

ISSN P 2321 - 5690

**Volume - 1**

**Issue - 2**

**Jul.- Dec. 2013**

# **Indian Journal of Physical Therapy**

An Indian National Journal

[www.indianjournalofphysicaltherapy.com](http://www.indianjournalofphysicaltherapy.com)





# Indian Journal of Physical Therapy

www.indianjournalofphysicaltherapy.com

## Editor

---

Dr. Dinesh M. Sorani,  
M.P.T. (Physical & Functional Diagnosis),  
Senior lecturer,  
Government Physiotherapy College, Jamnagar  
Email:  
editor@indianjournalofphysicaltherapy.com  
Phone: +91-9426786167

## Associate Editor

---

Dr. Paras Joshi  
M.P.T. (Neurological Conditions)  
I/C H.O.D. Physiotherapy Department,  
Civil Hospital, Rajkot.

## Advisory Board

---

Dr. Nita Vyas (Ph. D.)  
Principal,  
S.B.B. College of Physiotherapy,  
Ahmedabad

Dr. Anjali Bhise  
M.P.T. (Cardio-Pulmonary Conditions)  
Principal,  
Government Physiotherapy College,  
Ahmedabad

Dr. Yagna Shukla  
M.P.T. (Orthopedic Conditions),  
Senior Lecturer,  
Government Physiotherapy College,  
Ahmedabad

Dr. Sarla Bhatt  
Former Principal,  
Shri. K. K. Sheth Physiotherapy College,  
Rajkot



# Indian Journal of Physical Therapy

[www.indianjournalofphysicaltherapy.com](http://www.indianjournalofphysicaltherapy.com)

Editor's Desk



Dear Physiotherapists,

On behalf of core committee of INDIAN JOURNAL OF PHYSICAL THERAPY, I feel immense pleasure to thank all Physiotherapists for unexpected response to journal. When this is written number of visitors of our website [www.indianjournalofphysicaltherapy.com](http://www.indianjournalofphysicaltherapy.com) has crossed six thousand five hundred. I would like to thank all Physios also for their very good response to journal in article submission and on social media website from different parts of our country as well as from out of India.

With the blessings of all our teachers, seniors and love of all Physios, we are able to produce second issue (Jul-Dec 2013) of INDIAN JOURNAL OF PHYSICAL THERAPY. This issue covers different aspects of Physiotherapy related studies including different subjects like Neurological conditions, Musculoskeletal conditions and also Cardiopulmonary conditions with observational as well as interventional studies to provide readers evidence based information of different subjects.

Waiting eagerly for good response to this second issue also.

Thanks.

Dr Dinesh M Sorani

Editor

Indian Journal of Physical Therapy



# Indian Journal of Physical Therapy

July-December 2013, Volume. 1, Issue. 2

## INDEX

1	A COMPARATIVE STUDY ON THE EFFECTIVENESS OF COMBINED LUMBOPELVIC, HIP AND KNEE MANUAL THERAPY VERSUS KNEE MANUAL THERAPY IN RELIEVING PAIN AND IMPROVING FUNCTIONAL ABILITY IN PATIENTS WITH PATELLOFEMORAL PAIN P. Senthil Selvam, P.Sumitha	1
2	TO FIND THE INTRA-RATER RELIABILITY AND CONCURRENT VALIDITY OF CURRENT PERCEPTION THRESHOLD TO MEASURE PAIN IN TENNIS ELBOW-AN OBSERVATIONAL STUDY Gupta Richa R, Yagna Shukla	7
3	A STUDY TO FIND OUT THE EFFECT OF PROLONGED SLOW EXPIRATION TECHNIQUES (PSE) ON CARDIO RESPIRATORY PARAMETERS IN INFANTS WITH LOWER RESPIRATORY TRACT INFECTION- AN EXPERIMENTAL STUDY. Shanishwara Mittal, Thakkar Vaishali, Udeshi Vaidehi	11
4	A STUDY TO EVALUATE THE INVOLVEMENT OF SPINAL ACCESSORY NERVE IN INDIVIDUALS WITH CHRONIC NON-SPECIFIC NECK PAIN Khyatee Kamdar, Karishma Jagad, Ashish Kakkad	15
5	TO STUDY THE LEVEL OF STRESS IN THE STUDENTS AND IDENTIFY THE STRESS RELIEVING METHODS USED BY THEM. Thakkar Vaishali, Shanishwara Mittal, Udeshi Vaidehi	20
6	EFFICACY OF SCHEMATIC EXERCISES OVER STRENGTHENING EXERCISES ON WALKING ABILITIES, STRIDE LENGTH AND CADENCE IN DIABETIC NEUROPATHY Raghav D, Gera A, Sharma M, Rathore P, Pajnee K	24
7	PEAK AEROBIC CAPACITY IN PATIENTS WITH CHRONIC LOW BACK PAIN: A COMPARISON WITH NORMAL SUBJECTS Shikha Chulliyil, Neeta Vyas, Megha Sheth	29
8	TO FIND THE INTRA-RATER RELIABILITY AND CONCURRENT VALIDITY OF TWO METHODS OF MEASURING PECTORALIS MINOR TIGHTNESS IN PERIARTHRITIC SHOULDER PATIENTS Setoo N. Jain, Yagna U. Shukla	34
9	PREVALENCE AND SOURCE OF STRESS IN POSTGRADUATE PHYSIOTHERAPY STUDENTS Bhakti Trivedi, Megha Sheth, Neeta Vyas	39
10	EFFECT OF STABILIZATION EXERCISE ON CROSS-SECTIONAL AREA OF LUMBAR MULTIFIDUS MUSCLE IN PATIENTS WITH CHRONIC LOW BACK PAIN Akodu AK, Akinbo SRA, Odebiyi DO	43
11	REHABILITATION OF STROKE PATIENTS IN INDIAN SCENARIO: ACTIVITY AND PARTICIPATION PERSPECTIVE Ipsit Brahmachari	47
12	PREVALENCE OF MUSCULOSKELETAL DISORDERS AMONG NURSES Mamta Israni, Neeta J Vyas, Megha S Sheth	52



## A COMPARATIVE STUDY ON THE EFFECTIVENESS OF COMBINED LUMBOPELVIC, HIP AND KNEE MANUAL THERAPY VERSUS KNEE MANUAL THERAPY IN RELIEVING PAIN AND IMPROVING FUNCTIONAL ABILITY IN PATIENTS WITH PATELLOFEMORAL PAIN

P. Senthil Selvam<sup>1</sup>, P.Sumitha<sup>2</sup>

1 Principal/HOD, School of Physiotherapy, Vels University, Chennai

2 Physiotherapist, Sparc Institute, Chennai.

### ABSTRACT

**BACKGROUND:** Patellofemoral pain is the most common diagnosis in outpatients presenting with knee pain, affecting an estimated 7% to 40% of adolescents and active young adults. Manual therapy interventions directed at regions proximal to the patellofemoral joint have been found to decrease anterior knee pain. Patellar non-thrust manipulation, hip non-thrust manipulation, and lumbopelvic thrust manipulation are examples of manual therapy interventions investigated in the patellofemoral pain population.

**AIM:** To compare the effectiveness of combined lumbopelvic, hip and knee manual therapy when compared with knee manual therapy alone in a relieving pain and improving functional ability in patients with patellofemoral pain.

**METHODOLOGY:** Thirty female subjects with patellofemoral pain are randomly assigned to two different groups, Group A and Group B. For both the groups, Pain score and Kujala anterior knee pain score for patellofemoral pain were recorded before the treatment. Pretest values were recorded. Group A received combined lumbopelvic, hip and knee manual therapy for four weeks. Group B received knee manual therapy alone for four weeks. Both the groups were advised to follow the common exercise protocol for patellofemoral pain. Pain score and Kujala anterior knee pain score for patellofemoral pain were recorded as posttest values at the end of four weeks. Both the pretest and posttest values are tabulated, statistically analyzed and compared.

**RESULTS:** There was statistically significant reduction in pain and improvement in functional ability between pre and post treatment programs in Group A when compared with Group B.

**CONCLUSION:** The results of the study concluded that combined lumbopelvic, hip and knee manual therapy is more effective than knee manual therapy alone in reducing pain and improving functional ability in patients with patellofemoral pain.

**KEYWORDS:** patellofemoral pain, manual therapy, pain, functional ability and Kujala anterior knee pain scoring.

### INTRODUCTION

PATELLOFEMORAL PAIN can be defined as anterior knee pain involving the patella and retinaculum that excludes other intra-articular and peripatellar pathology<sup>1</sup>. It is characterized by pain or discomfort seemingly originating from the contact of the posterior surface of the patella with the femur. It is often used interchangeably with "anterior knee pain" or "runner's knee." It is an extremely common entity and probably the most common complaint of athletes and non-athletes<sup>2</sup>.

It is the most common diagnosis in outpatients presenting with knee pain, affecting an estimated 7% to 40% of adolescents and active young adults<sup>3,4</sup>. Eleven percent of musculoskeletal complaints in the office setting are caused by anterior knee pain<sup>5,6</sup>. Wilson showed that females (62% of cases) are significantly more at risk of experiencing patellofemoral pain than men (38% of cases)<sup>7</sup>. It has been suggested that anatomic, hormonal, and neuromuscular factors contribute to the greater risk, with the anatomic factor being the most widely discussed. Females with patellofemoral pain descend stairs with the knee in a more flexed position and have the hip in a more adducted and internally rotated position at foot contact during stair stepping at a comfortable speed<sup>8</sup>.

The patella articulates with the patellofemoral groove in the femur. Several forces act on the patella to provide stability and to keep it tracking properly<sup>9,10</sup>. Repetitive contact at any of the areas where the forces are acting, sometimes combined with maltracking of the patella

is the likely mechanism of patellofemoral pain. The result is the classic presentation of retropatellar and peripatellar pain. Biomechanical, muscular and overuse theories have been proposed to explain the etiology of patellofemoral pain. In general, the literature and clinical experience suggest that the etiology of patellofemoral pain is multifactorial<sup>11</sup>. Bending the knee increases the pressure between the patella and its various points of contact with the femur, patellofemoral pain is often classified as an overuse injury<sup>12, 13</sup>.

Several factors have been proposed to cause patellofemoral pain such as patellar malalignment, an increased Q-angle, quadriceps weakness, decreased flexibility of the lower extremity, overuse, and muscle imbalance which have all been shown to result in an increase in cartilage and subchondral bone stress<sup>14</sup>. It has been proposed that abnormal neuromuscular<sup>15,16,17,18</sup> factors alter patellar tracking and contribute to increased patellofemoral joint contact pressures that ultimately lead to pain and dysfunction<sup>19,20</sup>.

Patients with patellofemoral pain typically describe pain "behind," "underneath," or "around" the patella. The symptoms are usually of gradual onset, although some cases can be caused by trauma, and may be bilateral. Common symptoms include stiffness or pain, or both, on prolonged sitting with the knees flexed (sometimes called the "theater sign"), and pain with activities that load the patellofemoral joint, such as climbing or descending stairs, squatting, or running<sup>21</sup>.

The pain can be difficult for the patient to localize. If asked to point to the location of pain, patients may place

their hands over the anterior aspect of the knee or draw a circle with their fingers around the patella (the “circle sign”). The pain usually is described as “achy,” but it can be sharp at times. Patients may complain of the knee giving way. This usually does not represent true patellar instability but rather transient inhibition of the quadriceps because of pain or deconditioning<sup>22</sup>.

Current evidence-based treatment approaches include taping, strengthening of the hip musculature and quadriceps, manual therapy to the lower quarter, and fitting of foot orthoses<sup>24,25,26</sup>. The theory of regional interdependence explores the biomechanical link between the lumbopelvic region, hip, knee, and foot<sup>27</sup>. It is likely that patellofemoral pain may be the result of a dynamic dysfunction of the interaction between the lumbopelvic region, hip, knee, and foot. The biomechanical link between the lumbopelvic-hip complex and the knee region suggests that alterations in joint mobility in the lumbar spine, sacroiliac joint or hip joint may serve as an underlying contributor to the development of patellofemoral pain<sup>23</sup>.

Manual therapy interventions directed at regions proximal to the patellofemoral joint have also been found to decrease anterior knee pain<sup>28</sup>. Patellar non-thrust manipulation, hip non-thrust manipulation, and lumbopelvic thrust manipulation are examples of manual therapy interventions investigated in the patellofemoral population. Thrust manipulation techniques directed at the lumbopelvic spine decreased quadriceps muscle inhibition in patellofemoral pain population<sup>29</sup>. Studies have examined the dynamic relationship between the hip and knee and the foot and knee, and have found impairments in hip internal rotation in patients with patellofemoral pain<sup>30</sup>. Posterior-to-anterior tibiofibular thrust manipulation applied to the proximal tibiofibular joint resulted in immediate increase in pain-free flexion in patients with patellofemoral pain<sup>31</sup>. The mechanism by which manipulation affects pain response of an adjacent joint has been proposed to occur by either mechanical or neurophysiological mechanisms.

Exercises for patellofemoral pain are based on the muscular causes<sup>32</sup>. Quadriceps strengthening is most commonly recommended because the quadriceps play a significant role in patellar movement. Hip, hamstring, calf and iliotibial band stretching are also important. This study is focused on the effectiveness of the lumbopelvic, hip and knee manual therapy when compared with knee manual therapy alone in relieving pain and improving functional ability in patients with patellofemoral pain.

## AIM OF THE STUDY

The aim of the study is

- To find the effectiveness of knee manual therapy in relieving pain and improving functional ability in patients with patellofemoral pain.
- To find the effectiveness of combined lumbopelvic, hip and knee manual therapy in relieving pain and improving functional ability in patients with patellofemoral pain.

- To compare the effectiveness of combined lumbopelvic, hip and knee manual therapy when compared with knee manual therapy alone in relieving pain and improving functional ability in patients with patellofemoral pain

## METHODOLOGY

Study design: Randomized Clinical Trial

Study setting: Clinical Setting

Population: Females with patellofemoral pain

Sampling size: 30 patients

Sampling technique: Simple Random Sampling Technique

## INCLUSION CRITERIA

- Female subjects with a history of patellofemoral pain.
- Individuals between 18 to 50 years of age with patellofemoral pain.
- Individuals with a complaint of anterior peripatellar or retropatellar knee pain that was provoked by 2 or more of the following: Squatting, stair ascent, stair descent, prolonged sitting, and kneeling or isometric quadriceps contraction.
- Insidious or gradual onset of symptoms unrelated to a traumatic incident.

## EXCLUSION CRITERIA

- Osteoarthritis
- Knee ligament or meniscal injuries
- Patellar subluxation / dislocation
- Osgood-schlatter's syndrome
- Prior surgery on the spine or symptomatic knee
- Osteoporosis
- Compression fracture
- Signs of nerve root compression
- History of systemic, connective tissue or neurologic disorders

## OUTCOME MEASURES

- Pain
- Functional ability

## TOOLS USED

- Visual Pain Scale
- Kujala Anterior Knee Pain Scale
- Mulligan mobilization belt

## PROCEDURE

Thirty female subjects with patellofemoral pain who fulfilled the inclusion and exclusion criteria were evaluated through standardized history and physical examination. They are randomly assigned to two different groups, Group A and Group B. For both the groups, Pain score and Kujala anterior knee pain score for patellofemoral pain were recorded before the treatment. Pretest values

were recorded. Group A received combined lumbopelvic, hip and knee manual therapy for four weeks. Group B received knee manual therapy alone for four weeks. Both the groups were advised to follow the common exercise protocol for patellofemoral pain. Pain score and Kujala anterior knee pain score for patellofemoral pain were recorded as posttest values at the end of four weeks. Both the pretest and posttest values are tabulated, statistically analyzed and compared.

