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Editor's Desk



Dear Physiotherapists

It gives me immense pleasure to publish Volume 2 Issue 2 for Indian Journal of Physical Therapy. It has become possible only due to your positive response. On behalf of core committee of journal, I would like to thank all my respected teachers, respected seniors, colleagues and dear juniors for their kind support. I also congratulate all my associates and subordinates for completing 2 years successfully.

This contains new initiative of one letter to editor titled "**“INNOVATIONS IN TEACHING & LEARNING”**". This journal provides reader more numbers of article as compared to previous issue in different subjects. We invite suggestion from readers to improve quality of our journal. Readers can also read previous issue online free on website www.indianjournalofphysicaltherapy.com

I would also like to inform the readers that the articles are now getting indexed in google scholar. The articles of the first issue of volume one can now be accessed in google scholar.

Thanks.

Dr Dinesh M Sorani
Editor
Indian Journal of Physical Therapy



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LETTER TO THE EDITOR

INNOVATIONS IN TEACHING & LEARNING: OUR EXPERIENCE OF PBL

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Innovations has been a part of medical education since Flexner's report, although it has largely been confined to new medical schools & to small activities in a single course or clerkships. Problem Based Learning is one such innovation which was developed by McMaster University in 1965. It was developed as an alternative to traditional or teacher led education of healthcare professionals.

PBL as implemented in the health sciences is an educational method in which the focus of learning is small group tutorial in which students work through a health case scenario. The goals of health care scenarios are to provide a context for learning, to activate a prior knowledge, to motivate students. The theoretical basis of PBL is that the learning is enhanced by following conditions: stimulation of prior knowledge, learning in context to enhance retention & elaboration of knowledge through discussion.

PBL in Physical therapy is widely implemented in McMaster University as a completely integrated problem based curriculum. Other universities worldwide also have reported to use PBL in physical therapy. But in India there is no published evidence regarding the adoption of PBL in physical therapy.

Our Experience:

The first author of this study underwent extensive training in a workshop on Problem Based Learning. After the workshop the process of development of health care scenario started. Few conditions very commonly dealt with Physiotherapy were chosen such as low backache, periarthritis shoulder, degenerative disorders of knee, peripheral neuropathy. Out of these, finally Peripheral Neuropathy was selected as it was thought that as compared to other conditions, this condition will integrate all four common specialties of post-graduation & will help the students to integrate the knowledge of all subjects to betterment of patients. A preliminary case scenario was developed by the first author. It was discussed regularly in the formal & informal meetings of the Physiotherapy Education unit of our institute. Initially health case scenario was prepared for all the year students, adding some new information for each year. Based on the scenario, learning objectives were prepared for each year. They were prepared keeping in mind the desired gain in knowledge. Based on learning objective, a tutor guide was prepared wherein an attempt was made to give required information with respect to the learning objectives. Thus the final case scenario was again discussed with the faculty members of Physiotherapy education unit. After it was ready for pilot validation, an orientation of first year students was given regarding the process of PBL. Tutors who will act as facilitators were identified. They were given a facilitators' guide along with health case scenario & it was discussed at length before the actual implementation. A time slot was identified in the routine time table for PBL. The students were divided into two groups, each group was assigned a place along with a tutor.

The whole process was scheduled in two sessions. The first session being identification of difficult words & setting the learning objectives, for approximately 2 hours. Reading material was provided to the students in the form of dictionary, textbook of the concerned subjects. The facilitators moderated the two hours session in form of facilitation of discussion in the group. The students were motivated to identify the difficult words, look into the dictionary for primary information, to discuss amongst themselves if anybody has an idea regarding those words. The students very actively interacted with each other taking help of the facilitator wherever needed. Along with this they formulated learning objectives for the second session. A period of 6 days was given to them for meeting the learning objectives or find out the answers the questions framed in first session. Students were permitted to contact the facilitator if in case they need it. The second session was brainstorming one as students were ready with the answers of the questions or learning objectives set in the first session. In each session, as per earlier instructions learners identified group leader, a time keeper, a moderator in the group. At the end of the sessions a feedback was obtained, including five close ended questions & two open ended questions. This feedback form was then analyzed by a statistician.

During the first session, Students identified learning objectives, they were little different from the ones which we had set. This gave us the insight that we further need to think from learner's point of view. According learning objectives were changed for application to the next batch.

Our Inference:

Conduction of PBL session was a new experience for facilitator as well as learner. For facilitators, informally, it was very difficult to stop being teachers & let students to take the charge of themselves, but moderating them at the same time not letting them go out of the learning objectives. For students, it was a totally new experience as informally reported by them that besides being on their own, learning on their own, a healthy discussion helped them to know each other in a better way. This improved the communication amongst them.

Further this revised health case scenario will be implemented on other first year batches. Continued case scenario will be used for other year students. Also an attempt will be made to formally evaluate the students with respect to the knowledge gained through this PBL Process.

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PHYSIOTHERAPY STRATEGIES FOR A WOMAN WITH SYMPHYSIS PUBIS DIASTASIS (SPD) AFTER NORMAL VAGINAL BIRTH: A CASE STUDY

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ABSTRACT

A 32 years old primagravida complained of excruciating pain and tenderness over the symphysis pubis and sacroiliac joints and the range of hip movements was limited by pain, particularly during abduction and lateral rotation, associated with inability to stand or walk without extreme discomfort after normal vaginal delivery, was referred to the out-patient physiotherapy department of the Shri K K Sheth Physiotherapy College, Rajkot. A clinical and radiological diagnosis of post-partum pubic symphysis diastasis (SPD) was made by the referring physician. She had a safe vaginal delivery of a 3.8 kg weight of baby boy. Subsequent management with conservative physiotherapy, using pain modulating treatment like advise on back care and strategies to avoid activities that put undue strain on the pelvis, leading to excessive hip abduction, as well as on safe exercise of transverse abdominals and pelvic floor muscles combined with for 4 weeks, resulted in significant improvement in pain, mobility, and gait.

KEYWORDS: Symphysis Pubis Diastasis (SPD), Physiotherapy, Pelvic pain

INTRODUCTION

The pubic symphysis is a secondary cartilage-like joint classified as amphiarthrosis covered by a layer of hyaline cartilage with an interposed, softer fibrocartilaginous disc acting as a buffer. It is joint that allows only very limited movements except under hormonal stimulation during the third trimester of pregnancy or during birth when it becomes progressively looser. In normal conditions these movements are in the range of 0.5-1 mm¹. Starting from the seventh month of pregnancy a widening of the sacro iliac joint and the pubic symphysis occurs (4-8 mm). The pubic symphysis articular surfaces have been the subject of numerous studies because they change with age².

Each diastasis over 10mm in males and 15mm in females is considered a subdislocation or a gap¹. A diastasis wider than 14 mm indicates concomitant damage of the sacro-iliac joint with anterior lacerations on one or both sides of the ventral sacro-iliac ligament. A diastasis of the pubic symphysis after birth is a rare but painful complication that causes serious distress to the patient³. When this occurs, adequate treatment should be given while keeping in mind the needs of the mother and the baby. In an ultrasonographic study carried out on women in labour, Scriven et al found that the incidence of pubic diastasis is 1 out of 800 patients⁴.

Factors contributing to rupture of the symphysis pubis during vaginal delivery are poorly defined. The injury is thought to be caused by the fetal head exerting pressure on the pelvic ligaments, which have been weakened or relaxed by the hormones progesterone and relaxin. It is

thought to occur more commonly if manual pressure is applied to the pelvis in a latero-lateral and antero-posterior direction. The McRoberts manoeuvre, which is generally safe, may result in pubic symphysis diastasis, especially when excessive force is used or when there is prolonged placement of the patient's legs in a hyperflexed position⁵.

Clinically, the patient complains of pain, with swelling and sometimes deformity appearing in the involved area. In some cases it is possible to hear a clicking sound when the patient walks. If the dislocation is severe it can be accompanied by shock. A small percentage of patients can develop chronic pain requiring a surgical intervention of debridement or a pubic symphysis fusion⁶. The diagnostic test for this condition is an anteroposterior X-ray of the pelvis. Lesions along the genito-urinary tract may also be present. In an emergency, it is advisable to lie the patient in lateral decubitus. In his ultrasonographic study, Scriven shows a direct link between the permanence of the symphysis gap and the presence of chronic pain⁷.

A distasis of the pubic symphysis after birth is a rare but painful complication that causes serious distress to the patients. When this occurs, adequate treatment should be given while keeping in mind the need of the mother and baby. Diastasis pubis has been previously reported in both obstetric and orthopaedic literatures and the favoured treatment option is a physiotherapy approach.

CASE REPORT

We present a case of 32-year-old primigravida with a diagnosis of spontaneous

symphysis pubis diastasis (SPD), after an uncomplicated, non-operative, vaginal delivery. The delivery occurred after 39 weeks of gestation, presented no particular complications, and the baby was of normal dimensions. He weighed 3.8 kg, 53cm long, with cranial circumference about 37 cm, and his presentation was cephalic.

The patient presented with no previous medical or surgical history. She had an uneventful antenatal history, and all her routine antenatal blood investigations and ultrasound scans were normal. She experienced a spontaneous onset of labour at 39 weeks of gestation. She presented with regular, painful uterine contractions associated with show. On physical examination, she was found to have a fully effaced cervix dilated to 3 cm. She was admitted into the labour ward and amniotomy was performed, revealing clear liquor.

After 4 hours of active labour, she progressed to 7-cm cervical dilatation and she was increasingly distressed due to the uterine contractions. After an active phase of labour lasting 6 hours, she progressed to full dilatation and started bearing down. She had an uncomplicated normal vaginal delivery. A routine episiotomy was performed prior to the delivery of a baby boy with a birth weight of 3.8 kg. The second stage of labour lasted 40 minutes and the third stage lasted 5 minutes.

Just prior to the delivery of her baby, she was noted to have a swelling over the vulva. After the delivery, the swelling became more prominent and there was a passage of large blood clots vaginally. On clinical examination, the vulva was noted to be oedematous but there was no obvious haematoma. The symphysis pubis was noted to be widely separated, with the gap between pubic bones measuring about 4 to 5 cm. Prophylactic antibiotics in the form of intravenous ceftriaxone and metronidazole were administered and strict bed rest was instructed. An indwelling urinary catheter was inserted and clear urine was drained. Stool softeners were prescribed to prevent straining.

Clinical Examination/Physical Findings

The patient complained of pain along the anterior aspect of pelvis, which sometimes ‘went through the hip’. She described the pain as aching and throbbing with an occasional sharp or stabbing sensation when she made attempts to stand or walk. She also complained of pain in her lower back region.

Initial examination showed that the patient had walked into the consulting room with an unsteady gait. Breathing was normal. Muscle power in both lower limbs was grade 4 (Oxford Muscle Grading System), while the upper limb muscle strength was 5 bilaterally. Passive

and active ranges of motion were full in all joints of the left lower limb but the active range was significantly reduced in the right lower limb during active hip flexion. Sensory nerves were intact and reflexes were normal. On a visual analogue pain scale (VAS), the patient described her pain as 8 out of 10. Further musculoskeletal tests showed tenderness over the symphysis pubis and sacroiliac joints are the commonest clinical signs of SPD. The range of hip movements may be limited by pain, particularly during abduction and lateral rotation. A waddling gait may result from a tendency of the gluteus medius to lose its abductor function, which is further exaggerated by the natural lumbar lordosis of pregnancy. A positive sacroiliac joint stress test (pelvic compression, pelvic distraction and ‘figure of four’ tests), were carried out.

A pelvic X-ray (Fig. 1) was done, revealing a wide separation of the symphysis pubis measuring about 4.5 cm. The sacro-iliac and hip joints appeared intact. An urgent referral was made to the orthopaedic surgeon and upon assessment, a diagnosis of diastasis of the symphysis pubis was made.



FIGURE 1: A PELVIC X-RAY SHOWING A WIDE SEPARATION OF THE SYMPHYSIS PUBIS MEASURING ABOUT 4.5 CM

Following a careful objective examination, appropriate physiotherapy sessions were conducted for 6 days post-delivery when she was able to walk freely and independently with a walking frame. Her urinary catheter was removed and she was able to void freely without any difficulties. The patient was advised to take strict bed rest with a suitable abdominal binder or corset to immobilise the pelvis. Her vaginal bleeding stopped spontaneously a day after her delivery, with the removal of the vaginal pack. The patient was discharged from hospital 1 week after delivery. She was prescribed oral antibiotics and analgesics. She was advised to continue wearing her abdominal binder and maintain active ambulation at home.

Physiotherapy Treatment

The therapeutic exercise program as a noninvasive functional treatment for symphysis pubis diastasis (SPD) consisted of abdominal stabilization and strengthening of the pelvic floor

muscles, hip adductors, and extensors, training for bed mobility and walking training with suitable aids. The program was performed for half an hour per session, twice a day, for 4 weeks. Patient was treated by the physiotherapist twice daily and the treatment comprised:

1. Transcutaneous Electrical Nerve Stimulation (TENS) to the low back and right hip regions for 15-20 minutes
2. Ice packs can be used for five minutes at a time on the lower back and sacroiliac joints or an ice cube can be rubbed on the symphysis pubis for 20–30 seconds
3. Abdominal Strengthening exercises
4. Pelvic Floor Muscle Strengthening Exercises with biofeedback
5. Soft tissue manipulation to the low back and right hip regions
6. Strengthening of hip adductors, and extensors group of muscles
7. Training for bed mobility
8. Gait Training with assistive device
9. Advise on back care and strategies to avoid activities that put undue strain on the pelvis, leading to excessive hip abduction
10. Advice to maintain a good posture

The patient later had to wear a lumbosacral corset preparatory to ambulation, to restrict movement in the pelvic area when skin traction was discontinued.

OUTCOME MEASURE

These outcomes were evaluated at the end of two, three, and four weeks of routine physiotherapy treatment. The evaluation of the patient's response to the physiotherapy treatment was based on the following basic measures of treatment outcome; (1) pain response using the visual analogue scale (VAS), (2) functionality using the active range of right hip flexion, (3) radiological evidence of the degree of diastasis (in mm), and (4) gait assessment while walking.

Before the intervention, the patient was totally dependent on others for performing her daily activities owing to severe pain in the pelvic region. The patient could walk independently for 30 m with a pelvic corset. Low back pain had significantly subsided as well as anterior pubic symphyseal pain had gone down appreciably. At the end of third week moderate improvement in the active range of motion of the right hip joint was found as well as patient was more comfortable in getting in and out of the bed. Walking re-education was commenced with the aid of a walking frame in the fourth week showed marked improvement in gait pattern. A repeat X-ray was done at the end of 4th week which showed a significant reduction of the diastasis postpartum. After the 4-week intervention, however, the

interpubic distance was reduced by 36%, and pain and functional disability were remarkably improved. The patient was subsequently discharged after a gait assessment session and re-education by the physiotherapist.

Two-week follow up sessions were conducted for a period of six weeks, after which the patient reported 0 pain on the VAS pain scale and her normal gait had been restored. Our results suggest that a systematically designed functional rehabilitation program may be beneficial in the functional recovery of patients suffering from SPD related to pregnancy.

DISCUSSION

This case illustrates the rare occurrence of pubic symphysis diastasis in a healthy primigravida following an uncomplicated term vaginal delivery. Peripartum pubic symphyseal rupture was diagnosed on clinical grounds and the diagnosis was confirmed by radiography with an antero-posterior X-ray of the pelvis, which showed diastasis of the pubic rami.

The normal physiology of childbirth leads to an escalation of the levels of relaxin and progesterone, which facilitate the relaxation and consequent widening of the birth passage. Diastasis would indicate an exaggeration of the normal, which it does in fact appear to be⁸. The pain of symphysis pubis diastasis during and after pregnancy can be disabling. Most patients present with severe pain located in the areas supplied by the pudendal and genitofemoral nerves. The pain may radiate to the sacroiliac joints and shoot down the buttocks and legs⁹.

Most cases of non-traumatic symphysis pubis diastasis following vaginal birth can be successfully managed conservatively with bed rest, analgesia and activity restriction, especially in the early weeks post-delivery, also the time required when the maternal relaxin and progesterone return to normal non-pregnancy levels¹⁰.

If it were a disruption (traumatic), i.e., an inter-pubic distance of > 2.5 cm classified as a 'Type II open book' injury¹¹, then it would not heal with conservative treatment. Conversely however, several studies have shown that even such degrees of diastasis are amenable to conservative management¹. Based on a literature review, there is a significant risk of repeat symphyseal rupture with subsequent vaginal delivery. However, a case of successful and uneventful vaginal delivery following a rupture has been reported¹².

The present case definitely benefited from physiotherapy as shown by the gradual reduction in pain intensity and subsequent ability to walk (though initially with a walking aid). It should also be noted that she spent a

shorter time recovering with physiotherapy than she did when she had bed rest alone at the hospital. This clearly indicates the importance of physiotherapy when sometimes combined with ligamentous relaxation and when pelvic strain becomes so pronounced that it may result in permanent diastasis of the pubic symphysis with persistent symptoms and morbidity. It could therefore be implied that early physiotherapy intervention is imperative in order to take optimal advantage of the early hormonal resolution effect in postpartum diastasis.

CONCLUSION

Pubic symphysis diastasis is an uncommon injury that should be considered when assessing patients in the ante-natal or post-natal period who complain of pain along the suprapubic, sacroiliac or thigh regions. This case report demonstrated that severe non-traumatic symphyseal rupture associated with vaginal delivery can be managed satisfactorily, without any operative intervention or prolonged bed rest. Though the symptoms and clinical presentation are gross and may be incapacitating, conservative physiotherapy approaches are very effective.

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PRE AND POST INFORMAL TRAINING COMPARATIVE EVALUATION OF THE PERFORMANCE SKILLS AMONG PHYSIOTHERAPY STUDENTS

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ABSTRACT

The years spend by students in their college are sufficient to make them learn the theoretical knowledge. Practicing a skill on a model or dummy is way different than performing the same task on a patient. Application of theory in practice is required to gain skills and master the techniques; the practical training programs emphasize this aspect. The study compares the pre and post informal training performance of physiotherapy students upon improvement in their theory knowledge and performing skills. The performing skills include their ability to perform a given task with perfection and ability to make correct judgment in a given situation. Present study is an outcome measure of teaching and learning efficacy among 323 students of physiotherapy undergoing one month training programme at NIMHANS. The program included postings of the students in various units. The results show that significant improvement were present in overall learning of the students.

INTRODUCTION AND OBJECTIVES

Practical training programs are designed in such a way so that they can help the students apply their theoretical knowledge in practical's in a better way. A student may be very good in theory but that is not enough to make him a successful professional. For that he needs to master the art of application of that theory into practical, because at the end of the day what counts are good theory knowledge and a better way of its practical application.

A characteristic of any profession is that it occupies a social standing relative to other professions¹, social position in modern society is determined to a great extent by occupation (or one's parents' occupations) rather than inherited standing. Certain professions, including medicine, politics and the legal professions, are associated with power, prestige and material reward². There is also evidence that a person's character, level of intelligence and education, ability and personal acceptability are assumed from an occupational label³.

The objectives of the study were to test the efficacy of one month training programme at the NIMHANS for the physiotherapy students. The undergraduate students undergo rotatory internship programme for post-graduation clinical exposure. The master of physiotherapy students undergo clinical exposure programme as a part of their course regulations.

METHODOLOGY

A pre and post outcome measure of the training programme was assessed for 323 physiotherapy students. Pre assessment evaluation was carried out for the students at the start of the training programme and the same was administered at the end of the programme. The evaluation programme consisted of a multiple choice test of 100 items, assessing knowledge base of Neurosurgery, Neurology, Physical medicine, Human Anatomy and Physiology, Electrotherapy, Biomechanics.

All the students attending the training programme from May 2003 to June 2007 were included in this study as a sample. The students from different universities from India opt for NIMHANS as one of the training centre. The course can be classified as two types, one is 4 years course, wherein 3 ½ years of theoretical input with six months rotatory internship is provided by different universities. The other type of course is 4 ½ years of theoretical input and six months rotatory internship by another set of universities. However, the training pattern, module of training, inputs from the NIMHANS is the same to all the students. The training program included postings of the students in various units for practical exposure with theoretical inputs to the students by team of experienced physiotherapists. The various units are, Neurosurgery, Neurology, Physical medicine and neurological and neurosurgical Rehabilitation.

Along with this, the program included various seminars and quizzes at regular intervals. The result was calculated depending upon the scores of these tests and the pre and post training scores were compared individually for each student.

OUTCOME MEASURES

The outcome measures of the study include both pre and post training pre – designed questionnaire tests conducted both in theory and practical. The number of students attending from different universities, gender, age, course duration and type of institute are summarized below.

The students hailing from different types of institutes show that, 98% of the students hail from private colleges, only 2% were from government college, it is noted that nearly 20 government institutes teaching physiotherapy are available in India, rest nearly 250 private institutes are available.

CONCLUSION

The study concludes that the students are very much benefited by the practical training program undergone by them. There is a marked improvement in the performance of the students in terms of efficiency in task completion and their judgment or decision making capacity. Their theoretical knowledge also shows an appreciable improvement.

Hence we can conclude that the practical training programs like these can help the students to become better professionals.

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EFFECT OF HOME-BASED ANKLE MOBILITY AND ANKLE STRENGTHENING EXERCISES ON BALANCE IN COMMUNITY DWELLING OLDER ADULTS

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ABSTRACT

Background: Ageing commonly disrupts the balance control and compensatory postural responses that contribute to maintaining balance and preventing falls during perturbation of posture due to the weakness of ankle dorsiflexors and plantar flexors. This can lead to increase of falling in older adults over the age of 65. Although some exercise interventions with balance and muscle strengthening components have been shown to reduce falls.

Objective: To see the effect of a 2 week home based ankle mobility and strengthening exercises on balance and range of motion (ROM) in community dwelling older adults.

Method: This experimental study involved a convenience sample of 30 healthy ambulatory community-dwelling older adults aged above 65 years, both males and females with medium fall risk. Subjects with any history of giddiness, neurological condition, ankle injury, abnormal sensation of lower limb and fractures were excluded. They were divided in to 2 groups. Experimental group did home based ankle mobility and strengthening for 2 weeks while control group remained in waiting for 2 weeks. Outcome measures were ankle range of motion, five times sit to stand test (FTSTST) and modified performance oriented mobility assessment (POMA). Level of significance was kept at 5%.

Result: Data of 30 subjects was analyzed using SPSS version 16 using Mann Whitney U test. Difference in means between experimental group and control group were:

Dorsiflexion (A=4.23±1.82, B=0.66±0.83, U=12.5, p<0.01)

Planter flexion (A=3.60±2.66, B=0.70±0.97, U=35.2, p=0.01)

POMA (A=5.07±3.08, B=0.27±0.59, U=10.00, p<0.01)

FTSTST (A=3.63±2.21, B=0.81±0.86, U=29.50, p<0.01)

Conclusion: Home-based ankle mobility and ankle strengthening exercises showed significant improvement in ROM and balance (POMA, FTSTST). A simple but progressive home based ankle mobility and strengthening program is effective in older adults with medium fall risk to improve ROM and balance.

KEYWORDS: Home-based, Ankle mobility, Ankle strengthening, older adults, Five time sit to stand time, Performance oriented mobility assessment

INTRODUCTION

Ageing commonly disrupts the balance control and compensatory postural responses that contribute to maintaining balance and preventing falls during perturbation of posture due to the weakness of ankle dorsiflexors and plantar flexors. This can lead to increase of falling in older adults over the age of 65¹. Balance can be viewed as the ability to activate muscles with the amplitude and timing necessary to control movements of the body to prevent a fall during a range of tasks e.g. standing, reaching, stepping, walking². Diminished ability to maintain balance may be associated with an increased risk of falling. In older adults, falls commonly lead to injury, loss of independence, associated illness and early death. Although some exercise interventions with balance and muscle strengthening components have been shown to reduce falls³.

Ankle joint flexibility and strengthening are necessary for functional tasks like walking quickly, negotiating stairs, and rising from chair, balance and postural stability⁴. But, these are called as functional only when they are safely achieved and fall risk reduced.

Loss of ankle joint range and strength of muscles around ankle are considered to be part of normal ageing process. Ankle range of motion (ROM) has also been shown to be an important contributor to balance and gait performance, with a decrease in ankle dorsiflexion ROM being an independent predictor of falls.⁵ Stretching exercises have been shown to effectively increase ankle ROM in older adults^{6,7}. According to Orr R et al strength of ankle muscles, has a major role in the maintenance of balance and functional mobility⁸.

The purpose of the study was to see the effect of 2 weeks combined mobility and strengthening exercises for ankle at home setting on balance and range of motion (ROM) in community dwelling older adults.

METHODOLOGY

This experimental study involved a convenience sample of 30 individuals who were recruited from the community of Ahmedabad. Healthy ambulatory older adults aged above 65 years, both males and females with medium fall risk (according to t-POMA score 19-24) were included. Subjects with any history of giddiness, neurological condition, ankle injury, abnormal sensation of lower limb and fractures were excluded.

Procedure and purpose of the study were explained to the participants. Written informed consent was taken in understandable language. Subjects were divided into two groups -A) Experimental group and B) Control group.

Goniometer was used to measure flexibility. Ankle planter flexion and dorsiflexion ROM was tested with use of 180 degree goniometer. Average of right and left side was taken. The Five Time Sit to Stand time and the Tinetti Performance-Oriented Mobility Assessment (POMA) were used as measures of balance.

In POMA, 8 dynamic balance tasks and 9 characteristics of the walking pattern are scored on 2-or3-pointscales. The balance tasks are sitting balance, rising from a chair and sitting down again, standing balance (eyes open, eyes closed), and turning balance. Walking characteristics are gait initiation, step length, height, step length symmetry and continuity, path direction, and trunk sway. The POMA was originally designed as a measure for mobility and fall risk in elderly populations⁹. Scores on this assessment categorize individuals as having a "low risk for falling, "greater chance of falling, or" high risk for falling."

For the five times sit to stand test, participants were asked to cross their arms on their chest and start by sitting at the back of the chair. Subjects then asked to stand and sit five times as quickly as possible.

A home exercise program were taught to experimental group for 2 weeks as shown in tables 1 and 2. All exercises were performed 2 times a day for 2 weeks. Control group was in waiting period till 2 weeks. Level of significance was kept at %.

**TABLE-1 DESCRIPTION OF EXERCISES
PROTOCOL FOR WEEK -1**

| EXERCISES | DOSAGE |
|--|--------------------------------|
| Active ankle movement (dorsiflexion, planter Flexion) | 10 repetitions |
| Stretching of ankle planter flexor (with use of towel) | 3 repetitions 30second hold |
| Double toe rise with hand support | 10 repetitions |
| Double heel rise with hand support | 10 repetitions |

**TABLE-2 DESCRIPTION OF EXERCISES
PROTOCOL FOR WEEK-2**

| EXERCISES | DOSAGE |
|--|--------------------------------|
| Active ankle movement (dorsiflexion, planter Flexion) | 10 repetitions |
| Stretching of ankle planter flexor (with use of wedge) | 3 repetitions 30second hold |
| Single toe rise with hand support | 10 repetitions |
| Single heel rise with hand support | 10 repetitions |
| Forward lunges | 10 repetitions |
| Sideward lunges | 10 repetitions |

RESULTS

All participants completed the home exercises program. No unanticipated events were experienced during training. The study population had 30 participants of mean age of 68.50 ± 4.783 years.

Results were analyzed using SPSS version 16. Mann-Whitney U test was used to determine if there was any significant difference between experimental and control groups.

**TABLE-3 MEAN DIFFERENCE IN
PARAMETERS BETWEEN THE GROUPS.**

| Parameters | Experimental group | Control Group | U-value | p-value |
|-----------------|--------------------|-----------------|---------|---------|
| Dorsiflexion | 4.23 ± 1.82 | 0.66 ± 0.83 | 12.5 | <0.01 |
| Planter flexion | 3.60 ± 2.66 | 0.70 ± 0.97 | 32.5 | 0.01 |
| POMA | 5.07 ± 3.08 | 0.27 ± 0.59 | 10.00 | <0.01 |
| FTSTS | 3.63 ± 2.21 | 0.81 ± 0.86 | 29.50 | <0.01 |

As shown in table 3 Results there is a statistically significant difference found between the groups for ROM, POMA and FTSTS.

