates with the concept of Doppler Effect. There should be a correct alignment when dealing with radar gun. It has a cosine effect, that is, if the target is in the radar gun's direct line, the calculated speed will be correct. With increased angle of incidence, the accuracy will decrease.[7]

A pilot study was done by limiting all the previously said limitations. In this study it was noted that only the skinfold thickness was giving a statistically significant correlation with throwing velocity. However, we were not able to measure appropriately the muscle strength by using hand held dynamometer especially for wrist, ankle and trunk muscles. So, the present study will be an extension of the pilot study done earlier. In this a pressure biofeedback unit will be used to measure the above-mentioned muscle strength. So, a better conclusion may be made on the relationship between anthropometric parameters and throwing velocity.

Present study aimed to assess the relation between anthropometric parameters and throwing velocity which is estimated by correlating anthropometric measurements with throwing velocity.

Material & Method

It is a cross-sectional study conducted among 60 undergraduate male students aged 18-25 years at Yenepoya Physiotherapy College. The participants were included in present study after obtaining the informed consent. The study was approved by ethics committee of Yenepoya University. Male undergraduate students aged between 18-25 years were included in present study. The students with any musculoskeletal, neurological and cardiovascular condition or any other pathological condition contraindicating exercise participation and those who actively participated in sports in last 6 months were excluded.

Evaluation of throwing velocity was measured by a BUSHNELL[7] radar device. Radar device was placed perpendicular in direction to player. The Throw took place in a length of normal cricket pitch i.e.; 66 feet. The Radar gun was placed behind the throwers crease. The participants were wearing sleeveless t-shirt. They were asked to perform overhead throw with their maximum velocity. All the participants were using the same tennis ball for the trail. Prior to the throw a 10-minute standardized warm up was given. For better results, 3 throws were given to each participant. There was 20 second rest between each throw. Average of three throws was analyzed.

Anthropometry evaluation was done by using ISAK protocol.[9] Following 24 parameters were chosen. Basic parameter: Height (measured by a stadiometre in cm), Weight (measured by a weighing scale in kg); Skin folds (Measured using skin fold caliper) – Biceps, Triceps, Subscapularis, Forearm, Iliac crest, Abdominal, Front thigh, Medial calf; Girths – Arm (relaxed), Arm (flexed and tensed), Forearm, Wrist, Chest (mesosternal), Thigh, Calf; Length – Acromione – radiale, Radiale – stylion, Distylion – dactylion, Trochanterion – tibiallaterale, Tibia laterale – sphyriontibiale; Breadth – Humerus, Femur; Manual Muscle Testing: evaluated by handheld dynamometer (except wrist, ankle and trunk muscles), wrist, ankle and trunk muscles measured using pressure biofeedback unit.; Range of Motion: Using goniometry; Grip strength: Using hand grip dynamometer

All the collected data were expressed in terms of mean and SD. The strength of association between the variables was assessed using Pearson's correlation. a p-value <0.05 was considered statistically significant. The data entry was done in Microsoft excel sheet and statistical analysis using the SPSS v21 operating on windows 10.

Result

Total of 60 male undergraduate students were

included in present study who fulfilled inclusion criteria and consented. The mean age of the students was 21.43±2.40, BMI of 21.90±3.77 and other demographic physical parameters as in Table 1.

Table 1. Demographic details of the included participants

Baseline data	Mean±SD
Age (years)	21.43±2.40
Height (cm)	173.28±5.4
Weight (kg)	65.9±12.71
BMI (kg/m2)	21.90±3.77
Arm span (cm)	173.63±5.65
Grip strength (kg)	36.85±4.66
Throwing velocity	83.88±10.08

Table 2. Parameters having significant correlation with throwing velocity.

Parameters	Mean	SD	Pearson Correlation	P Value
Skinfold (In mm)				
Biceps	4.22	3.63	-.419*	.021
Triceps	9.39	5.81	-.363*	.049
Subscapularis	10.56	5.82	-.577*	.001
Forearm	5.12	4.11	-.400*	.029
Illiac crest	15.02	9.14	-.533*	.002
Abdomen	20.04	10.42	-.480*	.007
Front thigh	13.70	8.86	-.501*	.005
Medial calf	7.84	5.76	-.267	.154
Right shoulder muscle strength (In Kgs)				
Internal rotators	23.4	3.67	0.308	0.017
External rotators	21.72	3.08	0.325	0.011
Girth (in cm)				
Right Midthigh girth	47.49	4.64	-0.286	0.027
Length (in cm)				
Right Acromion-Radiale	30.57	1.87	-0.341	0.008
Breadth (in cm)				
Femur	9.67	.70	-0.283	0.028