## MANIPULATION TECHNIQUES

### GROUP A

#### Lumbopelvic thrust manipulation

Participants were positioned in side bending toward, and rotated away from, the painful side, and a high-velocity short-amplitude posterior thrust was delivered through the anterior superior iliac spine. For patients with bilateral knee pain, this technique was performed on both sides.

### GROUP B

#### Caudal hip non-thrust manipulation

Participants were positioned in supine lying with hip and knee flexed to 90, with a belt placed just distal to the hip joint. Graded oscillatory manual force was then applied inferiorly by the therapist to impart a distraction force through the hip joint.

### GROUP A & B

#### Proximal tibio-fibular non-thrust manipulation:

Participants were positioned in supine lying with hip and knee flexed to 90 degrees. The therapist should provide counterforce posterior to the fibular head as the knee was flexed towards 120 degrees.

Inferior and superior patellar non-thrust manipulations:

Participants were positioned in supine or long sitting with the painful knee placed in 15 degrees of flexion and the patella cupped by the examiner's hand. A superior, inferior, medial and lateral force is then applied until the restrictive barrier is achieved.

### COMMON EXERCISE PROTOCOL FOR BOTH GROUPS A AND B

Quad sets: Participants were instructed to position in long sitting with affected leg straight and the other leg bent. Back of the knee of affected leg is pressed against the floor or couch by tightening the muscles of the thigh. This position should be held for 10 seconds and relaxed. Three sets of ten repetitions should be done.

Side-lying leg lift: Participants were instructed to lie on the normal side and tighten the front thigh muscles on the top leg. Top leg should be lifted 8 to 10 inches away from the other leg. The leg should be kept straight and lowered slowly. Three sets of ten repetitions should be done.

Straight leg raise: Participants were instructed to lie on the back with both the legs straight. The knee on normal side should be bent placing the foot flat on the floor. The thigh muscles of the other leg should be tightened and

lifted 8 inches off the floor keeping the thigh muscles tight throughout. The leg should be lowered slowly down to the floor. Three sets of ten repetitions should be done.

Step-up: Participants were instructed to stand with the foot of affected leg on a support like a small step of block of wood 3 to 5 inches high. The other foot should be kept flat on the floor. The weight should be shifted onto affected leg on the support. The knee should be straightened as the other leg comes off the floor. The leg should be lowered back to the floor slowly. Three sets of ten repetitions should be done.

Wall squat: Participants were instructed to stand with back, shoulders and head against a wall with by looking straight ahead. The shoulder should be kept relaxed and feet should be kept 2 feet away from the wall and a shoulder width apart. The back should be kept upright slowly squatting down to a 45 degree angle. This position should be held for 10 seconds and then slowly side back up the wall. Three sets of ten repetitions should be done.

Standing hamstring stretch: Participants were instructed to place the heel of affected leg on a stool above 15 inches high. The knee should be kept straight. By leaning forward the hips should be bent until a mild stretch is felt in the back of the thigh. The stretch should be held for 15 to 30 seconds and repeated 3 times.

Quadriceps stretch: Participants were instructed to stand an arm's length away from the wall with affected leg farthest from the wall. One hand should be kept against the wall by facing straight ahead and should be braced. The ankle of the affected leg should be grasped with the other hand and the heel should be pulled towards the buttocks. The back should not be twisted or arched and the knees should be kept together. The stretch should be held for 15 to 30 seconds and repeated 3 times.

Standing calf stretch: Participants were instructed to stand facing a wall with hands against the wall at about eye level. One leg should be kept back with the heel on the floor and the other leg should be kept forward. The back foot should be turned slightly inward and slowly lean into the wall until a stretch is felt in the back of calf. It should be held for 15 to 30 seconds and repeated 3 times by switching the position of the legs.

Iliotibial band stretch: Side-bending: Participants were instructed to cross one leg in front of the other leg and lean in the opposite direction from the front leg. The arm on the side of the back leg should be reached over the head while doing this. The position should be held for 15 to 30 seconds and repeated 3 times by switching the legs.

## DATA ANALYSIS AND INTERPRETATION

### STATISTICAL METHOD

The collected data were tabulated and analyzed by using descriptive and inferential statistics. The data was analyzed by paired t-test. The Statistical package for social sciences (SPSS) package was used to calculate and analyze the above mentioned descriptive and inferential statistics.



## TABULATIONS AND INTERPRETATIONS

**TABLE 1: DESCRIPTIVE STATISTICS FOR PAIN SCORE AND FUNCTIONAL ABILITY SCORE FOR GROUP A PRE AND POST TREATMENT.**

Parameters	No. of Samples	MEAN±SD		Mean Difference
		Pre	Post	
Pain score	15	6.13±1.187	1.33±0.816	4.80
Functional ability score	15	67.27±6.497	89.87±3.461	-22.60

**TABLE 2: DESCRIPTIVE STATISTICS FOR PAIN SCORE AND FUNCTIONAL ABILITY SCORE GROUP B PRE AND POST TREATMENT.**

Parameters	No. of Samples	MEAN±SD		Mean Difference
		Pre	Post	
Pain score	15	6.07±1.387	2.67±0.9	3.40
Functional ability score	15	70.00±5.831	81.33±4.386	-11.33

**TABLE 3: COMPARATIVE STATISTICS (PAIRED 'T' TEST VALUES) FOR PAIN GAIN SCORE BETWEEN GROUP A AND GROUP B (PRE AND POST TREATMENT).**

Group	No. of Samples	Pain gain Score Mean±SD	't' value	'p' value
A	15	4.80±0.371	33.161	0.002 *
B	15	3.30±0.487	11.744	0.004 *

Note: \*\* denotes significant at 1% level.

\* denotes significant at 5% level.

**TABLE 4: COMPARATIVE STATISTICS (PAIRED 'T' TEST VALUES) FOR FUNCTIONAL ABILITY GAIN SCORE BETWEEN GROUP A AND GROUP B PRE AND POST TREATMENT.**

Group	No. of Samples	Functional ability gain score Mean± SD	't' Value	'p' Value
A	15	-22.600±3.996	-21.902	0.002 *
B	15	-11.333±4.685	-9.368	0.004*

Note: \*\* denotes significant at 1% level.

\* denotes significant at 5% level.

## RESULTS

The Mean, Mean difference and standard deviation for pain score and functional ability score between pre and post treatment for Group A are recorded in table 1. Analysis of the data showed that there is significant reduction in pain score and improvement functional ability score pre and post treatment programs.

The Mean, Mean difference and standard deviation for pain score and functional ability score between pre and post treatment for Group B are recorded in table 2. Analysis of the data showed that there is reduction

in pain score and improvement in functional ability score pre and post treatment programs.

The comparison of significance of reduction in the pain score and functional ability score between pre and post treatment programs for Group A and pre and post treatment programs for Group B was done with paired 't' test values.

The comparison of the significance of pain gain score and functional ability gain score between Group A and Group B are recorded in tables 3 and 4. Analysis for table 3 and table 4 was done using paired 't' tests. The level of significance was calculated from 'p' values between the groups. Analysis of the data showed that there is a significant reduction in pain and improvement in functional ability in Group A when compared with Group B.

There was statistically significant reduction in pain and improvement in functional ability between pre and post treatment programs in Group A when compared with Group B.

## DISCUSSION

The above study was undertaken to evaluate the efficacy of combined lumbopelvic, hip and knee manual therapy when compared with knee manual therapy alone for the treatment of patellofemoral pain and also to compare which of the treatments is better in terms of reducing pain and improving functional ability for patients with patellofemoral pain. The intervention was given for a period of four weeks. In both the groups, pain and functional ability were taken as the dependent variables to assess the improvement between the groups and within the group.

In this study, Visual pain scale was used to measure pain in both the groups. The effect of both the treatment techniques on pain was positive i.e., they both were effective in relieving the patient's pain with four weeks intervention. When the responses were compared, the results showed statistically significant difference between the groups. Maximum reduction of pain was in Group A when compared with Group B.

More significant pain relief in Group A is in accordance with a study, "Lumbopelvic Manipulation for the treatment of patients with patellofemoral pain syndrome: Development of a clinical prediction rule" done by Christine A. Iverson, Thomas G. Sutlive, Michael S. Crowell. Suter and colleagues in their study, "Decrease in quadriceps inhibition after sacroiliac joint manipulation in patients with anterior knee pain" showed that sacro iliac joint or lumbopelvic region manipulation led to a significant decrease in quadriceps inhibition in the involved knees of patients with patellofemoral pain.

Treatment of muscle inhibition is multifaceted. Utilization of manual therapy techniques such as joint manipulation or mobilization directed at the lumbopelvic region have been shown to be successful in disinhibiting lower extremity muscles. Previous studies have demonstrated sacroiliac joint manipulation disinhibited the quadriceps muscle in individuals with anterior knee pain.

In the present study, Kujala score for patellofemoral pain was used to assess functional ability

since its validity and reliability is already established by Kay M Crossley, Kim L Bennell, et al through the study, "Analysis of outcome measures for persons with patellofemoral pain: which are reliable and valid?" Analysis of kujala score revealed that there is improvement of functional ability in both the groups with four weeks of intervention. There is statistically significant difference when compared between the two groups. There is significant improvement in Group A supporting the research hypothesis. More improvement in functional ability in this group is in accordance with the study, "Evidence-Based Review of Manual Therapy Efficacy in Treatment of Musculoskeletal Pain" done by Andrew V. Bokarius, Vladimir Bokarius. They stated that manual therapy resulted in significant improvement in active knee flexion and step-climbing ability for anterior knee pain.

Hip non-thrust manipulation was suggested as a useful intervention in a case report, "Patello femoral pain and asymmetrical hip rotation" given by Cibulka MT, et al. which described decreased pain and improved functional outcome measures.

The results of the study showed that there is more significant difference in pain reduction and improvement of functional ability in Group A when compared with Group B. These findings are in accordance with the case report, "Management of patients with patellofemoral pain syndrome using a multimodal approach" done by Carina D. Lowry et al. They stated that patellofemoral pain may be the result of a dynamic dysfunction of the interaction between the lumbopelvic region, hip, knee and foot. The theory of regional interdependence explores the biomechanical link between the lumbopelvic region, hip, knee and foot according to the study, "Regional interdependence: a musculoskeletal examination model whose time has come" done by Wainner RS et al.

Alterations in joint mobility in remote regions such as the lumbar spine, sacroiliac joint or hip may contribute to the development of patellofemoral pain. The mechanism by which manual therapy affects pain response of an adjacent joint is not well understood but has been proposed to occur by either mechanical or neurophysiological mechanisms. In previous studies, the patients demonstrated asymmetrical hip internal rotation greater than 14 degrees, which could indicate a mechanical link. However, the decrease in pain in the patients after manual therapy was accompanied by an improvement in ability to recruit the lumbopelvic stabilizers, which may support a previously proposed neurophysiological mechanism. The implication of the findings of this study is that addressing proximal impairments may be an important element in the successful treatment of patients with patellofemoral pain.

## CONCLUSION

From the results of the study, there is decrease in pain and improvement in functional ability when knee manual therapy along with exercises is followed in patients with patellofemoral pain.

There is more significant decrease in pain and improvement in functional ability when combined lumbopelvic, hip and knee manual therapy along with exercises are followed in patients with patellofemoral pain.

The results of the study concluded that combined lumbopelvic, hip and knee manual therapy is more effective than knee manual therapy alone in reducing pain and improving functional ability in patients with patellofemoral pain.

## REFERENCES

1. Reid DC. The myth, mystic and frustration of anterior knee pain. *Clinical Journal of Sports Medicine*.1993;3:139-49.
2. Sameer Dixit, M.D., John P.Difiori, M.D., Monique Burton, M.D. Management of Patellofemoral Pain Syndrome. *American Family Physician*. 2007 Jan 15;75(2):194-202.
3. Almeida SA, Williams KM, Shaffer RA, Brodine SK. Epidemiological patterns of musculoskeletal injuries and physical training. *Medical Science Sports Exercises*. 1999;31:1176-1182.
4. Bizzini M, Childs JD, Piva SR, Delitto A. Systematic review of the quality of randomized controlled trials for patellofemoral pain syndrome. *Journal of Orthopedics and Sports Physical Therapy*. 2003;33:4-20.
5. Garrick JG. Anterior knee pain (chondromalacia patella). *Physician Sports medicine*. 1989;17:75-84.
6. Clement DB, Taunton JE, Smart GW, Mcnicol KL. A survey of overuse running injuries. *Physician Sports medicine*. 1981;9:47-58.
7. Arendt EA. Musculoskeletal injuries of the knee. Are females at greater risk? *Minnesota Medicine*, 2007; 90:38-40.
8. Kirsty McKenzie, Victoria Galea, Jean Wessel, Michael Pierrynowski. Lower Extremity Kinematics of Females With Patellofemoral Pain Syndrome While Stair Stepping. *Journal of Orthopedic and Sports Physical Therapy* 2010;40(10):625-632.
9. Reid DC. Sports injury assessment and rehabilitation. New York: Churchill Livingstone, 1992:345-98.
10. Mark S. Juhn, D.O., Patellofemoral Pain Syndrome: A Review and Guidelines for Treatment. *American Family physician*. 1999 Nov 1;60(7):2012-2018.
11. Brukner P, Khan K. *Clinical sports medicine*. Sydney, Australia: McGraw-Hill, 1993:372-91.
12. Milgrom C, Finestone A, Shalamkovith N, Giladi M, Radin E. Anterior knee pain caused by overactivity: a long term prospective follow up. *Clinical Orthopedics*. 1996;331:256-60.
13. Prins, Maarten R.; Van Der Wurff, Peter. Females with patellofemoral pain syndrome have weak hip muscles: a systematic review. (Research Report) *Australian Journal of Physiotherapy* March 1, 2009.
14. Cowan SM, Bennell KL, Crossley KM, Hodges, McConnell J. Physical therapy alters recruitment of the vasti in patellofemoral pain syndrome. *Medical Science Sports Exercises*. 2002;34:1879-1885.
15. Bennell KL, Cowan SM, Hodges PW, Crosley KM,