DISCUSSION

The above study shows that following the training, there is statistically significant difference in primary outcome measure of balance. Ankle ROM & gait also show improvement following exercises. Motor component of balance was evaluated using two tests, i.e. mPOMA and Functional reach test. The findings of this study are similar to those of Hautiera et al, Singh et al

Singh and Multani (2013) suggested that dorsiflexor muscle strength is an important component for maintaining static and dynamic balance¹⁰. By strengthening the dorsiflexors, ankle strategy can be trained thereby improving postural control and balance. Strength training induces muscular adaptations as well as neural adaptations that augment the ability of older adults to generate force and control falls⁹. Hautiera (2007) showed, that increase in lower body strength leads to an increase in balance function and postural stability and ultimately reduce in the risk of falling¹¹.

Stretching of calf muscle increases the dorsiflexion range of motion ankle. Spink et al

found a significant association between foot and ankle strength and ROM and performance in balance and functional tests in older adults¹².

The limitations of the study were that exercises were not directly supervised, long term follow up was not taken and blinding was not done.

Future research can be conducted on older adults with balance problem who can be included in a similar program, but with supervision.

CONCLUSION

Simple but progressive home exercises program of ankle mobility and ankle strengthening showed positive influence on balance and mobility in healthy community dwelling older adults.

CLINICAL IMPLICATION

This exercise program is convenient, cost effective simple, safe, progressive that can be done at a home setting in community dwelling older adults for improving or/and maintaining balance.

ETHICS APPROVAL

This study was approved by Institutional Ethics Committee of S.B.B College of Physiotherapy, V.S. General Hospital, Ahmedabad, Gujarat.

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INFLUENCE OF BMI ON HANDGRIP STRENGTH IN NORMAL INDIVIDUAL

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ABSTRACT

Purpose: To examine the influence of body mass index on hand grip strength in normal individuals

Methodology: Participants were divided into 3 groups Normal, Overweight and Obese according to their BMI.

30 participants were included in each group. Their hand grip strength was assessed using the Jamar hand dynamometer in a sitting position as described by the American Society of hand therapists .Data was analyzed using unpaired t tests.

Results: Significantly higher grip strength was seen in subjects with normal BMI when compared in subjects with obese BMI ($P < 0.05$).No Significant difference was seen in the hand grip strength between normal and overweight group ($P>0.05$) and between overweight and obese group ($P>0.05$). Also the mean values of the hand grip strength went on declining from normal to overweight to obese group.

Conclusion: Hand grip strength is seen to be declining as the BMI increases

KEYWORDS: BMI, Handgrip strength, Obese

INTRODUCTION

The hand is an organ specialized for grip and sensation. This makes the hand to be an irreplaceable and subtlest instrument of work as well as a sensory organ of humans. The grip is an act of taking by hand and keeping a firm hold of any object, tool or instrument. It is widely accepted that grip strength measurements provide an objective index of the functional integrity of the upper extremity¹. One of the determinant of hand grip strength apart from age, gender, dominance, is also the Body composition².

Sufficient physical fitness is required for functioning in ADL'S³. Overweight and Obesity are associated with low levels of physical activity. Hand grip strength measurements provide an objective index of the functional integrity of the upper extremity. Besides, grip strength can be an important index of general health, nutritional status overall strength and the amount of protein reserves in the body. Muscle function correlates closely with whole body protein, body cell mass, anthropometrically measured arm muscle mass, and even with body mass index (BMI), loss of weight or muscle mass invariably results in decreased muscle strength, i.e. weakness, which is reflected in deteriorating muscle function tests as well as in prominently altered muscle morphology⁴.

Hand grip strength is an important tool to evaluate physical fitness and nutritional status. It has come to be regarded as the most reliable clinical measure of human strength. This sedentary lifestyle in turn could lead to low physical fitness and low muscle strength. Also the excess fat globules get deposited over the muscle

fibres and leads to reduced muscle strength⁵. Regarding long-term outcome, hand grip strength has been shown to predict onset of dependency in the activities of daily living (ADL) within the subsequent five years in elderly and even old age disability in at baseline healthy middle aged men⁶.

This suggests that higher strength might provide greater physiologic and functional reserve that protects against mortality and morbidity. Furthermore, the measurement of grip strength is an important component of hand rehabilitation, because it helps establish a baseline for treatment and it is a measure of the effectiveness of therapy⁷.

AIMS AND OBJECTIVES

AIM

To assess the hand grip strength in healthy individuals with different body mass index.

OBJECTIVES

1. To assess the hand grip strength in individuals with Normal, Overweight and Obese Body Mass Index.
2. To compare the hand grip strength between normal and overweight individuals.
3. To compare the hand grip strength between overweight and obese individuals.
4. To compare the hand grip strength between normal and obese individuals.

METHODOLOGY

MATERIALS USED

1: Wall mounted Scale.

2: Weighing scale.

3: JAMAR hand Dynamometer.

Sample size: 90 subjects.

Study Design: Assessment based study.

Study Settings: Different colleges and Residential Societies of Pune

Sampling design: Convenient Sampling.

Inclusion criteria: Healthy individuals with age of 18-35 years with

Normal BMI

Overweight BMI

Obese BMI

Exclusion criteria: Subjects having history of:

Any systemic illness.

Recent hand surgery or an upper limb fracture.

PROCEDURE

After obtaining clearance from the ethical committee, with the consent of Principal Madam and the project Guide, the study was started. According to the inclusion and exclusion criteria subjects were screened and were selected from different colleges and residential societies of Pune. Before filling the assessment form and starting the procedure, the subjects received information about the questions and their doubts were cleared, and written consent was taken from them.

Height was measured with shoes removed and the subject standing against the wall. Body weight was measured with a weighing scale. BMI was calculated using the Quetelet's Index.

$$\text{BMI} = \text{weight (kg)} / \{\text{height (m)}\}^2$$

Then the subjects were classified into 3 groups based on their BMI values into normal, overweight and obese. A Minimum of 30 subjects were taken in each group.

Then the hand grip strength of both the hands i.e. dominant and non-dominant hand was assessed using the Jamar hand dynamometer.

POSITION OF TESTING:

The Standard testing position as described by the **American Society Of Hand Therapists (ASHT)**⁸⁻¹⁰ was as follows:

Handgrip strength was measured with a Jamar dynamometer in the following manner:

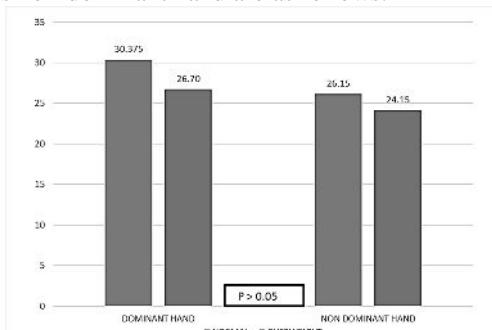
- The volunteers were seated in a standardized position used by the American Society of Hand Therapists in which the hips and knees are flexed at 90°, the shoulder adducted in

neutral position, the elbow flexed at 90° and the forearm in mid prone position without radial or ulnar deviation.

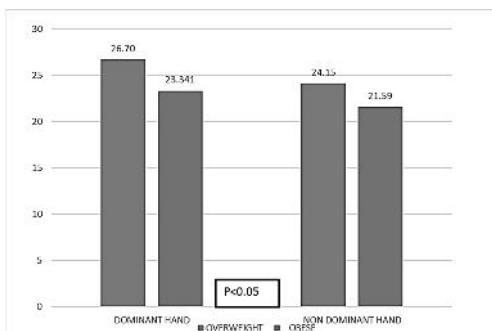
- Then the subjects were instructed to breathe in through nose and exhale through a pursed lip after a maximum grip effort was made.
- Every subject was asked to squeeze the handle of the dynamometer which was placed vertically in their hand. The test was performed three times, with the dominant hand first and then the non-dominant hand, with an interval of 1 minute between each attempt in order to avoid fatigue during the test.
- Force was applied for 5 seconds in each attempt, and the mean value was considered. The results were recorded in kilograms and the mean values of the hand grip strength were used for analysis.

RESULTS

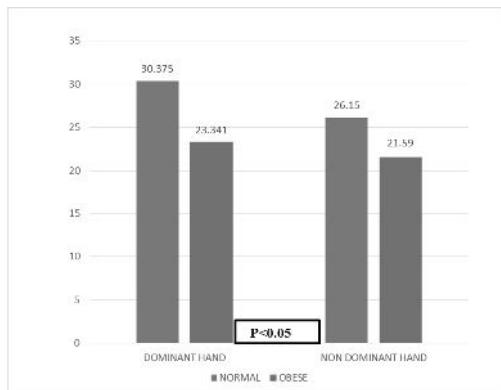
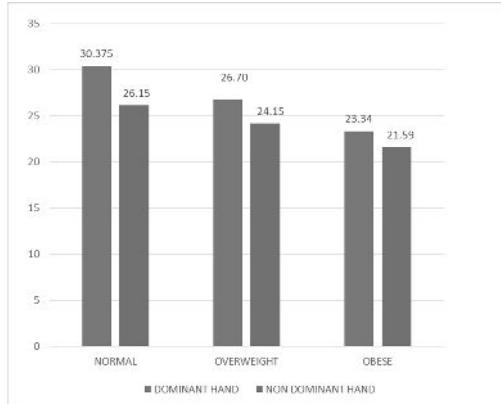
The results seen in both dominant as well as non-dominant hand are as follows:



GRAPH 1: HAND GRIP STRENGTH BETWEEN NORMAL AND OVERWEIGHT INDIVIDUALS.



GRAPH 2: HANDGRIP STRENGTH BETWEEN OVERWEIGHT AND OBESE SUBJECTS.

**GRAPH 3: HANDGRIP STRENGTH BETWEEN NORMAL AND OBESE SUBJECTS****GRAPH 4: COMPARISON OF HANDGRIP STRENGTH IN ALL 3 GROUPS.**

DISCUSSION

Many daily functions and sporting events require a good grip strength. From finer activities like threading, writing to gross functions like carrying laundry, turning a door knob, vacuuming, etc. Also in sports activities like tennis, basketball, baseball. Almost all tasks require a good amount of grip strength in their execution. The characteristic structure of the hand is related to its function as a grasping tool. Grasping ability is made possible by the fact that the thumb can be opposed to the fingers. The fingers and the thumb act as a versatile pair of pliers. They need the palm of the hand as a flat base, on which the object grasped can be held¹².

As seen in graph 1 Hand grip strength was not significantly different in Normal and Overweight Individuals.

Similar results were seen in the study of Smriti et al .The study suggested that physical activity hindered the accumulation of body fat and extensive use of hand and finger muscles which enables to achieve greater strength¹³

As seen in graph 2 Hand grip strength was not significantly different in Overweight and Obese Individuals.

Physically active lifestyles lessen the “normal” pattern of fat gain in adulthood. For young and middle-aged individuals who are active, time spent in physical activity relates inversely to body fat level¹⁴.

As seen in table and graph 3, significantly higher grip strength was seen in subjects with Normal BMI when compared with obese subjects.

In the study of Hulens et al, similar results were seen where the handgrip strength was 10-16% lower in obese women. When corrected for fat free mass through allometric scaling, Hulens and co-workers even reported that obese women exhibit lower muscle strength of both upper and lower extremities when compared to lean women, which might be explained by their lower degree of activity¹⁵.

Similar result were seen in the study of Sari Stenholm¹⁶. The results of this study suggest that a long-lasting obesity may predispose to decreased muscle strength, thus potentially endangering to an imbalance between fat and muscle mass or strength.

As seen in Graph 4, Hand grip strength went on declining from normal to overweight to obese group. In the study of Duangporn Thong et al, The study showed that subjects with higher BMI tended to have less muscular strength¹⁷. The finding observed in this study emphasized the negative impact of obesity on physical performance apart from increasing the risk of various diseases. The more weight they gain, the lower physical performance they have. With declining physical performance, they tend to have functional limitation, to be less physically active, and will consequently gain more weight.

Regular physical activity, through either recreation or occupation, effectively impedes weight gain and the adverse changes in body composition. Individuals who maintain weight loss over time show greater muscle strength and engage in more physical activity than counterparts who regained lost weight. Variations in physical activity alone accounted for more than 75% of regained body weight. Such findings point to the need to identify and promote strategies that increase regular exercise¹⁸.

In conclusion, long-term exposure to obesity is associated with poor hand grip strength. Thus, maintaining healthy body weight throughout the life span may help to prevent or delay muscle strength decline in later life¹⁹.

LIMITATION OF STUDY

Percentage of Fat and Fat Free Mass was not analyzed.

RECOMMENDATION

Cause and duration of obesity should be taken into consideration.

CONCLUSION

Significantly higher hand grip strength is noted in subjects with Normal BMI when compared with subjects with Overweight and Obese BMI.

CLINICAL APPLICATION

It is prominently accepted that grip strength measurements provide an objective index of the functional integrity of the upper extremity. Hence an assessment of grip strength is necessary in individuals with different BMI and also could be used as early screening of population to identify those at higher risk of physical disability related to low peripheral muscle strength and to take measures to improve the hand grip strength.

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EFFICACY OF ENDURANCE TRAINING OF THE TRUNK EXTENSOR MUSCLES IN SUBJECTS WITH SUBACUTE LOW BACK PAIN

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ABSTRACT

Background and Purpose. Clinicians treating patients with low back pain often use exercise to reduce pain and improve function. The aim of this study was to evaluate the effectiveness of trunk extensor endurance training in reducing pain and decreasing disability in subjects with subacute low back pain (ie, onset of back pain within 7 days to 7 weeks).

Subjects and Methods. Patients were randomly assigned to either an experimental group or a control group. The Sorensen Test was used to measure trunk extensor endurance. Subjects in the experimental group attended exercise sessions 3 times per week for 6 weeks. Subjects in the control group did not do exercises. Both groups were given back care advice and hot packs for 15 minutes, 3 to 5 times per week. Reassessments were carried out at 3 and 6 weeks.

Results. At 3rd week comparison endurance time was significantly improved for experimental group compared to control group ($p<0.001$). At 6 week experimental group endurance time value was significantly improved compared to control group ($p<0.001$).

Conclusion and Discussion. Muscular endurance training protocols improved endurance in the experimental group significantly and this can be seen as 10% improvement in 3 weeks compared to 5% for control group and at 6 weeks 22% improvement for experimental group and 10% improvement for control group and when seen in the light of other studies it also improved the neuromuscular system and this may lead to an increase in the precision and control of muscles.

KEYWORDS: Sorensen Test, CG, EG, Exercise, Subacute low back pain, Trunk endurance.

INTRODUCTION

Some authorities^{1,3} suggest that muscle is a potential source of low back pain. They argue that failure of muscles to protect passive structures from excessive loading may result in damage to these pain-sensitive structures and produce pain⁴. Enhancing muscle endurance, therefore, may help to reduce low back pain. Poor endurance of the trunk muscles may induce strain on the passive structures of the lumbar spine, leading eventually to low back pain. Evidence suggests that muscle endurance is lower for people with low back pain than for individuals without low back pain^{5,7}. Using the Sorensen Test as a measure of spinal extensor endurance, some researchers^{5,7} have found a difference in holding time between subjects with chronic low back pain (CLBP) and individuals without low back pain^{5,7}. These findings seem to suggest that poor trunk extensor endurance is associated with prolonged or recurrent back pain. The endurance of the trunk muscles may be related to low back pain. Fatigue can affect the ability of people with low back pain to respond to the demands of an unexpected load^{8,9}. Fatigue after repetitive loading also leads to a loss of control and precision, which may predispose an individual to developing low back pain^{10,11}. Therefore, trunk muscle endurance training has been recommended to elevate fatigue threshold and improve performance, thus reducing disability^{12,13}.

Our objectives were:

- (1) Trunk extensor endurance training reduces pain and disability and improves trunk extensor endurance, and
- (2) There is a relationship between trunk extensor endurance (as measured using the Sorensen Test), pain, and disability.

METHODOLOGY

MATERIALS AND METHODS

Subjects

Thirty five subjects were recruited from the patients regularly referred to Outpatient Physiotherapy Department, Rajeev Gandhi college Hospital, and Bhopal. The subjects were randomly assigned to either an experimental or a control group using a randomized number sheet. The experimental group consists of 14 males and 6 females. The control group consists of 11 males and 4 females.

The inclusion criteria were:

- Subjects were between 20 and 45 years of age;
- Subjects had low back pain as a primary complaint, with or without associated leg pain;
- The onset of pain was between 7 days and 7 weeks before the study began;

- Subjects had no history of back pain for a period of 6 months prior to the current episode; and
- Subjects were able to understand the English language.

Subjects were excluded if they:

- Were receiving concurrent treatments from another practitioner for their low back pain such as traditional Chinese medicine, which is often used in India;
- Were diagnosed as having a tumor, infection, or inflammatory disease affecting the spine;
- Had spinal or lower-limb surgery;
- Had spinal fractures or structural deformities such as spondylolisthesis and spondylolysis;
- Had any contraindications to exercise therapy (e.g., uncontrolled hypertension, previous myocardial infarction, cerebrovascular disease, peripheral vascular disease,
- Were involved in workers' compensation claims;
- Had signs of nerve root compromise, defined as decreased tendon reflexes, sensory loss, and motor deficits; and
- Were receiving medications other than analgesics and nonsteroidal anti-inflammatory drugs.

Procedure

All subjects completed a questionnaire designed to elicit demographic data, the VAS for measuring present pain and pain in the preceding 24 hours. All subjects also performed the Sorensen Test, which was conducted by a physical therapist. The exercise consisted of 4 levels. The first level consisted of bilateral shoulder lifts in a prone position. The second level consisted of contralateral arm and leg lifts in a prone position. The third level required the subject to place both hands behind the head and perform bilateral shoulder lifts. The fourth level consisted of bilateral shoulder lifts with arms fully elevated. The first exercise session commenced immediately following the initial assessment. The warm-up protocol included cycling on an ergometer at 40 to 90 W for 7 to 10 minutes. Ten repetitions of back extensor stretches were performed before and after the endurance exercise program. The ease of coping with the exercise was assessed using a categorical scale. The scale's 5 grades were:

1st "no sweat, could have done 1 more round,"

2nd "just nice,"

3rd "slightly strenuous, but coping okay,"

4th "can't continue anymore,"

5th "just can't do it."

Subjects were progressed to the next exercise in addition to the existing exercise if their responses were scale grades 1, 2, or 3. They were

asked to stop if their response was scale grade 4 or 5. A record was kept by the physical therapist. The ease of exercise was assessed during and at the end of each exercise session. If pain was aggravated during the exercise, the subjects were asked to stop. If the pain diminished within 5 minutes after the exercise, they were asked to continue the exercise but to hold the exercise position for only 5 seconds. They were progressed to 10 seconds if there was no adverse response. Each exercise was repeated 9 times. After 10 repetitions, the subjects were instructed to rest for 30 seconds to 1 minute. For subjects who performed well and had indicated the level of ease as grade 1 or 2, the rest interval was 1 minute for every 50 repetitions until 300 repetitions were completed. The dosage of 5 series of 10 repetitions for 6 cycles was adopted from a previous protocol for subjects with acute low back pain.¹² holding time in the unsupported position was gradually increased to 20 seconds to provide a greater training stimulus.

Endurance training of the trunk extensors:

- (A) Bilateral shoulder lifts,
- (B) Contralateral arm and leg lifts,
- (C) Bilateral shoulder lifts with hands behind the head,
- (D) Bilateral shoulder lifts with arms in full elevation.

RESULTS

Outcome Measures

Endurance of the trunk extensors was measured using the Sorensen Test. The Sorensen Test measures the trunk extensors' capability of sustaining an antigravity position over time. During this test, subjects lie prone with the pelvis at the edge of a plinth. We instructed our subjects to maintain their body in the horizontal position for as long as they could tolerate that position. If the torso deviated more than 6 degrees from the stable position for longer than 6 seconds, the test was terminated and the time the subject took to maintain the horizontal position was entered. Subjects were given a rest of at least 10 to 15 minutes before performing the retest. The 10- to 15-minute rest period, therefore, should have provided adequate rest before the retest.

TABLE 1: DISPLAYS THE MEAN AND STANDARD DEVIATION PRE TEST, POST TEST 3RD WEEK AND 6TH WEEK OF SORENSEN TEST (EG)

| Scores | Mean | SD |
|---------------------------|-------|--------|
| Pre Test | 59 | 2.8654 |
| Post 3 rd Week | 65.45 | 3.0517 |
| Post 6 th week | 72.1 | 3.9987 |

Table 1 show that (EG) Pre test mean 59(2.8654), Post 3rd week 65.45(3.0517) and post 6th week mean 72.1(3.9987). This results concludes that drastically increase the mean value.

TABLE 2: DISPLAYS THE MEAN AND STANDARD DEVIATION PRE TEST, POST TEST 3RD WEEK AND 6TH WEEK OF SORENSEN TEST (CG)

| Scores | Mean | SD |
|---------------------------|-------|--------|
| Pre Test | 58.46 | 2.6696 |
| Post 3 rd Week | 61.06 | 3.1578 |
| Post 6 th week | 64.86 | 3.2264 |

Table 2 show that (CG) Pre test mean 58.46(2.6696), Post 3rd week 61.06(3.1578) and post 6th week mean 64.86(3.2264). This results concludes that drastically increase the mean value.

TABLE 3: DISPLAYS THE MEAN AND STANDARD DEVIATION PRE TEST, POST TEST 3RD WEEK AND 6TH WEEK OF SORENSEN TEST (CG-EG)

| Sorensen Test | T Value | P Value |
|----------------------------------|---------|---------|
| Pre Test(EG-CG) | 0.5609 | NS |
| Post 3 rd Week(EG-CG) | 3.6393 | 0.001* |
| Post 6 th week(EG-CG) | 5.7377 | 0.001* |

Table 3 shows that at 3rd week comparison endurance time was significantly improved for experimental group compared to control group ($p<0.001$). At 6 week experimental group endurance time value was significantly improved compared to control group ($p<0.001$).

TABLE 4: COMPARISON OF % PAIN REDUCTION OF SORENSEN TEST

| Sorensen Test | EG | CG |
|----------------------|-------|-------|
| 3 rd Week | 10.93 | 5.47 |
| 6 th Week | 22.03 | 10.27 |

Table 4 displays that mean and standard deviation pre test, post test 3rd week and 6th week of Sorensen Test (CG-EG). At 3rd week experimental group showed 10.93% increase and 5.47 % increase for control group. At 6th week experimental group showed 22.03% increase and 10.27 % increase for control group.

DISCUSSION

Our study indicated that endurance training of the trunk extensors reduced pain in the short term (i.e., up to 3 weeks) in subjects with subacute low back pain. The amount of pain experienced was reduced faster in the experimental group than in the control group.

At 3rd week comparison endurance time was significantly improved for experimental group compared to control group ($p<0.001$). At 6 week experimental group endurance time value was significantly improved compared to control group ($p<0.001$).

At 3rd week experimental group showed 10.93% increase and 5.47 % increase for control group. At 6th week experimental group showed 22.03% increase and 10.27 % increase for control group.

At the 6-week reassessment, however, both groups reported similar pain. For subjects with subacute low back pain, it is possible that healing may have been completed 6 weeks after entry into the study. Thus, the pain may have been resolved due to factors other than the endurance exercise protocol.

CONCLUSION

Muscular endurance training protocols improved endurance in the experimental group significantly and this can be seen as 10% improvement in 3 weeks compared to 5% for control group and at 6 weeks 22% improvement for experimental group and 10% improvement for control group and when seen in the light of other studies it also improved the neuromuscular system and this may lead to an increase in the precision and control of muscles.

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CONFLICT-OF-INTEREST

Statement: I have read the above information and understand the request for disclosure. The details are accurate to the best of my knowledge.

SOURCE OF FUNDING

This study utilized by the scholar self-source of money

ETHICAL CERTIFICATE

CLEARANCE

As this study involving human subjects the ethical clearance has been obtained from the ethical committee of as per the ethical guidelines for Biomedical Research on Human subjects, 2001 ICMR, and New Delhi.

A RANDOMIZED COMPARISON OF EFFECTIVENESS OF CONSTRAINT-INDUCED MOVEMENT THERAPY VERSUS CONVENTIONAL PHYSIOTHERAPY ON UPPER-EXTREMITY DYSFUNCTION IN TREATMENT OF HEMIPLEGIC CEREBRAL PALSY

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ABSTRACT

Aim: This study is designed to compare the effectiveness of Constraint-Induced Movement Therapy and Conventional Physiotherapy for improving involved upper extremity movement efficiency in hemiplegic cerebral palsy children.

Study design: Experimental study, Randomized Control Trial.

Method: 20 hemiplegic C.P children were recruited into two groups. Experimental Group (n=20) received Constraint-Induced Movement Therapy (CIMT) for involved upper extremity. CIMT tasks which included such as functional tasks, card games, board games, manipulative games, puzzles, arts and crafts and gross motor activities. Control Group (n=20) received Conventional Physiotherapy for involved upper extremity such as Stretching of tight muscles of affected upper limb, Weight bearing of affected upper limb, Manual dexterity exercises like grasp release, pack board activities, Teaching of ADLs and Functional task practice with detailed evaluation including Jebsen-Taylor Hand Function Test scores were taken at baseline as well as after 4 week of treatment.

Results: Both the groups showed clinically and statistically significant improvement in Jebsen-Taylor Hand Function Test scores at the end of 4-weeks of treatment session. Jebsen-Taylor Hand Function Test scores had improved by 53.23 in experimental group and 27.14 in control group at the end of 4-weeks of treatment session in both the groups.

Conclusion: There was significant improvement in both the groups; however, Constraint-Induced Movement Therapy (CIMT) group was more effective for improving involved upper extremity movement efficiency in hemiplegic C.P children as compared to conventional physiotherapy

KEYWORDS: Constraint-Induced Movement Therapy, hemiplegic cerebral palsy, Conventional Physiotherapy, Upper-Extremity Dysfunction

INTRODUCTION

In 2011, the prevalence rate of cerebral palsy (C.P.) in children < 10 years of age in Jammu and Kashmir of India was 2.27 per 1000 live birth¹.

Impaired hand function is a major disability in children with hemiplegic C.P. So, they often fail to use involved upper extremity (U.E) and learn to perform most tasks with their noninvolved upper extremity (i.e. developmental disuse)². Reduced U.E function impacts on ability to perform activities of daily living³, which is likely to reduce independence and increase burden of care.

Subsequent Research Identified that use of a deafferented arm could be induced by either immobilizing unaffected arm for a period of days or training the affected arm⁴. Constraint-induced Movement Therapy (CIMT) is a rehabilitation technique for hemiparesis that consists of restraining the unaffected U.E. while intensively training the affected arm & hand to improve performance on functional motor tasks^{5,6}.

The first investigation into the effects of CIMT on humans, involving both training of the

paretic upper limb for 6 hours a day each weekday for 2 weeks and restraint of the contralateral upper limb (90% of waking hours for 14 consecutive days)⁴. The involved hand and arm as a result of restraining the noninvolved U.E along with providing structured practice including the essential elements of shaping and repetitive practice with involved U.E^{6,8}.

The CIMT treatment regimen proposed by Taub⁹ has 3 components: (1) repetitive, task-oriented training of impaired extremity or function following shaping principles (2) constraining patients to use impaired extremity or function during waking hours (3) applying a package of behavioural methods designed to transfer gains made in clinical setting to real world. 3rd element is essential for CIMT but many interventions use only combination of intensive repetitive practice & constraining the use unaffected limb¹⁰.

Charles JR, in a randomized control trial found that among carefully selected subgroup of children with hemiplegic CP, CIMT was modified to be child-friendly, appears to be efficacious in improving movement efficiency of the involved upper extremity¹¹.

AIM AND OBJECTIVE OF THE STUDY

To compare the effectiveness of Constraint-Induced Movement Therapy and Conventional Physiotherapy for improving involved upper extremity movement efficiency in hemiplegic cerebral palsy children.

MATERIAL AND METHODOLOGY

STUDY SETTING: Hemiplegic C.P children visited to College of Physiotherapy, Anand and Mitra Rehabilitation Centre, Mogri.

STUDY DESIGN: Experimental study.

SAMPLING TECHNIQUE: Simple random sampling technique.

SAMPLE SIZE: 20 (10 subjects in each group.)