Among baseline parameters age shows a positive correlation (r = 0.339, p value = 0.008), in the age group 18-25 years. Weight (r = -0.405, p value = 0.001) and BMI (r = -0.387, p value = 0.002) shows a negative correlation. The skinfold thickness of biceps, triceps, forearm, subscapularis, iliac crest, abdomen, and front thigh showed a pearsons correlation of -0.294, -0.287, -0.318, -0.431, -0.366, -0.291, and -0.319 respectively with a significance value less than 0.05. There is a positive correlation between the shoulder internal (r = 0.308, p value = 0.017) and external rotators (r = 0.325, p value = 0.011) strength and throwing velocity. The right side midthigh girth, Acromione- Radiale length, femoral breadth shows a negative correlation with throwing velocity with p value <0.05 (Table 2).

Discussion

The present study was done by correlating 24 anthropometric parameters to the throwing velocity to find the relationship between anthropometric parameter and throwing velocity among male undergraduate college students. The participants of the study were 60 male undergraduate college students aged between 18 to 25 years. ISAK protocol was used for measuring anthropometric parameters and throwing velocity was evaluated using a radar device.

A pilot study was done prior on 30 male undergraduate college students aged between 18 to 25 years, and found that except in skin fold thickness none of the other anthropometric parameters had a relation with the throwing velocity among male undergraduate college students. The present study was done by limiting all the limitation of previous pilot study and the results are in agreement with the pilot study, and we got some other important parameters which will influence the throwing velocity.

Among baseline parameters age shows a positive correlation (r = 0.339, p value = 0.008), so as age increases the throwing velocity also increases in the age group 18-25 years. Weight (r = -0.405, p value = 0.001) and BMI (r = -0.387, p value = 0.002) shows a negative correlation. The BMI has an adverse effect on throwing performance, which is if the BMI is more, the throwing velocity will be less and vice versa. So this result affirms the findings of the previous pilot study.

Throwing is subdivided into (1) windup phase, (2) late cocking phase and (3) arm acceleration phase.[10] Shoulder external rotators are at their peak activity in late cocking phase to externally rotate the arm concentrically and shoulder internal rotators are at their greatest activity in arm acceleration phase of throwing.[11]The present study conforms to these statements. There is a positive correlation between the shoulder internal (r = 0.308, p value = 0.017) and external rotators (r = 0.325, p value = 0.011) strength [Table 2] and throwing velocity. These findings may be useful for bowlers as they can perform the throw well if they have good shoulder internal and external rotators strength. A training program of a player who wants to improve their throwing velocity may set exercises concentrating more on strengthening of shoulder musculature.

A Negative association was found between skinfold thickness and throwing velocity. That is; for an individual with minimal skinfold thickness has more throwing velocity and vice versa. Biceps, triceps, forearm, subscapularis, iliac crest, belly, and front thigh skin thickness showed a pearson correlation of -0.294, -0.287, -0.318, -0.431, -0.366, -0.291, and -0.319, respectively and the significance value was less than 0.05, while the medial calf displayed a pearson correlation of -0.234 with a real value greater than 0.05 [Table 2]. These results may be beneficial for players as they can perform the throw well if their body has less fat.

We found significant correlations between BMI, and weight with throwing velocity, these results are different from those reported by Ferragut C et al. They found that body mass aspects are not related to throwing velocity. [8] However, our results are in line with Ferragut C et al in relation with femoral breadth and throwing velocity. Ferragut C et al. took all parameters from ISAK protocol except skinfold. But in this study skinfold was included which showed a significant correlation with throwing velocity.

A study by Pyne DB et al. concluded that growth and maturation primarily account for greater peak bowling speed in senior fast bowlers compared with their junior counterparts.[12] The present study is in agreement with the result of this study in case of age because we also got that as age increases from 18 to 25 years, the throwing velocity also increases.

Limitation: It was done in the southern zone of India and may not be generalized to the population based on the north as there may be some effect of the geographical area on the individual body type.

Conclusion

There is a significant association between age, weight, BMI, internal and external rotator strength of the shoulder, skin fold thickness, middle thigh girth, acromio-radial length, and femoral breadth and throwing velocity; no other anthropometric parameters relate to throwing velocity. Provides a highlight for coaches and players to include training sessions that are helpful in reducing skin fold thickness, thereby reducing weight and BMI, and to include training sessions on reinforcing shoulder muscles, particularly internal and external rotators, in order for the player to maintain or improve their throw performance.

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Conflict of Interest: Nil

Ethical Clearance- Yenepoya University Ethics Committee

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