- McConnell J. Delayed onset of electromyographic activity of vastus medialis obliquus relative to vastus lateralis in subjects with patellofemoral pain syndrome. *Archives of Physical Medicine Rehabilitation*. 2001;82:183-189.
16. Crossley K, Bennell K, Green S, Cowan S, McConnell J. Physical therapy for patellofemoral pain: a randomized, double-blinded, placebo-controlled trial. *American Journal of Sports Medicine*. 2002;30:857-865.
17. Landel R, Powers CM, Perry J. Timing and intensity of vastus muscle activity during functional activities in subjects with and without patellofemoral pain. *Physical Therapy*. 1996;76:946-955; discussion 956-967.
18. Powers CM. Rehabilitation of patellofemoral joint disorders: a critical review. *Journal of Orthopedics Sports Physical Therapy*. 1998;28:345-354.
19. Thomee R, Augustsson J, Karlsson J. Patellofemoral pain syndrome: a review of current issues. *Sports Medicine*. 1999;28:245-262.
20. Wilson T. The measurement of patellar alignment in patellofemoral pain syndrome: are we confusing assumptions with evidence? *Journal of Orthopedics and Sports Physical Therapy*. 2007; 37: 330-341.
21. Post WR. Clinical evaluation of patients with patellofemoral disorders. *Arthroscopy*. 1999;15:841-51.
22. Koh TJ, Grabiner MD, De Swart RJ. In vivo tracking of the human patella. *Journal of Biomechanics*. 1992;25:637-43.
23. Iverson CA, Sutlive TG, Crowell MS, et al. Lumbopelvic manipulation for the treatment of patients with patellofemoral pain syndrome: development of a clinical prediction rule. *Journal of Orthopedics and Sports Physical Therapy*. 2008;38:297-309; discussion 309-212.
24. Leshner JD, Sutlive TG, Miller GA, Chine NJ. Development of a clinical prediction rule for classifying patients with patellofemoral pain syndrome who respond to patellar taping. *Journal of Orthopedics and Sports Physical Therapy*. 2006;36:854-866.
25. Mascal CL, Landel R, Powers C. Management of patellofemoral pain targeting hip, pelvis, and trunk muscle function: 2 case reports. *Journal of Orthopedics and Sports Physical Therapy*. 2003;33:647-660.
26. Wainner RS, Whitman JM, Cleland JA, Flynn TW. Regional interdependence: a musculoskeletal examination model whose time has come. *Journal of Orthopedics and Sports Physical Therapy*. 2007;37:658-660.
27. Cibulka MT, Threikeld-Watkins J. Patellofemoral pain and asymmetrical hip rotation. *Physical Therapy*. 2005;85:1201-1207.
28. Suter E, McMorand G, Herzog W, Bray R. Decrease in quadriceps inhibition after sacroiliac joint manipulation in patients with anterior knee pain. *Journal of Manipulative Physical Therapy*. 1999;22:149-153.
29. Powers CM, Chen PY, Reischl SF, Perry J. Comparison of foot pronation and lower extremity rotation in persons with and without patellofemoral pain. *Foot Ankle International*. 2002;23:634-640.
30. Carina D, Lowry, Joushua A. Cleland, Kelly Dyke. Management of Patients With Patellofemoral Pain Syndrome Using a Multimodal Approach: A Case Series. *Journal of Orthopedics and Sports Physical Therapy*. 2008; 38:691-702.
31. Thomee R, Renstrom P, Karlsson J, Grimby G. Patellofemoral pain syndrome in young women. A clinical analysis of alignment, pain parameters, common symptoms and functional activity level. *Scandinavian Journal of Medical Science Sports*. 1995;5:237-44.
32. Callaghan MJ, Oldham JA. The role of quadriceps exercise in the treatment of patellofemoral pain syndrome. *Sports Medicine*. 1996;21:384-91.
33. Chris Adams: Visual pain scale. *Ergonomics Guide*.
34. Kujala UM, Jaakkola LH, Koskinen SK, Taimela S, Hurme M. Scoring of patellofemoral disorders. *Arthroscopy*. 1993; 9: 159-163.
35. American Academy of Orthopaedic Manual Physical Therapists. *Orthopaedic Manual Therapy: Description of Advanced Clinical Practice*. 1999 pp: 29.
36. International Association for the Study of Pain: Pain Definitions. Bonica JJ. The need of a taxonomy. *Pain*. 1979;6(3):247-8.
37. Bowling A. *Measuring Health. A Review of Quality of life Measurement Scales* 3rd edition, Maidenhead, England: Open University Press:2005.

# TO FIND THE INTRA-RATER RELIABILITY AND CONCURRENT VALIDITY OF CURRENT PERCEPTION THRESHOLD TO MEASURE PAIN IN TENNIS ELBOW-AN OBSERVATIONAL STUDY

Gupta Richa R<sup>1</sup>, Yagna Shukla<sup>2</sup>

1 2nd year M.P.T (Musculoskeletal), Government physiotherapy college, Ahmedabad.

2 M.P.T (Musculoskeletal), Sr. Lecturer, Government physiotherapy college, Ahmedabad.

## ABSTRACT:

**BACKGROUND AND PURPOSE:** The measurement of pain intensity continues to be important to both researchers and clinicians. Although several scales are currently used to assess the intensity construct, it remains unclear which of these provides the most precise, replicable, and predicatively valid measure. The current perception threshold of pain varies with the actual pain. Pressure Pain Threshold being the most reliable & valid tool for scoring Pain, this study helps find whether an alternative tool to measure pain, the CURRENT PERCEPTION THRESHOLD which can be more objective, be used to score pain.

**Aim of study:** To study the test re-test reliability & concurrent validity of CURRENT PERCEPTION THRESHOLD for scoring pain.

**Method:** 25 patients diagnosed with tennis elbow were rated for pain score by PRESSURE PAIN THRESHOLD and CURRENT PERCEPTION THRESHOLD (faradic current) in the beginning. The scoring was repeated after 2 hours for EPT. The patients received conventional treatment which included Ultrasound therapy and strengthening exercises 5 days a week. After a week of treatment the pain scores were again repeated.

**Results:** ICC values for reliability of test retest CPT was 0.91(0.82-0.96) at  $p < 0.0$ . The Pearson Correlation coefficient values before and after Rx between CPT and PPT ;  $r_1 = -0.96$  and  $r_2 = -0.86$  respectively at  $p < 0.01$ . There was a negative correlation between PPT and CPT. **Conclusion:** CURRENT PERCEPTION THRESHOLD proves to be a reliable & valid tool for measuring pain.

**Key Words:** PRESSURE PAIN threshold, visual analog scale, CURRENT PERCEPTION THRESHOLD, tennis elbow

## NEED OF THE STUDY

Pain scoring has been long interest of researchers both in clinical field and drug trials. However there have been limited data available for more accurate and objective tool available for measurement of pain. Though many pain scores are available it becomes difficult to tell which of the measures are predictable; the scoring being more of subjective. There had been a constant need for a pain measuring scale or tool which can be more objective. Reliable & clinically feasible methods are desperately needed to assess for pain so that it can be managed appropriately. So the researcher felt the need to find the reliability and validity of CURRENT PERCEPTION THRESHOLD (CPT) to measure pain.

## INTRODUCTION

The International Association for the Study of Pain widely used definition states: "Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage"<sup>1</sup>. The basic neurophysiology of pain is described in figure 1.

Pain threshold is the lowest stimulus value at which patient reports stimulus feels painful. Methods for estimating the intensity of stimulus required to evoke a painful sensation in the skin can be classified as: mechanical, electrical, chemical and thermal. The mechanical device involves production of pain by pressure. There is an assumed proportionality between pressure and intensity of sensory stimulus produced by a Pressure pain algometer. The chemical methods of irritating the skin have

not been thoroughly explored. The thermal method includes production of pain by local heat or cold stimuli. The electrical method of production of pain by faradic stimulation was introduced by Martin et al.<sup>2</sup> This method have been widely used in study of action of analgesics both on animals and humans.

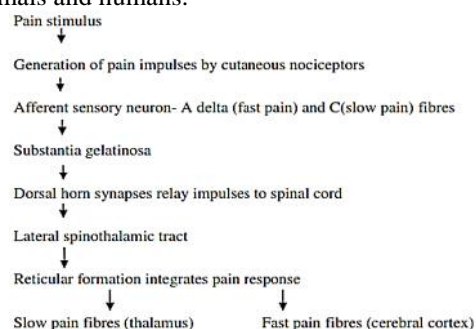


FIGURE 1: NEUROPHYSIOLOGY OF PAIN

Pain scales commonly used are: visual analogue scale (VAS), faces pain scale, numeric pain rating scale etc. which are more of subjective in nature. Although several scales are currently used to assess the intensity construct, it remains unclear which of these provides the most precise, replicable, and predicatively valid measure.

PRESSURE PAIN THRESHOLD (PPT) can be easily measured with a Pressure Algometer. Measuring pain such way is universally accepted.

Tennis elbow however is a non inflammatory chronic degeneration of Extensor Carpi radialis brevis at common extensor origin of elbow due to repetitive stress, trauma, overuse or weak forearm muscles. It results in

tenderness over lateral epicondyle and pain on passive wrist and finger flexion and resisted wrist extension<sup>3</sup>.

## METHOD

**Study Design:** Observational study

**Study setting:** Outpatient department of Govt. Physiotherapy College, civil hospital, Ahmedabad

**Sample Size:** 25

**Sampling Method:** Convenience Sampling

**Materials:** Electrical Stimulator Machine, point electrode, metal electrode,

Wagner- Force TEN<sup>TM</sup> FDX Compact Digital Force Gage, Record sheet.

Subjects who were referred from the outpatient department of Civil Hospital, Ahmedabad to physiotherapy department were screened for selection criteria. From the 37 patients referred only 25 met the selection criteria.

**Inclusion criteria:** Able to follow commands, Willingness to participate, patient with tennis elbow diagnosed & referred by Orthopedic Surgeon, duration: subacute(10 days-3 months) tenderness over lateral epicondyle , age:18 to 30.

**Exclusion criteria:** open wound, burnt area, epilepsy, incomprehensive, malignancy, metal implant.

## PROCEDURE:

The patients thus selected were explained about the procedure and written informed consent was taken from them. All the patient information such as age, height, weight was taken. On the first visit their pain score was taken with Digital Force Gage for measuring PPT over the tender point and twice by electrical stimulation with (cathode ) point electrode over the same point at interval of 2 hours by a 2<sup>nd</sup> investigator. The patients were prior made aware of the mild prickling sensation to be felt beneath the point electrode and report as soon as they perceive the prickling. The intensity was gradually increased until patients reported initiation of prickling sensation beneath the point electrode. The lowest intensity at which patients perceived current was noted. The electrical stimulator was a constant current electrical stimulator and parameters set were: mode: faradic current, pulse width: 1ms, pulse duration: 60 Hz. The inactive electrode was the anode kept at the volar aspect of the opposite forearm. The scoring for CPT was done twice before treatment.

The patients were then given conventional treatment which included: Ultrasound therapy- 3 MHz, 0.8 W/cm<sup>2</sup>, 5 min and Eccentric resisted wrist extension exercises for 5 days a week for 1 week.

After a week of treatment the pain scores were again taken by Digital Force Gage for PPT and electrical stimulator for CPT.



FIGURE 2: MEASURING CPT



FIGURE 3: ULTRASOUND THERAPY



FIGURE 4: RESISTED ECCENTRIC EXERCISE

## DATA ANALYSIS

There were 17 female and 8 male patients. The mean and standard deviation of Age and BMI was analyzed. The data analysis was done with help of SPSS for Windows Version 16.

**Test-Retest Reliability:** test used was INTRACLASS CORRELATION COEFFICIENT for the data obtained on Intensity of electrical stimuli before and after 2 hours at first visit.

**Concurrent Criterion Validity:** Pearson r Correlation was used to examine scores between PPT which is a gold standard and CPT both before and after Rx.

## RESULTS

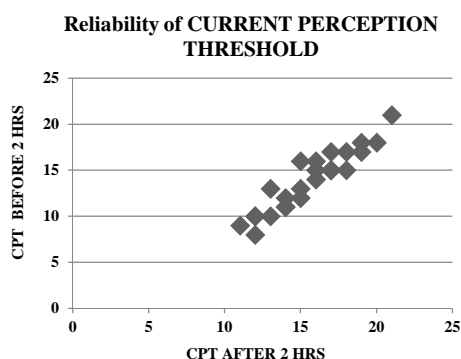
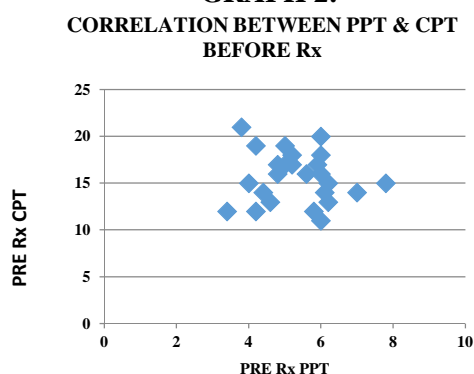
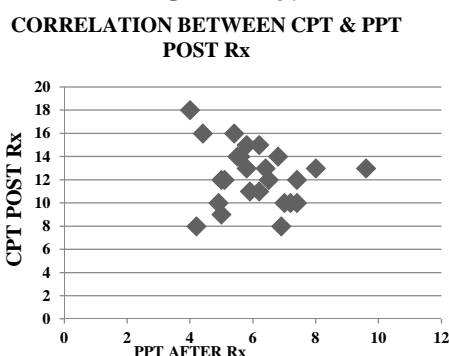
The descriptive data of the patients is listed in Table 1 below.

**TABLE 1:**

Patients	Mean	SD
Age (years)	24	2.7
BMI(kg/m <sup>2</sup> )	26	1.9

**TABLE 2:**

	CPT 1	CPT 2	ICC	P
Mean	15.64	13.92	0.91 (0.82-0.96)	0.05
SD	2.69	3.27		

**GRAPH 1:****GRAPH 2:****GRAPH 3:****TABLE 3: PRE AND POST TREATMENT PPT AND CPT**

	Pre treatment				Post treatment			
	PPT	CPT1			PPT	CPT		
Mean	5.32	15.64	-0.96	0.01	6.08	12.36	-0.86	0.01
SD	1.04	2.69			1.28	2.56		

## DISCUSSION

At the peripheral end of nociceptors noxious stimuli are transduced in to currents that above a given threshold generate action potential. Electrical stimuli lead to nonselective activation of all types of peripheral fibres and end organs. Experimentally produced pain is sharp and prickling carried by fast conducting A- fibres then by slow conducting C fibres which results in stabbing sensations. Pain sensitizes nociceptors which results in increase in GABA, OPIATES, BRADYKININ, SEROTONIN & CAPSAICIN receptors which thereby result in increase of pain threshold<sup>4</sup>.

In the present study the reliability of CURRENT PERCEPTION THRESHOLD was high when tested by a 2<sup>nd</sup> investigator at an interval of 2 hours (ICC= 0.91). Also there was a negative correlation of CURRENT PERCEPTION THRESHOLD with PRESSURE PAIN THRESHOLD both before and after pain relief respectively ( $r_1 = -0.96$ ,  $r_2 = -0.86$ ). The high correlation of CPT with PPT which is a standard gold standard of measuring pain shows CPT can measure pain and is valid to measure pain. Thus as threshold to pressure decreases due to pain as measured by PPT there results in simultaneous increase in threshold to pain perception.

The results are supported by the theory given by MELZACK & WALL which states that pain results in increase in threshold required to initiate action potential. Also intense pain at one location may lead to increased pain threshold at other location<sup>5</sup>.