INCLUSION CRITERIA

The inclusion criteria were on the basis of those used in CI-therapy prior studies with young children^{2, 11, 12}

1. Age group of hemiplegic C.P children: 4 to 10 years.
2. Ability to extend the wrist 20° and metacarpophalangeal joint 10° from full flexion¹³
3. 50% difference between involved and noninvolved hand on Jebsen-Taylor Test of Hand Function¹⁴
4. Willingness to agree to intervention and testing procedures and travel to the department for participation.

EXCLUSION CRITERIA¹⁵

1. Any health problems that are not associated with C.P.,
2. Seizures,
3. Visual problems that would prevent them from carrying out the intervention or testing tasks,
4. Severe muscle tone (Modified Ashworth score of >3),
5. Orthopedic surgery on their more affected upper extremity,
6. Experienced a dorsal rhizotomy
7. Received botulinum toxin therapy in the upper-extremity musculature during the last 6 months or who wish to receive it within the period of study
8. Received intrathecal baclofen, and
9. Balance problems while wearing the restraint.

PRIMARY OUTCOME MEASURE**Jebsen-Taylor Test of Hand Function¹⁶**

- 6 Subtests (performed on both non-dominant and dominant hand) include:
 - Card turning

- Picking up small common objects (pennies, paper clips, bottle caps) and placing them in a container
- Stacking checkers
- Simulated feeding
- Moving light objects (empty cans)
- Moving heavy objects (weighted cans (1 lb))

- Subtest score = time (seconds) to complete task
- Total score = sum of times for each subtests
- Max time allotted per subtest is 120 seconds
- Lower score = greater function
- Each item performed with each hand separately in non-dominant hand first.
- Measures unilateral hand function.
- Assesses speed, not quality of performance.

The test was modified by capping the maximum allowable time to complete each of the 6 timed items (writing was excluded) at 2 minutes instead of 3 minutes to reduce frustration levels associated with failure to accomplish the task.

Thus, the maximum time to complete all of the items was 720 seconds.

Equipment Required

1. Stopwatch
2. Chair (18" seat height), desk/table (30" high)
3. Black ball point pen, four 8x11" sheets of unruled white paper stacked and fastened to a clipboard
4. Five 3x5" index cards (ruled on one side only)
5. Empty 1 pound coffee can
6. Two 1" paper clips
7. 2 regular sized bottle caps (1" diameter)
8. 2 U.S. pennies
9. 5 kidney beans (~5/8" long)
10. 1 regular teaspoon
11. Wooden board (41 1/2" long, 11 1/4" wide, 3/4" thick), "C" clamp, plywood (20" long, 2" wide, 1/2" thick) glued to the board (see Jebsen 1969 for details)
12. Four standard size (1 1/4" diameter) red wooden checkers
13. Five No. 303 cans

PROCEDURE

Following baseline measurements, the subjects will be randomly divided into 2 equal groups:

**Group 1: Experimental Group (n=10)
Constraint- Induced Movement Therapy (CIMT) for involved upper extremity**

These tasks included

- functional tasks (e.g. eating and putting away games),
- card games ,
- board games,

- manipulative games,
- puzzles,
- arts and crafts,
- gross motor activities (bowling).



FIGURE 1: A CHILD WITH THE SLING.

Group 2: Control Group (n=10) Conventional Physiotherapy for involved upper extremity.

- Stretching of tight muscles of affected upper limb.
- Weight bearing of affected upper limb.
- Manual dexterity exercises like grasp release, pack board activities.
- Teaching of ADLs.
- Functional task practice.

Exercise regimens will be conducted for period of 4 weeks. This regimen would be under the supervision of physical therapist for every alternate day for a period of 4 weeks. The subjects will be advised to practice the respective regimen once a day at home alternately when they don't attend department during total intervention period.

Outcome measures will be assessed prior (baseline) and at the end of 4th weeks.

DATA ANALYSIS

To compare the outcome measurement data between two groups, we have used unpaired 't' test. In present study, P- value is used to test two tailed hypothesis at 5% level of significance i.e. if P-value is < 0.05, the difference is significant otherwise not. Statistical software SPSS had been used.

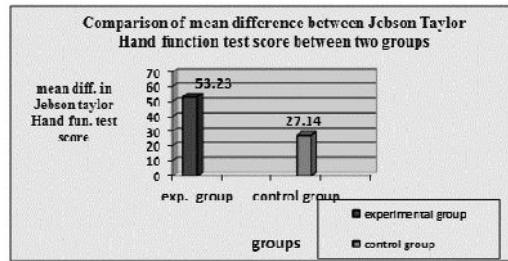
TABLE 1: JEBSEN-TAYLOR HAND FUNCTION TEST SCORE BETWEEN BOTH THE GROUPS.

| Unpaired 't' test | 't' calculated value | P- value |
|--|----------------------|----------|
| JebSEN-Taylor Hand Function Test score | 2.884 | 0.006 |

P < 0.05 .There is significant difference between the groups for JebSEN-Taylor Hand Function Test score i.e Mean JebSEN-Taylor Hand Function Test score of experimental group

shows significantly higher improvement than control group.

DATA ANALYSIS FOR OUTCOME MEASURES (JEBSEN-TAYLOR HAND FUNCTION TEST)



GRAPH 1: COMPARISON OF MEAN DIFFERENCE BETWEEN JEBSEN TAYLOR HAND FUNCTION TEST SCORE BETWEEN THE TWO GROUPS.

RESULTS

JebSEN-Taylor Hand Function Test scores had improved by 53.23 in experimental group and 27.14 in control group after 4-weeks. There was significant improvement in JebSEN-Taylor Hand Function Test scores between the groups.

However, the experimental group showed significantly higher improvement compared with control group after intervention between the groups.

DISCUSSION

Both treatment groups obtained successful outcomes by significant improvement in JebSEN-Taylor Hand Function Test scores over a 4-week period. The results are in agreement with other studies suggesting that CI therapy improves involved hand-movement efficiency in children with hemiplegia¹⁵. Furthermore, the results also suggest that the intensive practice associated with CI therapy can improve movement efficiency in a carefully selected subgroup of children with hemiplegic CP of a variety of ages¹⁵.

The format of the intervention in this study and others on older children (2 weeks of intensive structured practice)^{2,11,12,17,18} is more synonymous with that used in studies of adult stroke patients¹⁹.

The key element of CIMT therapy as applied in this study is practice. To engage children in an active intervention and sustain their attention, this study established of a list of fine motor and manipulative gross motor activities that elicit the general movement behaviors of interest². They included a range of functional and play activities in which children might typically participate on a given day. The activities are age-appropriate and are all performed unimanually.

Repetitive-task practice involves the performance of movements embedded in functional and play activities continuously for 15 to 20 minutes. This approach allows practice of a movement in the context of the preceding and following movement and a functional task. Shaping involves a motor task goal being approached in small steps by successive approximation and/or grading of the task difficulty based on the patient's capabilities and is similar to adaptive or part practice documented in the motor learning literature.

A study by Taub in 2000 showed that brain activity actually improves with CIMT treatment. This finding offers hope to researchers who believe it may be possible to stimulate or manipulate brain areas to take over lost functions, a process known as cortical reorganization says Dr. Taub¹². The effects of intensive therapy at the neuronal level and its subsequent functional manifestations as a result of cortical reorganization have become a focal point of interest in stroke rehabilitation research in the past decade¹⁵.

The benefits of CIMT are overall greater improvements in function versus conventional treatment and also observed gray matter reorganization in primary motor & sensory cortices and hippocampus by way of neuroplasticity²⁰.

LIMITATIONS OF THE STUDY

The sample size was small.

Study duration (data collection) was less.

There may be chances of biased for subjects performing home exercises program.

The outcome measures were taken after 4th week of exercise program, hence long term benefits and follow up were not checked.

FURTHER IMPLICATIONS

Other Outcome Measures can be taken.

Sample size should be large in both groups.

Long term benefits can be checked.

Multicentered studies should be carried out to see effectiveness of these interventions in hemiplegic C.P children.

CONCLUSION

Results of the study concluded that there was significant improvement in both the groups; however, Constraint-Induced Movement Therapy (CIMT) group was more effective for improving involved upper extremity movement efficiency in hemiplegic C.P children as compared to conventional physiotherapy.

ACKNOWLEDGEMENTS

There are no words to gratitude sufficient enough to thank my honorable Dr. Vattianandane for his help, direction, supports and encouragement for my work.

CLINICAL APPLICATION:

Constraint-Induced Movement Therapy (CIMT) should be used in hemiplegic C.P children as it more effective than conventional physiotherapy to improve movement efficiency in involved upper extremity.

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EFFICACY OF BREATH HELD AT MAXIMUM EXPIRATION ON TRANSVERSE ABDOMINIS STRENGTH, PAIN AND DISABILITY IN PATIENTS WITH NON-SPECIFIC LOW BACK PAIN

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ABSTRACT

Study objectives: To check the efficacy of Breathe Held at Maximum Expiratory Technique on Transverse Abdominis Strength, Pain and Disability in Patients with Non-specific Low Back Pain.

Design: Experimental study.

Setting: Subjects were taken from Departmental OPD of Dolphin (PG) Institute Of Biomedical and Natural Sciences Dehradun , Premnagar OPD of Dolphin (PG) Institute Of Biomedical and Natural Sciences Dehradun, Sakaya Hospital in Dehradun, Physiotherapy clinics in Jammu.

Methods: A total of 30 subjects were recruited for the study on the basis of inclusion and exclusion criteria after signing the informed consent form. The subjects were divided into two Groups (A=Core Stability Exercises & B=Core Stability and Breathe Held at Maximum Expiration Exercises).

Outcome measure: Pain thresh hold was measured using VAS (Visual Analog Scale), Strength was measured by PBU (Pressure Biofeed Unit), and Disability was measured by RMDQ (Roland-Morris Disability Questionnaire).

Result: The result of the study shows that both Breathe Held at Maximum Expiration along with Core Stability Exercises and Core Stability alone are effective in Low Back Pain (LBP). However Group B shows significant improvement in TrA Strength ($p=0.000$), Pain ($p=0.000$) and Disability ($p=0.000$) post intervention between the group.

Conclusion: Based on the findings of the present study, it can be depicted that Breathe Held at Maximum Expiration Technique along with Core Stability is a better choice of treatment than Core Stability alone in case of Non-specific Low Back Pain. Thus it can be concluded that Breathe Held at Maximum Expiration Technique is an effective technique in decreasing Pain, Disability and increasing TrA Strength in patients with Non-specific Low Back Pain.

KEYWORDS: Transverse Abdominis, Core Stability Exercises, Breathe Held at Maximum Expiration Exercises, TrA Strength, Pain and Disability.

INTRODUCTION

Low back pain is a common and costly problem, often associated with high recurrence rates and equivocal management efficacy. According to Vesa Lehtola et al (2012) Low back pain (LBP) remains the primary cause of absenteeism and disability in every industrialized society¹. Only 10% of LBP cases can be attributed to specific disorders like nerve root compression, vertebral fracture, tumors, infection, inflammatory diseases, spondylolisthesis or spinal stenosis^{2,3}. Yasuchika Aoki et al (2012) added that cases in which the origin of back pain cannot be determined, the diagnosis is given as Non specific Low Back Pain (NSLBP)⁶. Luciana G Macedo et al (2009) stated that Studies of individuals with LBP have identified impairments in the control of the deep trunk muscles (e.g. transversus abdominis and multifidus) responsible for maintaining the stability of the spine. Enhancing muscle endurance, therefore, may help to reduce low back pain. Poor endurance of trunk muscle may induce strain on passive structure of lumbar

spine and hence result in low back pain⁸. The relationship between the presence of LBP and a delay in the activation of Transverse Abdominis (TrA) muscle suggests that the TrA muscle is important for normal motor control during active movement¹⁰. The transversus abdominis (TrA) is a spine stabilizer frequently targeted during rehabilitation exercises for individuals with low back pain (LBP)¹³. Core stabilization exercise links to the most effective abdominal training and increases ones strength and stamina⁸. The Abdominal drawing-in maneuver (ADIM) is commonly used as a fundamental component of lumbar stabilization programs. The ADIM produces specific contraction of TrA muscle¹². According to Hiroshi Ishida et al (2012) On comparing the Abdominal drawing-in maneuver with the new technique breathe held at maximum expiration, Maximum expiratory technique was proved to be more effective method for training of co-activation of the lateral abdominal muscles.¹⁰ As it has been proved that the strengthening of TrA muscle decreases Low Back Pain¹². So there was a need to check whether breathe held at maximum expiration has positive effect on the

TrA Strength thereby decreasing Pain and Disability in patients with NSLBP.

METHODS

An experimental study was conducted on total of 30 subjects who were included from various hospitals and community centers in Dehradun and Jammu based on the inclusion and exclusion criteria and they were divided into 2 groups randomly by chit method after informed consent was obtained .Group A (Core Stability Exercises N=15), Group B (Breathe Held at Maximum Expiration Exercises along with Core Stability Exercises N=15). Pre intervention measurements of TrA Strength, Pain and Disability using Pressure Biofeedback Unit (PBU), VAS and RMDQ respectively were carried out for each patient. For both the groups intervention was given 5 days per week for 5 weeks and final reading was taken after 5 weeks. TrA activation capacity was assessed by using the Stabilizer Pressure Biofeedback Unit (PBU). The participant lied in a prone position on a plinth, arms to each side, head fully relaxed in the designated mould so that the neck was straight and relaxed with the head in the midline. The Pressure Biofeedback unit was placed under the lower abdomen with its distal end in line with the anterior superior iliac spine (ASIS). At first the cuff was inflated to a pressure of 70mmHg. Participants were instructed to relax their whole body fully, especially the abdomen, before each contraction. The participants were instructed to draw the lower stomach gently off the pressure sensor without moving the back or the hips and to sustain it for 10 seconds. The data was collected as the ability of each subject to perform abdomen hollowing, holding it at particular level for 4 seconds within a 10 second period, monitored by using a stop watch¹⁶.The process was followed three times and a mean of it was taken as main value. After each contraction there was an interval of 20 seconds for the subject to rest.

Protocol for Group A (Core Stability Exercises): All the patients in this group performed the Core stability Exercises.8Modified Curl-up and Back Extension Exercises on the floor. Each session of Core Strengthening Exercises will be performed for 15 minutes. The 5-week program for Core Stability Exercises is shown in table 1.

Protocol for Group B (Breathe Held at Maximum Expiration along with Core Stability Exercises): All patients in this group received Breathe Held at Maximum Expiration Technique and Core Stability Exercises for 5 days per week for 5 weeks.

Breathe Held at Maximum Expiration: Subjects were positioned in the supine position

with their arms crossed over the chest and hands over their opposite shoulders. The verbal instruction for the Maximum Expiratory task was “Breathe out maximally, hold your breath.10The Maximum Expiration was performed with “almost maximal” effort which is equivalent to a rating of 10 on the Borg scale. All the patients performed 3 sets of 3 repetitions for 5 days per week for 5 weeks. The progression was done by increasing the breathe holding time which was 5 seconds for First week, 10 seconds for 2nd week, 15 seconds for 3rd week, 20 seconds for 4th week and 25 seconds for 5th week.

Core Stability Exercises: All the patients of this group performed the modified Curl-up and Back Extension Exercises on the floor. Each session of Core Strengthening Exercises were performed for 15 minutes. The 5-week program for Core Stability Exercises is shown in table 1.

TABLE 1: CORE STABILITY PROTOCOL

| | Mon Sets/rep | Tues Sets/rep | Thurs Sets /rep | Fri Sets/rep | Sat Sets/rep |
|-----------|--------------|---------------|-----------------|--------------|--------------|
| Week 1 | | | | | |
| Curl-up | 3/15 | 3/15 | 3/15 | 3/15 | 3/15 |
| Back extn | 3/15 | 3/15 | 3/15 | 3/15 | 3/15 |
| Week 2 | | | | | |
| Curl-up | 4/15 | 4/15 | 4/15 | 4/15 | 4/15 |
| Back extn | 4/15 | 4/15 | 4/15 | 4/15 | 4/15 |
| Week 3 | | | | | |
| Curl-up | 4/20 | 4/20 | 4/20 | 4/20 | 4/20 |
| Back extn | 4/20 | 4/20 | 4/20 | 4/20 | 4/20 |
| Week 4 | | | | | |
| Curl-up | 4/20 | 4/20 | 4/20 | 4/20 | 4/20 |
| Back extn | 4/20 | 4/20 | 4/20 | 4/20 | 4/20 |
| Week 5 | | | | | |
| Curl-up | 4/25 | 4/25 | 4/25 | 4/25 | 4/25 |
| Back extn | 4/25 | 4/25 | 4/25 | 4/25 | 4/25 |

DATA ANALYSIS

Data was analysed using SPSS Software (version 16.0).Paired t-test was applied to compare the pre and post intervention readings of VAS, RMDQ and TrA Strength within the groups. Independent t-test was used to compare the pre and post intervention readings of VAS, RMDQ and TrA Strength between the groups. The statistical significance was set at 95% of confidence interval with p value <0.05 was considered significant.

RESULTS

Data was analyzed for 30 participants: 15 in each Group A & Group B.

TABLE 2: BETWEEN GROUP ANALYSIS FOR VAS SCORE

| | Mean | | SD | | t | p |
|------|---------|---------|---------|---------|-------|-------|
| | Group A | Group B | Group A | Group B | | |
| Pre | 7.6 | 7.6 | 0.6324 | 0.9102 | .000 | 1.000 |
| Post | 2.6 | 1 | 0.50709 | 0.3779 | 9.798 | .000 |

TABLE 1.3: BETWEEN GROUP ANALYSIS FOR RMDQ

| | MEAN | | SD | | t | p |
|------|---------|---------|---------|---------|-------|-------|
| | Group A | Group B | Group A | Group B | | |
| Pre | 15.733 | 15.733 | 0.45774 | 0.79881 | .000 | 1.000 |
| Post | 3 | 1.5333 | 1.06904 | 0.74322 | 4.363 | .000 |

TABLE 4: BETWEEN GROUP ANALYSIS FOR TRANSVERSE ABDOMINUS (TRA) STRENGTH

| | Mean | | Sd | | t | p |
|------|---------|---------|---------|---------|-------|------|
| | Group A | Group B | Group A | Group B | | |
| Pre | 65 | 64.733 | 2 | 1.98086 | .367 | .716 |
| Post | 50.2 | 42.8 | 4.17817 | 2.39643 | 5.950 | .000 |

Results of the study showed that there is improvement in the TrA Strength, Pain and Disability after the intervention in both the groups. This improvement was found to be statistically significant. Group B (Breathe Held at Maximum Expiration along with Core Stability) showed more improvement than Group A and this was found to be statistically significant.

DISCUSSION

Non-specific low back pain has become a major public health problem worldwide². Sullivan⁹ suggested that exercise programs designed to improve the function of abdominals should be advocated by clinicians for treatment. In this context, the present study focused on the usage of Breathe Held at Maximum Expiratory technique in patients with Non-specific Low Back Pain. The result of the present study depicted that Breathe Held at Maximum Expiration could be a useful technique to train abdominal muscles as it was found to have positive effects in strengthening the TrA muscles ($p=0.000$) (Table 4). The results are supported by Hiroshi Ishida, et al¹⁰. Kaneko et al (2005) found that the percent change in TrA muscle thickness with maximum expiration was 86%¹⁴. According to Hiroshi Ishida et al. the Maximum Expiration may be an effective method for training of co-activation of lateral abdominal muscles too¹⁰. Abe et al (1996) reported that abdominal muscles are activated differentially the TrA is the most active followed by the IO and EO¹⁷. According to Shankar and Chaurasia (2012), poor endurance of trunk muscles may induce strain on passive structures of lumbar spine and hence result in LBA⁸. In the present study Breathe Held at Maximum Expiration was found to have a significant decrease in LBA. ($p=0.000$) (Table 2). The possible cause can be explained on the basis of the relationship between the presence of LBP and delay in the activation of TrA muscle suggesting that the TrA muscle is important for normal motor control during active movement¹¹. Monica Unsgaard-Tøndel et al (2012) added that the

horizontal fibers of TrA form a belt around the anterolateral part of abdomen. Exercise techniques that promote independent contraction of the transversely oriented abdominal muscles have been demonstrated to have beneficial effects in relieving pain and disability in patients with chronic NSLBP and lowering recurrence rates after an acute pain episode¹⁸. In addition to that Nikita G. Patel et al. (2012) added that TrA strengthening along with core muscles are effective in decreasing pain in LBA patients¹⁹. Thus it could be said that transversus abdominis (TrA) is a spine stabilizer frequently targeted during rehabilitation exercises for individuals with Non-specific low back pain (NSLBP)¹³. In support of that Craodyn¹² added that contraction of TrA significantly decreases the laxity of the sacroiliac joint. The decrease in laxity as a result of the abdominal wall muscle action is in line with biomechanical model calculations and supports the use of transverse abdominis contractions for the treatment of low back pain. This could be a reason of decrease in pain in our study where the Breathe Held at Maximum Expiration technique was used to strengthen the abdominal muscles. The results were supported by Lyndsey Bilka et al who concluded that Core Stability Exercises decreases low back pain and disability in patients with LBA. Low back pain (LBP) remains the primary cause of absenteeism and disability in every industrialized society.¹ Poor endurance of trunk muscle may induce strain on passive structure of lumbar spine and hence result in low back pain and disability as failure to protect passive structure from excessive loads may lead to pain and disability²¹. In the present study Breathe Held at Maximum Expiration was found to have a significant decrease in Disability. ($p=0.000$) (Table 3). It could be said that transversus abdominis (TrA) along with other abdominals was effective in stabilizing the spine and thus effective in decreasing disability during rehabilitation exercises for individuals with low back pain (LBP).

Limitations - sample size was small. Only specific age group was taken.

Future Research by using EMG could be used to exactly evaluate the alterations in muscle activity. The study could be done with gender specification. Isokinetic evaluations of trunk can be used to identify effect of Breathe Held at Maximum Expiratory Technique on peak torque of TrA.

CONCLUSION

Based on the findings of the present study, it can be depicted that Breathe Held at Maximum Expiration Technique along with Core Stability is a better choice of treatment than Core

Stability alone in case of Non-specific Low Back Pain. Thus it can be concluded that Breathe Held at Maximum Expiration Technique is an effective technique in decreasing Pain, Disability and increasing TrA Strength in patients with Non-specific Low Back Pain.

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CLINICAL APPLICATION

For a Non Specific Low Back Pain rehabilitation programme clinically Breathe Held at maximum Expiration with Core Stability is better than Core Stability alone.

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TO STUDY THE IMMEDIATE EFFECT OF MYOFASCIAL RELEASE WITH PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION FOR SUBSCAPULARIS ON GLENOHUMERAL EXTERNAL ROTATION IN SHOULDER PERIARTHRITIS - AN INTERVENTIONAL STUDY

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ABSTRACT

Study design: An Interventional study

Background: It is postulated that limitation in glenohumeral external rotation, when measured at <90° of shoulder abduction, represents subscapularis muscle flexibility deficit in patients with periarthritis (PA) of shoulder joint. No research is however available to demonstrate whether intervention strategies intended to improve subscapularis flexibility & glenohumeral external rotation in < 90° of shoulder abduction in PA shoulder.

Objectives: The purpose of this study was to evaluate the immediate effect of myofacial release (MFR) with proprioceptive neuromuscular facilitation (PNF) to increase glenohumeral external rotation at < 90° of shoulder abduction in patients with periarthritis shoulder.

Methodology: 30 Patients with limited glenohumeral external rotation at < 90° of shoulder abduction are selected for the study. They are divided into 2 groups. Group A (Experimental group) receives MFR+PNF+Conventional Exercises & Group B (Control group) receives Conventional Exercise only. Goniometric measurements of glenohumeral external rotation taken pre intervention and immediately post intervention.

Results: For Experimental Group & Control Group, within group analysis was done by using paired t-test, yielded t value 5.07 and p value < 0.05 and for experimental group & t value 2.53 & p value < 0.05 for Control Group. Between group analyses was done by using unpaired t test yielded t value 4.03 and p value < 0.05 suggesting that there was statistical significant difference between experimental group receiving Myofacial Release, proprioceptive neuromuscular facilitation technique and conventional therapy than control group receiving conventional therapy alone.

Conclusion: Experimental group with new intervention of MFR+PNF with conventional treatment shows significant improvement in terms of glenohumeral external ROM at < 90° of shoulder abduction in PA shoulder.

KEYWORDS: Myofacial Release, proprioceptive neuromuscular facilitation, shoulder external range of motion, subscapularis.

INTRODUCTION

Periarthritis of shoulder is also known as frozen shoulder. Duplay first describes the symptoms in 1872 using the term 'periarthrite scapulohumerale'. The term "frozen shoulder" was first introduced by Codman in 1934. He described frozen shoulder as a painful shoulder condition of insidious onset that was associated with stiffness and difficulty sleeping on the affected side. Codman also identified the marked reduction in forward elevation and external rotation that are the hallmarks of the disease².

In the rehabilitation of patients with shoulder impairments, regaining adequate glenohumeral external rotation is believed to be essential for Activity of daily life.

Identification of the structure, or structures, limiting glenohumeral external rotation may assist in planning the appropriate intervention for these patients. The common limiters of glenohumeral external rotation are the glenohumeral capsule and the shoulder internal rotators. The investigators of this study have

observed that glenohumeral external rotation is commonly more limited in the lower ranges of abduction, such as at 45° of abduction, when compared to the higher ranges of abduction, such as at 90° of abduction. Cadaver studies and outcomes of subscapular surgical releases suggest that subscapularis muscle flexibility deficits are responsible for glenohumeral external rotation limitations in the lower ranges of abduction³. The upper subscapularis muscle has been shown to contribute to both shoulder abduction and internal rotation⁴. In this instance, an appropriate intervention may include procedures purported to improve muscle extensibility, such as MFR and proprioceptive neuromuscular facilitation (PNF)³. Myofacial release is the application of specific and progressive manual forces with the intent of promoting changes in the myofascia, allowing for elongation of shortened structures⁸. MFR procedures are often combined with PNF procedures because they are both used to effect changes in myofascial length^{8,9}. Contract-relax PNF procedures have been shown to be effective in increasing range of motion (ROM)⁵.

Thus, the purpose of this study is to evaluate whether MFR to the subscapularis combined with PNF procedures intended to increase shoulder external rotation will produce an immediate improvement in glenohumeral external rotation when measured at < 90° of shoulder abduction in subjects with Periarthritis shoulder.

METHODOLOGY

30 patients between the ages of 45-60 years, with 2nd stage of Periarthritis shoulder, participated in the study. Both male and female are included in study who were referred to an outpatient physical therapy clinic for evaluation and interventions. Patients were included in the study if they exhibited limitations in glenohumeral external rotation when measured at < 90° of shoulder abduction. Subjects whose available glenohumeral external rotation decreased as the humerus was abducted to 90° were presumed to have capsular restrictions and thus excluded from the study. Subjects who had Any H/o trauma, fracture, dislocation or post-surgery to the shoulder and cervical region, Having cervical spondylosis and/or radiculopathy, Any H/o surgery around neck or shoulder, Presence of congenital deformity (Sprangels shoulder, CV anomaly, fused cervical vertebrae etc..) were also excluded from the study. After they signed consent form to participate in the study, patients were randomly assigned to a treatment or control group. A predetermined schedule of random assignments to treatment and control groups was followed. The protocol for this study was approved by the Govt. Physiotherapy College, Civil Hospital, Ahmedabad.