Also in drug trial of action of analgesics David I Macht et al.<sup>6</sup> showed that before and after local application of opium alkaloids there was measurable action on the sensory nerve terminals shown by reduction of electrical pain threshold producing analgesic effect<sup>6</sup>. A similar study was done by Daniel Le Bars et al.<sup>7</sup> in which three doses of morphine administered in rodents resulted in reduction of electrical pain threshold in dose dependent manner<sup>7</sup>. In a study done by Michael Teepker et al. who studied the effects of oral contraceptive pills on headache intensity and thermal and pain detection threshold proved that higher values of electrical pain threshold were related to more severe migraine bouts<sup>8</sup>.

However there are differences in sensitivity of cutaneous tissues that have to be taken in to account. Also that tissue impedance may vary at different sites. The Current Perception threshold may vary with age, ethnicity, sex & genetics<sup>9</sup>.

In the present study only subacute pain in Tennis Elbow is studied with a tender pain around lateral epicondyle. The effect of varying current threshold in different painful conditions is not known. Also faradic current with a fixed pulse frequency and pulse duration is used; the changes on varying frequencies and pulse width cannot be commented upon.

In a nutshell measuring Current Perception Threshold is a cheap, noninvasive, reproducible, reliable method which can be used at will with no harm to tissues as minimal intensity is measured. Also the sensory threshold



is a sharply defined experience so accurate and the stimulus can be repeated with no harm.

## CONCLUSION

It can be concluded that CURRENT PERCEPTION THRESHOLD have a high Reliability means consistent on repeated measurements. It has high Concurrent Validity as well due to negative correlation with PRESSURE PAIN THRESHOLD a gold standard for measuring pain mechanically.

## ACKNOWLEDGEMENTS

We wish to thank the patients for their generous participation in the study, all the staff at Govt. Physiotherapy College, Ahmedabad for their help during the study.

## REFERENCES

1. International Association for the Study of Pain: Pain Definitions [Retrieved 10 Sep 2011]. Derived from Bonica JJ. The need of a taxonomy. *Pain*. 1979;6(3):247-8. doi:10.1016/0304-3959(79)90046-0. PMID 460931.
2. Martin E et al. A quantatitive study of faradic stimulation. *American journal of physiotherapy*, 1908;22;116
3. Khatri Shubhash M. Basics of orthopaedic physiotherapy: Tennis elbow.2013;78-86
4. Woolf C J, Nociceptors- Noxious stimulus detectors; *Neuron* 55(3)2007: 353-364
5. J D HARDY et al. Studies on pain. *Journal of clinical investigations* 1940:649-657
6. DAVID I. MACHT et al. Peripheral action of the opium alkaloids; effect on the sensory nerve terminals ; *JPET* August 1916 vol. 8no. 8 451-463
7. Daniel le bars et l. Animal models of nociception: *Pharmacological Reviews* December 1, 2001 vol. 53 no. 4 597-652
8. Michael Teepker et al.Effects of OCPs on Detection and Pain Thresholds As Well As Headache Intensity During Menstrual Cycle in Migraine headache. *American Headache Society* 2010; 92:104,
9. Melzack R ,Wall PD. The Challenge of pain. 2<sup>nd</sup> edition, New York Penguin books 1996:17-19

# A STUDY TO FIND OUT THE EFFECT OF PROLONGED SLOW EXPIRATION TECHNIQUES (PSE) ON CARDIO RESPIRATORY PARAMETERS IN INFANTS WITH LOWER RESPIRATORY TRACT INFECTION- AN EXPERIMENTAL STUDY

Shanishwara Mittal<sup>1</sup>, Thakkar Vaishali<sup>2</sup>, Udeshi Vaidehi<sup>3</sup>

1,2,3 Master of physiotherapy student, Shree K.K. Sheth Physiotherapy College, Rajkot.

## ABSTRACT

**BACKGROUND:** Prolonged slow expiration technique (PSE) is a physiotherapy technique for infants to reduce secretions in lungs and improve lung functions, but there are few studies which observe the effect of PSE's on the cardio respiratory system.

**OBJECTIVE:** To find out effects of prolonged slow expiration technique (PSE) on cardio respiratory parameters [SPO<sub>2</sub>%, Pulse rate (PR) beats / minute and respiratory rate (RR) breaths/minute] in infants with lower respiratory tract infection.

**MATERIALS AND METHODS:** An experimental study was conducted on 30 patients with lower respiratory tract infection with infants (age group - 1 month to 1 year) from civil hospital, Rajkot. Patients were selected by convenient sampling. Measurement of SPO<sub>2</sub>%, Pulse rate (PR) and respiratory rate (RR) was taken prior to the test. PSE was performed in infants in three sequences of prolonged manual thoraco-abdominal compressions during the expiratory phase. Immediately after the PSE measurement of SPO<sub>2</sub>%, Pulse rate (PR) and respiratory rate (RR) were taken.

**RESULTS:** The Infants Suffering from LRTI showed improvement in cardio respiratory parameters with prolonged slow expiration technique. The SPO<sub>2</sub>% showed a statistically significant increase in Pre and Post value of means ( $P = 0.000$ ) The Mean $\pm$ SD of SPO<sub>2</sub>% Pre technique value was  $93.67 \pm 0.71\%$  and Post technique value was  $98.63 \pm 1.25\%$ . The Mean $\pm$ SD of PR beats /min showed difference from pre technique value  $127.83 \pm 11.12$  beats/min to post technique value  $123.16 \pm 11.57$  beats /min. ( $P = 0.081$ ). The Mean and SD of RR breaths/min showed Change from pre technique value  $40.3 \pm 9.49$  breaths/min to post technique value  $36.7 \pm 5.61$  breaths/min. ( $p = 0.012$ ).

**KEY WORDS:** Prolonged slow expiration technique (PSE), lower respiratory tract infection (LRTI), saturation of oxygen, cardio respiratory parameters

## INTRODUCTION

Lower respiratory tract includes trachea, primary bronchia and lungs. There are a number of acute and chronic infections that can affect the lower respiratory tract. The two most common infections are bronchitis and pneumonia. Lower respiratory tract infections (LRTI) are generally more serious than upper respiratory infections. Symptoms include shortness of breath, weakness, high fever; coughing and wheezing<sup>1</sup>.

Pathophysiology behind LRTI includes entry of microorganisms in lower respiratory tract, and then inhaled to the alveolar level; the resident alveolar macrophages if efficient then it will kill pathogens. When the capacity of the alveolar macrophages to ingest or kill the microorganisms is reduced then the clinical pneumonia manifests. The four phases of underlying pathology of LRTI includes oedema, red hepatisation, grey hepatisation, resolution<sup>2</sup>.

Chest physiotherapy is commonly employed in the treatment of infants with respiratory diseases. Infant's respiratory system is different from an adult's and the effects of chest physiotherapy may not be the same of adult. New chest physiotherapy techniques were developed specifically for infants in accordance with their physiological characteristics<sup>3</sup>.

There are many different chest physiotherapy techniques which are used and also found beneficial in infants like Expiratory flow increase technique (EFIT), Vibration, Percussion, Postural drainage (PD) and Nebulization and Prolonged slow expiration technique<sup>4,5</sup>.

The Prolonged slow expiration technique (PSE) is one of the techniques, employed in clinical practice in infants with bronchial obstruction and hyper-secretion. In this technique, pressure is exerted on the thorax and abdomen to prolong the expiratory phase and favors the elimination of air. Few studies are done in past to see the benefits of PSE in infants on different parameters and symptoms of the infants suffering from LRTI. Postiaux and co-workers observed a reduction in respiratory distress and Pulse rate, as well as increase in SpO<sub>2</sub>% after PSE in 19 infants evaluated during viral bronchiolitis<sup>3</sup>.

The PSE technique mainly stimulates Hering-Breuer inflation (HB) reflex<sup>3</sup>. The circuit of Hering-Breuer inflation reflex includes regions of the central nervous system, and both sensory and motor components of the vagus nerve. Increased sensory activity of the pulmonary-stretch lung afferents (via the vagus nerve) results in inhibition of the central inspiratory drive and thus inhibition of inspiration and initiation of expiration. The lung afferents also send inhibitory projections to the cardiac vagal motor neurons (CVM). The CVMs, which send motor fibers to the Pulse via the vagus nerve, are responsible for tonic inhibitory control of Pulse rate<sup>6</sup>. Presumed neurological pathways involved in the HB reflex include lung stretch receptors, diaphragm, intercostals and abdominal muscles. Among this abdominal muscle are active in forced expiration only. In addition to the chemical regulation of respiration, the stretch receptors signal the expansion of the lungs, and provide inhibitory feedback to the inspiratory drive signal, thus inhibit activity of the main inspiratory muscles, the diaphragm, and the intercostals. This mechanism alters the respiratory rate<sup>7</sup>.



## AIM & OBJECTIVE

Aim of this study is to find out the effect of prolonged slow expiration technique (PSE) on cardio respiratory parameters [SPO<sub>2</sub>%, Pulse Rate (PR) and Respiratory Rate (RR)] in infants with lower respiratory tract infection.

## METHODOLOGY

An experimental study was conducted on 30 infants (age group - 1 month to 1 year)<sup>8</sup> including 18 male and 12 female with lower respiratory tract infection from civil hospital, Rajkot. Patients were selected by convenient sampling.

## INCLUSION CRITERIA

- Age – infants
- Gender – male and female
- Infants suffering from LRTI
- Full-term babies

## EXCLUSION CRITERIA

- Infants with upper airway obstruction
- Gastro-esophageal reflux disease
- Thoracic and/or abdominal surgical procedures
- Acute respiratory disease

On first day the parents of the infants was explained about the study and written Informed consent was taken from them. Infant's age, gender, history of respiratory symptoms like wheezing or any other, medication history was taken. Prior to the test respiratory rate was taken by stop watch, SPO<sub>2</sub> % & pulse rate was measured by pulse Oxymeter (Model- MD 300C11)<sup>9</sup>.

## PROLONGED SLOW EXPIRATION TECHNIQUE

For the implication of PSE Technique the hypothenar region of one hand was placed on the thorax at below the suprasternal notch and the hypothenar region of the other hand on the abdomen over the umbilicus. At the end of the expiratory phase, compression was applied with both hands, with the hand on the thorax moving in the cranial caudal direction and the hand on the abdomen moving in the caudal-cranial direction. The Inspiratory phase of the three subsequent respiratory cycles of the infants was restricted in the technique by compression. This procedure was repeated three times with an interval of 30 seconds between them<sup>3</sup>. Then Post technique the level of SPO<sub>2</sub>%, PR and RR were recorded.



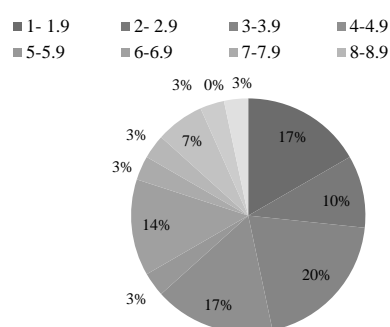
**FIGURE 1- HAND PLACEMENT FOR PSE TECHNIQUE**

## RESULTS

The obtained data of 30 infants (18 male and 12 female) with LRTI was calculated by using Student's paired *t* test. Test was performed between pre and post value comparison of SPO<sub>2</sub>%, pulse rate, respiratory rate. A statistical analysis was performed with SPSS version 14.0.

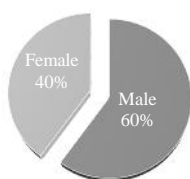
The SPO<sub>2</sub>% showed a statistically significant increase in Pre and Post value of means ( $P = 0.000$ ). The Mean  $\pm$  SD of SPO<sub>2</sub>% Pre technique value was  $93.67 \pm 0.71\%$  and Post technique value was  $98.63 \pm 1.25\%$ . The Mean and standard deviation (SD) of PR beats / min showed difference from pre technique value  $127.83 \pm 11.12$  beats / min to post technique value  $123.16 \pm 11.57$  beats / min. ( $p = 0.081$ ). The Mean and SD of RR breath /min showed Change from pre technique value  $40.3 \pm 9.49$  breath /min to post technique value  $36.7 \pm 5.61$  breath /min. ( $p = 0.012$ ).

### Age distribution (Months)

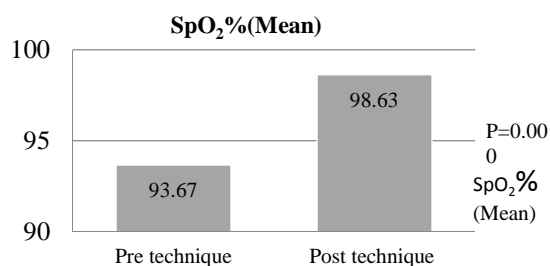
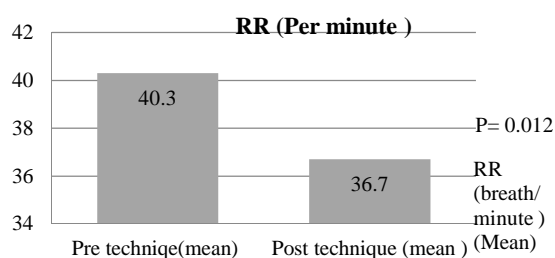


**GRAPH-1: AGE DISTRIBUTION IN MONTHS**

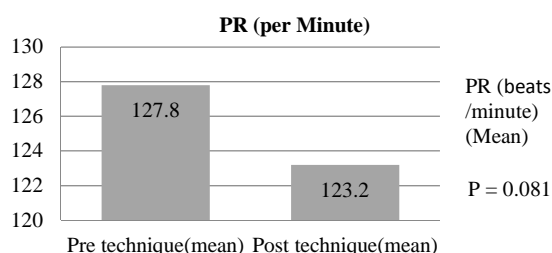
Gender distribution



GRAPH-2: GENDER DISTRIBUTION

GRAPH-3: COMPARATIVE GRAPH OF PRE TECHNIQUE AND POST TECHNIQUE OF SPO<sub>2</sub>% MEANS

GRAPH-4: COMPARATIVE GRAPH OF PRE TECHNIQUE AND POST TECHNIQUE OF RR (BREATH/ MINUTE) MEANS



GRAPH-5: COMPARATIVE GRAPH OF PRE TECHNIQUE AND POST TECHNIQUE OF PR (BEATS / MINUTE) MEANS

**TABLE-1: RESULT OF  
CARDIORESPIRATORY PAREMETERS  
[SPO<sub>2</sub>%, RR (BREATH / MIN), PR (PULSE /  
MIN)] OF THE STUDY (MEAN± SD)**

	Means ± SD	P - Value
SpO <sub>2</sub> %- Pre technique	93.67 ± 0.71	0.000
Post technique	98.63 ± 1.25	
RR(breath/ minute) - Pre technique	40.30 ± 9.49	0.012
Post technique	36.70 ± 5.61	
PR(pulse / minute) - Pre technique	127.83 ± 11.12	0.081
Post technique	123.17 ± 11.58	

## DISCUSSION

The Infants Suffering from LRTI showed improvement in cardio respiratory parameters with prolonged slow expiration technique. In the present study the effect of PSE in Infants was seen on the levels of SPO<sub>2</sub>%, PR & RR. The result showed significant improvement in level of SPO<sub>2</sub>% and RR & PR in infants suffering from LRTI. So, PSE can be used in infants for the reduction in Respiratory distress and improvement in oxygen saturation level.

Prolonged slow expiration technique is a slow physiotherapy technique [no changes in Peak expiratory flow (PEF)], induces sigh breaths and progressively exhaled expiratory volume during its performance. An expressive reduction in Tidal Volume (VT) was noted during PSE in many of the studies done in Infants, probably the main mechanical feature was mucus clearance<sup>10</sup>.

PSE is safe and well tolerated as it is more attuned to the infant's mechanical respiratory system. PSE avoids bronchial collapse with its flow interruption. The prolonged slow expiratory phase during PSE exhales a substantial portion of the Expiratory Reserve Volume (ERV). The reduction in lung volume is associated with the protective reflex of the airways, which restores lung volume by sigh breathing (Hering-Breuer deflation reflex)<sup>3,11,12</sup>. As secretions reach the proximal airways, provoked coughing (PC) takes over.

The PSE maneuver is a technique described to promote bronchial clearance in infants. There is a study being done on wheezing infants to see the impact of the prolonged slow expiratory maneuver on respiratory mechanics which showed significant changes in Tidal Volume (VT) and RR in infants with recurrent wheezing, even in the absence of exacerbations. The fact that the variables related to respiratory mechanics remained unchanged indicates that the technique was safe to apply in infants<sup>13</sup>.

A transient effect was shown with prolonged slow expiration techniques combined with salbutamol in children with moderate bronchiolitis in a review carried out by Roqué i Figuls M et al on Chest physiotherapy for acute bronchiolitis in paediatric patients between 0 and 24 months old<sup>14</sup>.

There was study done to see the effect of three sequences of PSE, which showed an average of 53% Expiratory Reserve Volume (ERV) exhaled and 20-25% increase in exhaled volume after each sequence of PSE. In

contrast if more consecutive sequences of PSE are applied then there will be excessive increase in exhaled volume which could reduce SPO<sub>2</sub> % and lead to respiratory distress caused by bronchial collapse, which may occur when residual volume is reached. Thus the proper training of physiotherapist is must for application of PSE on infants without any risk<sup>15</sup>.

## LIMITATIONS

- Sample size was small.
- The Particular Lower respiratory tract infection was not taken.
- Weight of the Infants was not taken into consideration.
- The Infant with any Previous History of Respiratory Disease was not being excluded.

## CONCLUSION

PSE predisposes infants to sigh breaths, thereby demonstrating that the variation in volume caused by the technique stimulates the Hering-Breuer deflation reflex. Also PSE technique may exhale more expiratory reserve volume. Thus with present study concluded that the use of PSE technique on Infants with LRTI shows beneficial effect on SPO<sub>2</sub>%, RR breath /min & PR beats / min.

## CLINICAL IMPLICATIONS

1. PSE can be useful to decrease the respiratory distress in Infants with LRTI.
2. Reduction in PR can be obtained in infants by use of PSE technique.
3. Blood O<sub>2</sub> saturation level can be improved with PSE.

## ACKNOWLEDGEMENT

We gratefully acknowledge our principal ( Shree K.K Sheth Physiotherapy college, Rajkot.) , professor Dr. Ashish Kakkad, all other respected Teachers, and Dr. Mehul Rathod (pediatric resident in civil hospital, Rajkot.) all parents of the infants, librarian and my colleagues for their kind support and help for this study.

## REFERENCE

1. Lower respiratory tract infection, Wikipedia.
2. www.scribd.com- lower respiratory tract infection pathophysiology.
3. Fernanda de Cordoba Lanza, PT, Federal University of São Paulo, Respir Care Articles: June 17, 2011 as DOI: 10.4187/respcare.01067.
4. Melissa KP, Adriana GL, José DR, Emílio CE, Comparison of the effects that two different respiratory physical therapy techniques have on cardio respiratory parameters in infants with acute viral bronchiolitis. J Bras Pneumol. 2009; 35(9):860-867.
5. Guy Postiaux PT, Bruno Zwaenepoel PT, Jacques Louis MD. Chest Physical Therapy in Acute Viral Bronchiolitis: an updated review. Respiratory care Paper in Press. Published on January 01, 2013 as DOI: 10.4187/respcare.01890.
6. Hering-Breuer deflation reflex. Wikipedia.
7. Thomas CF, Robert JJ. The Role of the Hering-Breuer Deflationary Reflex in the Control of Spontaneous Human Respiration journal of automatic control, university of belgrade; vol. 12:56-63, 2002
8. Ghai OP, Vinod KP, Arvind B. Ghai essential paediatrics, 7th ed.cbs publisher, publication year 2010
9. Hartmut Gehring Pulse Oxymeter in a comparative test Intensive Care Medicine September 2006, Volume 32, Issue 9, pp 1287-1289
10. Fernanda CL, Gustavo W, Ana CD, Carolina LC, Guy PP, Dirceu S. Prolonged Slow Expiration Technique in Infants: Effects on Tidal Volume, Peak Expiratory Flow, and Expiratory Reserve Volume, respiratory care ; dec 2011 vol 56 no 12
11. Rabbette PS, Stocks J. Influence of volume dependency and timing of airway occlusions on the Hering-Breuer reflex in infants. J Appl Physiol 1998; 85(6):2033-2039.
12. Rabbette PS, Costeloe KL, Stocks J. Persistence of the Hering – Breuer reflex beyond the neonatal period. J Appl Physiol 1991; 71(2):474-480.
13. Fernanda CD, Gustavo FW, Carolina LD. Impact of the prolonged slow expiratory maneuver on respiratory mechanics in wheezing infants. J Bras Pneumol. 2013;39(1):69-75
14. Roqué i Figuls M, Giné- Gahriga M, Granados Rugeles C, Pehrotta C. Chest physiotherapy for acute bronchiolitis in paediatric patients between 0 and 24 months old. Cochrane Database of Systematic Reviews 2012, Issue 2. Art. No.: CD004873. DOI: 10.1002/14651858.CD004873.pub4.
15. Fernanda CL, Gustavo W, Ana CD, Carolina LC, Guy P, Dirceu S. Prolonged Slow Expiration Technique in Infants: Effects on Tidal Volume, Peak Expiratory Flow, and Expiratory Reserve Volume respiratory care, dec 2011 vol 56 no 12

## A STUDY TO EVALUATE THE INVOLVEMENT OF SPINAL ACCESSORY NERVE IN INDIVIDUALS WITH CHRONIC NON-SPECIFIC NECK PAIN

**Khyatee Kamdar<sup>1</sup>, Karishma Jagad<sup>2</sup>, Ashish Kakkad<sup>3</sup>**

*1 Post Graduate Student, Shri K. K. Sheth Physiotherapy College, Rajkot;*

*2 Associate Professor, Shri K. K. Sheth Physiotherapy College, Rajkot;*

*3 Assistant Professor, Shri K. K. Sheth Physiotherapy College, Rajkot.*

### ABSTRACT:

**BACKGROUND:** Chronic non specific neck pain is the most common function limiting musculoskeletal problem and affects mainly modern society leading to physical, psychological, occupational disability. With an increasing sedentary population, it is predicted that the prevalence rate of non-specific neck pain continue to rise. To keep the body and head in an erect posture and coordinate the neck and upper-back movements, upper trapezius muscle always requires sustained contraction. Chronic trapezius spasm associated with chronic neck pain, might result in compression of the spinal accessory nerve, leading to weakness of the trapezius muscle, thus weakening one of the cervical spine support systems and as a result producing neck pain.

**AIM:** To Evaluate the involvement of Spinal Accessory Nerve in Individuals with Chronic Non Specific Neck Pain.

**STUDY DESIGN:** A Cross-sectional Observational Study

**METHOD:** Total numbers of 40 subjects were equally divided into two groups. Group-A had 20 individuals of chronic non specific neck pain while group-B had 20 Age and Sex matched healthy individuals. Onset latency and peak to peak amplitude of CMAP of bilateral spinal accessory nerve and followed by that, peak to peak amplitude of maximum voluntary isometric contraction (MVIC) of bilateral upper trapezius muscle by surface electromyography of upper trapezius muscle were taken from the individuals of both the groups. After that obtained values of 20 individuals of chronic non specific neck pain were compared with the values of 20 healthy individuals of matched Age & Sex.

**RESULT:** Result was calculated by using unpaired t-test from SPSS version 14. Obtained values of p (probability) for mean onset latency and amplitude of CMAP of spinal accessory nerve were 0.001 and 0.16 respectively & obtained p value for maximum voluntary isometric contraction of upper trapezius muscle was 0.002 which showed that result was statistically significant at 99% significance level.

**CONCLUSION:** There is a presence of Spinal Accessory Neuropathy and weakness of upper trapezius muscle in individuals with chronic non-specific neck pain.

**KEYWORDS:** Chronic Neck Pain (CNP), Spinal Accessory Nerve (SAN), Compound Motor Action Potential (CMAP), Electromyography (EMG) Maximum Voluntary Isometric Contraction (MVIC).

## INTRODUCTION

Pain is the most common symptom of which the human kind complains. Pain from musculoskeletal system is very common internationally in modern sedentary society. Most of the acute musculoskeletal pain conditions which might lead to a reduction in the percentage which goes on to become chronic<sup>1</sup>.

Pain is defined as chronic when persistent or regularly recurrent with duration of more than 3 months<sup>2,3</sup>. With an increasing sedentary population, especially with reliance on computer technology in the workplace, it is predicted that the prevalence rate of nonspecific neck pain will continue to rise<sup>4</sup>.

Neck pain is defined as pain located between the occiput and the third thoracic vertebra<sup>5</sup>. Neck pain most commonly causes by biomechanical axial neck pain, whiplash-associated disorder and cervical radiculopathy and secondary to rheumatic causes (ankylosing spondylitis, rheumatoid arthritis), osteoarthritis and major trauma, including fractures, dislocations, and cord injuries<sup>6</sup>. These causes lead to muscular imbalance followed by instability of spine. Major instability in the cervical spine usually arise when there is gross disruption of passive restraining influences, leading to bony impingement or compression of neural or vascular structure<sup>7</sup>. While Panjabi M.M.

described spinal instability can be caused by disturbed spinal stabilizing system which contains three subsystems:

1. Passive ligamentous subsystem,
2. Active musculoskeletal subsystem and
3. Neural control subsystem.

In the presence of injury or pathology, the role of the muscular system becomes even greater which highlights the need to address the muscle system during both the assessment and rehabilitation of patients with neck pain<sup>8</sup>.

Muscles respond to dysfunction in two ways: by becoming inhibited or by weakness<sup>9</sup>. If there is pain for whatever reason, these muscles will become inhibited & there will be selective weakness, a decrease in force production and a decrease in tonic stabilizing capacity or endurance capacity of the muscle<sup>10,11</sup>.

Anatomically, the trapezius muscle is a large, superficial muscle that is supplied by the spinal accessory nerve and is composed of upper, middle, and lower-functional segments. Physiologically, the trapezius muscle is a major scapular stabilizer and contributes to scapulohoracic rhythm by elevating, rotating and retracting the scapula<sup>12</sup>.

It has been found that trapezius muscle spasm is common with chronic neck pain whatever its cause<sup>12</sup>. Therefore, chronic trapezius spasm associated with chronic neck pain, might result in compression of the spinal accessory nerve, leading to weakness of the trapezius

muscle, thus weakening one of the cervical spine support systems and as a result causing neck pain.

There are various studies available on chronic neck pain, but very few of them had checked consequences of chronic neck pain by using electrophysiological parameters.

So, this study aimed to investigate the involvement of spinal accessory nerve in individuals with chronic nonspecific neck pain.

## MATERIALS AND METHODS

### MATERIALS USED

1. Treatment Table
2. Pillow
3. EMG-NCV Instrument (Rms Ep Mk-II, Version 1.1)
4. Electrodes (Bipolar Stimulating Electrode, Ground Electrode, Surface Electrode)
5. Electrode Gel
6. Spirit Cotton
7. Adhesive tape
8. Data collection sheet
9. Consent form
10. Pen

### INCLUSION CRITERIA

1. Subjects with non-specific neck pain.
2. Pain Duration: > 3 months.
3. Age: 20-40 years
4. Gender: Both Male & Female

### EXCLUSION CRITERIA

1. Vertebro Basilar Insufficiency
2. History of recent trauma around neck.
3. Any surgery around posterior neck triangle
4. Infection in cervical spine or in the posterior triangle of the neck.
5. Radiating pain with paresthesia
6. Degenerative disease of spine
7. Tumor in cervical region
8. Any Neurological disease
9. Thoracic outlet syndrome
10. Inflammatory conditions of spine

### METHODOLOGY

A total number of 20 individuals with chronic non-specific neck pain diagnosed by orthopedic surgeon, between 20 to 40 years of age were taken for the study from various physiotherapy centers in and around Rajkot as per the selection criteria and 20 healthy individuals with matched age and sex were taken as a control.

Total numbers of 40 subjects was equally divided into two groups. Group-A had 20 individuals of chronic non specific neck pain while group-B had 20 Age and Sex matched healthy individuals.

All the participants were explained properly about the procedure and purpose of the study and after explanation written consent was taken from individuals who fulfilled both the criteria and were willing to participate in the study.

All the participants were asked to avoid exercise, stimulant/depressant drugs, and pain medications prior to participation in the study.

Trapezius muscle examination was performed by palpation of the muscle for spasm, full neurological examination was performed to clinically exclude peripheral neuropathy and other neurological diseases.

Onset Latency and peak to peak amplitude of CMAP of SAN were taken and followed by that peak to peak amplitude of MVIC of upper trapezius muscle (best of 3 attempts) was taken bilaterally from the individuals with CNP. Same procedure was done for the age and sex matched healthy individuals. Obtained values of individuals of both the group were compared.

### TECHNIQUE FOR NERVE CONDUCTION STUDY OF SPINAL ACCESSORY NERVE



**FIGURE-1: NERVE CONDUCTION STUDY OF SPINAL ACCESSORY NERVE**

Subjects were seated and relaxed with naturally suspended arms to minimize muscular movement in the test. Then used a bipolar electrode for stimulation, stimulation was performed at the posterior border of the sternocleidomastoid muscle, midway between the mastoid process and the suprasternal notch at the level of the upper margin of the thyroid cartilage. Surface electrodes were placed using a technique similar to that of Cherington<sup>13, 14</sup>, placement of recording active electrode at the midpoint between the acromion of the scapula and the bony prominence of the seventh cervical spinal process and the reference electrode on the acromion. The ground electrode was placed between the stimulation and recording electrodes. (As shown in figure-1)

### TECHNIQUE FOR SURFACE EMG OF UPPER TRAPEZIUS MUSCLE

Subjects were seated and relaxed with naturally suspended arms to minimize muscular movement in the test. Recording active electrode placed at the angle of neck

and shoulder while recording reference electrode placed on the acromion. The ground electrode was placed between these two electrodes. Subjects were asked to elevate the shoulder against resistance of therapist<sup>15,16</sup>. (As shown in figure-2)



**FIGURE-2: SURFACE EMG OF UPPER TRAPEZIUS MUSCLE**

## STATISTICAL ANALYSIS

The obtained data of 20 individuals of CNP and 20 healthy individuals of bilateral spinal accessory nerve conduction studies and bilateral upper trapezius muscle were calculated by using Student's unpaired *t* test.