PROCEDURES

Measurements of external rotation were made on all subjects before and after receiving either the experimental or control intervention. Glenohumeral external rotation was measured with the subjects lying supine on a treatment table with a pillow under their knees. Stabilization of the scapula was achieved by depressing the shoulder girdle. Reference lines for abduction were drawn on the skin over the midline of the sternum and the anterior aspect of the midline of the humerus. A reference point was also drawn on the skin over the anterior aspect of the acromion. In addition, a reference line was drawn on the skin over the ulnar aspect of the forearm, with a reference point on the olecranon process. Using the line over the humerus and an imaginary line parallel to the line over the sternum as references, the shoulder was abducted in available ROM. Maintaining shoulder abduction and 90° of elbow

flexion, the patient's arm was passively externally rotated through the available pain free ROM. External rotation was measured with the stationary arm of the goniometer perpendicular to the ground and the moving arm in line with the reference line on the forearm (Figure 1) as described by Norkin and White⁶. Subjects in the treatment group received MFR to the subscapularis, followed by PNF procedures. The subjects were positioned with the humerus abducted in lower degree (< 90°). With the elbow flexed to 90°, the humerus was externally rotated to a midrange position. The subscapularis was palpated in the axilla to identify areas of myofascial mobility restrictions, taut bands, or trigger points⁷. Identified restrictions were treated with MFR utilizing a combination of sustained manual pressure, and slow deep strokes to the subscapularis myofascia (Figure 2) for 7 minutes. The MFR was followed by contract-relax PNF to the subscapularis and other glenohumeral medial rotators, beginning in the same position used for the MFR. The patients were instructed to perform maximal glenohumeral internal rotation against an opposing, isometric, manual resistance applied by the treating physical therapist for 7 seconds. Afterwards, the patient actively moved the humerus into full available external rotation. This position was maintained for 15 seconds. This 7-second internal rotation contraction against resistance followed by full active external rotation was repeated 5 times. Subjects were then instructed to actively move through the PNF flexion-abduction external-rotation diagonal pattern⁷ for 5 repetitions with manual facilitation (Figure 3). The same physical therapist investigator performed all of the MFR and contract-relax PNF procedures. The total time for the described intervention was approximately 10 minutes. The control subjects lay supine on a treatment table with pillows under their knees and resting their hands on their abdomen for a period of 10 minutes.



FIGURE 1: PRE MEASUREMENT OF GLENOHUMERAL EXTERNAL ROTATION



FIGURE 2: SOFT TISSUE MOBILIZATION TO THE SUBSCAPULARIS REGION.



FIGURE 3: PNF OF ACTIVE SHOULDER FLEXION, ABDUCTION, AND EXTERNAL ROTATION



FIGURE 4: POST MEASUREMENT OF GLENOHUMERAL EXTERNAL ROTATION

RESULTS

Statistical analysis was done by using SPSS V.16. Paired t-test was used for within group analysis and unpaired t-test was used for between group analyses.

TABLE 1. SHOWS MEAN DIFFERENCE BETWEEN PRE AND POST OF GLENOHUMERAL EXTERNAL ROM IN EXPERIMENTAL GROUP AND CONTROL GROUP.

| Groups | Pre Intervention | | Post Intervention | | t | p |
|--------------------|------------------|----------|-------------------|----------|------|--------|
| | Mean | $\pm SD$ | Mean | $\pm SD$ | | |
| Experimental Group | 51.66 | 6.15 | 63.33 | 5.36 | 5.07 | < 0.05 |
| Control Group | 53.58 | 7.94 | 56.75 | 7.64 | 2.53 | < 0.05 |

For Experimental Group & Control Group, within group comparison was done by using paired t-test, yielded p value < 0.05 and t value 5.07 for experimental group & p value < 0.05 & t value 2.53 for Control Group.

TABLE 2: SHOWS MEAN DIFFERENCE OF GLENOHUMERAL EXTERNAL ROM OF EXPERIMENTAL GROUP AND CONTROL GROUP AFTER INTERVENTION.

| Groups | Mean of Post Intervention | $\pm SD$ | t | p |
|--------------------|---------------------------|----------|------|--------|
| Experimental Group | 63.33 | 5.36 | 4.03 | < 0.05 |
| Control Group | 56.75 | 7.64 | | |

Unpaired t test was used yielded t value 4.03 and p value < 0.05 suggesting statistical significant difference between experimental group receiving Myofacial Release, proprioceptive neuromuscular facilitation technique and conventional therapy than control group receiving conventional therapy alone

DISCUSSION

The purpose of the study is to determine whether MFR & PNF procedures to subscapularis producing an immediate effect in glenohumeral external rotation at lower degrees of shoulder abduction (< 90°) in PA of shoulder joint. Based on biomechanical studies that demonstrate more selective tension of the glenohumeral joint capsular-ligamentous structures than tensioning of the musculature surrounding the shoulder at 90° abduction, restrictions of external rotation at lower degrees of abduction are potentially caused by primarily muscular restriction rather than joint capsular restrictions. However, long-term reduced mobility and capsular irritation from subscapularis dysfunction may result in adhesive capsulitis (Cailliet 1991). The results of this study suggest that examining the amount of glenohumeral external rotation at lower degrees of abduction (<90°) may be useful in guiding a clinician's plan of care for patients with shoulder disorders. Initiating procedures intended to address subscapularis muscle flexibility exercise may be the intervention of choice for patients who

exhibit less glenohumeral external rotation at lower degrees of abduction (<90°) when compared to 90 of abduction.

CONCLUSION

Soft tissue mobilization of the subscapularis for 7 minutes and 5 repetitions of contract-relax to the shoulder internal rotators(Subscapularis), followed by 5 repetitions of PNF facilitating the flexion, abduction, and external rotation diagonal, was found to be effective in gaining glenohumeral external rotation during a single intervention session in patients with limited glenohumeral abduction <90° in PA shoulder.

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TO COMPARE THE EFFECT OF HIGH FREQUENCY (CONVENTIONAL) TENS AT DERMATOME LEVEL & LOW FREQUENCY (ACUPUNCTURE LIKE) TENS AT ROOT LEVEL IN PAIN MANAGEMENT OF DYSMENORRHEA

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ABSTRACT

Background: Dysmenorrhea is the occurrence of painful uterine cramps during menses and is the most common of all gynecologic complaints. Transcutaneous electrical nerve stimulation (TENS) is a treatment that has been shown to be effective for pain relief in a variety of conditions. Electrodes are placed at dermatomal level and at root level and electric current applied at different pulse rates (frequencies) and intensities is used to stimulate these areas so as to provide pain relief in dysmenorrhea.

Objective: The main aim of this study is to compare effect of high & low frequency tens at dermatome Level & root level.

Method: All subjects are selected randomly for two experimental. In 1st experiment high frequency TENS is applied at dermatome level T12-L1 & In 2nd experiment low frequency TENS is applied at root level L3. Pain is measured by VAS before & after giving treatment.

Outcome Measure: Length of menstrual period (LMP); Total no. of painful days during menstruation (PDB); Overall mean percentage of pain relief (PPR); Overall mean duration of pain relief (DPR), VAS were taken as outcome measures.

Result: PPR is found to be statistically significant between patients of group 1 and group 2 since $P=0.001$. While LMP, PDB and DPR shows no significant difference between patients of group 1 and group 2 since $P>0.05$.

Conclusion: High TENS at Dermatomal level and Low TENS at root Level both are effective in reducing pain but High TENS at dermatomal Level is more effective. TENS placements has no significant effect in reducing LMP, PDB and DPR.

KEYWORDS: Dysmenorrhea, High TENS, Low TENS, Root level, Dermatomal placement

INTRODUCTION

Dysmenorrhea is the occurrence of painful uterine cramps during menses and is the most common of all gynecologic complaints. Dysmenorrhea is divided into primary and secondary forms. Primary dysmenorrhea has no known pelvic pathologic etiology. Whereas secondary dysmenorrhea is related to the presence of pelvic lesions secondary to organic disease such as endometriosis, salpingitis, PID (pelvic inflammatory disease), adhesions, etc. Characteristically, primary dysmenorrhea starts shortly after menarche. The pain lasts for 48-72 hours of menstruation and is most severe during the first or second day of the menstrual cycle. Reported prevalence rates are as high as 90 percent.²⁰ It is the leading cause of absenteeism of women from work, school, and other activities^{1, 21}.

Dysmenorrhea is pain concentrated in the lower abdomen, in the umbilical region or the suprapubic region of the abdomen. It may radiate to the thighs and lower back. Dysmenorrhea can feature different kinds of pain, including sharp, throbbing, dull, nauseating, burning, or shooting pain. Symptoms often co-occurring with menstrual pain include nausea and vomiting,

diarrhea or constipation, headache, dizziness, disorientation, hypersensitivity to sound, light, smell and touch, fainting, and fatigue. Symptoms of dysmenorrhea often begin immediately following ovulation and can last until the end of menstruation.

Dysmenorrhea is often associated with changes in hormonal levels in the body that occur with ovulation. During menstrual cycle, the endometrium thickens in preparation for potential pregnancy. After ovulation, if the ovum is not fertilized and there is no pregnancy, the built-up uterine tissue is not needed and thus shed. Women with primary dysmenorrhea have increased production of endometrial prostaglandin, resulting in increased uterine tone and stronger, more frequent uterine contractions. Majority of prostaglandins are released during the first 48 hours of menstruation, thus explaining the timing and limitation of symptoms. Prostaglandins stimulate an increase in myometrial muscle tone and contractions, and release of vasoressin in uterine blood vessels which may result in ischemic pain and other associated symptoms. Compared with other women, females with primary dysmenorrhea have increased activity of the uterine muscle with increased contractility and increased frequency of contractions³. It is observed that in dysmenorrheic patients, visible

features on cycle days 1-3 correlated with the degree of pain, and differed significantly from the control group.

Methods of treatment for dysmenorrheal range from prostaglandin synthetase inhibitors and oral contraceptives to noninvasive methods such as heat packs, biofeedback, relaxation techniques, and acupressure⁵. Traditional acupuncture has been used successfully. Use of transcutaneous electrical nerve stimulation over traditional acupuncture points to achieve the same success¹⁸.

Transcutaneous electrical nerve stimulation is an accepted method of noninvasive, nonnarcotic pain control. The particular advantage of this modality are that it can be self-administered as needed without significant side effects¹⁶. It has been used successfully in control of postoperative pain low back pain, labor and delivery pain. Pain due to dysmenorrheal is similar to pain during child birth. TENS has been successfully used for pain control during labor and delivery without complication^{4,7,9,10}. Conventional TENS and "acupuncture-like" TENS are used most frequently for treatment.

Conventional TENS requires a high pulse rate with a low intensity, whereas Low TENS uses a low pulse rate with a high intensity. TENS has also been used with varying pathologies not considered primarily musculoskeletal origin such as cystitis, Pancreatitis, angina pectoris and thrombophelebitis^{2,11,12}. Longitudinal muscle fibers of uterus contract downward on circular fibers of cervix. The resultant tension prohibits relaxation of cervix Producing simultaneous contraction of uterus. Conventional TENS, electrodes are commonly arranged to stimulate the region of discomfort, above and below, medial and lateral or criss-crossing over area of pain^{6,16}.

The effect of acupuncture like TENS are considered to be supraspinal^{13,16}. Conventional TENS activate the large myelinated A alpha and beta fibers.¹⁶ These fibers transmit proprioceptive information which according to gate control theory, inhibits the smaller nociceptive fibers primarily at level of substantia gelatinosa in the dorsal horn of spinal cord. TENS seems to work by altering the body's ability to receive or perceive pain signals, rather than by having a direct effect on the uterine contractions²².

Pain relief with TENS is postulated as involving two possible mechanisms, the gate-control theory as proposed by Wall and Melzak in 1965, or endorphin-mediated pain relief. The "gate" to sensory input is present in the spinal cord, which is stimulated by activity in small-diameter nociceptive fibers and closed by activity in large-diameter fibers. Therefore, if electric stimulation is applied to a peripheral site, the large

diameter fibers are activated first and thus inhibit the small nociceptive fiber input transmitted to higher centers. The "gating" effect is established at the dorsal horn level of the spinal cord thereby inhibiting the transmission of pain-related impulses. This mechanism is thought to be responsible for the action of high frequency TENS.

Other studies on TENS have shown the pain relief attributed to TENS is reversible with opioid antagonists, leading to postulations that it somehow stimulates endogenous endorphins. An increased release of endogenous endorphins, resulting in potent analgesic effects, has been demonstrated with electrical stimulation. Pain relief that is partially reversible by naloxone has been shown to occur in low frequency TENS¹⁷. However, increased levels of endorphins are found in CSF with both high and low frequency TENS^{17,19}.

AIMS AND OBJECTIVES:

- To study the effectiveness of High TENS at Dermatomal Level in pain.
- To Study effectiveness of Low TENS at root Level in pain due to Dysmenorrhea.
- To compare effect of high & low frequency tens at dermatome level & root level in pain due to Dysmenorrhea.

METHODOLOGY

Sample size: 30.

Study Design: Comparative study.

Sampling Design: Selective sampling.

Materials: TENS machine, Paper, Pen, Watch

Inclusion criteria

- Between age from 19 to 25 years
- Primary dysmenorrhea, i.e. no identifiable pelvic pathology
- Self-reported pain during the majority of the menstrual cycles
- Self-reported pain for three consecutive menstrual cycles;
- Moderate to severe primary dysmenorrhoea (pain that does not respond well to analgesics, affects daily activities, or has a high baseline score on a validated pain scale).

Exclusion criteria

- diagnosed secondary dysmenorrhea (e.g. fibroids, endometriosis);
- Dysmenorrhoea resulting from use of an intra-uterine device (IUD);
- Mild or infrequent dysmenorrhea.

PROCEDURE

The study was conducted over a 2 month period. 30 girls who were experiencing self-reported dysmenorrhea volunteered to participate in this study. The girl rated age from 19 to 25 year. Each subject notified the investigator upon onset of her pain, and a time was scheduled for that day for either a TENS treatment. The subjects were instructed to take no pain medication for at least 4-6 hours before treatment. Before beginning treatment, the subjects completed a menstrual history and a pre & post TENS pain rating scale with the help of VAS. The VAS was used to establish a baseline level of pain. Girls who only had low back pain & not abdominal pain were eliminated from the study. Randomly 2 groups of 15 girls were made.

In group 1 conventional TENS was placed at dermatome level & in group 2 Low TENS was placed at root level. Electrode pads are self-adherent, thus eliminating the need for transmission gel & electrode tape & activated by moistening with water. All participants use same electrode.

In group 1 conventional TENS is placed at T12-L1 at dermatome level. The umbilicus and ASIS as a land mark for electrode placement. They were instructed to place the electrodes at the most antero lateral area of pain but not higher than the umbilicus or lower than ASIS. Electrical parameter consistent with conventional TENS use a high frequency (50-100 HZ), pulse width (40-75 micro sec) & the intensity that produce comfortable perceptible paresthesia without muscle contraction for the subject for 30 minutes¹⁶. Electrodes were arranged so that stimulation was occurred in a criss-cross manner over the abdomen and after 5 min rechecked the TENS unit. After completing the treatment session electrodes were then removed and pain was rated subjectively on VAS immediately after use of TENS & participants were also ask to determine the pain reduced after 2hrs, 4hrs, 8hrs & next day early morning.

In group 2 low frequency TENS was used. Participants in group 2 were instructed to place the electrodes at L3 root level over low back. Electrical parameter consistent with accupunter like TENS requires a low frequency (1-4HZ), with pulse width (100-250 micro sec) & intensity to tolerance level to produce rhythmic muscle contraction. The TENS unit was rechecked after 5 minutes. The treatment was given for a total of 30 minutes.¹⁶ After completing the treatment session electrodes were then removed and pain was rated subjectively on VAS immediately after use of TENS & participants were also ask to determine the pain reduced after 2hrs, 4hrs, 8hrs & next day early morning.

RESULT

PPR is found to be statistically significant between patients of group 1 and group 2 since P=0.001. While LMP, PDB and DPR shows no significant difference between patients of group 1 and group 2 since P>0.05.

Statistical Analysis

TABLE 1: STATISTICS (GROUP 1)

| | LMP | PDB | PPR | DPR |
|-------------|-----|--------|--------|----------|
| Percentiles | 25 | 4.0000 | 2.0000 | 60.0000 |
| | 50 | 4.0000 | 2.0000 | 90.0000 |
| | 75 | 5.0000 | 2.0000 | 1.0000E2 |

LMP: Length of menstrual period; PDB: Total no. of painful days during menstruation; PPR: Overall mean percentage of pain relief; DPR: Overall mean duration of pain relief

TABLE 2: STATISTICS (GROUP 2)

| | LMP | PDB | PPR | DPR |
|-------------|-----|--------|--------|---------|
| Percentiles | 25 | 3.0000 | 2.0000 | 20.0000 |
| | 50 | 4.0000 | 2.0000 | 50.0000 |
| | 75 | 5.0000 | 3.0000 | 70.0000 |

TABLE 3: MEAN RANK VALUES

| Group | N | Mean Rank | Sum of Ranks |
|-------|---|-----------|--------------|
| LMP | 1 | 15 | 239.00 |
| | 2 | 15 | 226.00 |
| PDB | 1 | 15 | 195.00 |
| | 2 | 15 | 270.00 |
| PPR | 1 | 15 | 310.50 |
| | 2 | 15 | 154.50 |
| DPR | 1 | 15 | 249.50 |
| | 2 | 15 | 215.50 |

TABLE 4: TEST STATISTICS

| | LMP | PDB | PPR | DPR |
|----------------|---------|---------|---------|---------|
| Mann-Whitney U | 106.000 | 75.000 | 34.500 | 95.500 |
| Wilcoxon W | 226.000 | 195.000 | 154.500 | 215.500 |
| Z | -.286 | -1.871 | -3.254 | -.803 |
| p-value | .775 | .061 | .001 | .422 |

It is clear from table 4 that only PPR is found to be statistically significant between patients of group 1 and group 2 since p = 0.001. While LMP, PDB and DPR shows no significant difference between patients of group 1 and group 2 since p>0.05. Low TENS at root level is effective in reducing PDM but it is statistically not significant as p=.061. Mean Rank of group-1 is higher for percentage of pain relief. (Statistically significant as p=.001) And mean duration of pain relief so it suggests that High TENS at dermatomal level is effective. (Statistically not significant as p=.422)

DISCUSSION

Conventional and Low TENS are commonly used modes of TENS but are directly opposite to one another in terms of stimulation parameters. For conventional TENS electrodes are arranged in criss-cross manner over area of pain. For low TENS electrodes can be placed at root level because it has supraspinal effect. When high TENS is applied at dermatomal level it activates large myelinated A alpha and beta fibers. According to Gate control theory this inhibits smaller nociceptive fibers primarily at the level of substantia gelatinosa in the dorsal horn of the spinal cord and thus inhibits pain. Low TENS at root level activates small diameter afferent fibers and also excites efferent fibers. It produces endorphin liberation in cerebrospinal fluid, brainstem and circulatory system. The neurohumoral liberation in to inhibit the activity or release of substance P thus dampening the systemic transmission of pain to the higher centre of perception. Thus it will produce long lasting effect due to suprasegmental stimulation which is not much effective in reducing pain as compare to high TENS at dermatomal level.

According to population coding property of receptors when the brain uses input from multiple receptors to calculate location and timing of a stimulus it will produce more effect. The sensory receptor responds to its stimulus modality by initiating sensory transduction. High TENS relieves pain by a segmental mechanism. Segmental mechanisms suggest that TENS induced A-d activity causes long-term depression of central nociceptive cell activity for up to 2 hours. Low TENS activates extra segmental descending pain inhibitory pathways. Extra segmental mechanisms TENS-induced activity in small diameter afferents (A-d) leads to activation of the midbrain periaqueductal grey and rostral ventromedial medulla and inhibition of descending pain facilitatory pathways. Larger effects have been observed, when muscle rather than skin afferents are used. TENS is thought to work by alteration of the body's ability to receive or perceive pain signals rather than by having a direct effect on the uterine contractions. Receptors and pain pathways play important role in transmitting pain signals. When we place Electrodes at dermatomal level the pain signals are modulated resulting in pain relief.

Sjolund and Erikson reported that by low frequency electrical stimulation increase release of endogenous endorphin which is used for chronic pain condition while dysmenorrhea is acute condition so high TENS will be more effective for the condition.

T. Lundeberg, L. Bondesson and V. Lundström concluded in their study that about

70% of the patients experienced pain reduction when treated with high-TENS. Low-frequency TENS was clearly less effective and relieved only about 45% of the patients.

Other studies on TENS have shown the pain relief attributed to TENS is reversible with opioid antagonists, leading to postulations that it somehow stimulates endogenous endorphins. An increased release of endogenous endorphins, resulting in potent analgesic effects, has been demonstrated with electrical stimulation. Pain relief that is partially reversible by naloxone has been shown to occur in low frequency TENS¹⁶. However, increased levels of endorphins are found in CSF with both high and low frequency TENS^{16,4}.

A study by Mannheimer et al, randomized women to the following three groups. High frequency TENS, Low frequency TENS, and placebo TENS. There was no significant difference between the two types of TENS but the high frequency TENS achieved slightly more pain relief^{9,10}.

LIMITATIONS

- Sample size is small.
- More Precise stimulation Parameters Required.
- Pain assessment is subjective

FUTURE RECOMMENDATIONS

- Study can be performed with large sample size.
- Same stimulation parameters will be taken for different Placements.
- Along with abdominal Pain Back pain is also included in the study.

CONCLUSION

High TENS at Dermatomal level and Low TENS at root Level both are effective in reducing pain but High TENS at dermatomal Level is more effective. TENS placements has no significant effect in reducing LMP, PDB and DPR.

CLINICAL APPLICATION

It is proven that TENS is useful modality for pain reduction. It can also be used for relief of Dysmenorrheic pain. High TENS at dermatomal level can be used as a part of treatment for pain due to Dysmenorrhea.

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EFFECTIVENESS OF MANUAL STRETCHING ON PAIN AND DISABILITY IN PATIENTS WITH PLANTAR FASCIITIS – A COMPARATIVE STUDY

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ABSTRACT

Objective: To study the effectiveness of manual stretching on pain and disability.

Background: Foot is a remarkable structure. Plantar fasciitis is one of the most common causes of foot pain and is experienced by nearly 10% of the population in their lifetime. Physiotherapists attempt to manage it by utilizing a wide variety of interventions.

Study Design: experimental study and different subject design

Methods: 30 participants with plantar fasciitis were divided to Group A (Therapeutic ultrasound and strengthening exercises) and Group B (Manual stretching along with therapeutic ultrasound and strengthening exercises). Outcome measures were VAS and FFI. Outcomes of treatment were captured on the 1st day and 21st day of the treatment session.

Results: significant changes in scores of VAS and FFI were found in both treatment groups. However, the results of group receiving manual stretching were more significant.

Conclusion: manual stretching is effective in reducing pain and disability in plantar fasciitis when used in combination with conventional therapy and exercises and therefore can be included in the regular treatment protocol.

KEYWORDS: plantar fasciitis, manual stretching, therapeutic ultrasound, strengthening exercises.

INTRODUCTION

The foot is an important link between a person and the earth¹ and serves several important functions. It enables propulsion through space, acts as a base of support, provides a mechanism for rotation of the tibia and fibula during the stance phase of gait, provides flexibility to adapt to uneven terrain and acts as a lever during push off.

The plantar fascia or plantar aponeurosis is a fibrous band of connective tissue located on the plantar surface of the foot and acts as a truss while maintaining the medial longitudinal arch of the foot, assists during the gait cycle and facilitates shock absorption during weight bearing².

Plantar fasciitis is a non-inflammatory degenerative syndrome of the plantar fascia resulting from repeated trauma at its origin on the calcaneus³. It is a clinical syndrome characterized by pain and tenderness beneath the heel which is typically worse in the morning and improve after few steps of the day.⁴ Plantar fasciitis occurs in both sexes, but is more common in females. Its incidence and severity strongly correlates with obesity⁵. Rome et al reported that plantar fasciitis accounts for 15% of all adult foot complaints requiring professional care and is prevalent in both athletic and non-athletic population⁶.

The condition is thought to be multi-factorial in origin with factors such as obesity, decreased ankle joint range of motion, prolonged weight bearing and increase in age are suggested

to be commonly involved^{7,8}. Buchbinder et al⁹ in his study observed that risk of plantar fasciitis increases as the range of ankle dorsiflexion decreases. Individuals with less than 10° of ankle dorsiflexion had an odds ratio of at least 2:1 for plantar fasciitis and the ratio increased dramatically as the range of dorsiflexion decreased¹⁰. Various possible risk factors may be sudden increase in body weight, increase in running distance or intensity and occupation involving prolonged weight-bearing¹¹.

Plantar fasciitis is considered as a self limiting condition. However the typical resolution time is anywhere from 6-18 months or sometimes longer¹². Conservative management is reportedly very successful and various treatment options have been advocated in the past.

METHODOLOGY

A randomized clinical trial was conducted in the department of physiotherapy of GJUS&T, Hisar. The purpose of study was explained to the patients and written informed consent was taken prior to their participation. 30 participants who consented were screened for inclusion and exclusion criteria and divided equally into two groups by random sampling method. The duration of study was 3 weeks.

Demographic information including age, gender, body weight, height was collected. Evaluation of pain profile and disability was done by visual analog scale (VAS) and foot function index (FFI) respectively.

Visual Analog Scale (VAS): A horizontal 10 cm line was drawn on paper and participants were asked to mark a point on the line that best defined the present pain level (0= no pain; 10= worst imaginable pain)

Foot Function Index (FFI): It is a self-report questionnaire with three subscales for pain, disability and activity-limitation. This scale consist a total of 23 questions. High scores indicate greater disability or decreased function. The test-retest reliability of FFI total and sub-scale scores is 0.87-0.69¹³

Inclusion Criteria

- Patients diagnosed with plantar fasciitis
- Age group 25-35 years
- Duration of symptoms 4 weeks or more
- Both sex group

Exclusion Criteria

- Acute inflammation in ankle-foot region
- Subjects with calcaneal fracture or metal implants around ankle
- Impaired sensation in lower extremities
- Foot deformities, calcaneal spurs, ankylosis or arthritis of ankle
- Corticosteroids injection in heel in past 1 month

Procedure

After this initial evaluation the participants were randomly allotted to one of two study groups A or B. Outcomes of treatment were captured on the 1st day and 21st day of the treatment session. All participants were advised to use soft heel footwear, not to stand for long period of time and avoid walking bare foot.

Group A

1. Ultrasound pulsed mode (1:4) with output of 1w/cm² with frequency of 1 MHz for 10 minutes.
2. Strengthening exercises for foot intrinsics:
 - Standing toe curls
 - Towel toe curls

Group B

1. Ultrasound pulsed mode (1:4) with output of 1w/cm² with frequency of 1 MHz for 10 minutes.
2. Strengthening exercises for foot intrinsics:
 - Standing toe curls
 - Towel toe curls
3. Stretching exercises:
 - Calf muscles
 - Plantar fascia

RESULTS

The dependent variables were VAS and FFI. Unpaired t-test was used to examine changes in the dependent variables. p-value < 0.05 is taken

up for statistical significance at $n_1 + n_2 - 2$ degree of freedom.

TABLE 1: ANALYSIS OF VAS AT PRE-TREATMENT STAGE:

| Parameters | Group A | Group B |
|---------------------------|---------|---------|
| Mean | 6.53 | 6.80 |
| Standard deviation | 1.68 | 1.68 |
| 't' value | 0.498 | |
| p value | 0.622 | |

TABLE 2: ANALYSIS OF VAS AT POST-TREATMENT STAGE

| Parameters | Group A | Group B |
|---------------------------|---------|---------|
| Mean | 2.27 | 1.00 |
| Standard deviation | 1.53 | 1.07 |
| 't' value | 2.624 | |
| p value | 0.013 | |

Mean \pm SD for pain at pre-treatment was 6.53 ± 1.68 and 6.80 ± 1.68 for group A and group B respectively and 't' calculated value was 0.498 at $n_1 + n_2 - 2$ degree of freedom. Data analysis demonstrated no statistically significant difference between the two groups.

Whereas, mean \pm SD for pain at post-treatment was 2.27 ± 1.53 and 1.00 ± 1.07 for group A and group B respectively and 't' calculated value was 2.624 at $n_1 + n_2 - 2$ degree of freedom. Data analysis demonstrated statistically significant difference between the two groups

TABLE 3: ANALYSIS OF FFI AT PRE-TREATMENT STAGE

| Parameters | Group A | Group B |
|---------------------------|---------|---------|
| Mean | 41.005 | 42.666 |
| Standard deviation | 5.856 | 5.907 |
| 't' value | 0.768 | |
| p value | 0.448 | |

TABLE 4: ANALYSIS OF FFI AT POST-TREATMENT STAGE

| Parameters | Group A | Group B |
|---------------------------|---------|---------|
| Mean | 6.203 | 4.158 |
| Standard deviation | 1.959 | 2.203 |
| 't' value | 2.685 | |
| p value | 0.012 | |

Mean \pm SD for disability at pre-treatment was 41.005 ± 5.856 and 42.666 ± 5.907 for group A and group B respectively and 't' calculated value was 0.768 at $n_1 + n_2 - 2$ degree of freedom. Data analysis demonstrated no statistically significant difference between the two groups.

Whereas, mean \pm SD for disability at post-treatment was 6.203 ± 1.959 and 4.158 ± 2.203 for group A and group B respectively and 't' calculated value was 2.685 at $n_1 + n_2 - 2$ degree of freedom. Data analysis demonstrated statistically significant difference between the two groups.

DISCUSSION

The present study was conducted to find out the effectiveness of manual stretching along with conventional treatment on pain and disability in plantar fasciitis. The group receiving manual stretching of plantar fascia and calf muscles showed better results than the group receiving conventional therapy alone.

These results favor a similar study done by Digiovanni BF et al, who supported the use of plantar fascia specific stretching as a key component of treatment for plantar fasciitis¹⁴. Wyne M et al in their study have found similar results, where participants with PF showed reduction in pain and improvement in function.

In plantar fasciitis, the fascia undergoes degeneration and becomes tight thereby leading to hypomobility within the ankle-foot complex especially talocrural, subtalar and 1st tarsometatarsal joints¹⁵. Limitation of talocrural joint dorsiflexion, would require compensatory movements at more distal joints to allow forward progression of leg over the foot during stance phase of the gait. This could theoretically decrease the height of medial longitudinal arch and further increase the tensile stress through plantar fascia. Stretching reduces the tension in the fascia, which becomes tight during plantar fasciitis. Thereby it recreates the windlass mechanism¹⁶ by optimizing the tissue tension.

The goal of plantar fascia specific stretching is to release the fascial restriction and restore tissue length. Gentle and sustained stretching is believed to free adhesions and softens the fascia, which may be impeding blood supply or nerves.

Tightness of calf muscles leads to decrease in dorsi-flexion range of motion at talocrural joint. This also puts excessive load on plantar fascia during the push-off phase of gait. Use calf stretching maneuver is advocated by Michelsson O et al¹⁷ in their study as an effective intervention.

These results point towards the importance of manual stretching program including plantar fascia specific stretching and stretching of calf muscles in the treatment protocol of plantar fasciitis.

LIMITATIONS OF THE STUDY

- The study was done on a small sample size
- Study was conducted over a short period of time
- No follow-up could be done to see the long term effects

CONCLUSION

By the present study, we can conclude that manual stretching is effective in plantar fasciitis when used in combination with conventional therapy and exercises and therefore it can be included in the regular treatment protocol.

ETHICAL CLEARANCE: We certify that this study involving human subjects is in accordance with Helsinki declaration of 1975 and has been approved by the relevant ethical committee.

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A STUDY TO FIND OUT TEST RETEST RELIABILITY AND VALIDITY OF GUJARATI VERSION OF NECK DISABILITY INDEX AMONG GUJARATI SPEAKING INDIAN POPULATION WITH NECK PAIN –A CORRELATIONAL STUDY

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ABSTRACT

Background: The NDI is one of the most widely used reliable and valid instruments for assessing functional disabilities in Neck pain patients. However, no any other reliable and valid tools are available in Gujarati language to assess disability for individuals with neck pain.

Aim: To check the test retest reliability and validity of Gujarati version of Neck Disability Index (NDI) among Gujarati speaking Indian population with neck pain.

Method: The study was carried out in three phases: the first was translation into Gujarati and cultural adaptation of the questionnaire, the second was a pilot study on 20 individuals with neck pain to assess the comprehensibility of the pre final version; third was the reliability and validity study of the final version of the questionnaire. The Gujarati version was tested on 100 patients with neck pain. Test retest reliability and internal consistency were investigated.

Result: Statistical analysis was obtained by using graph pad instate 3 and SPSS 14. Test retest reliability was assessed with a time interval of 24 hours. The total value of intra class correlation coefficient (spearman's correlation coefficient) of test retest reliability was 0.98 with all items having individual ICC scores ranging from 0.89-0.98. Reliability estimated by the internal consistency reached a Cronbach's alpha of 0.99. The NDI subscale shows excellent test retest reliability with Cronbach's alpha ranging from 0.94-0.99.

Conclusion: The results of this study indicate that the Gujarati version of the NDI is a reliable and valid tool for measuring disability caused due to neck pain in Gujarati speaking Indian population.

KEYWORDS: Neck disability index (NDI), Neck Pain (NP), Reliability, Validity, Gujarati version, ICC (Intraclass Correlation Coefficient).

INTRODUCTION

Neck Pain is one of the major complaints among the cervical spine disorders and is a common problem among most communities. It is highly prevalent and experienced health problem facing the work place and health care communities¹. It is the second most common regional pain syndrome next to backache and is also an important occupational related problem.

Neck pain is defined as pain located between the occiput and the third thoracic vertebra². Neck pain most commonly causes by biomechanical axial neck pain, whiplash-associated disorder and cervical radiculopathy and secondary to rheumatic causes (Ankylosing spondilitis, Rheumatoid arthritis), osteoarthritis and major trauma, including fractures, dislocations, and cord injuries³.

Neck pain is becoming increasingly prevalent in society. The current research incidence of neck pain in India has been estimated as 35% and the median age as 27 years and it ranges between 18 to 52 years. Epidemiological surveys show that 45-71% of people recall an episode of neck pain that affected their activities of daily living⁴. Prevalence is generally higher in women compared to men, higher in high-income

countries compared with low- and middle-income countries and higher in urban areas compared with rural areas⁵.

The increased frequency of neck pain and its impact on function including work performance makes this an important health issue for the individual the employer, the health care sector and the society at large³. There are several questionnaires available measuring NP that have been developed and published in English speaking countries⁶.

- Neck disability Index (NDI)
- Neck Pain and Disability Scale (NPDS)
- The Northwick Park Neck Pain Questionnaire
- The Copenhagen Neck Functional Disability Scale
- The Patient-Specific Functional scale (PSFS)

The Neck Disability Index is the most commonly used questionnaire assessing disability in patients with neck pain. It is a self-administered questionnaire that was adapted from the Oswestry Disability Index by Vernon et al at 1991. NDI contains 10 items, in which 7 related to activities of daily living, 1 related to pain, 1 item related to concentration and 1 item related to recreation. Each item is scored from 0 to 5 and the total score is expressed as a percentage, with higher scores corresponding to greater disability⁷. It is a relatively short, paper-pencil instrument that is

easy to apply in both clinical and research settings⁸.

The Neck Disability Index has already been translated into Dutch⁹, Brazilian¹⁰, Greek¹¹, Spanish¹², Turkish¹³, Korean¹⁴, French¹⁵, Finnish¹⁶ and Iranian¹⁷ and Hindi¹⁸ used in a number of research studies. Reliability and validity of the NDI has been reported in previous studies. It has been revalidated in several study population and has shown stable psychometric properties.

Reliability is defined as the extent to which a questionnaire, test, observation or any measurement procedure produces the same results on repeated trials. It shows the stability or consistency of scores over time or across raters. There are three aspects of reliability, namely: equivalence, stability and internal consistency (homogeneity)¹⁹.

Studies of test-retest reliability for health-related quality of life instruments have been used with varying intervals between test administrations. The interval has been ranged from 10 minutes to 1 month²⁰.

Validity is defined as the extent to which the instrument measures what it purports to measure. There are many different types of validity, including: content validity, face validity, criterion-related validity (or predictive validity), construct validity, factorial validity, concurrent validity, convergent validity and divergent (or discriminant validity)¹⁹.

However, till date no Gujarati version of Neck Disability Index has been developed. In addition to the lack of a standard reliable and valid instrument in Gujarati for measuring disability in neck pain, the purpose of this study is to find out the reliability and validity of the Gujarati translation of neck disability index among Gujarati speaking Indian patients with neck pain.

HYPOTHESIS

Null hypothesis

Gujarati version of neck disability index is not reliable and valid tool for assessing disability among Gujarati speaking Indian population with neck pain.

Experimental Hypothesis

Gujarati version of neck disability index is a reliable and valid tool for assessment of functional status among Gujarati speaking Indian population with neck pain.

SELECTION CRITERIAS

Inclusion criteria

- Subjects with neck pain.
- Subjects must be able to read and understand Gujarati language.

- Age: 25-50yrs

Exclusion criteria

- Illiterate people with neck pain.
- Subjects who were not able to read and understand Gujarati language.
- Uncooperative subjects.

MATERIALS AND METHODOLOGY

MATERIAL USED

- Consent form
- Neck disability index
- Pen

METHODOLOGY

- **Study Setting:** Physiotherapy centres of Rajkot.
- **Study Population:** Subjects with neck pain between 25-50 years
- **Sampling Method:** Purposive sampling.
- **Sample Size:** 100 subjects
- **Study Design:** A correlational study

The study was carried out in three phases: the first was translation into Gujarati and cultural adaptation of the questionnaire; the second was a pilot study to assess the comprehensibility of the pre final version; third was the reliability and validity study of the final version of the questionnaire.

Translation and Cultural Adaptation

For the translation the recent guidelines for cross cultural adaptation was used.²¹ Two translations of the original Neck Disability Index from English to Gujarati were performed by two bilingual translators whose mother tongue was Gujarati allowing detection of errors and divergent interpretations of items with ambiguous meaning in the original instrument. The first translation was done by a translator of medical background who was aware of the process and purpose. The other translation was done by a naïve translator from non-medical background that was unaware of the translation objectives and this was useful in eliciting unexpected meanings from the original tool.

Both the Gujarati translations were then compared for inconsistencies and a pre final version of the two translations was synthesized working from the original questionnaire as well as the first and second translator's versions. The pre final version was then back translated by two naïve English speakers who were able to read and understand Gujarati. Each translation was then compared with the original English neck disability index and checked for inconsistencies and then Gujarati version was reviewed by the expert

committee, including the translators, physiotherapists etc. to assure semantic and idiomatic equivalence (i.e. to check for ambiguous words or inappropriately translated colloquialisms) and to address any peculiarities specific to the cultures examined between the Gujarati and English versions of the questionnaire.

Pilot Study and Modification of the Pre Final Version

A pilot study was done on a sample of 20 subjects with neck pain. The subjects were selected purposively on the basis of inclusion and exclusion criteria. The patients were asked to fill the questionnaire and also asked to give feedback and comments regarding the questions and identify words or sentences that were difficult to understand at the end of filling of the questionnaire. On the basis of their reviews the final version of the index was developed which was again checked and approved by the committee.

Reliability and Validity Study

The study was carried out at various physiotherapy clinics of Rajkot. Total 100 subjects of both genders, mean age of 35.4 yrs with neck pain were included in the study on the basis of selection criteria. After taking written consent form from the subjects, they were asked to fill the NDI questionnaire twice with a time interval of 24 hours in order to assess test retest reliability of the questionnaire.

The test retest reliability was measured by comparing the results of first and second administrations of the NDI. Intra Class Correlation Coefficient (ICC) was used to evaluate test retest reliability.

The internal consistency of a scale relates to its homogeneity and hence, Cronbach's alpha was used to evaluate the same. Face and content validity was judged by health professionals. It was also assessed by examining the completeness of item responses, the distribution of the scores and magnitude of ceiling and floor effects i.e. a proportion of the best and worst possible scores, respectively.

RESULTS

The obtained data of 100 neck pain patients with the mean age and standard deviation of 35.4 ± 7.8 years was calculated by using graph pad instate 3 and SPSS version 14. The study group comprised of 42 males and 58 females.

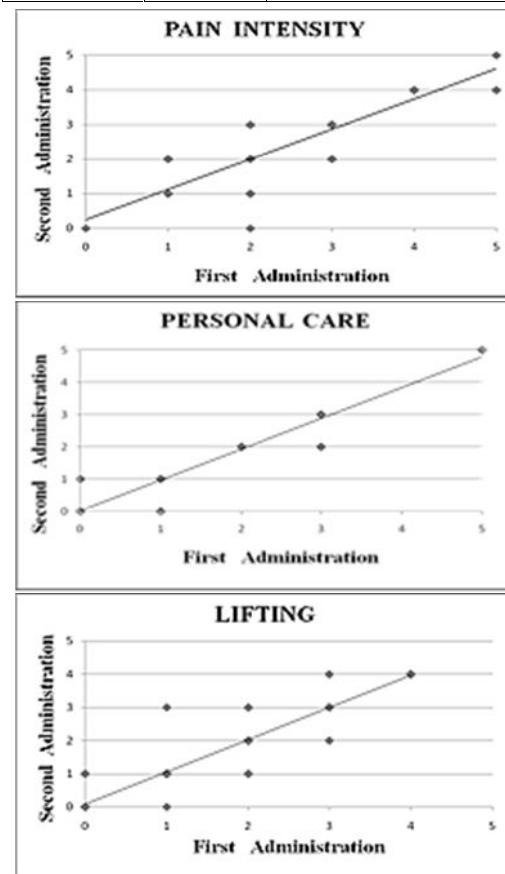
Reliability estimated by the internal consistency using Cronbach's alpha and test retest reliability estimated by intraclass correlation coefficient (Spearman's correlation co-efficient).

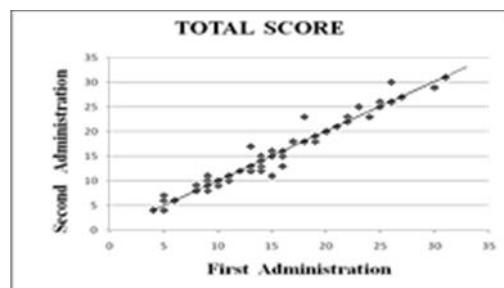
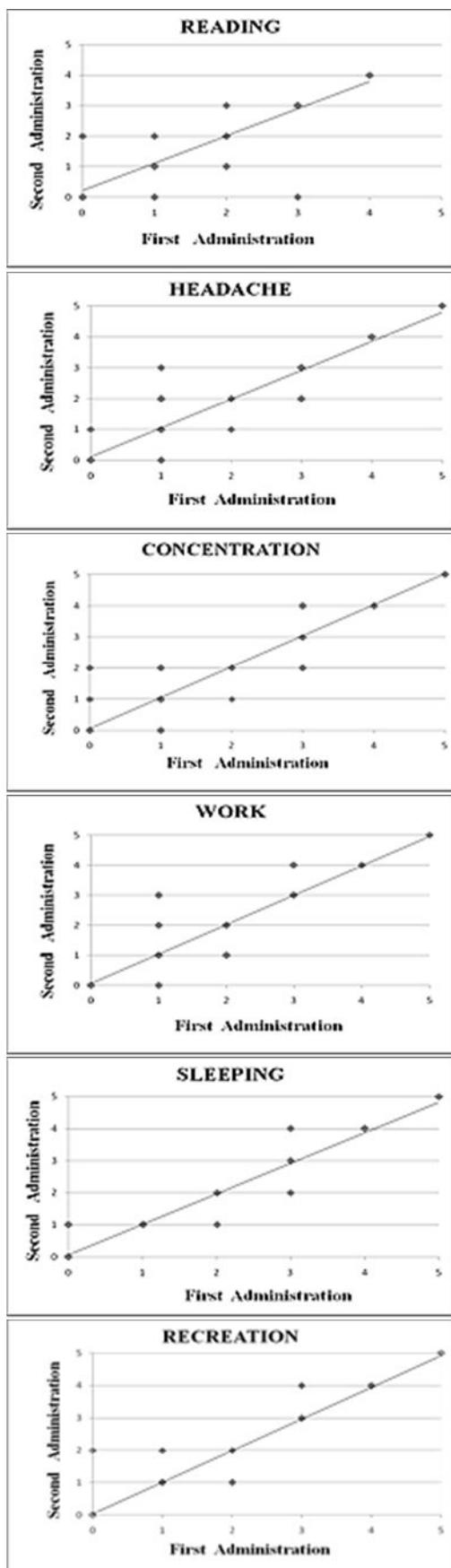
Obtained value of Cronbach's alpha is 0.99 which shows excellent homogeneity between all the items of NDI and obtained value of ICC assessed at time interval of 24 hours is 0.98 which shows excellent test-retest reliability and high correlations between the baseline and retest questionnaires of the Gujarati version of the NDI (Table-1)

Result shows that the translated version is reliable with a low standard error of measurement. It shows moderately positive correlation between the scores of each item of NDI at different administration intervals with total score. (Graph- 1)

TABLE 1: ICC AND TEST RETEST RELIABILITY OF ALL ITEMS OF THE NDI AND TOTAL SCORE

| ITEM | ICC | CHRONBACH'S ALPHA |
|----------------|------|-------------------|
| Pain intensity | 0.89 | 0.94 |
| Personal care | 0.94 | 0.98 |
| Lifting | 0.95 | 0.97 |
| Reading | 0.91 | 0.94 |
| Headache | 0.91 | 0.96 |
| Concentration | 0.95 | 0.98 |
| Work | 0.89 | 0.95 |
| Driving | 0.95 | 0.98 |
| Sleeping | 0.96 | 0.98 |
| Recreation | 0.94 | 0.97 |
| Total score | 0.98 | 0.99 |





GRAPHS: SCATTER PLOT OF FIRST ADMINISTRATION AND SECOND ADMINISTRATION OF ALL ITEMS OF NDI WITH TOTAL SCORE.

DISCUSSION

The result shows that Gujarati version of neck disability index is a reliable and valid tool for assessment of functional status among Gujarati speaking Indian population with neck pain. Result is supporting the experimental hypothesis of this study.

The value of ICC in this study (0.98) is more than the original English version of NDI (0.89). One reason for this difference could be the time interval between the baselines and retest administration of the questionnaires by the original authors in their study. It is seen that ICC values decrease with the increase in the time interval between the two administrations of the questionnaire.

In the studies of Salo P; Yelenen J and Marianna^{12,16} it was seen that the ICC values decreased in the retest scores as the test retest interval was extended to 7 days. Such an observation could be because of the natural change in the physical and health status of the individual.

In the studies of Mousavi Sayed et al¹⁷ found approximately similar scores for the 24 hour interval between test and retest and suggested that testing of reliability was done within a short time interval to minimize changes in the clinical status of patient.

Face validity is concerned with whether a measurement seems to be assessing the intended parameters in the given situation. In this study, translation of the questionnaire seemed to be valid and the instrument was well accepted by the patients as well as approved by the committee comprising of translators, physiotherapists, health professionals etc. The layout of the questionnaire and clear structure and clarity of the questions enhanced its face validity.

Criterion and construct validity could not be tested due to absence of other standard Gujarati language disability measure for cervical spine.

Additionally, findings of this study shows that female with age between 25-50yrs are

suffering more with neck pain compared to male with same age.

LIMITATIONS

- Sample size was small.

FUTURE RECOMMENDATION

- This study can be done with large sample size.
- This study can be done with varying time interval between test and retest.
- This study can also be done by taking specific population with neck pain.

CONCLUSION

Gujarati version of neck disability index is a reliable and valid tool for assessment of functional status among Gujarati speaking Indian population with neck pain.

CLINICAL IMPLICATION

Because of its easy scoring, high sensitivity towards change and wide acceptance by the patients, the Guajarati version of NDI can be recommended for clinical trials to investigate the effectiveness of the therapeutic interventions among the Guajarati speaking Indian patients undergoing in clinical set ups.

ACKNOELEDGEMENT

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CONFLICT OF INTEREST

This study is done only for the knowledge purpose, not for any other purpose. So, there is no any conflict of interest.

SOURCE OF FUNDING

All above mentioned materials were provided by our college.

ETHICAL CLEARENCE

This study is approved by Ethical Committee of our college.

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EFFECT OF STABILIZATION EXERCISE ON FEAR AVOIDANCE BELIEF OF PATIENTS WITH NON-SPECIFIC CHRONIC LOW BACK PAIN

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ABSTRACT

Objective: This study sought to investigate the effect of stabilization exercise on Fear-avoidance beliefs (FAB) of patients with non-specific chronic low back pain (NCLBP).

Materials and Methods: A total of 122 individuals (44 males, 78 females) with NCLBP participated in this study. They were recruited from Orthopaedic Clinic of Lagos University Teaching Hospital and National Orthopaedic Hospital, Lagos, Nigeria. They were assigned to four different groups. Group 1 received stabilization exercise only. In addition to stabilization exercise, Groups 2 and 3 received Transcutaneous Electrical Nerve Stimulation (TENS), and massage therapy respectively. Group 4 was the control who received drug therapy only. Subjects went through this protocol twice weekly for 8 consecutive weeks. Subjects were assessed for FAB using a structured 16 item questionnaire.

Results: Participants in three groups (1, 2 and 3) recorded significant improvement in FABP and FABW, following intervention ($P<0.05$). There was no significant improvement in FABP and FABW assessed in the control group.

Conclusion: The study provides evidence that stabilization exercise only and in combination with TENS and massage is effective in managing fear avoidance belief of patients with non-specific chronic low back pain.

KEYWORDS: Fear avoidance belief, Low back pain, Stabilization exercise.

INTRODUCTION

Fear-avoidance beliefs (FAB) symbolize cognitions and emotions that emphasize concerns and fears about the potential for physical activities to produce pain and further harm to the lumbar spine¹. Excessive FABs results in heightened disability of the lumbar spine and are obstacle for recovery from acute, sub-acute, and chronic low back pain¹.

Pain has been viewed as a complex, multidimensional developmental process attributed to various psychosocial factors². Psychosocial factors (yellow flags) include having negative attitude that back pain is harmful or potentially severely disabling, exhibiting an expectation that passive, rather than active, treatment will be beneficial and having a tendency to depression. Also, having low morale, social withdrawal or financial problems, displaying fear avoidance behaviour and reduced activity levels³. These factors play a key role in the development of chronic musculoskeletal pain, in particular dysfunctional beliefs about pain and fear of pain.

Fear of pain leads to avoidance of activities (physical, social and professional) that individual's associate with the occurrence or exacerbation of pain, even after they might have physically recovered. Fear-avoidance beliefs towards pain make low back pain more likely to become chronic⁴. A relationship between fear-avoidance beliefs and chronic pain has been reported⁵. Fear-avoidance beliefs are used in clinical prediction rules and can be used to guide decision making⁶. Because of the direct

consequences of heightened FAB on the health and well-being of people with low back pain, it would seem beneficial for the health care system to understand and address them. Unfortunately, discoveries about FAB have not been extensively translated into clinical practices. Many health care providers are not aware of the importance of FAB and are subsequently unaware of the potential for clinical encounters to positively or negatively impact FAB¹. This omission may be partly responsible for the escalating level of disability reported by people with low back pain in modern societies, despite ever increasing medical expenses for the care of this problem⁷. Hence this study is therefore designed to investigate the effect of stabilization exercise on fear avoidance belief of patients with non-specific chronic low back pain.

Objective: The objective of the present study was to determine the effect of stabilization exercise on fear avoidance belief of patients with non-specific chronic low back pain.

METHODS

A total of 135 individuals (49 males, 86 females) with non-specific chronic low pain back (NCLBP) between 24- 67 years of age were recruited for this study. They were recruited from Orthopaedic Clinic of Lagos University Teaching Hospital (LUTH), Idi-Araba, Lagos and National Orthopaedic Hospital Igbobi, Lagos, Nigeria. All patients included into the study were subjects with history of non specific chronic low back pain with or without pain radiating to one or both lower

limbs, and subjects whose clinical assessment indicates that he/she is suitable for stabilization exercise training. Excluded from the study were subjects confirmed to be pregnant, subjects with specific LBP, subjects with medical or surgical conditions that might hinder exercise performance. Prior to the commencement of the study the subjects' demographic data such as age, gender, weight, height, occupation, marital status, clinical history of LBP and number of LBP episodes during 12 months were obtained from the subjects and baseline assessment of FABW and FABP was done. Informed written consent was obtained by providing a consent form for the subjects to fill. Ethical approval was sought and obtained from the Health Research and Ethics Committee of Lagos University Teaching Hospital, Idi-Araba, Lagos (LUTH).

Of the 135 patients, seven were found ineligible for the study after screening and were therefore excluded. The eligible patients were randomly assigned to four groups using computer generated numbers. Each group had 32 patients from the 128 eligible patients. Group 1 received stabilization exercise only. In addition to stabilization exercise, Groups 2 and 3 received Transcutaneous Electrical Nerve Stimulation (TENS), and massage respectively. Group 4 was the control who received drug therapy only. However only 122 patients (44 males, 78 females) age range 25-65 years completed the study. 6 subjects did not complete with reasons ranging from lack of effect, transportation problem and illness. Subjects went through the protocol twice

RESULTS

Demographic characteristics of the subjects

The mean age of subjects in groups 1, 2, 3 and 4 were 45.84 ± 9.95 years, 47.03 ± 12.07 years, 44.57 ± 11.82 years and 50.83 ± 13.03 respectively (Table 1).

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF THE SUBJECTS

| | All X \pm SD N=122 | subjects X \pm SD n=31 | GRP1 X \pm SD n=31 | GRP2 X \pm SD n=31 | GRP3 X \pm SD n=30 | GRP4 X \pm SD n=30 | F | p-value |
|-------------------------|----------------------------|--------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------|---------|
| Age (yrs) | 47.06 ± 11.84 | 45.84 ± 9.95 | 47.03 ± 12.07 | 44.57 ± 11.82 | 50.83 ± 13.03 | 1.59 | 0.19 | |
| Height (m) | 1.72 ± 0.10 | 1.71 ± 0.89 | 1.71 ± 0.98 | 1.71 ± 0.10 | 1.75 ± 0.11 | 1.41 | 0.24 | |
| Weight (kg) | 74.85 ± 11.14 | 78.10 ± 11.70 | 74.23 ± 14.16 | 75.83 ± 9.31 | 75.27 ± 7.91 | 0.72 | 0.54 | |
| BMI(Kg/m ²) | 25.45 ± 3.97 | 26.57 ± 3.76 | 25.50 ± 3.42 | 26.31 ± 4.47 | 24.81 ± 3.88 | 1.28 | 0.28 | |

KEY:

- X \pm SD = Mean \pm Standard Deviation
- BMI = Body Mass Index
- GRP1- Group 1 = Stabilization exercise only
- GRP 2- Group2 = Stabilization exercise with TENS
- GRP 3- Group 3 = Stabilization exercise with TENS and massage.
- GRP4 - Group 4 = Control
- N = Total subject population
- n = Subjects in each group

weekly for 8 consecutive weeks. Assessment of Fear Avoidance Belief for physical activity (FABP) and work activity (FABW) was done at baseline, end of 4th week and end of 8th week respectively.

Fear Avoidance belief questionnaire was designed to investigate fear-avoidance beliefs among LBP patients in the clinical setting. It helps predict people that have high pain avoidance behavior. It consists of 2 Subscales, which are reflected in the division of the outcome form into 2 separate sections.

The first subscale (5 Items) is the physical activity subscale and the second subscale item (11 Items) is the work subscale. The instrument has a cut-off score for FABP and FABW which are 15 and 34 respectively. Scores >15 and 34 shows high fear for physical and work activity respectively.

STATISTICAL METHODS

Statistical package for social science SPSS version 17 was used for statistical analyses. Summary of the socio demographic data was done. Kruskal wallis test was used to analyse the FABP and FABW at baseline end of 4th week and 8th week. Wilcoxon test was used to compare baseline and 8th week values of the FABP and FABW. A least significant difference post hoc analysis was carried out to determine the exclusively significant group in the outcome measure parameters. Level of significance was set at p<0.05.

COMPARISON OF FEAR AVOIDANCE BELIEF AT BASELINE, End of 4TH WEEK AND 8TH WEEK POST-INTERVENTION ACROSS THE GROUPS

At baseline (pre-treatment) Kruskal Wallis test showed no significant difference for FABP and FABW across the four groups (Table 2).

There was significant difference at 4th week for FABP when across group comparison was done. While at 8 week post-treatment intervention there was significant difference in FABP and FABW (Table 3). Least significant difference (LSD) post hoc analysis shows that the significance lies between group 1& 4, groups 2 &4 and groups 3&4 post intervention assessment.