Each subject was assessed bilaterally for onset latency and peak to peak amplitude of CMAP of spinal accessory nerve and peak to peak amplitude of MVIC of upper trapezius muscle so total 40 readings were taken for each of group for the above parameters i.e. individuals of CNP as well as for healthy individuals.

Test was performed for between group comparison of onset latency and peak to peak amplitude of CMAP of spinal accessory nerve and peak to peak amplitude of MVIC of upper trapezius muscle. A statistical analysis was performed with SPSS version 14.0.

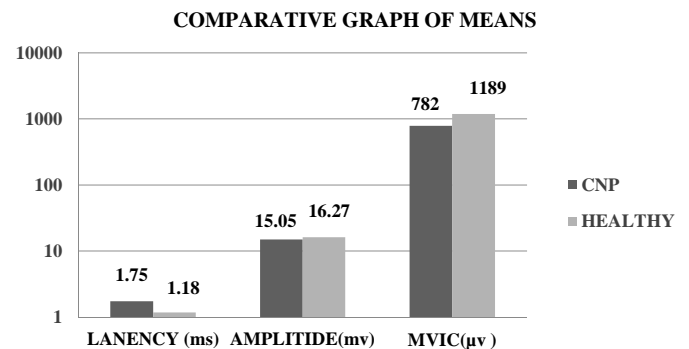
## RESULT

Obtained result of between group comparison showed that there was statistically very highly significant difference found for onset latency of SAN ( $p=0.002$ ) and peak to peak amplitude of MVIC of upper trapezius muscle ( $p=0.001$ ), while statistically significant difference was found peak to peak amplitude of CMAP of spinal accessory nerve ( $p=0.16$ ). (Table- 1)

There was marked increased mean onset latency value of SAN while reduced mean value of peak to peak amplitude of CMAP of spinal accessory nerve and mean value of peak to peak amplitude of MVIC of upper trapezius muscle was noted in individuals with chronic nonspecific neck pain compared to healthy individuals. (Graph- 1)

**TABLE-1: COMPARISON OF ELECTROPHYSIOLOGICAL PARAMETERS BETWEEN TWO STUDY GROUPS (MEAN $\pm$  SD)**

Parameters	Experimental group	Control group	P value
Latency (ms)	1.75 $\pm$ 0.41	1.15 $\pm$ 0.40	0.001
Amplitude (mv)	15.1 $\pm$ 2.7	16.25 $\pm$ 2.65	0.16
MVIC ( $\mu$ v)	718.9 $\pm$ 280.1	1189 $\pm$ 446.2	0.002



**GRAPH-1: COMPARISON OF ELECTROPHYSIOLOGICAL PARAMETERS BETWEEN TWO STUDY GROUPS**

## DISCUSSION

Chronic neck pain is pain that occurs over a long period, usually more than three months. There are many causes for this condition.<sup>17</sup> chronic neck pain is associated with spasm in neck muscles one of which is the upper trapezius muscle<sup>18</sup>.

This study shows reduction in values for CMAP amplitude and prolonged latencies in experimental group with comparison to the control group.

This result is contradicted with the result of Mohamed A. Hafeny and colleagues, who searched for spinal accessory neuropathy in chronic neck pain patients. And found only prolongation of onset latency with normal amplitude of CMAP of spinal accessory nerve. The possible mechanism behind that was explained by them was the prolonged latencies indicated that the fastest conductive fibers in the spinal accessory nerve are affected. However, the nerve fibers reacting to stimulation and their supplying muscle fiber are normal<sup>19</sup>.

This result is also contradicted with the result of Chang et al who searched for spinal accessory neuropathy in individuals with myofascial pain syndrome (MFPS) and found that the amplitude of CMAPs of spinal accessory nerves recorded from the upper segments of trapezius muscles were significantly smaller in the symptomatic and asymptomatic sides of MFPS patients than in controls. There were no significant differences regarding latencies and nerve conduction velocities between the symptomatic and asymptomatic sides neither of MFPS nor between cases



and controls. They explained these electrophysiological findings by axonal loss or axonal degeneration, which affect a small fraction of nerve and translated clinically as asymptomatic or normal muscle strength, as they found in their MFPS patients. They found that this degeneration may result from fibrosis and taut band associated with MFPS<sup>10</sup>.

In this study the prolongation of onset latency as a result of prolonged compression indicates that the fastest conductive fibers in the spinal accessory nerve are affected. And as a result of demyelination of nerve fibers gradually produce axonal degeneration which affects a small fraction of nerve. There was reduction in maximal voluntary isometric contraction of upper trapezius muscle found as a result of axonal degeneration of the some fibers of upper segment of trapezius produce reduction in strength of the muscle.

These findings can be explained as the upper segment of the trapezius muscle is the major portion that is responsible for most of the shoulder and neck movements, and stabilization of the scapula. Certain postures or positions of the shoulder and neck, especially neck spasm, may increase pressure around the spinal accessory nerve. This has been recognized with increased frequency for nerve compression, progressing to demyelination of the nerve, which leads to electrophysiological changes<sup>20</sup>.

The exact pathological changes affecting the nerves after prolonged compression have been thoroughly explained in many studies.

Early changes consist of edema of the subperineurial space occurring within four hours of compression. Inflammation and fibrin deposits occur from 24-36 hours and are followed by proliferation of endoneurial fibroblasts and capillary endothelial cells<sup>21,22</sup>.

Demyelination and Schwann cell necrosis appears at seven and ten days of compression<sup>23,24</sup>. Other findings include thinning of the myelin along with evidence of degeneration and regeneration of fibres<sup>25</sup>. Thus the most obvious function disturbance will be related to affection of the myelin sheath that is translated in nerve conduction as prolonged onset latency.

## LIMITATIONS

Room temperature could not be controlled.

## FURTHER RECOMMENDATION

This study can be done with...

1. Large sample size.
2. Taking subjective outcome measure along with objective outcome measures.
3. Dividing the subjects according to type and category of work.

## CONCLUSION

There is a presence of Spinal Accessory Neuropathy and reduced strength of Upper Trapezius muscle in individuals with chronic non-specific neck pain.

## CLINICAL IMPLICATION

Spinal Accessory Neuropathy and strength of Upper Trapezius muscle should be assessed in individual having chronic neck pain.

## ACKNOWLEDGEMENT

We gratefully acknowledge principal of Shri K.K. Sheth Physiotherapy College, our colleagues, all the participants, librarian and other staff members for their kind support and help for this study.

## REFERENCES

1. Issues with chronic musculoskeletal pain, Rheumatology 2005;44:831-833.
2. Andersson HI, Chronic pain in a geographically defined general population studies of differences in age, gender, social class, and pain localization.
3. Simo Taimela\_Active treatment of patients with nonspecific chronic neck pain A Prospective Randomized Intervention; SPINE 2000 Volume 25, Number 8, p: 1021-1027.
4. Falla D, Unraveling the complexity of muscle impairment in chronic neck pain, 2004.
5. Cote 2003, The epidemiology of neck pain: what we have learned from our population-based studies J Can Chiropr Assoc 2003; 47(4).
6. Alan Douglass Evaluation and treatment of posterior neck pain JABFP November-December 2004 Vol. 17 Supplement <http://www.jabfp.org>.
7. Janda V Muscle and motor control in cervicogenic disorders: Assessments and management In management of cervical and thoracic spine 1994.
8. Wiater JM, Bigliani LU. Spinal accessory nerve injury. Clin Orthop Relat Res 1999; (368): 5-16
9. Mohamed A. Hefny & colleagues, spinal accessory neuropathy in chronic neck pain patients; WJR world of rheumatology 2012 ,October 3;2(2);21-26.
10. Chang CW, Chang KY, Chen YR, Kuo PL. Electrophysiologic evidence of spinal accessory neuropathy in patients with cervical myofascial pain syndrome. Arch Phys Med Rehabil 2011; 92: 935-940
11. Kim DH, Cho YJ, Tiel RL, Kline DG. Surgical outcomes of 111 spinal accessory nerve injuries. Neurosurgery 2003; 53: 1106-1112; discussion 1106-1112.
12. Dailiana ZH, Mehdian H, Gilbert A. Surgical anatomy of spinal accessory nerve: is trapezius functional deficit inevitable after division of the nerve? J Hand Surg Br 2001; 26:137-141.
13. Cherington M. Accessory nerve. Conduction studies. Arch Neurol 1968; 18: 708-709.
14. Daniel Dumitru, Machiel J. Zwarts; Special Nerve Conduction Techniques, ch.6; pg-234.
15. U.K. Mishra & J. Kalita; clinical neurophysiology; 2nd ed; Elsevier; 2012 pg 156.
16. Ana Paula Moura campos carvalho e silva and

- colleagues Electromyographic analysis of upper trapezius muscle relaxation induced by interferential current in subjects with neck discomfort; the journal of applied research, vol-11,no.-1,2011.
17. Sherman KJ, Cherkin DC, Hawkes RJ, Miglioretti DL, Deyo RA. Randomized trial of therapeutic massage for chronic neck pain. *Clin J Pain* 2009; 25: 233-238.
  18. Gross A, Miller J, D'Sylva J, Burnie SJ, Goldsmith CH, Graham N, Haines T, Brønfort G, Hoving JL. Manipulation or mobilization for neck pain. *Cochrane Database Syst Rev* 2010;(1): CD004249
  19. Mohamed A. Hefny & colleagues, spinal accessory neuropathy in chronic neck pain patients; *WJR world of rheumatology* 2012 ,October 3;2(2);21-26.
  20. Novak CB, Mackinnon SE. Nerve injury in repetitive motion disorders. *Clin Orthop Relat Res* 1998; (351): 10-20
  21. Benstead TJ, Sangalang VE, Dyck PJ. Acute endothelial swelling is induced in endoneurial microvessels by ischemia. *J Neurol Sci* 1990; 99: 37-49.
  22. Cornefjord M, Sato K, Olmarker K, Rydevik B, Nordborg C. A model for chronic nerve root compression studies. Presentation of a porcine model for controlled, slow-onset compression with analyses of anatomic aspects, compression onset rate, and morphologic and neurophysiologic effects. *Spine (Phila Pa 1976)* 1997; 22: 946-957
  23. Rempel DM, Diao E. Entrapment neuropathies: pathophysiology and pathogenesis. *J Electromyogr Kinesiol* 2004; 14: 71-75.
  24. Rempel D, Dahlin L, Lundborg G. Pathophysiology of nerve compression syndromes: response of peripheral nerves to loading. *J Bone Joint Surg Am* 1999; 81: 1600-1610.
  25. Dahlin LB, McLean WG. Effects of graded experimental compression on slow and fast axonal transport in rabbit vagus nerve. *J Neurol Sci* 1986; 72: 19-30.



## TO STUDY THE LEVEL OF STRESS IN THE STUDENTS AND IDENTIFY THE STRESS RELIEVING METHODS USED BY THEM

Thakkar Vaishali<sup>1</sup>, Shanishwara Mittal<sup>2</sup>, Udeshi Vaidehi<sup>3</sup>

1,2,3 Master of physiotherapy student, Shree K.K. Sheth Physiotherapy College, Rajkot.

### ABSTRACT

**BACKGROUND:** Stress is generally defined as body's nonspecific response or reaction to demands made on it. Medical education is very demanding and stressful. Coping strategies are defined as the person's constantly changing cognitive and behavioral efforts to manage specific external and internal demands that are appraised as taxing or exceeding the person's resources.

**PURPOSE OF STUDY:** To know the level of stress and coping methods used for that by students.

**METHODOLOGY:** Heads of the Health Science Institutes were approached and permission was taken to allow their students to participate in the study. Written informed consent was taken from all the students who are willing to participate in the study. Questionnaire comprising of two parts was explained to all participants 1) Perceived stress scale 2) Brief cope-28. Participants were requested to answer genuinely. The participants were requested to submit the filled questionnaires on the same session.

**DATA ANALYSIS:** ANOVA test was used to analyze the level of stress and descriptive analysis was done for coping strategies.

**Results:** Among 120 students (>50%) fell in the category High Level of Stress (LOS) & they commonly preferred Active coping, self-distraction and acceptance as their coping-strategies.

**KEYWORDS:** Stress, Coping Strategies, Perceived stress scale, Brief Cope-28.

## INTRODUCTION

Stress is generally defined as body's nonspecific response or reaction to demands made on it, or to disturbing events in the environment. It is a process by which we perceive & cope with environmental threats & challenges. Personal and environmental events that cause stress are known as stressors. It is noteworthy that the same stressors may be perceived differently by different people, depending on their cultural background, personality traits, experience and coping skills<sup>1</sup>.

Medical education is very demanding and stressful. When students look at their education as a challenge, stress can bring them a sense of competence and increased capacity to learn but when education is seen as a threat, such stress can elicit feelings of helplessness<sup>1</sup>.

Chronic and excessive stress leads to physical, emotional and mental health problems, reduced self-esteem and affects student's academic achievement, personal and professional development. Therefore, early detection and intervention may prevent and minimize the exert effects of stress on the people.<sup>1</sup> Coping strategies are defined as the person's constantly changing cognitive and behavioral efforts to manage specific external and internal demands that are appraised as taxing or exceeding the person's resources<sup>2,3</sup>.

Studies indicate increased level of stress in health science students but there are only few studies about coping strategies adopted by the Health science students. Hence this study will examine coping strategies of third and final year health science students as well as most commonly used coping methods amongst them. According to Folkman and Lazarus, coping strategies can be grouped into two types, problem - focused and emotion - focused coping. Problem - focused coping is aimed at problem solving or doing something to alter the source of stress. Emotion - focused

coping is aimed at reducing of managing the emotional distress that is associated with the situation.

Carver et al. have proposed 16 dimensions of coping: Five dimensions assess conceptually distinct aspects of problem - focused coping (active coping, planning, suppression of competing activities, restraint coping, seeking of 5 instrumental support); Other Five dimensions assess aspects of what might be viewed on emotion - focused coping (seeking of emotional social support, positive reinterpretation, acceptance, denial, turning to religion); and remaining six dimensions assess coping responses that are less useful [focus on and venting of emotions (venting) behavioral disengagement, humor, substance - use, self- blame]<sup>1</sup>.

Park and Adler reported that effective and 4 appropriate coping strategies may buffer the impact of newly encountered stressful situations on mental and physical health. Therefore, using coping strategies effectively and appropriately will help the students in improving their stress level. It was reported in the literature that students with an active coping style have lower level of psychological distress<sup>1</sup>.

## AIM OF THE STUDY

- To know the level of stress and coping methods used for that by students.

## OBJECTIVES OF THE STUDY

- To know the level of stress in Physiotherapy and Nursing students.
- To know the coping strategies adopted by students for stress.