TABLE 2: COMPARISON OF FEAR AVOIDANCE BELIEF AT BASELINE, END OF 4TH WEEK AND 8TH WEEK ACROSS THE GROUPS

| | OUTCOME MEASURE | GRP1 MEAN RANK | GRP2 MEAN RANK | GRP3 MEAN RANK | GRP4 MEAN RANK | H Value | p value |
|--------------------|-----------------|----------------|----------------|----------------|----------------|---------|---------|
| (Pre-Rx) | FABP | 61.77 | 59.77 | 60.72 | 63.78 | 0.22 | 0.98 |
| | FABW | 61.60 | 64.77 | 69.83 | 49.68 | 5.30 | 0.15 |
| Mid-Rx | FABP | 52.95 | 53.66 | 50.70 | 89.23 | 24.72 | 0.01* |
| 4 th Wk | FABW | 51.92 | 58.85 | 60.92 | 74.72 | 6.71 | 0.08 |
| (Post-Rx) | FABP | 48.13 | 54.21 | 47.30 | 97.05 | 41.35 | 0.01* |
| 8 th Wk | FABW | 50.95 | 55.24 | 48.55 | 91.82 | 31.19 | 0.01* |

* Significant difference p< 0.05

Key:

- X ± SD = Mean ± Standard deviation
- GRP 1 = Group 1 = Stabilization exercise only
- GRP 2 = Group 2 = Stabilization exercise with TENS
- GRP 3 = Group 3 = Stabilization exercise with TENS and massage.
- GRP 4 = Group 4 = Control
- Rx = Treatment
- H = Kruskal Wallis test
- FABP = Fear avoidance Belief for physical activity

COMPARISON OF FEAR AVOIDANCE BELIEF AT PRE-TREATMENT (BASELINE) AND POST-TREATMENT (END OF 8TH WEEK).

Table 3 shows the comparison of the mean score of fear avoidance belief at (pre-treatment) baseline and end of 8th week (post-treatment) intervention among the groups.

Wilcoxon - test showed that there was significant difference between pre- and post-treatment intervention assessment for FABP and FABW assessed within each of the groups except group 4 (control) (Table 3).

TABLE 3: COMPARISON OF FEAR AVOIDANCE BELIEF AT PRE- TREATMENT (BASELINE) AND POST- TREATMENT (END OF 8TH WEEK) AMONG THE GROUPS.

| | OUTCOME MEASURE | PRE - Rx (BASELINE) X±SD | POST - Rx (End of 8 th wk) X±SD | z- Value | p – value |
|------|-----------------|--------------------------|--|----------|-----------|
| GRP1 | FABP | 16.58±5.99 | 15.90± 6.78 | 4.79 | 0.01* |
| | FABW | 19.42± 14.48 | 3.19±4.8 1 | 6.60 | 0.01* |
| GRP2 | FABP | 15.90±6.78 | 4.39±4.39 | 4.01 | 0.01* |
| | FABW | 18.81±10.35 | 2.42±3.47 | 4.79 | 0.01* |
| GRP3 | FABP | 16.63± 5.44 | 3.47± 3.93 | 4.79 | 0.01* |
| | FABW | 20.13±13.39 | 3.35±4.59 | 4.37 | 0.01* |
| GRP4 | FABP | 16.50± 6.99 | 16.31±4.86 | 0.59 | 0.95 |
| | FABW | 15.13±12.32 | 14.99±10.12 | 0.02 | 0.98 |

* Significant difference at p< 0.05

KEY:

- GRP 1 = Group1 = Stabilization exercise only,
- GRP2 = Group 2 = Stabilization exercise with TENS,
- GRP3 = Group 3 = Stabilization exercise with TENS and Massage.
- GRP4 = Group 4 = Control
- FABP = Fear Avoidance Belief for Physical activity,
- FABW = Fear Avoidance Belief Work activity.
- FD = Functional disability
- Rx = Treatment
- z = Wilcoxon test

DISCUSSION

The result of the present study has demonstrated that the use of stabilization exercise in the treatment of patients with non-specific chronic low back pain, reduce fear avoidance belief for physical and work activity.

Participants in the four groups were similar in age and physical characteristics, and there were no significant difference in the physical characteristic in the four groups, this suggests that all the groups were comparable. This results conforms to the study of Hides et al⁸ who in their study on the effect of stabilization training on multifidus muscle cross-sectional area among young elite cricketers with low back pain reported that there was no significant different in the age and physical characteristics of the groups that were studied.

The improvement in the parameters measured, that is fear avoidance belief for physical and work activity could be as a result of the reestablishment of the normal control of the deep spinal muscles (DSM), which reduced the activity of more superficial muscles (rectus abdominis, external oblique, internal oblique) which when recruited stiffens the spine and increase activity in the lumbar muscles. This will result into decrease in pain, fear avoidance belief and disability level. More so that co-contraction of the local muscles (DSM) such as TrA and LM has been reported to be effective in the stabilization of the motion segments of the lumbar spine particularly within the neural zone, thus providing a stable base on which the global muscles (superficial muscles) can safely act⁹.

The present study revealed that the stabilization exercise only, stabilization exercise combined with TENS and stabilization exercise combined with TENS and massage had a significant effect in the improvement of FAB of patients in groups 1, 2 and 3. This assertion was supported by the result of the study of Fritz et al.¹⁰ which reported that fear avoidance belief of work activity were significant predictor of four weeks disability and work status, even after controlling initial level of pain and disability and may be an essential factor for explaining the switch from acute to chronic condition. This is contrary to the result of the study of Vlaeyen et al¹¹, and Leeuw et al¹² who reported that exposure in vivo was superior to graded exercise as a means of reducing excessive FAB. It is contrary to the study of Rasmussen et al.¹³ who reported that there was no improvement in fear avoidance belief for patients with recurrent low back pain after graded exercise. The study by Waddell et al.¹⁴ confirms the importance of fear avoidance belief (FAB) assessment and demonstrated that specific fear avoidance belief of work activity are strongly

related to work loss due to low back pain. This assertion was corroborated by the present study in all the groups.

CONCLUSIONS

Stabilization exercise when used only and also when combined with TENS and massage was all effective in relieving symptoms of fear avoidance belief in patients with non-specific chronic low back pain (NCLBP). This study established that stabilization exercise only can be used successfully in the treatment of fear avoidance belief of patients with NCLBP.

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None

CONFLICTS OF INTEREST

All authors have none to declare

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PHYSICAL THERAPY PROFESSION PERCEPTION BY PHYSICIANS AND MEDICAL STUDENTS IN SUDAYR REGION

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ABSTRACT

Background: Physiotherapy has been defined as a dynamic health care profession with established theoretical and widespread clinical applications in the preservation, development and restoration of optimal physical functions. While physical therapist is a member of primary care team. He has an important role in improving public health and meeting national targets. Physical therapy mainly depends on referrals from physicians of different fields of medicine so poor knowledge about physical therapy profession may lead to misconceptions about the profession and inter-professional conflicts.

Subjects: 150 persons “physicians of many facilities in Sudayr region and medical students from the faculty of medicine at Al Majmaah University” participated in this study. **Methods:** A survey would be done about physical therapy profession from views of physicians and medical students. A self-developed closed –ended questionnaire was designed. The questionnaire included informations on participants’ demographic data, perception of physical therapy subspecialties, roles, and modalities.

Objectives: The aims of this study were mainly to clarify the importance of physical therapy profession and to highlight the role of physiotherapist as a member of medical team.

Results: The results revealed that there was high awareness about physical therapy (PT) subspecialty regarding orthopedics with a percentage of 95.3% as well as to exercises as one of physical therapy modality with a percentage of 95.3%. In contrast it showed lack of awareness regarding the PT modality as hydrotherapy with a percentage of 56%.

Conclusion: The study concluded that there is deficits in the perception in different areas regarding to PT profession. This lack of awareness must be overcome.

KEYWORDS: Physical therapy; Role of physiotherapy; PT modalities; PT perception

INTRODUCTION

Physiotherapy (PT) is defined by the World Confederation of Physical Therapy (WCPT) as “services to people and populations to develop, maintain and restore maximum movement and functional ability throughout the life span”¹. It also commonly known as physical therapy. While physiotherapist (also physical therapist) is a member of primary care team^{2, 3}. The physiotherapy service gained its importance in developed nations which is offered through primary health centers and funded by the public health system after having understood the need of this service in prevention, promotion, curative and rehabilitation of health for the individual and population. Hence the profession has a good development and the scope is growing each year, but, there is not equal importance given to physiotherapy service and its profession in developing world⁴.

As a result of increasing incidence of disability and deficits resulting from traffic accidents, the demand to medical rehabilitation is increasing. For this reason the government of the Kingdom of Saudi Arabia represented by the Ministry of Health is interested in providing rehabilitation services to rehabilitate these cases through providing hospitals, rehabilitation centers

and medical departments in all regions of the Kingdom⁵.

Physicians have profound influence on other health professions including physiotherapy as they are at the ‘top of the pyramid’ of health care professionals⁶. Generally, patients still rely on physicians for recommendation to other health care professionals. Medical referrals serve not only as a tool for communication, but as an indicator of the level of awareness of physiotherapy by referring health care professionals⁷. As well as undergraduate medical students represent a key target because they are the future physicians. Also, students have been found to be socially representative of the general population in their assessments⁸.

According to Jackson (2004)⁹, lack of knowledge about a profession may lead to misconceptions about the profession and inter-professional conflicts. Thus, understanding of physicians’ and medical students’ perception of PT profession would help the medical team to provide better health care services.

OBJECTIVES

The objectives of this research are to: clarify the importance of physical therapy profession and highlight the role of

physiotherapist as a member of medical team, explore the perceptions, views of physician and medical students about the physiotherapy profession, identify areas of deficit in physicians' and medical students' perception of PT profession in Sudayr region, and update the knowledge of public about physiotherapy profession to benefit the health care process.

REVIEW OF LITRATURE

A profession is a vocation obtained through education in a college or university which gives identification, shares common values and do services for public good by also having responsibility for knowledge development and research¹⁰. While professionals are the people who practice specialized knowledge in the field for a fee¹¹. In addition health professionals are the one who deliver health care service through preventive, promotive, curative and rehabilitative activities for individuals and community¹².

PT is considered as one of health care profession carried out by physiotherapists whom through their examination, evaluation, and physical intervention skills works on healing of impairments and disabilities and also helps in promoting ambulation, functional abilities, quality of life and movement². However, one of the major objectives that should not be ignored by physical therapy profession is to "promote the health and well-being of people with disabilities"¹³. PT involves the interaction between the physical therapist, patients/clients, other health professionals, families, care givers and communities in a process where movement potential is assessed and goals are agreed upon, using knowledge and skills unique to physical therapists"¹⁴. Physiotherapists often mainly depend on referrals from physicians from the different fields of practice of medicine¹⁵. Since a high standard of patient care is the goal of the medical team, so effective communication between the physician and the physical therapist is necessary to ensure this level of care¹⁶.

The extensive knowledge in physiotherapy and the broad scope of physiotherapy paved the way of much specialization within the physiotherapy profession. The specializations which are registered in American Board of Physiotherapy that list eight specialist certifications , which are (1) cardiovascular &pulmonary physical therapists who treat a wide variety of individuals with cardiopulmonary disorders or those who have had cardiac or pulmonary surgery, (2) clinical electrophysiology is a specialty area which encompasses electrotherapy, electrophysiological evaluation, physical agents, and wound management, (3) geriatric

physiotherapist covers a wide area of issues concerning people as they go through normal aging as; arthritis, balance disorders, etc., (4) neurological physical therapy is a field focused on working with individuals who have a neurological disorder or disease as Parkinson's disease, spinal cord injury, and stroke, (5) orthopedic physical therapists diagnose, manage, and treat disorders and injuries of the musculoskeletal system including rehabilitation after orthopedic surgery, (6) pediatric physiotherapist assists in early detection of health problems and uses a wide variety of modalities to treat disorders in the pediatric population, (7) sports physical therapists are involved in the care of athletes from recreational to professional and Olympians. This area of practice includes athletic injury management, including acute care, treatment and rehabilitation, prevention, and education, and (8) women's health PT addresses women's issues related to child birth, and post-partum. These conditions include lymphedema, osteoporosis, pelvic pain, prenatal and post-partum periods, and urinary incontinence^{17,18}.

There are wide variety of interventions in physiotherapy they are: therapeutic exercises, which are planned physical movements, postures and activities to prevent impairments, promote function, reduce risk, optimize overall health and improve fitness and well-being^{19,20}, electrotherapy; it is using the electrical energy for treatment of medical conditions^{19,21}, airway clearance techniques, which involves clearing the airway for an improved breathing using different techniques like postural drainage, deep breathing exercises, spinal mobilization, vigorous chest massage, suctioning, positioning etc^{19,22} , manual therapy techniques; these are hands on techniques like manipulation and mobilization for assessment and treatment of joint structure and soft tissues^{19,23} , physical agents and mechanical modalities; physical agents are different forms of energy and materials used for therapeutic purpose by applying over the body and they include heat and cold while mechanical modalities are used to apply mechanical force which can increase or decrease pressure in the body , prescription and application of mobility aids like wheel chair, crutches, canes, walker and assistive devices like orthotics and prosthetics¹⁹ ,and therapeutic massage; that provides pain relief to soft tissues, decrease muscle tone, improve lymphatic drainage and induce relaxation (physical &mental) to the body^{19,24}.

MATERIALS AND METHODS

Study Design: Cross-sectional study was approved by the Research Ethical Committee of Basic and Health Science Research Centre

"BHSRC", Majmaah University, Kingdom of Saudi Arabia.

Subjects: A sample of 150 person (73.3% male and 26.7% female) was participated in this study. It consisted of 110 physicians from different specialties who are practicing in various facilities in Sudayr region in addition to 40 medical students from faculty of medicine- Majmaah University. Table.1 showed the demographic data of the sample.

Questionnaire Design: A self-developed questionnaire was used to explore the perceptions and views of physician and medical students about the physiotherapy profession. In order to ascertain content validity, two copies of the initial draft of the questionnaire sent to two physiotherapy educators from the College of Applied Medical Sciences. Pilot tested of the questionnaire was conducted on 10 practicing physicians to ensure that the questions are clearly stated and easily be understood by the respondents.

The questionnaire consisted of 3 sections; section A: included collected information on personal characteristics such as: age, sex, nationality, specialty and city ,section B: included collected information on educational attainment, university of graduation, year of graduation, working relationship with physiotherapists, rate of referral for physiotherapy, section C: included information about the perception of physical therapy subspecialties, modalities, physical therapy role, sources of information concerning physical therapy profession, and the extent of importance of physical therapy role as a member of medical team, and section D: for other suggestions.

The aims of the study would be clearly stated in a cover letter was attached to each copy of the questionnaire to clarify the importance of the study.

Procedures: A total number of 200 questionnaires distributed from October 1st to 30th 2013, to the physician and medical student in Sudayr region. The participants were given 10 minutes to review the survey for any queries or required explanation, and they were given a one week to complete the survey.

Data Analysis: Data were analyzed using SPSS statistical software, version 20. Descriptive statistics were done to determine response frequencies and percentages.

RESULTS

Of the total 200 questionnaires distributed, 150 questionnaires were returned.

Demographics

Analysis of demographic data revealed that the majority of the respondents for this study were male with a percentage of 73.3% and 26.7% of this percentage were students from the faculty of medicine Majmaah University. The participants age percentages were 32% from 20-30 y, 28% from 30-40 y, 30% from 40-50y and 10% above 50y. It also showed that internal medicine specialty is the major specialty with a percentage of 13.3% and then orthopedic and pediatric with 10.7% and 8.7 respectively.(Table 1)

TABLE 1 . SUMMARY OF DEMOGRAPHIC DATA

| Variables | N | % |
|---------------------------|-----|-------|
| Sex | | |
| Male | 110 | 73.3% |
| Female | 40 | 26.7% |
| Age (y) | | |
| 20-30 | 48 | 32% |
| 30-40 | 42 | 28% |
| 40-50 | 45 | 30 % |
| above 50 | 15 | 10% |
| Student | 40 | 26.7% |
| Specialty of physician: | | |
| Orthopedic | 16 | 10.7% |
| Pediatrics | 13 | 8.7% |
| Neurology | 17 | 11.3% |
| Internal | 20 | 13.3% |
| medicine | 10 | 6.7% |
| Obstetrics and gynecology | 5 | 3.3% |
| Community medicine | 12 | 8% |
| Surgery | 17 | 11.3% |
| Others | | |

Results of the first question "which of these subspecialty are considered to be related to physiotherapy?"

Table 2 showed that the highest percentage of awareness of PT subspecialty were orthopedic, neurology and internal medicine with a percentage of 95.3%, 82% and 68% respectively, while the lowest awareness were obstetrics & gynecology , pediatrics and burns with a percentage of 66%, 63.7% and 56.7% respectively.

Results of the second question "which of the following is considered as PT modality?"

As revealed in fig 2 about 95.3% of the total sample was aware of exercises as a PT modality. Respondent perception of manual therapy, massage and electrotherapy were 87.3%, 82% and 71.3% respectively. In addition it showed that the lowest awareness of PT modalities were traction and hydrotherapy with a percentage of 56.7% and 56% respectively.

TABLE 2 . THE FREQUENCIES AND PERCENTAGES OF PHYSICAL THERAPY SUBSPECIALTY AWARENESS

| PT subspecialty | SR | R | UC | U | SU |
|---------------------------------|--------------|--------------|--------------|--------------|--------------|
| | N(%) |
| Orthopedics | 77.3% 116 | 18% 27 | 4.7 % 7 | 0% - | 0% - |
| Pediatrics | 4.7 % 7 | 32% 48 | 36.7 % 55 | 18% 27 | 8.7 % 13 |
| Neurology | 55.3% 83 | 26.7 % 40 | 4.7 % 7 | 4.7 % 7 | 8.7 % 13 |
| Cardiopulmonary | 24 % 36 | 24% 36 | 16 % 24 | 24 % 36 | 12 % 18 |
| Surgery | 10% 15 | 36 % 54 | 14% 21 | 14% 21 | 26 % 39 |
| Burns | 20% 30 | 23.3 % 35 | 32 % 48 | 10% 15 | 14.7 % 22 |
| Internal medicine and Geriatric | 26.7% 40 | 41.3 % 62 | 13.3 % 20 | 18.7% 28 | 0% - |
| Obstetrics and Gynecology | 4.7 % 7 | 29.3% 44 | 46.7 % 70 | 19.3 % 29 | 0% - |

SR: Strongly related

R: Related

UC: Uncertain

U: Unrelated

SU: Strongly unrelated

TABLE 3. PERCEPTION OF PHYSICAL THERAPY ROLE

| PT role | SR | R | UC | U | SU |
|---|---------------|--------------|-------------|------------|------------|
| | N % | N % | N % | N % | N % |
| Maintain and improve physical function | 77.3 % 116 | 18 % 27 | 0% - | 4.7 % 7 | 0% - |
| Improve mobility | 82 % 123 | 13.3 % 20 | 0% - | 4.7 % 7 | 0% - |
| Relief pain | 40 % 60 | 35.3 % 53 | 10 % 15 | 10% 15 | 4.7 % 7 |
| Improve balance | 46% 69 | 40% 60 | 14% 21 | 0% - | 0% - |
| Rehabilitation of postoperative patient | 18% 27 | 14% 21 | 18 % 27 | 27 % 41 | 23% 34 |
| Maintain and improve muscles strength | 71% 107 | 10% 15 | 5% 7 | 4% 6 | 10% 15 |
| Improve movement dysfunction | 73.3% 110 | 22 % 33 | 4.7% 7 | 0% - | 0% - |
| Improve endurance | 36.7% 55 | 36.7% 55 | 21.3% 32 | 5.3% 8 | 0% - |

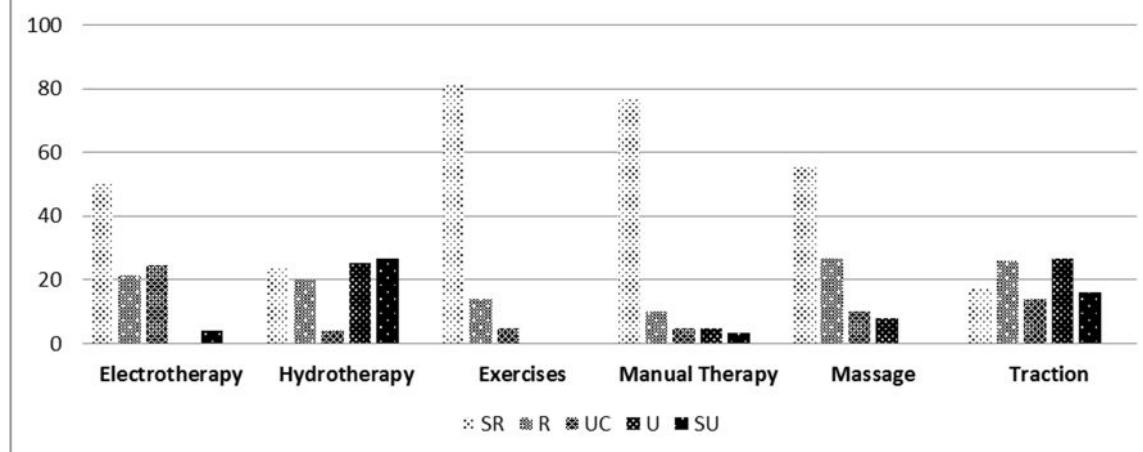
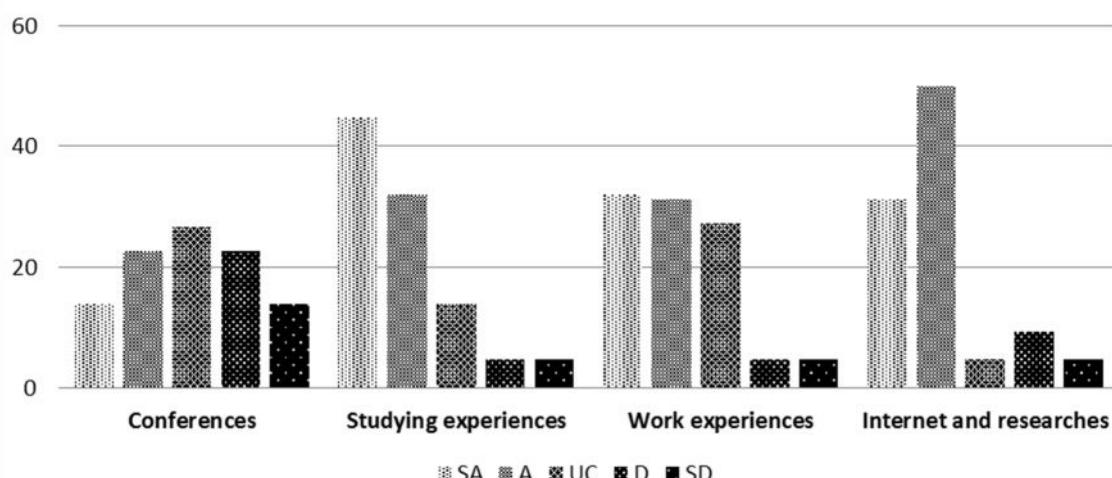
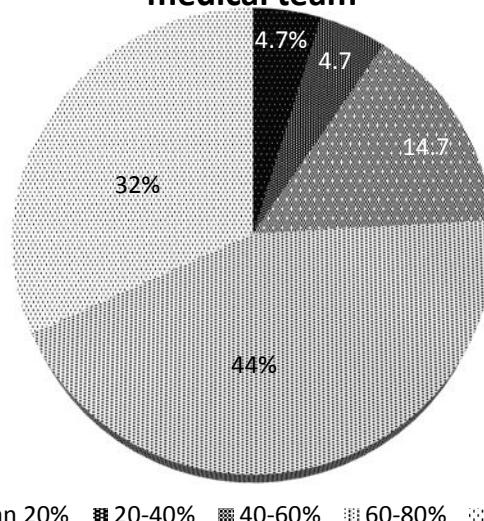
Fig 1. Perception of physical therapy modalities

Fig 2. Source of information about PT profession**Fig 3. Importance of physical therapy role as a member of medical team**

Results of the forth question "What are your sources of information about PT profession?"

The results of this study represented that the most common source of information about PT profession was internet& researches with percentage of awareness 81.3% while conferences was considered as the lowest source with percentage of awareness 36.7%. The results also revealed that studying and work experiences represented high level of awareness with a percentage of 76.7% and 63.3% respectively.(Fig 2)

Results of the third question "which of the following do you think is one of PT role?"

Concerning of this question, most of the responses represented that the respondents had a good perception in relation to PT role. PT roles "maintain &improve function, improve mobility,

and improve movement dysfunction" represented 95.3% for each of the total sample. The results also showed that the respondents had a lowest awareness by 68% for the PT role related to rehabilitation of postoperative patient. (Table 3)

Results of the fifth question: "To what extent you are convinced of the importance of physical therapy role as a member of medical team?"

Fig 3. Showed that 66 of the respondents (44%) were convinced of the importance of physical therapy role as a member of medical team by 60%-80% , while 48 of the total sample (32%) were convinced by 80%- 100%.

DISCUSSION

This study was conducted to identify areas of deficits in physical therapy profession

perception by physician and medical students in Sudayr region, in addition to clarify the importance of physical therapy profession and highlight the role of physiotherapist as a member of medical team.

The results of this study indicated that there was a high awareness of PT subspecialty as orthopedic, neurology and internal medicine. This findings support other findings suggesting that physical therapists are best known for treatment of musculoskeletal conditions^{25,26}. Additionally treatment of neurological conditions is more commonly recognized. Other subspecialty such as obstetrics and gynecology, burn and surgery lacked familiarity and this is similar to a previous study conducted by Sheppard²⁵.

Regarding PT modality the results revealed that, there was a high awareness of exercises and also for manual therapy, electrotherapy and massage in contrast there was lack of awareness regarding traction and hydrotherapy. Parti and Liu²⁵ concluded that traditional treatment such as physical exercise, massage, versus modern treatment, such as electrical stimulation and ultrasound are still widely associated with PT. The finding of our study related to exercise and massage is supported by public awareness¹⁴

According to the results, the participant showed awareness regarding the physical therapy role related to improve mobility, improve function and relief pain which was supported by previous study^{14,27}.

Regarding the subjects' awareness related to sources of information about PT profession the study showed that internet, researches and conferences are the common sources respectively, in contrast studying and work experiences are less common. Sixty six of the study sample represented that physiotherapist is considered as an important member of the medical team by a percentage of 60%-80%.

CONCLUSION AND RECOMMENDATION

From the previous, the study concluded that there is deficits in the perception of PT in different areas. This lack of awareness must be overcome. As a high standard of patient care is the main goal of medical team so effective communication between physician and physical therapist is necessary to ensure this level of care. As well as physical therapists should center efforts on marketing to physician and medical students²⁸. Continuing education programs is suggested to increase PT profession awareness. Additionally it is recommended that mass media should be improved in its accuracy about PT²⁹.

Further studies should be conducted on Saudi physician only. As well as perception of PT should be evaluated in relation to patients.

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EFFECT OF SLUMP STRETCHING FOR THE MANAGEMENT OF NON RADICULAR LOWER BACK PAIN AMONG ANXIETY NEUROSIS

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ABSTRACT:

Backache among anxiety neurosis is an olden problem of mammalian body. It is traced in human from long yearly life. Non-radicular backache among anxiety neurosis is mentioned in Ayurvedic texts as a primary etiology of mental disorders.

Introduction: - Disability associated with low back pain (LBP) continues to rise, contributing to a substantial economic burden that exceeds nearly 50 billion annually in the United States alone (Frymoyer, 1992). Health care expenditures among individuals with LBP are also 60% greater than those without LBP (Luo et al., 2004) with 37% of the costs a direct result of physical therapy services (Maniadakis and Gray, 2000)

Purpose Of the study: The purpose of this study was to determine if slump stretching results in improvements in pain, centralization of symptoms, and disability in patients with non-radicular low back pain (LBP) among anxiety neurosis with likely mild to moderate neural Mechano-sensitivity. Twenty consecutive anxiety neurosis patients referred to physical therapy by their primary care physician for LBP who met all eligibility criteria including a positive slump test but who had a negative straight-leg-raise test (SLR) agreed to participate in the study.

Outcome measures: NPRS, ODI, FABQ (TL)

Study design: Single group experimental study (Bonferroni)

Study population: 20 Subjects (16Males & 04 Females)

Results: All patients were treated in physical therapy thrice weekly for 2 weeks for a total of 6 visits. Upon discharge, outcome measures were re-assessed. Repeated measure ANOVA was used to assess differences between groups at baseline and discharge. At discharge, anxiety neurosis patients who received slump stretching demonstrated significantly greater improvements in disability (3.45 points on the ODI), pain (0.85 points on the NPRS), and Activity of daily living (4.4 points on the FABQ (Total) than patients who did not. The results suggest that slump stretching is beneficial for improving short-term disability, pain, and centralization of symptoms. Future studies should examine whether these benefits are maintained at a longer-term follow-up.