## MATERIAL AND METHODOLOGY

**Study design:** Cross sectional Observational study

**Study setting:** Shree Krishna Hospital, Karamsad

**Study population:** 120 Physiotherapy and Nursing students.

**Sampling design:** purposive sampling

**Sample size:** 120

**Inclusion Criteria:** Third & final year Physiotherapy & Nursing students

**Exclusion Criteria:** Any student reporting mental disorder was excluded.

## METHODOLOGY

The study proposal was submitted and approved by Human research ethics committee of H. M. Patel center of Medical Care and Education, Karamsad.

Heads of the Health Science Institutes were approached, explained about the study and written permission was taken to allow their students to participate in the study. In a gathering of students, who satisfy the inclusion criteria, the study was explained and informed consent was taken from all the students who are willing to participate in the study. Questionnaire comprising of two parts, as shown below, was explained to all participants and information regarding how to fill up the questionnaire was provided.

## TWO QUESTIONNAIRES

1. Perceived stress scale
2. Brief cope-28

Also participants were requested to answer genuinely and follow fair and square methods while answering. Queries of the students if any, related to questionnaire, were clarified by the investigators immediately. The participants were requested to submit the filled questionnaires on the same session. Data collected from the answers of the questionnaire, which was assessing two components i.e. stress levels and coping methods utilized by the students, was analyzed for individual components.

## RESULTS

The classes of physiotherapy and nursing college were coded alphabetically as A, B, C, D, and E. From the questionnaires of 120 students the total score of perceived stress for each student was calculated.

The level of perceived score of stress of each student was identified and grouped according to various levels of perceived stress. And from this data mean, and standard deviation (SD) was calculated and ANOVA was used to know whether there is any significant difference in level of stress in students. To know between which classes of students there is more significant difference post hoc test was done. Then from questionnaire the data of brief cope-28 was collected and descriptive analysis was done.

The results indicate various levels of significant stress in all the groups. As seen in Table-1, 66 participants of 120 (>50%) fell in the category of more than 21 LOS indicating High stress level. Only 8 students fell in the low LOS i.e. between 8-11.

All the classes showed increased level of perceived stress (average LOS is 12-15). However more than 21 LOS indicates significantly high LOS which is seen in almost 4 classes. Significant difference of LOS ( $p < 0.034$ ) between the classes was determined by ANOVA.

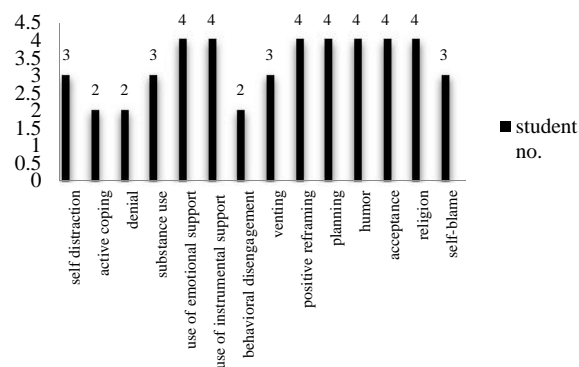
To understand the stress levels of each class as against the other classes, Post Hoc analysis for comparison was done. Class E of particular institute was most stressed with A & B of particular institute being minimally stressed. Thus in the ascending order the stress levels of classes are as shown:  $A < B < D < C < E$ .

There is one particular student amongst 120 with lowest level of stress who is seen not to give preference to any particular coping strategy.

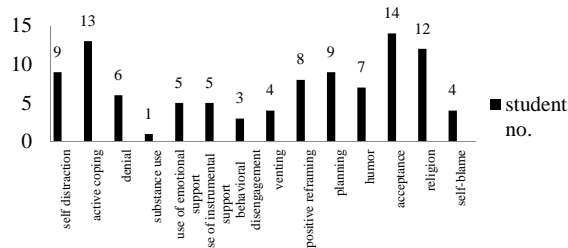
Graph- 1,2,3,4,5 shows the students with higher perceived level of stress, these students are commonly seen to prefer Active coping, self-distraction and acceptance as their coping-strategies.

**TABLE 1 - CATEGORICAL VARIABLE OF LOS (THE TABLE SHOWING NUMBER OF STUDENTS UNDER VARIOUS LEVELS OF STRESS)**

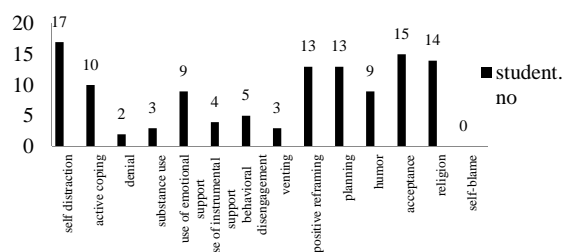
Levels of stress	Frequency	Percent (%)
8-11	8	6.7
12-15	11	9.2
16-20	35	29.2
>= 21	66	55.0
Total	120	100.0



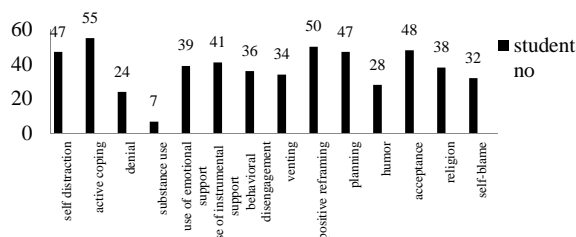
**GRAPH- 1: LOS 0-7 COPING STRATEGIES**



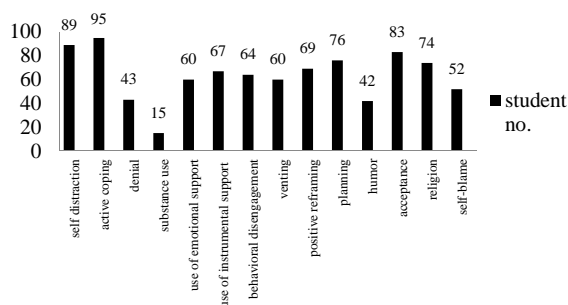
**GRAPH- 2: LOS 8-11 COPING STRATEGIES**



**GRAPH - 3: LOS-12-15 COPING STRATEGIES**



**GRAPH -4: LOS-16-20 COPING STRATEGIES**



**GRAPH- 5: LOS-21-40 COPING STRATEGIE**

## DISCUSSION

There are very few studies done in India to analyze stress level of students. The present study was undertaken to study level of stress & also identify the coping strategies preferred by the students. The study indicated more than 50% of the total participants falling under the category of high perceived level of stress. And only one student

amongst 120 was having low level of perceived stress (LOS 0-7). A number of studies have concluded that the students belonging to medical profession are stressed due to many of the factors like academic burden, home sickness, social problem and many other different problems.<sup>9,10</sup> The reasons of stress in particular did not form the part of study. So it is difficult to state any particular reason of stress amongst 120 students studied. M S Sherina conducted a study at Malaysian university in 2002 and found that the prevalence of psychological stress among medical students was high and Psychological stress was also significantly associated with depression<sup>12</sup>.

For analysis classes were coded as A,B,C,D and E also students were grouped according to different levels of stress i.e.0-7,8-11,12-15,16-20 & >20. With post hoc test we found that class E of third institute was most stressed as compared to classes C & D of second institute whilst class A & B of first institute was minimally stressed. A number of studies have been done to know the coping strategies used by the students for stress<sup>(1,2)</sup>. The present study found that students with different perceived level of stress were using various different methods as their coping strategies.

LOS (0-7): There was only one student with this level of minimal stress, this student as seen did not give preference to any particular coping strategy.

LOS (8-11): The students in this category were identified as mostly using acceptance, active coping and religion as their coping strategies.

LOS (12-15): The students in this category were mostly using self-distraction, acceptance and religion as their coping strategies.

LOS (16-20): In this group of students it was found that active coping, positive-reframing and acceptance as their mostly used coping-strategies.

LOS (21-40): The majority of students belong to this group and were seen as using active-

Coping, self-distraction and acceptance as their main coping strategies.

Thus this study also conclude that the students of Health science Institutes are highly stressed but the good point on the other part was that in almost all the categories the students were using coping strategies like active-coping, self-distraction and acceptance as reported in different studies<sup>1,7,13,14</sup>. Mosley et al reported that the type of adaptive or maladaptive coping skill developed during medical school may have consequences for long term professional adaptation or impairment<sup>1</sup>.

So, corrective steps are essential to be taken at the beginning of medical under graduations such that the students develop and inculcate a habit of adaptive coping skills during their formative years, this will help them throughout their life time.

## CONCLUSION

1. Students of Health science institutes studied had high perceived level of stress.
2. The students were commonly using active coping, self-distraction and acceptance as their coping strategies.

## LIMITATIONS

1. Reasons of stress were not taken into consideration for the study.
2. Gender was not considered separately for analysis of the data.

## RECOMMENDATIONS FOR FURTHER STUDY

1. Health science and / or other Institutes can be included and same study can be carried out.
2. Level of stress can be studied separately between male and female students.
3. Coping strategies can be compared between two genders.

## ACKNOWLEDGEMENT

We gratefully acknowledge to the Assistant Professor Dr. Ashish Kakkad, all other respected teachers (Shree K.K Sheth Physiotherapy college, Rajkot.) and all participating student, librarian and my colleagues for their kind support and help for this study.

## REFERENCES

1. Muhammad Saiful BY. Stress, Stressors And Coping Strategies Among Secondary School Students In A Malaysian Government Secondary School: Initial Findings ASEAN Journal of Psychiatry, Vol.11 (2) July – December 2010: XX XX.
2. M. Kate, U.J. Kulkarni, Y.C. Shetty, Y.A. Deshmukh, V.V. Moghe. Acknowledging Stress in Undergraduate Medical Education and Methods of Overcoming it Current Research Journal of Social Sciences 2(5): 282-287, 2010 ISSN: 2041-3246.
3. Helmers KF, Danoff D, Steinert Y, Leyton M, Young SN. Stress and depressed mood in medical students, law students, and graduate students at McGill University. Acad Med. 1997 Aug; 72(8):708-14.
4. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Social Behavior 1983;24; 385-396.
5. Carver, C. S. (1997). Brief COPE 28. International Journal of Behavioral Medicine, (vol 4), 92-100.
6. Mannapur b, dorle as, hiremath ld, ghattargi ch, ramadurg u, Kulkarni kr. a study of psychological stress in undergraduate medical students at s. n. medical college journal of clinical and diagnostic research 2010 ;( 4):2869-2874.
7. Mohsin Shah, Shahid Hasan, Samina Malik, and Chandrasekhar T Sreeramareddy, Perceived Stress, Sources and Severity of Stress among medical undergraduates in a Pakistani Medical School BMC Med Educ. 2010; 10: 2.
8. Robert JM., Sarah AG, Kathleen R, Joseph D. A Comparative Study of Professional Student Stress. J Dent Educ. 73(3): 328-337 2009© 2009 American Dental Education Association.
9. Elzubeir MA, Elzubeir KE, Magzoub ME, King Saud bin Abdul Aziz, Stress and coping strategies among Arab medical students: towards a research agenda. University for Health Sciences, Educ Health (Abingdon). 2010 Apr; 23(1):355. Epub April 9, 2010
10. Rafidah Kamarudin Azizah, Aris Norzaidi, Mohd Daud Chong, Siong Choy Salwani, Mohamed Intan Noraini, Ibrahim Stress and academic performance: empirical evidence from university students. Academy of educational leadership Journal Publisher Jan, 2009; 13(1)
11. M S Sherina, L Rampal, N Kaneson, Psychological Stress Among Undergraduate Medical Students Med J Malaysia 2004; 59 (2).
12. Jan DH, Ai Hang Do, Kathryn A. Hollenbach, Anthony SM, David SA, Students' Health-Related Quality of Life Across the Preclinical Pharmacy Curriculum Am J Pharm Educ. 2009 December 17; 73(8): 147.

## EFFICACY OF SCHEMATIC EXERCISES OVER STRENGTHENING EXERCISES ON WALKING ABILITIES, STRIDE LENGTH AND CADENCE IN DIABETIC NEUROPATHY

Raghav D<sup>1</sup>, Gera A<sup>2</sup>, Sharma M<sup>3</sup>, Rathore P<sup>4</sup>, Pajnee K<sup>5</sup>.

1 MPT (Musculoskeletal), Principal, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh

2 MPT (Neurology),

3 MPT (Neurology), Assistant Professor, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh.

4 MPT (Cardio-Pulmonary), Assistant Professor, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh.

5 MPT (Sports medicine), Assistant Professor, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh.

### ABSTRACT

**AIM:** To measure the efficacy of schematic exercises over strengthening exercises on walking abilities, stride length and cadence in diabetic neuropathy.

**BACKGROUND:** Diabetic neuropathy leads to alteration in gait parameters like lower velocity, decrease cadence, increased stance time and shorter stride length. There is necessity for studies that examine the contribution of muscle strength decrement on musculoskeletal complications and to see the effect of resistance training in the improvement of gait parameters.

**METHODS:** A total of 30 Diabetic patients were selected on the basis of inclusion and exclusion criteria and divided into two groups. Group A or Intervention group i.e. focused exercise regimen and Group B or Control group i.e. strengthening exercises. Each group performed the exercises for duration of 30 minutes per day for 5 times a week for 3 weeks. The gait parameters such as Stride length and Cadence and Dynamic gait index were assessed during the first day before treatment and at the end of third week for both the groups.

**RESULT:** Post-test comparison of mean and standard deviation values of stride length, cadence, between group-A and group-B was significant with p-value (0.009) and (0.001) ( $p < 0.05$ ) respectively, but the difference between the post values for dynamic gait index was not significant with p-value (0.06) ( $p > 0.05$ ).

**CONCLUSION:** this study suggested that schematic/ focused group regimen is significant tool than strengthening exercises in improving gait in patients with diabetic neuropathy and sensations as well as muscular strength both need improvement in order to achieve balance and gait improvement.

**KEYWORDS:** Diabetic neuropathy, schematic exercises, strengthening exercise, stride length and cadence.

### INTRODUCTION

Diabetes Mellitus is a group of metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both<sup>1,2</sup>. The vast majority of cases of diabetes fall into two broad categories. In one category, type 1 diabetes, the cause is an absolute deficiency of insulin secretion. In the other, much more prevalent category, type 2 diabetes, the cause is a combination of resistance to insulin action and an inadequate compensatory insulin secretory response<sup>2</sup>. Worldwide-The prevalence of diabetes for all age-groups was estimated to be 2.8% in 2000 and 4.4% in 2030.

At least 75% of all diagnosed neuropathies are distal and symmetrical. Neuropathy usually leads patients to progressive loss of distal to proximal somatosensory sensitivity, especially during night time<sup>3</sup>.

The loss of sensation associated with diabetic peripheral neuropathy is thought to contribute to impaired balance, altered gait patterns, and increased risk of falling, power generation at the ankle, and decreased ground reaction forces<sup>4</sup>.

Although exercises like focused exercise regimen would increase the rapidly available ankle strength that would show improved balance<sup>5</sup>. Combination of balance exercises, walking task, strength and endurance exercises are effective for the improvement of gait and balance<sup>6</sup>. On contrary specific exercise regimen like bipedal and unipedal

toes and heel raises, inversion, eversion improved clinical measures of balance in patients with diabetic polyneuropathy<sup>5</sup>.