KEYWORDS: Low back pain; Neurodynamics; Slump test; Slump stretching

INTRODUCTION

Backache among anxiety neurosis is a olden problem of mammalian body. It is traced in human from long yearly life. Non-radicular backache among anxiety neurosis is mentioned in Ayurvedic texts as a primary etiology of mental disorders.

Disability associated with low back pain (LBP) continues to rise, contributing to a substantial economic burden that exceeds nearly 50 billion annually in the United States alone¹. Health care expenditures among individuals with LBP are also 60% greater than those without LBP¹ with 37% of the costs a direct result of physical therapy services².

Non-radicular pain (Spondylogenic referred pain).

Syndrome (lumbar pain-unilateral, central or bilateral and diagnosis of Disc protrusion or apophyseal joint dysfunction) is the most common clinical presentation in general practice and most cases can be expected to subside within three weeks; spinal manipulation will

shorten that period. A typical patient is a middle-aged person who complains of the sudden onset (after twisting) of right-sided back pain, localized to the fourth or fifth level in the lumbar spine: the Dural stretch test is negative.

Spondylogenic pain is that which originates from any of the components of the vertebrae (spondyles) including joints, the intervertebral disc and ligaments, muscle attachments. An important example of spondylogenic pain is referred pain in an area distal to or removed from actual source of pain, such as pain experienced in the buttocks from a disorder of an apophyseal joint. Although analogous to visceral referred pain such as appendicitis or renal colic, spondylogenic referred pain must be distinguished clinically from this type of pain.

INTERVENTION

Slump stretching group

Patients in the slump-stretching group completed the identical warm-up followed by the identical standardized stabilization exercise program. Slump stretching was performed with

the patient in the long sitting position with the patient's feet against the wall to assure the ankle remained in 0 degree of dorsiflexion. The therapist applied over pressure into cervical spine flexion to the point where the patient's symptoms were reproduced. The position was held for 30 s. A total of 5 repetitions were completed. Patients in the slump stretching group completed a similar self-slump stretching home exercise program, except patients actively flexed their neck and applied overpressure using their upper extremities until symptoms were reproduced. Patients completed 2 repetitions, maintaining this position for 30 s. Follow-up At the completion of 6 physical therapy sessions(weekly 3 times/2 weeks), The decision to use a treatment procedure that reproduced the patient's symptoms was based on a case series reported by (George et al., 2002)

Statistical formulae used for data analysis

The present study consists of twenty subjects consists of 16 males and 04 females. The demographic variables are described by frequency distribution and graphical presentation. The three scales NPRS, FABQ (Tl) and ODI are compared. Statistical analysis has been carried out in the present study to compare the three scales on the three occasions (Baseline intervention, Post intervention 1, and Post intervention 2). Results on continuous measurements are presented on Mean \pm SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. Repeated measure ANOVA has been used to compare the three occasions and Bonferroni (non-parametric) has been used to find the significance of study parameters on continuous scale between two occasions.

Statistical formulae used for data analysis

Statistical tests used for the analysis of the data in the present study are Paired t-test, repeated measure ANOVA followed by Post hoc test (Bonferroni) and correlation analysis.

METHODOLOGY

The present study is interference in nature. The approach is called "Inferential Statistics" as the study involves selecting a small sample of people for study.

Sampling

The nature of sampling in this study was inferential random sampling. The sample consists of 20 subjects in the age group 20-45 years. They were randomly assigned to experimental group after evaluation.

Description of the tools used for data collection

The data going to collect the following

1. Tools for pain evaluation
2. Tools for disability evaluation
3. Tools for symptoms evaluation

SAMPLE SELECTION

1. Population – subjects with Non radicular low back pain
2. Sample size – 20 Patients with anxiety neurosis
3. Sampling design – simple random sampling.

INCLUSION CRITERIA:-

1. Subjects with a chief complaint of non-radicular LBP having age between 20and 45years among anxiety neurosis.
2. Subjects were required having symptoms that referred distal to the buttocks, reproduction of patient symptoms with slump Testing.
3. Subjects with no change in symptoms with lumbar flexion or extension and baseline oswestry score greater than 10%.
4. Subjects with non-radicular low back pain among anxiety neurosis.
5. Subjects with positive slump test with absence of radicular symptoms.

EXCLUSION CRITERIA:-

1. Subjects with serious spinal conditions like infections, tumors, osteoporosis and
2. Spinal fracture etc.
3. Subjects having pregnancy, have history of spinal surgery, positive neurological signOr symptoms suggestive of nerve root involvement (Diminished upper or lowerExtremity reflexes, sensation to sharp and dull, or strength).
4. Subjects with osteoporosis.
5. Subjects exhibited a straight leg raise (SLR) test of less than 45 degree.
6. Subjects with coronal artery dysfunction (Heart attack, Cardiac surgery)

Perhaps the slump stretching was effective in reducing the patients' pain by dispersing intraneurial edema, thus restoring pressure gradients, relieving hypoxia and reducing associated symptoms³. Slump stretching may also have resulted in improved outcomes by reducing antidromic impulses generated in C-fibers at the dysfunctional site which result in the release of neuropeptides and subsequent inflammation in the tissues supplied by the nerve³. Hence if normal neurodynamics are restored by alleviating any sites of neural compression, excessive friction or tension, antidromically evoked impulses may perhaps be eliminated. It is also possible that slump stretching may have resulted in a reduction of scar tissue, which had adhered to neural tissue and its associated

connective tissue structures². Although preliminary evidence exists in support of the validity of the slump test in identifying neural tissue involvement³, the possibility that the source of pain was derived from structures other than the neural tissues cannot be eliminated. Further research is necessary to examine the sensitivity and specificity of neurodynamic tests as well as the effectiveness of using such techniques in the management of altered neurodynamics.

TABLE 1: GENDER DISTRIBUTION

| Gender | Frequency | Percent |
|--------|-----------|---------|
| Female | 4 | 20.0 |
| Male | 16 | 80.0 |
| Total | 20 | 100.0 |

The study sample consists of 16 males (80%) and 4 Females (20%). Simultaneously overall total frequency was 20 (100%).

A single group of study with 20 Non radicular low back pain among anxiety neurosis subjects out of which 16 were males and 4 were females is undertaken to the study is used to assess the effects of the treatment with the same group over a period of time. All subjects fulfilled the inclusion and exclusion criteria.

TABLE 2: AGE DISTRIBUTION

| Age in Years | Frequency | Percent |
|--------------|-----------|---------|
| 20-30 | 6 | 30.0 |
| 31-40 | 8 | 40.0 |
| 41-45 | 6 | 30.0 |
| Total | 20 | 100.0 |

Present sample consists of Age distribution in a years from 20-30, frequency was 6 (30%), Similarly Age distribution in a years from 31-40, frequency was 8 (40%) and also Age distribution in a years from 41-45, frequency was 6 (30%).Simultaneously overall total frequency was 20 (100%).

TABLE 3: DURATION OF ILLNESS (MONTHS) DISTRIBUTION

| Duration in months | Frequency | Percent |
|--------------------|-----------|---------|
| Less Than 2 Months | 7 | 35.0 |
| 2 – 3 Months | 9 | 45.0 |
| 3 and above months | 4 | 20.0 |
| Total | 20 | 100.0 |

Present sample consists of Duration of illness distribution Less Than 2 Months, frequency was 7 (35%), Similarly Duration of illness distribution 2-3 Months frequency was 9 (45%) and also Duration of illness distribution 3 Months and above frequency was 4(20%).Simultaneously overall total frequency was 20(100%)

TABLE 4: TREATMENT STRATEGY DISTRIBUTION

| Treatment strategy | Frequency | Percent |
|---------------------|-----------|---------|
| No Previous therapy | 16 | 80.0 |
| Undergone Therapy | 4 | 20.0 |
| Total | 20 | 100.0 |

Present sample consists of Treatment strategy distribution, No Previous therapy frequency was 16 (80%) Similarly Undergone Therapy distribution, frequency was 4 (20%) and also overall total frequency was 20(100%)

Comparison of scales on three occasions.

A comparative study with 20 Non radicular low back pain subjects among anxiety neurosis out of which 16 were males and 4 were females randomized into single Slump stretching is undertaken to find out the effect of study. All subjects fulfilled the inclusion and exclusion criteria.

TABLE 5: MEAN AND STANDARD DEVIATIONS OF NPRS SCALE FOR THE THREE OCCASIONS ARE PRESENTED BELOW

| NPRS | | | | | |
|---------------------|----|-----|-----|---------------------|----------------|
| | N | Min | Max | Mean | Std. Deviation |
| Base line | 20 | 7 | 10 | 8.85 | 1.226 |
| Post intervention1 | 20 | 2.0 | 5.0 | 3.400 | 1.0954 |
| Post intervention 2 | 20 | 0 | 2 | 0.85 | .745 |
| | | | | F=405.515, P <0.001 | |

Repeated measure ANOVA was applied to compare the mean values of three occasions of NPRS. Initial mean NPRS score was 8.85. At the end 1st week, mean NPRS score was 3.4. Last week mean NPRS score was 0.85. The calculated Repeated measure ANOVA F=405.515, P <0.001 and conclude that there was significant difference between the three occasions. All the pairs of three sessions were compared by Pair wise Comparisons. The result shows there was significant difference between session 1 and session2 (P<0.001). Similarly we found that session 2 and session 3 were significantly different (P<0.0and session 1 and session3 were also significant (P<0.001).

TABLE 6: MEAN AND STANDARD DEVIATIONS OF FABQ (TOTAL) SCALE FOR THE THREE OCCASIONS ARE PRESENTED BELOW

| FABQ (Total) | | | | | |
|---------------------|----|-------|-------|----------------------|----------------|
| | N | Min | Max | Mean | Std. Deviation |
| Base line | 20 | 59.00 | 63.00 | 60.7500 | 1.25132 |
| Post intervention 1 | 20 | 32.00 | 40.00 | 36.9500 | 2.23548 |
| Post intervention 2 | 20 | 1.00 | 7.00 | 4.4000 | 1.50088 |
| | | | | F=6739.862, P <0.001 | |

Repeated measure ANOVA was applied to compare the mean values of three occasions of

FABQ (Total). Initial mean FABQ (Total) score was 60.75. At the end 1st week, mean FABQ (Total) score was 36.95. Last week mean FABQ (Total) score was 4.40. The calculated Repeated measure ANOVA $F=6739.862$, $P <0.001$ and conclude that there was significant difference between the three occasions. All the pairs of three sessions were compared by Pair wise Comparisons. The result shows there was significant difference between session 1 and session2 ($P<0.001$). Similarly we found that session 2 and session 3 were significantly different ($P<0.001$) and session 1 and session3 were also significant ($P<0.001$).

TABLE 7: MEAN AND STANDARD DEVIATIONS OF ODI SCALE FOR THE THREE OCCASIONS ARE PRESENTED BELOW

| ODI score | | | | | |
|---------------------|----|-------|-------|----------------------|----------------|
| | N | Min | Max | Mean | Std. Deviation |
| Base line | 20 | 44.00 | 50.00 | 46.0000 | 2.24781 |
| Post intervention 1 | 20 | 22.00 | 28.00 | 25.5500 | 1.57196 |
| Post intervention 2 | 20 | .00 | 7.00 | 3.4500 | 1.87715 |
| | | | | F=2690.914, P <0.001 | |

Repeated measure ANOVA is applied to compare the three occasions of ODI. The calculated A Repeated measure ANOVA was applied to compare the mean values of three occasions of ODI. Initial mean ODI score was 46.00. At the end 1st week, mean ODI score was 25.55. Last week mean ODI score was 3.45. The calculated Repeated measure ANOVA $F=2690.914$, $P <0.001$ and conclude that there was significant difference between the three occasions. All the pairs of three sessions were compared by Pair wise Comparisons. The result shows there was significant difference between session 1 and session2 ($P<0.001$). Similarly we found that session 2 and session 3 were significantly different ($P<0.001$) and session 1 and session 3 were also significant ($P<0.001$).

Although the slump test is used clinically to investigate the presence of altered neurodynamics, there is currently a lack of evidence suggesting that any particular neurodynamic treatment technique results in changes of the mechanical or physiological function of nerve tissues. Determining the mechanism for why patients receiving slump stretching improved to a greater extent is beyond the scope of this study. However, it is useful to consider plausible physiological explanations for findings. Perhaps the slump stretching was effective in reducing the patients' pain by dispersing intraneural edema, thus restoring pressure gradients, relieving hypoxia and reducing associated symptoms⁴. Slump stretching may also have resulted in improved outcomes by

reducing antidromic impulses generated in C-fibers at the dysfunctional site which result in the release of neuropeptides and subsequent inflammation in the tissues supplied by the nerve⁵. Hence if normal neurodynamics are restored by alleviating any sites of neural compression, excessive friction or tension, antidromically evoked impulses may perhaps be eliminated. It is also possible that slump stretching may have resulted in a reduction of scar tissue, which had adhered to neural tissue and its associated connective tissue structures⁵. Although preliminary evidence exists in support of the validity of the slump test in identifying neural tissue involvement⁶, the possibility that the source of pain was derived from structures other than the neural tissues cannot be eliminated. Further research is necessary to examine the sensitivity and specificity of neurodynamic tests as well as the effectiveness of using such techniques in the management of altered neurodynamics

CONCLUSION

It can be assumed that Single group Slump stretching intervention study was more beneficial for reducing short term disability, pain and promoting centralization of symptoms among anxiety neurosis patients hypothesized to benefit from this form of treatment. These data provide preliminary evidence supporting the notion that anxiety neurosis patients with distal symptoms who are unable to centralize their symptoms may be a distinct subgroup of patients with LBP that benefit from slump stretching exercise. Future studies should examine whether these benefits are maintained at a longer-term follow-up.

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CONFLICT-OF-INTEREST

Statement: I have read the above information and understand the request for disclosure. The details are accurate to the best of my knowledge.

SOURCE OF FUNDING

This study utilized by the scholar self source of money

ETHICAL CERTIFICATE

As this study involving human subjects the ethical clearance has been obtained from the ethical committee of as per the ethical guidelines for Biomedical Research on Human subjects, 2001 ICMR, and New Delhi.

TO STUDY THE UPPER EXTREMITY PROPRIOCEPTION IN JUVENILE IDIOPATHIC SCOLIOSIS- AN OBSERVATIONAL STUDY

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ABSTRACT

Background: Idiopathic scoliosis is the lateral curvature of spine for which the cause is not known mainly prevalent in adolescent group. In recent years CNS lesions have been put forward in etiology of juvenile Idiopathic scoliosis. In such cases a sensory (i.e. proprioceptive) rearrangement or recalibration of internal representation of body in space is present and that a nonerect vertebral alignment may be erroneously perceived as straight.

Aims and objective: The purpose of the study was to examine the joint repositioning accuracy of elbow joint as obtained by proprioceptive information in upper extremity in juvenile idiopathic scoliosis (JIS) compared with normal individuals.

Methodology: Patients with progressive as well as non-progressive JIS were included in the study. Their ability to reproduce angle to which the elbow joint previously positioned was measured by a universal goniometer. This was done for both dominant as well as non-dominant upper extremity and repeated 3 times for each elbow joint. The average mean value of difference in targeted joint angle and reproduced angles were measured. The same procedure was being done for normal individuals in control group and compared to those with JIS.

Result and conclusions: Data analyzed using student "t" test showed statistical significant difference in repositioning error between scoliotic patients and normal individuals ($p<0.05$) but no significant difference between dominant and non-dominant arm in both groups.

KEYWORDS: Idiopathic scoliosis, Juvenile idiopathic scoliosis, joint repositioning accuracy, mean repositioning error, Universal Goniometer.

INTRODUCTION

Idiopathic scoliosis is a developmental pathology which expresses spinal deformity involving all 3 spatial planes¹, mostly the cause of which is unknown, mainly during adolescence. Adolescence is a period of physiological and psychological transition between childhood and adulthood, which is known to involve considerable morphological, structural and functional changes^{2,3}. In young healthy subjects proprioceptive cues are predominant in the control of body orientation rather than visual or vestibular cues for the control of upright body posture⁴.

In the recent years, central nervous system lesions have been put forward in etiology of idiopathic scoliosis⁵. Although no consistent neurologic abnormality have been identified in Juvenile Idiopathic Scoliosis (JIS) it is possible that a defect in processing by C.N.S affect the growing spine Herman et al. postulated that in the case of Idiopathic Scoliosis, a sensory (i.e. proprioceptive) rearrangement or recalibration of the internal representation of the body in space is present and that a nonerect vertebral alignment may be erroneously perceived as straight⁶.

System of proprioceptive sensory organs constantly monitor function of musculoskeletal system and allows for appropriate muscle tonus and balance. A fault in this results in altered postural coordination and/or joint alignment.

Proprioception provides the basis for knowing where our limbs are in space and is comprised of both static (joint/limb position sense) and dynamic (kinesthetic movement sense) components. Following on the early observations of Sherrington, it has been established that muscle spindles are a major source of proprioceptive feedback to the central nervous system and appear to mediate the conscious perception of movement and limb position⁷. Other sources of proprioceptive information, such as cutaneous and joint mechanoreceptors, are also known to contribute in the determination of more distal body segment positions and signaling extreme ranges of motion⁸.

In the present study the ability to reproduce elbow joint target angle removing visual and vestibular cues have been studied basically which determines the proprioception i.e. ability and accuracy to sense & reposition elbow joint in space.

NEED OF THE STUDY

Causes of Idiopathic Scoliosis have been nonexistent. Because of a lack of an etiology current treatment methods have been incomprehensive and focus on treating muscular imbalance rather the root cause. Insight into the possible cause or mechanism involved may help greatly in managing such a condition. This study mainly focuses on the recent concept of JIS; whether a

defect in proprioception be linked to etiology of JIS.

AIM & OBJECTIVES

The aim of the study was to study the upper extremity proprioception in JIS.

Objectives: To study the Elbow joint Repositioning Accuracy in both dominant and non-dominant arm in JIS & to compare it with that of Normal adolescents.

METHOD

Study Design: Observational study

Study Duration: 6 months

Study setting: Outpatient department of Govt. Physiotherapy College, civil hospital, Ahmedabad
Sample Size: 24

Sampling Method: Convenience Sampling

Materials: Universal Goniometer, Two Velcro Straps, Record sheet, Ruler, Two way Adhesive tapes, Pencil, Black Cloth to Blind fold.

Subjects who were diagnosed with Juvenile Idiopathic Scoliosis (JIS) & referred from the outpatient department of Civil Hospital, Ahmedabad to physiotherapy department were screened for selection criteria. From the 19 patients referred only 12 met the selection criteria.

Inclusion criteria: Able to follow commands, Age: 10-16 yrs, Cobb's Angle: 10-35.

Exclusion criteria: H/O surgical correction for scoliosis, Deformity of Upper extremities, H/O injury to Upper extremities.

Procedure: After screening the patients 12 patients were thus selected for the study. Informed written consent was taken from them. Peer or sibling to patient of age between 10-16 yrs was taken in control group. The patients were explained about the procedure. They were comfortably made to sit in a chair beside an adjustable plinth. The arm was fixed in 90° abduction. Black cloth was used to blind fold the patient & the Goniometer was strapped to the elbow joint with the arm fixed on the plinth. The fixed arm of Goniometer was strapped over arm and movable arm fixed with forearm with fulcrum over the epicondyle. Two way adhesive used at fulcrum and both ends of Goniometer to further fix the Goniometer.

The patient's elbow joint starting position was 0° with the forearm resting on plinth. Then the elbow was taken to the target angle which was 90° elbow flexion & kept for 30 sec and later brought to 0° again. The patient was then asked to reposition the elbow joint as previously positioned for 3 times and the repositioned angle was noted.

$$\text{REPOSITIONING ERROR} = \text{TARGET ANGLE} - \text{REPOSITIONED ANGLE}$$

The mean of repositioning error of three trials was taken for analysis. The similar procedure was done for the Normal individuals in control group. The subjects in the control group were peer or sibling to the patient with age between 10-16 yrs and had no spinal deformity.



FIGURE 1: RESTING POSITION ELBOW 0° FLEXION



FIGURE 2: TARGET ANGLE ELBOW 90° FLEXION



FIGURE 3: REPOSITIONED ANGLE



FIGURE 4: ERROR OF REPOSITIONING

DATA ANALYSIS

The Gender & Age distribution of both groups is shown in graph 1. The data analysis was done with help of SPSS for Windows Version 16. The PAIRED "t" TEST was used for within group

analysis between MEAN REPOSITIONING ERROR (MRE) in dominant and non-dominant arms in both the groups. The UNPAIRED "t" TEST was used for between group analysis comparing MRE between Dominant arms in both groups as well as comparing MRE between non dominant arms in both groups. The confidence interval (CI) was set at 95% ($p<0.05$)

RESULTS

The age and gender distribution of both groups is listed in Table 1. The within group analysis between Dominant & Non dominant arms using Paired t test; showed no statistical difference within both groups. Group 1- $t=1.78(p>0.05)$ & Group 2- $t= 1.93(p>0.05)$.

The between group analysis done for comparing MRE in dominant arms in both groups showed statistically significant difference; $t=2.24(p<0.05)$ & comparing MRE in Non dominant arms in both groups also showed statistically significant difference; $t=2.37(p<0.05)$.

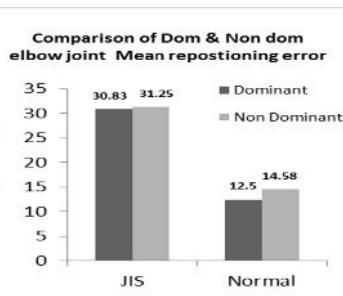
Thus there is a statistical difference in JIS patients in ability to reproduce elbow joint angle in space as compared to normal subjects of similar age group. There is no statistical difference in ability to reproduce target elbow joint angle between dominant and non-dominant upper extremities in either group

TABLE 1

| | Subjects | | Age | |
|------------------------|----------|--------|------|-----|
| | Male | Female | Mean | SD |
| Group 1(JIS) | 3 | 9 | 13.5 | 1.5 |
| Group 2(Normal) | 4 | 8 | 11 | 2.5 |

TABLE 2

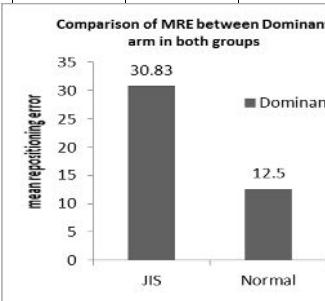
| | Dom | Non Dom | t value | p value |
|----------------|-----------|-----------|---------|---------|
| | Mean±SD | Mean±SD | | |
| Group 1 | 30.83±2.9 | 31.25±2.2 | 1.78 | >0.05 |
| Group 2 | 12.5±3.1 | 14.58±3.6 | 1.93 | >0.05 |



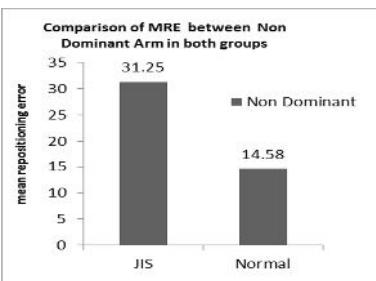
GRAPH 1

TABLE 3:

| | Group 1 | Group 2 | t VALUE | p VALUE |
|------------------|--------------------------|--------------------------|---------|---------|
| | Mean Repositioning error | Mean Repositioning error | | |
| | Mean±SD | Mean±SD | | |
| Dominant Arm | 30.83±2.9 | 12.5±3.1 | 2.24 | <0.05 |
| Non Dominant Arm | 31.25±2.2 | 14.58±3.6 | 2.37 | <0.05 |



GRAPH 2



GRAPH 3

DISCUSSION

The occurrence of idiopathic Scoliosis have been associated with concealed neurologic deficits. Ideas about localization of this deficit vary widely from a neurogenic disorder of paraspinal muscle as recorded by measurement of stretch reflex response⁹ to a deficit on a cerebral(i.e. cortical) level as postulated by findings of impairments of integrated vestibular, visual and academic functions⁶. Between these extremes, microscopic examination of spinal muscle has demonstrated a reduction in number of muscle spindle¹⁰.

On the basis of observations of electroencephalographic abnormalities, visuospatial impairments, motor adaptations, Herman et al postulated the existence of cortical level disturbance in Idiopathic scoliosis. In this the contradictory information on spatial orientation from proprioceptive, visual, and vestibular cue is weighted inappropriately as a sequel of incomplete maturation of cortical control mechanisms. This in turn causes recalibration of proprioceptive signals arising from the axial musculature. The assumption of dysfunction in the proprioceptive system in

patients with JIS is in agreement with the above findings.

The question might arise as to whether these differences are connected to the cause of JIS or be considered to be an effect of oblique disadvantageous position of scoliotic spine. In the present study no correlation could be found between degree of scoliosis and joint repositioning inaccuracy. Also it is unlikely that ability to reproduce elbow joint angle in space be influenced by spinal deformity. In order to find experimental evidence for this hypothesis, we have excluded visual cues (blind folded) and canalar vestibular cues (patient stable sitting position). Also the inaccuracy have no statistical difference between dominant and non dominant upper extremities.

The effects of aging in proprioceptive maturation is excluded in both groups as the group age is concisely a specific age group i.e. adolescents. So the inaccuracy cannot be affected by differences in age thereby proprioceptive maturation.

The test results per se do not allow any speculation about localisation of the defect-sensory, central or motor. However because defects in proprioceptive accuracy have been established over lower extremities and axial musculature^{5,11} in this study an upper extremity dysfunction is established , a central localization is probable.

The inaccuracy was observed in two subjects of control group. It is therefore questionable whether the aberrations observed among JIS patients be regarded as caused by real defect or considered a borderline of normal function.

CONCLUSION

From the above study it becomes reasonable to assume that a proprioceptive dysfunction or a borderline function may be a causative factor for spinal asymmetry

CLINICAL PEARL

As Proprioceptive deficits may be one of the cause for Juvenile Idiopathic Scoliosis, it becomes important to corporate proprioceptive exercises which brings about active correction of spine and postural alignment besides crawling, hanging and stretching exercises.

ACKNOWLEDGEMENTS

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COMPARISON OF EFFECTIVENESS OF POST FACILITATION STRETCHING AND AGONIST CONTRACT-RELAX TECHNIQUE ON TIGHT HAMSTRINGS

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ABSTRACT

Background: Flexibility is an important component of physical conditioning programs. The most common factor limiting flexibility at a joint is the inability of a muscle to stretch to its maximum required length during movement. The hamstring muscles are the most commonly involved muscular injury and it is mainly due to lack of stretching. Various stretching techniques are used in clinical practice including PNF and MET, but no research has compared post facilitation stretching with agonist contract-relax technique.

Objective: The purpose of the study was to find out the effectiveness of post facilitation stretching and agonist contract-relax technique on hamstring muscle tightness and to compare the effectiveness between these two methods.

Methods: 50 subjects with tight hamstring muscles were randomly divided in to two groups of 25 each. Group I: Undergone post facilitation stretching technique. Group II: Undergone agonist contract-relax technique.

After 6 weeks outcome was measured in terms of knee extension range of motion using digital inclinometer and the results were compared.

Results: The results of the study show that both groups produce a significant increase in range of motion.

Patients in Group I showed increase in knee range of motion, with a mean of 15.20 (SD 1.7078)

Patients in Group II showed increase in knee range of motion, with a mean of 7.04 (SD 1.2410) But Group I produced a significant increase than the Group II when compared between groups ($P<.001$)

Conclusion: It is concluded that as post facilitation stretching achieved a significant increase in range, it could be the choice of technique in clinical practice to increase flexibility.

KEYWORDS: Hamstring tightness; post facilitation stretching; agonist contract-relax.

INTRODUCTION

Stretching is aimed at increasing flexibility in order to improve performance. Flexibility is an important component of physical conditioning programs as an adjunct to muscle strength and endurance training¹. Flexibility may be defined as the possible range of motion at a joint or group of joints. Adequate flexibility helps to prevent soft tissue injuries. Athletes should be engaged in stretching program to help reduce the risk of more serious injuries.

The implementation of a stretching program as part of a rehabilitative progress must take into account this specificity. Consideration must also be given to the neurophysiological, basis for stretching. All movements are based in a neuromuscular control paradigm, therefore stretching is neurally based. In muscle, there are two main types of nueroreceptors which are sensitive to stretch². These are the muscle spindles, which consist of small modified muscle fibers and the Golgi tendon organs. The tendon organs are in series with the extrafusal muscle fibers. The muscle spindles are in parallel with them. Examination of their function shows that basically the tendon organs are responsive to changes in tension and the muscle spindles to changes in length and the rate of such change.

Conceptually, therefore, the control of flexibility can be learned and can be changed.

The hamstring muscles are the most commonly involved muscular injury of the pelvis, hip and thigh⁴. The hamstrings are at increased risk of injury because they cross two joints, the hip and knee joints. One of the risk factor for hamstring injury is lack of stretching. Poor flexibility or tightness will increase the susceptibility to hamstring injuries. Because of the potential impact of decreased hamstring flexibility on posture, muscle performance, and injuries, improving hamstring flexibility is not only of clinical importance but has also been the goal of a number of clinical studies. An explanation for hamstring tightening that could potentially lead to a pulled hamstring is proposed by Beckman and Block. They point out that during gait; many determinants operate to smooth out the movement of the center of gravity. They are the foot mechanism (eversion), the ankle mechanism (Plantar flexion), and the knee mechanism (flexion). These systems are intimately related, so that if one Parameter is decreased, the others are increase. If there is the presence of a calcaneal virus at heel contact. Consequently, the knee mechanism must be more flexed when the foot contacts the ground. But by so doing the hamstrings do not get properly stretched on each step. As a result, an acquired shortening takes

place. Later, this tightness could predispose one to be a pulled hamstring⁴. Another explanation is that during exercise muscles swell and shorten. If the muscles are not flexible they will be more susceptible to strain during the next exercise period. Consequently, there is increased risk of injury.

Hamstring flexibility has been assessed through active knee extension test (AKET). The reliability of this method has been demonstrated.⁶

Various stretching techniques are used in clinical practice to increase hamstring flexibility including static stretching, ballistic stretching, proprioceptive neuromuscular facilitation relaxation techniques, and muscle energy techniques^{5,7,8}.

Generally, for stretching to be safest, the contractile elements of the muscle should be totally relaxed. P.N.F. and M.E.T. stretching techniques are based on optimizing relaxation of the muscles, facilitating a greater stretch.

The P.N.F. concept applies Neurophysiological principles derived from Sherrington's work as cited by Kabat which are based on the theory that motor output is dependent on sensory input and that antagonistic muscles are reflexly coupled through reciprocal inhibition⁸. Under the assumption that an inhibitory interneuron reduces the activity in the a-motor neuron to the antagonist muscle. It is suggested that PNF methods, particularly those involving reciprocal activation, provide the greatest potential for muscle lengthening. Previous research suggests P.N.F. stretching techniques produce greater increases in range of motion than static or ballistic⁹. Some research found that Agonist Contract relax produced more range of motion than contract relax and stretch relax.¹¹

Muscle energy was a technique developed by Fred L. Mitchell Snr. Muscle energy technique (M.E.T.) is defined as a form of osteopathic manipulative treatment in which the patient actively uses his or her muscles, on request from a precisely controlled position in a specific direction, against a distinctly executed counter force.¹⁵ The neurophysiological basis of M.E.T. is the same as that of P.N.F. methods. The major difference is the degree of force or counter force. Only 20 % to 50 % of patient's strength is used.¹⁷

Post facilitation stretching is a MET technique which uses positsometric relaxation. The term refers to the effect of the subsequent relaxation experienced by a muscle after an isometric contraction has been performed. The effect of a sustained contraction on the Golgitendon organs seems pivotal, since their response to such a contraction seems to be set the tendon and the muscle to a new length by inhibiting it.^{23,24}

In spite of its popularity as a manual therapy technique, to date, no research has compared post facilitation stretching with the more frequently used Agonist contract relax techniques on the effectiveness of increasing muscle flexibility. Therefore, the purpose of the study was to find out the effectiveness of post facilitation stretching and agonist contract relax technique on hamstring muscle tightness and to compare the effectiveness between these two methods.²⁶

OBJECTIVES

The objective of the study was to find out the effectiveness of post facilitation stretching and Agonist Contract-relax technique on hamstring muscle tightness and to compare the effectiveness between these two methods.

RESEARCH HYPOTHESIS:

It is hypothesized that post facilitation stretching would be better than agonist contract-relax technique in increasing hamstring flexibility.

METHODOLOGY

STUDY DESIGN: This was a cross-sectional experimental study conducted on subjects with hamstring tightness.

SOURCE AND SAMPLING: In this study 50 subjects with tight hamstring muscles participated. The subjects selected from Aashray Physiotherapy Centre, Baroda

The subjects were divided in to two groups, each group contains 25 subjects.

Ethical clearance for the study was obtained from the Ethical committee of Aashray Physiotherapy Centre, Baroda and a signed consent was obtained from each individual who volunteered to undergo the study.

INCLUSION CRITERIA

1. Subjects were included in the study if they had visible evidence of hamstrings tightness, defined as a limitation of 20 or more from full extension as determined by the active knee-extension (AKE) test.

2. Age Group: 18-30 years
3. Sex: Both sexes were taken for the study.

EXCLUSION CRITERIA

1. History of pathology of the knee, hip or low back.
2. History of neurological problems.
3. Subjects were excluded if they had undergone in a specific lower extremity flexibility programme within the past two years.

MATERIALS

Digital inclinometer, Universal goniometer, Spring balance, Straps, Sling, Hooks, Marker, White paper, Pencil

PROCEDURE

Subjects were randomly divided into two groups of 25 each and for each subject, 1 leg was randomly selected for stretching so that each leg would have the same activity level.

Group I - undergone post facilitation stretching technique

Group II - undergone agonist contract-relax technique

This was given as 5 stretches per day, 5 days a week for 6 weeks. After 6 weeks outcome was measured in terms of knee extension range of motion using digital inclinometer and the results were compared.

Subject positioning for AKE testing:

The subject's hip was placed at 90 degree of hip flexion using a goniometer while an assistant half the thigh without excessively compressing the posterior thigh. So that 90 degree hip flexion was maintained throughout AKE measurements. A digital inclinometer was attached below the fibular head by a strap. The inclinometer was adjusted to read 90 degree when the knee was flexed to 90 degree. The investigator recorded inclinometer measurements of AKE on the testing side.



FIGURE 1: ACTIVE KNEE EXTENSION TEST

Prestretch Measurement:

For Prestretch measurements, subjects in both groups performed a total of 6 AKEs with a 60 second rest period between repetitions. The first 5 AKEs served as warm-ups to decrease any effect that may occur with repeated measures performed from a cold start. The sixth AKE was recorded as the pre stretch measurement.

Post stretch measurement:

One AKE measurement was taken after the final stretch in the last day of six-week programme. Measurements of the angle of knee joint ROM was recorded.

Stretching Protocol:

Group I received the post facilitation stretching. In this 30 % of the patients strength is used. For each stretch the subject positioned in supine with hip and knee flexed to mid-range. Next the subjects isometrically contracted the hamstring using 30 % of the strength for 15 seconds by attempting to push the leg back toward the subject relaxed for 5 seconds. The investigator then passively stretched the muscle until a mild stretch sensation was reported. The stretch was held for another 10 seconds.



FIGURE 2: POST FACILITATION STRETCHING

This sequence was repeated 5 times on each subject in the group.

Group II received agonist contract relax technique. For each stretch, the subject positioned supine with hip and knee flexion. Next the subject maximally isotonically contracted the quadriceps for 15 seconds by attempting to push the leg toward the extension against the resistance of the investigator. After the contraction the subject relaxed for 5 seconds. The investigator then passively stretched the muscle until a mild stretch sensation was reported. The stretch was held for another 10 seconds. This sequence was repeated 5 times on each subject in the group.



FIGURE 3: CONTRACT RELAX

OUTCOME MEASURE

The outcome is measured in terms of active knee extension range of motion using digital inclinometer.

DATA ANALYSIS

The obtained data were analyzed by using paired "t" test and unpaired "t" test. The pre and post knee range of motion of the groups were compared by using paired "t" test, the pre-post gain of knee range of motion of the group I compared with the group II by using unpaired "t" test with the level of significant kept at $P < .05$.

Comparison between Pre to Post Rom in the Groups:

The Pre and Post ROM of the Groups are compared by using paired "T" Test Group I- It is found to be very highly significant between Pre ROM and Post ROM with a mean of 15.20 (SD=1.7078, T=44.501) [Table IV, graph III]

The 'P' Value is .001

Group II- It is found to be very highly significant between Pre ROM and Post ROM with a mean of 7.04 n (SD=1.2410, T=28.365) [Table IV, graph III]

The 'P' Value is .001

Comparison of Pre-Post Gain between two groups:

The Pre-Post gain of knee range of motion of the group I compared with the group II by using unpaired "T" Test.

It is found to be very highly significant between Pre-Post gains of the two groups (T=19.3270) [Table V, graph IV]

The 'P' Value is .001

This shows a significant increase in knee ROM of group I than group II.

TABLE 1: AGE DISTRIBUTION

| GROUP | N | MEAN | STD. DEVIATION | T |
|-------|----|---------|----------------|----------|
| 1 | 25 | 21.0400 | 3.1156 | 1.4260 |
| 2 | 25 | 19.9600 | 2.1502 | p=.16 ns |

TABLE 2: SEX DISTRIBUTION

| | GROUP | | TOTAL |
|--------------------|-------------|-------------|--------------|
| | 1.00 | 2.00 | |
| M Count (% w) | 15 (60.0 %) | 13 (52.0 %) | 28 (56.0 %) |
| F Count (% w) | 10 (40.0 %) | 12 (48.0 %) | 22 (44.0 %) |
| Total Count (%) w) | 25 (%) | 25 (%) | 50 (100.0 %) |

TABLE 3: COMPARISON BETWEEN TWO GROUPS

| GROUP | N | MEAN | SD | T |
|---------|----|----------|--------|-----------|
| ROMPRE | | | | |
| 1 | 25 | 136.8400 | 5.5879 | 1.7530 |
| 2 | 25 | 139.9200 | 6.7757 | p=086 ns |
| ROMPOST | | | | |
| 1 | 25 | 152.0400 | 4.2277 | 3.3940 |
| 2 | 25 | 146.9600 | 6.1744 | p=001 vhs |

TABLE 4: COMPARISON OF PRE AND POST ROM BETWEEN THE GROUPS

| GROUP | N | MEAN | SD | T |
|-------|----|---------|--------|-----------|
| 1 | 25 | 15.2000 | 1.7078 | 19.3270 |
| 2 | 25 | 7.0400 | 1.2410 | p=001 vhs |

DISCUSSION

The increased hamstring flexibility may be due to several factors. The most prominent are the viscoelastic, thyrotrophic and neural properties of the musculotendinous unit.

Viscoelastic properties

Musculotendinous units function in a Viscoelastic manner, and therefore, have the properties of creep and stress relaxation. Creep is characterized by the lengthening of muscle tissue due to an applied fixed load. Stress relaxation is characterized by the decrease in force over time necessary to hold a tissue at a particular length. The musculotendinous unit deforms or lengthens as it is being stretched and goes through elastic and then plastic deformation before completely rupturing. In post facilitation stretching the same group of muscles (hamstrings) is used therefore more chance of viscoelastic changes. This may be one of the reasons for increase in flexibility than agonist contract-relax²³

Thixotropic properties.

Thixotropy is the property of a tissue to become more liquid after motion and return to a stiffer, gel-like state at rest. The thixotropic property of muscle is thought to result from an increase in the number of stable bonds between actin and myosin filaments when the muscle is at rest. Hence, the stiffness of muscle increases. With activity, the muscle becomes more fluid-like because the stable bonds are broken or are prevented from forming²¹

Neural properties.

The agonist contract-relax technique applies neurophysiological principles based on the theory that antagonistic muscles are reflexly coupled through reciprocal inhibition. Under the assumption that an inhibitory interneuron reduces the activity in motor neuron to the antagonist muscle. When applying resistance to the contracting muscle may cause irradiation of tension to the tight muscle (Hamstrings) this may have affected the hamstring flexibility.⁵ The post facilitation stretching uses post isometric relaxation or autogenic inhibition of the stretched muscle provides increased ROM. Autogenic inhibition was defined by knot and Voss as the inhibition of the homonymous muscle alpha motor neurons by the stimulation of the Golgi tendon organ. This inhibitory effect is thought to diminish muscle activity and therefore, allow for relaxation so that

the muscle can be stretched. This inhibitory effect has been suggested to increase muscle compliance, allowing for increased length during a stretch without stimulation of the stretch reflex.²⁴

The specific goal of stretching exercises is to increase Rom, thus, increase functional capabilities and prevent injuries. Therapeutically, stretching exercises have been used for patients with adaptive shortening of muscle, tendon or joint structures due to postural problems, biomechanical problems, immobilization, improper positioning or long term disability.²⁶

LIMITATION

Age, joint type, muscle composition, the different connective tissues and tissue bulk play a role in determining the extensibility of a muscle.

It was evident that some subjects needed more detailed instructions, assistance or encouragement in performing the stretching regimes; however, it is not anticipated that this would have a major effect on the result.

CONCLUSION

It is concluded that as post facilitation stretching achieved a significant increase in range, it could be the choice of technique in clinical practice to increase flexibility.

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EFFECT OF PROXIMAL & DISTAL FIBULAR GLIDE IN THE SUBJECTS WITH KNEE OSTEOARTHRITIS

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ABSTRACT

Background & Objective: Osteoarthritis (OA) is the most common joint disease causing disability. Current physical therapy management for knee OA is aiming to increase range of motion and improve functional ability. The purpose of this study is to find out the effectiveness of fibular glide with conventional treatment for improving range of motion and functional ability in the subjects with knee OA.

Methods: Thirty subjects with osteoarthritis of knee were selected for the study and randomly divided in to two groups of 15 subjects each. Group A received conventional treatment Group B received fibular glide with conventional therapy, ROM was measured by Goniometry and functional ability was measured by WOMAC scale.

Results: The patients those who received fibular glide and conventional therapy both their WOMAC and ROM improved significantly ($p<0.05$) as compared to those who received the conventional therapy alone

Conclusion: This study demonstrated that fibular glide when combined with conventional physiotherapy, improved range of motion and functional ability in patients with knee osteoarthritis

KEYWORDS: Osteoarthritis, Fibular Glide

INTRODUCTION

Osteoarthritis (OA) is the second most common rheumatological problem and is most frequent joint disease encountered in the clinical practice. It is probably not a single disease but represents the final end result of various disorders as joint failure. OA may cause joint pain, bony or soft tissue swelling, tenderness, bony crepitus, peri-articular muscle atrophy, bony hypertrophy, deformity and marked loss of joint motion. It commonly affects the hands, feet, spine, and large weight bearing joints¹.

OA is the most common disabling condition in humans affecting 80% of individuals over the age of fifty five. This can have an effect on their overall health and wellbeing².

Osteoarthritis (OA) is the most prevalent form of arthritis, one of the most common diseases affecting humans and a common cause of disability⁵. It is estimated that as of 1998, more than 20 million Americans have symptomatic OA (Lawrence et al., 1998). OA is a major cause of disability in people aged 65 and older³. There is a higher prevalence of OA with advanced age and in females. Knee osteoarthritis produces significant changes in health-related quality of life, particularly physical, mental and social components of health. The posterolateral surface of the tibia and the head of the fibula form an arthrodial articulation known as the proximal

tibiofibular (PTF) joint⁴. An adjacent structure which may contribute to lateral knee pain is the proximal tibiofibular joint^{4,5}. Previous authors⁵ have suggested that hypermobility of the proximal tibiofibular joint may be a source of lateral knee pain. During ankle dorsiflexion, torsional stress is placed through the proximal tibiofibular joint, via external rotation and anterior glide of the fibula¹⁴. Decreased mobility of the proximal tibiofibular joint may subsequently limit ankle dorsiflexion range of motion (ROM). Ankle dorsiflexion restrictions have been previously associated with anterior knee pain^{6,7} and are thought to be due to gastrocnemius/soleus tightness or talocrural joint hypo-mobility⁸.

Management of pain in OA knee is a multidisciplinary approach. Physiotherapy, as a mainstay of conservative treatment for OA knee involves the use of various modalities such as manual therapy, exercises, patellar taping, thermal modalities and electrical stimulations as a direct or an indirect pain reduction measure. Manual therapy includes soft tissue manipulation, massage, manual traction, joint manipulation and joint mobilization⁹.

The Physical therapy management aim to control pain, stiffness, instability, deformity and functional performance of the patient. Different types of therapeutic exercises, such as stretching, strengthening (isotonic, isokinetic, and isometric) and aerobic exercise, and

electrotherapy are frequently used for the treatment of different musculoskeletal disorders⁷¹. Regular physical activity and lower limb strengthening exercises are key components of knee osteoarthritis (OA) management (Zhang et al., 2007). Exercise has shown to have beneficial effects on decreasing symptoms of pain and improving physical function in knee OA patients¹⁰.

Joint mobilization, also called non-thrust manipulation, is a form of manual physical therapy and is a tool used by a physical therapist in the treatment of many disorders of the neurological, muscular, and skeletal system, including OA. Many common manual mobilization techniques used by physical therapists when treating the knee joint are described by Maitland et al.¹¹ Knee joint mobilization can be described as an oscillatory manual force applied to the tibiofemoral, proximal tibio-fibular, or patellofemoral joints, in a variety of directions and positions based on the patient's presentation. Mobilizations to the knee may be applied with several different hand positions or grips. Physical therapists typically select 1 of 4 grades, or types of mobilization application based on the amount of resistance and magnitude of movement, which have been described by Maitland et al¹¹ and Grieve depending on the aim of treatment¹². The aim of study was to compare the effect of proximal and distal fibular glide in improving the knee range of motion (ROM) and function in the subjects with knee Osteoarthritis.

METHODOLOGY

30 subjects with age 40-60 years with knee osteoarthritis were recruited from Physiotherapy department diagnosed with osteoarthritis by orthopedic surgeon. As per the criteria of radiological classification by Kellgren and Lawrence (Grade 1 & 2) OA and divided into two groups, 15 subjects in each group.

A consent form was signed by all subjects before including in the study. All subjects were assessed with WOMAC Scale & ROM before giving the treatment.

The exclusion criteria included that patients had not any history of fracture or any trauma to knee joint, history of surgery around the knee joint, myocardial infarction within the past 6 months, congestive heart failure, uncontrolled hypertension, any other referred pain to hip or knee joint, subjects with autoimmune disease, malignancy and history of stroke.

Group A (N=15) – (57.53±6.40) received range of motion, strengthening & stretching exercises, hot pack (15 mins)¹³ frequency 100 Hz, pulse width of 50 µs, intensity

(mA) set at the individual subject's sensorial threshold, modulation up to 50% of variation frequency, quadratic biphasic symmetrical pulse and a length of application of 20minutes)¹⁴. Group B (N=15) – (54.13±7.40) received range of motion, strengthening, stretching exercises, hot pack & TENS & fibular glides⁸ (3 sets of 30 seconds with a 30 second rest between sets)⁹⁰. Study duration was 3 weeks.



FIGURE 1: PROXIMAL TIBIOFIBULAR GLIDE - AP SIDE LYING



PHOTOGRAPH 2: PROXIMAL & DISTAL TIBIOFIBULAR GLIDE

WOMAC Index is self-administered and assesses the three dimensions of pain, disability and joint stiffness in knee and hip OA using a battery of 24 questions. ROM was measured by universal Goniometry. After giving the treatment all subjects were reassessed and data was subjected to statistical analysis.

DATA ANALYSIS

The data were summarized as Mean ± SD. The groups were compared by paired t test and independent Student's t test. A two-sided ($=2$) $p<0.05$ was considered statistically significant. All analyses were performed on STATISTICA (version 6.0) software.

RESULTS

The age of two groups (Group A and Group B) are summarized in Table 1. The age of Group A and Group B patients ranged from 46-65

yrs and 44-66 yrs, respectively with mean (\pm SD) 57.53 ± 6.40 yrs and 54.13 ± 7.40 yrs, respectively. The mean age of Group A is slightly higher than Group B. Comparing the mean age of two groups, t test revealed similar ($p>0.05$) age between the two groups (57.53 ± 6.40 vs. 54.13 ± 7.40 , $t=1.35$, $p=0.189$). In other words, patients of two groups were age matched and therefore, age may not influence the outcome measures of the study (i.e. WOMAC and ROM).

TABLE 1: AGE (MEAN \pm SD) OF TWO GROUPS

| GroupA(n=15) | GroupB(n=15) |
|------------------|------------------|
| 57.53 ± 6.40 | 54.13 ± 7.40 |

Outcome measures: The pre and post treatments WOMAC (score) of two groups are summarized in Table 2. Table 2 showed that the mean WOMAC in both groups decreased (improved) after the treatments and the decrease (improvement) was evident higher in Group B than Group A.

TABLE 2: COMPARATIVE MEAN WOMAC SCORE OF EACH GROUP OVER THE PERIODS

| Groups | 0 sitting | 5th sitting | 10th sitting |
|---------|-------------------|-------------------|-------------------|
| Group A | 76.07 ± 10.93 | 72.60 ± 10.69 | 67.87 ± 11.43 |
| Group B | 76.87 ± 10.08 | 66.00 ± 14.16 | 56.67 ± 13.74 |
| t value | 0.21 | 1.44 | 2.43 |
| p value | 0.836 | 0.161 | 0.022 |

Comparing the mean WOMAC score within the groups (Table 3), the WOMAC score in both Group A and Group B decreased (improved) significantly ($p<0.001$) at after both 5th sitting and 10th sitting as compared to 0 sitting. Further, WOMAC score in both Group A and Group B also decreased (improved) significantly ($p<0.001$) at after 10th sitting as compared to 5th sitting. In other words, both the treatments are effective for improving the WOMAC in patients with knee OA.

TABLE 3: COMPARISON OF MEAN WOMAC (SCORE) BETWEEN THE PERIODS (WITHIN GROUPS) BY PAIRED T TEST

| Comparisons | Group A | | Group B | |
|------------------------------|-----------------|-----------|-----------------|-----------|
| | t value (DF=14) | p value | t value (DF=14) | p value |
| 0 sitting vs. 5th sitting | 5.25 | $p<0.001$ | 6.75 | $p<0.001$ |
| 0 sitting vs. 10th sitting | 8.08 | $p<0.001$ | 12.19 | $p<0.001$ |
| 5th sitting vs. 10th sitting | 9.43 | $p<0.001$ | 11.07 | $p<0.001$ |

Similarly, comparing the mean WOMAC score between the groups (Table 2), the WOMAC score of two groups not differed ($p>0.05$) at pre treatment (0 sitting) i.e. found to be statistically the same (76.07 ± 10.93 vs. 76.87

± 10.08 , $t=0.21$; $p=0.836$). In other words, WOMAC score of two groups were comparable. Similarly, the mean WOMAC score of two groups also not differed ($p>0.05$) at 5th sitting (72.60 ± 10.69 vs. 66.00 ± 14.16 , $t=1.44$; $p=0.161$). However, the mean WOMAC score of Group B at 10th sitting was found significantly ($p<0.05$) different and lower as compared to Group A (67.87 ± 11.43 vs. 56.67 ± 13.74 , $t=2.43$; $p=0.022$).

The pre and post treatments ROM (score) of two groups are summarized in Table 4. Table 4 showed that the mean ROM in both groups increased (improved) after the treatments and the increase (improvement) was evident higher in Group B than Group A.

TABLE 4: PRE AND POST TREATMENTS ROM (MEAN \pm SD) OF TWO GROUPS

| Groups | 0 sitting (n=15) | 5th sitting (n=15) | 10th sitting (n=15) |
|---------|--------------------|--------------------|---------------------|
| Group A | 104.67 ± 14.07 | 110.33 ± 11.09 | 113.40 ± 11.95 |
| Group B | 103.40 ± 12.09 | 112.47 ± 10.88 | 122.73 ± 10.40 |
| t value | 0.26 | 0.53 | 2.28 |
| p value | 0.793 | 0.599 | 0.030 |

Numbers in parenthesis represents the range (min-max)

Comparing the mean ROM score within the groups (Table 5), the ROM score in both Group A and Group B increased (improved) significantly ($p<0.001$) at after both 5th sitting and 10th sitting as compared to 0 sitting. Further, the mean ROM score in both Group A and Group B also increased (improved) significantly ($p<0.01$ or $p<0.001$) at after 10th sitting as compared to 5th sitting. In other words, both the treatments are effective for improving the ROM in patients with knee OA.

TABLE 5: COMPARISON OF MEAN ROM (SCORE) BETWEEN THE PERIODS (WITHIN GROUPS) BY PAIRED T TEST

| Comparisons | Group A | | Group B | |
|------------------------------|-----------------|-----------|-----------------|-----------|
| | t value (DF=14) | p value | t value (DF=14) | p value |
| 0 sitting vs. 5th sitting | 5.26 | $p<0.001$ | 5.78 | $p<0.001$ |
| 0 sitting vs. 10th sitting | 8.76 | $p<0.001$ | 9.49 | $p<0.001$ |
| 5th sitting vs. 10th sitting | 4.11 | $p<0.001$ | 7.79 | $p<0.001$ |

Similarly, comparing the mean ROM score between the groups (Table 4), the ROM score of two groups not differed ($p>0.05$) at pre treatment (0 sitting) i.e. found to be statistically the same (104.67 ± 14.07 vs. 103.40 ± 12.09 , $t=0.26$; $p=0.793$). In other words, ROM score of two groups were comparable. Similarly, the mean ROM score of two groups also not differed ($p>0.05$) at 5th sitting (110.33 ± 11.09 vs. 112.47 ± 10.88 , $t=0.53$; $p=0.599$). However, the mean

ROM score of Group B at 10th sitting was found significantly ($p<0.05$) different and higher as compared to Group A (113.40 ± 11.95 vs. 122.73 ± 10.40 , $t=2.28$; $p=0.030$).

DISCUSSION

The aim of study was to compare the effect of proximal and distal fibular glide in patients of knee Osteoarthritis. The patients those who received fibular glide and conventional therapy both their WOMAC and ROM improved significantly ($p<0.05$) as compared to those who received the conventional therapy alone. This study demonstrated that fibular glide when combined with conventional physiotherapy, improved range of motion and functional ability in patients with knee osteoarthritis.

Results agree with previously published studies on this subject indicating the ability of Joint mobilization to reduce pain and improve physical function. In this study proximal tibiofibular joint mobilization has done on the subjects of knee osteoarthritis as medial side forces increased. Patients with osteoarthritis often have substantially larger varus moments at the knee during gait (Mundermann et al. 2004) Previous study suggests that there is significant motion in this joint during forces and torques consistent with physiologic motion⁴⁷. It has been proposed that the fibula can serve as a channel for dissipation of torsional stresses in the ankle (Lambert, 1971), and proposed that this could also be the case for excessive stresses in the knee joint itself¹⁵.

Sterling et al (2001), have demonstrated that joint mobilization produces rapid hypoalgesia. The result is in congruous with the findings by Kumar et al. (2006), who combined complex knee mobilization and electrotherapy. Pain reduction following joint mobilization has been established in previous studies. An in vitro animal study by Sambajon et al. (2003) found a 70% reduction in levels of cellular prostaglandin (PG) E2 a strong inflammatory mediators causing hyperalgesia in arthritic joints, within 24 hours of mobilization. Skyba et al. (2003) suggested that analgesic effect following knee joint mobilization was primarily due to enhancement of the descending pain inhibitory pathway in the spinal cord, which utilized serotonergic (5-HT1A) and noradrenergic receptors (alpha-2)⁹. Previous study revealed that early mobilization (compression and decompression with glide) in patients of osteoarthritis of knee, result in significant improvement of the symptoms of the patient which, support the results of study.

In the present study, when the mean scores of Western Ontario McMaster University Osteoarthritis Disability Index was analyzed intra

group, it was found statistically significant in both the groups and has shown reduced WOMAC scores which represents an improvement in the pain, range of motion and function activities where as when inter group comparison was done, group A had shown statistically significant changes in pain, range of motion and functional activities than group B which indicated that fibular glide is better than the conventional treatment.

Knee osteoarthritis presents a serious health care problem and produces a large burden on society. Simple, safe, physical treatment procedures such as fibular glide could be of great value. This provides pain relief, increases range of motion, improves functional performance and reduces functional disability. It is a low cost and easy means of treatment in subjects with knee osteoarthritis.

CONCLUSION

The study concludes fibular glide is more effective in decreasing pain improving physical function of the subjects with knee osteoarthritis..

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