After a plethora of literature and information available on the basis of concrete ground this study has been designed to evaluate the efficacy of schematic exercises over strengthening exercises on walking abilities, stride length and cadence in diabetic neuropathy.

### METHODS

30 patients of diabetic neuropathy selected from the O.P.D of the Leprosy Mission Hospital, Delhi. And Indraprastha Diagnostic Center, Delhi. The Inclusion Criteria were age between 50 to 80 years, History of diabetes treated by diet, oral hypoglycemics or insulin, peripheral neuropathy, Ability to walk without difficulty, Muscle strength of knee and ankle more than grade 3 and bilaterally positive Semmes Weinstein monofilament test and Diabetes duration > 7 years. However, history of cardiorespiratory problem, Concomitant foot ulcers, orthopedic or surgical problems, vestibular dysfunction affecting gait, postural hypotension and alcohol or drug abuse were excluded.

### PROCEDURE

Subjects who satisfied the inclusion criteria were requested to sign the written consent form and then

randomly divided into two groups: Group A or Intervention group and Group B or Control group. Basal gait parameters (i.e. stride length, cadence, and dynamic gait index) were measured before and after the treatment for all the subjects by following method:

1) Stride length and Cadence- The patients were asked to relax and walk from a starting point marked on the floor after immersing the affected foot in a tray containing chalk powder paste to gain the impressions of the foot. This procedure was repeated twice for the reliability factor and the time was recorded in the stop watch for the number of steps walked per minute which gave the value of cadence and the stride length was measured by using an inch tape.

2) Dynamic gait index- It has 8 items: walking, walking while changing speed, walking while turning the head horizontally and vertically, walking with pivot turn, walking over and around obstacles, and stair climbing. The scoring is based on a 4-point scale ranging from 0 to 3. The best performance total score is 24.

The gait parameters such as Stride length and Cadence and Dynamic gait index were assessed during the first day before treatment and at the end of third week respectively for both the groups.

Each group performed the exercises with time duration of 30 minutes per day for 5 times a week for 3 weeks.

## GROUP A -FOCUSED REGIMEN EXERCISES/ SCHEMATIC EXERCISES

These exercises were performed on firm surface for the period of three weeks.

1) Warm up (open chain exercise): subjects wrote the alphabet in the air with each foot by moving the ankle.

2) Bipedal toe raises and heel raises (lifting the forefoot as one does to balance on a heel):

subjects did these as quickly as possible by using support if necessary and started with 1 set of 10 and increased it by 1 set after every 5 exercise sessions for a total of 3 sets.

3) Bipedal inversion and eversion: center of mass was shifted laterally as strengthened ankle invertors and evertors via closed chain exercises without using the upper extremities, but support used as necessary. Started with 10 repetitions in each direction and increased to 2 sets of 10 repetitions after 5 exercise sessions.

4) Unipedal toe raises and heel raises: Subjects attempted to perform this quickly—even if that was not possible. Subjects started with 5 repetitions of each exercise and increased to 10 repetitions after 5 exercises and then to 2 sets of 10 after every 10 exercise sessions.

5) Unipedal inversion and eversion

Subjects inverted and everted the foot while standing on it to challenge balance and to create a closed chain exercise of the ankle invertors and evertors. It was anticipated that most subjects would find this task challenging and so they used their hands for balance when needed. Subjects started with 1 set of 5 repetitions in each direction and increased to 10 repetitions after 5 exercise sessions.

6) Wall slides: Subjects started with bipedal slides with knee flexion maximum of about 45°. They performed 3 sets of 10 repetitions. After 5 exercise sessions the first set was performed on each foot.

7) Unipedal balance for time three tries on each foot.

## GROUP B- STRENGTHENING EXERCISES: PERFORMED WITH THERA BANDS

1) *Knee resistive exercises –subject performed knee flexion and extension resistive exercises with theraband.*

A) Knee flexion-(Prone) Attach elastic to secure object. Attach elastic to ankle of involved leg. Lie face down. Begin with knee straight. Bend knee through available range. Slowly return to starting position.

B) Knee extension-(Prone) Lie face down, attach elastic to ankle. Attach other end of elastic to secure object near head or shoulders. Begin with knee bent. Extend knee against pull of band. Slowly return to start position and repeat.

2) *Ankle resistive exercises –subject performed ankle plantarflexion, dorsiflexion, inversion and eversion with theraband.*

A) Ankle plantarflexion-(Long sitting) Sit on floor or couch with leg in front. Hold elastic in hands. Attach other end of elastic to forefoot. Push foot forward. Slowly return and repeat.

B) Ankle dorsiflexion-(Long sitting) Sit on floor or couch with leg in front. Attach elastic to secure object in front of foot. Attach other end of elastic to forefoot. Pull foot backward toward shin. Slowly return and repeat.

C) Ankle Inversion-(Long sitting) Attach elastic to secure object Sit on floor with leg straight. Attach elastic to forefoot. Pull foot inward as shown. Slowly return and repeat.

D) Ankle Eversion-(Long sitting) Attach elastic to secure object. Sit on floor with leg straight. Attach elastic to forefoot. Pull foot outward as shown. Slowly return and repeat.

Repetitions and sets-Each exercise was performed for 3 sets of 10 repetitions.

Resistance:

In I week with low resistance yellow band.

In II week with moderate resistance red band.

In III week with high resistance green band.

## PROTOCOL

Total 30 subjects divided into two groups. Group A (n=15) and group B (n=15). Group A underwent schematic exercises / Focused exercises i.e. Warm up, Bipedal Toe Raises and Heel Raises, Bipedal inversion and eversion Unipedal toe raises and heel raises, Unipedal inversion and eversion, Wall slides, Unipedal balance for time and group B (n=15) underwent

(1) Knee Resisted Exercise (Knee flexion, Knee extension),

(2) Ankle Resisted Exercises (Ankle Plantar flexion, Dorsiflexion, inversion, Eversion) then after that

outcome measures i.e. stride length, Cadence and Dynamic Gait Index taken at 0 week and 3<sup>rd</sup> week.

## DATA ANALYSIS

The data was analyzed by using SPSS (windows-16.0). The outcome measures were the difference in stride length, cadence, and dynamic gait index between 0 week (pretest value) and at the end of 3<sup>rd</sup> week (posttest value). Paired t-test for within group comparison and between group comparisons. Significance for all statistical tests was set to  $p = 0.05$ .

## RESULTS

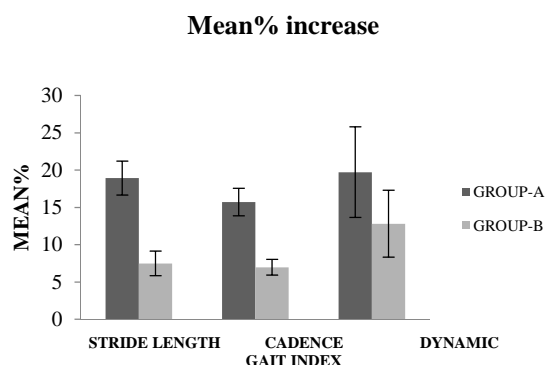
**TABLE: 1 COMPARISON OF AGE BETWEEN GROUPS**

Groups	Number of subjects	Mean $\pm$ SD	p-value
Group-A	15	57.33 $\pm$ 4.03	0.4417
Group-B	15	58.93 $\pm$ 6.50	

**TABLE: 2 MEAN IMPROVEMENT IN VARIABLES BETWEEN GROUP-A AND GROUP-B.**

Variables	Group-A	Group-B	p-value
Stride length	18.94 $\pm$ 2.29	7.49 $\pm$ 1.64	0.01*
Cadence	15.72 $\pm$ 1.84	6.98 $\pm$ 1.06	
Dynamic gait index	19.73 $\pm$ 6.07	12.81 $\pm$ 4.48	

\* Significance is  $P \leq 0.05$



**GRAPH 1: MEAN IMPROVEMENT IN ALL VARIABLES BETWEEN GROUPS.**

The difference between the age groups was not significant with p-value 0.44 ( $p > 0.05$ ) as in table 1.

Values were taken at 0 week and at the end of 3<sup>rd</sup> week. The pre mean and standard deviation values for stride length, cadence and dynamic gait index were 52.80 $\pm$ 3.28, 71.27 $\pm$ 2.28 and 17.20 $\pm$ 1.26 respectively. In post-test the mean and standard deviation values of stride length, cadence and dynamic gait index were 62.80 $\pm$ 4.09, 82.47 $\pm$ 2.95 and 20.53 $\pm$ 0.83. The difference between the pre

and post values was significant with p-value of 8.79, 2.04, 2.53 ( $p < 0.05$ ) respectively for stride length, cadence and dynamic gait index as in table 1.

However mean % increment in all the three variables of both groups and their significance. Mean% improvement with standard deviation % values of stride length, cadence, and dynamic gait index for group-A were 18.94%, 15.72%, and 19.73% and for group-B were 7.49%, 6.98%, 12.81%. The standard deviation % values for group-A were 2.29%, 1.84%, 6.07% and for group-B were 1.64%, 1.06%, 4.48%. The mean% improvement for stride length, cadence, and dynamic gait index between the group-A and group-B was significant with p-value of 0.0103 ( $p < 0.05$ ) as shows in fig. 1.

## DISCUSSION

This study aimed to evaluate the efficacy of schematic exercises over strengthening exercises on stride length, cadence and dynamic gait index of diabetic neuropathy patients and has demonstrated significant improvement in the stride length and cadence and comparatively lesser improvement in dynamic gait index in the group which underwent schematic/focused exercise regimen as compared to other group underwent strengthening exercise.

According Kwon et al. reduced ankle strength and mobility are the primary factors responsible for gait alterations<sup>6</sup>. The other aspect is that the lost sensation like proprioception, kinesthesia also lead to balance impairment and gait alterations and increased risk of falling<sup>4,7,8,9</sup>.

Although some researches have indicated the effect of balance training<sup>9</sup>, proprioceptive training<sup>10</sup>, combined balance, gait, strengthening exercises<sup>6</sup> or combined strength and aerobic exercises for improving balance, gait, or to reduce risk of fall. Till date limited researches have been done to investigate the effect of strength training on muscle weakness and then its following effect on gait deficit<sup>11</sup>.

This study demonstrated that some specific and focused exercises are required for neuropathic patients to improve the rapidly available ankle strength and improvement in balance<sup>5</sup> so taking this aspect as a baseline the present study has tried to demonstrate the effect of schematic exercises on gait. In this study we have given focused or schematic exercises to group-A and strengthening exercises to group-B. In both the groups there is an attempt to increase the muscle strength of lower limb and to see its effect on gait.

In a study done by L. Allet & S. Armand et.al 2009 showed that a specific gait and balance training program based on a circuit approach and balance exercises combined with function-orientated strengthening can improve gait speed and balance, and increases both muscle strength and joint mobility of diabetic patients<sup>6</sup>. Further studies with a larger sample size are needed to explore the influence of these improvements on the number of reported falls, physical activity levels and quality of life. Present study is being done on the context that although it was reported in the literature that there would be improvement



in the gait parameters of diabetic neuropathy patients with exercises. But it was not explicit from the literature that which type of exercises will be more beneficial to diabetic neuropathic patients.

Studies have shown that diabetic neuropathy patients are unable to generate adequate amount of torque when perturbed which can be attributed to decreased muscle strength and this can further lead to gait deficits, so schematic exercise regimen mainly emphasize on increasing rapidly available muscle strength in ankle and there by producing adequate amount of torque as well as proprioception rather than simply hypertrophy of muscle which is basically the after-effect of strengthening exercises.

Present study clearly demonstrated that there is significant improvement in gait parameters in both the group of patients. This improvement in the patients of group A may be due to increment in available torque around ankle, recruitment of motor units and improvement in ankle proprioceptive threshold by indirectly improving muscle strength<sup>5</sup>.

In group-B patients undergoing strengthening exercises have shown improvement in all gait parameters but showing less significant result that can be attributed that there was only hypertrophy of muscles after resistance training<sup>12</sup> and moreover it included open chain exercises that provide lesser proprioceptive feedback. While in group-A the exercises were properly designed in such a manner that they just not improve muscle strength but also other factors like proprioception, kinesthesia, torque production, and balance. Now considering the dynamic gait index that was used as a measurement tool for walking abilities, the study demonstrated that there was no significant difference between the groups but if mean% increment is being considered between both the groups dynamic gait index has demonstrated better improvement in group-A than in group-B. This again can be attributed to increased proprioception in group-A than in group-B. Our research showed statistically significant improvement in the gait parameters like stride length, cadence and dynamic gait index in both groups.

In our study substantial difference in the pre and post values of the stride length, cadence and dynamic gait index was observed in patients of group A and in group-B as both the schematic/focused exercises and strengthening exercises are responsible for improvement in muscle strength therefore are responsible for improvement in the gait parameters. As dynamic gait index is considered to be the one of the most reliable and valid tool, therefore it was taken as an outcome measurement.

The result of this study clearly establishes the supremacy of schematic exercises/ focused exercises over to that of the strengthening exercises in improving the gait parameters of patients with diabetic neuropathy, it also reveals that proprioceptive and kinesthetic sensation as well as muscular strength should be taken under consideration while planning the treatment of balance and gait in diabetic neuropathic patients.

## FUTURE RESEARCH

- Further studies are required with greater patient population.
- Other variables can include like walking velocity, step length, gait assessment rating scale.
- Gender specific can be done.

## RELEVANCE TO CLINICAL PRACTICE

Focused/ Schematic exercises can be used as a better tool in patients with diabetic neuropathy for improving the Walking abilities, Stride length and Cadence. So these exercises can also be used for some extent of improvement in gait of diabetic neuropathic patients.

## CONCLUSION

It was noticed that the patient with diabetic neuropathy which underwent schematic exercise regimen showed quite significant improvement in gait parameters except for dynamic gait index in which there was better mean improvement but not significant in comparison to that other group which underwent general strengthening exercises. Hence schematic/ focused group regimen can be suggested as a significant tool than strengthening exercises in improving gait in patients with diabetic neuropathy and it can also be concluded that sensations as well as muscular strength both need improvement in order to achieve balance and gait improvement.

## REFERENCES

1. World Health Organization, WHO/NCD/NCS/99.2; "Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications".1991.
2. American Diabetes Association, Diabetes care; "Diagnosis And Classification Of Diabetes Mellitus".Diabetes Care Journal.2005;Vol 28; s37-s42.
3. Isabel de Camargo Neves Sacco ,Silvia Maria Amado Joao; "Implementing a clinical assessment protocol for sensory and skeletal function in diabetic neuropathy patients at a university hospital in Brazil".Sao Paulo Med journal.2005;Vol 123(5);229-233
4. Hylton B. Menz, Bpod; "Walking Stability and Sensorimotor Function in Older People with Diabetic Peripheral Neuropathy". Arch Phys Med Rehabil.2004 Feb;Vol 85;245-252
5. James K. Richardson, David Sandman; "A Focused Exercise Regimen Improves Clinical Measures of Balance in Patients With Peripheral Neuropathy".Arch Phys Med Rehabili.2001Feb;Vol 3;205-209.
6. L. Allet, S. Armand; "The gait and balance of patients with diabetes can be improved: a randomized controlled trial". Diabetologia. 2009 November; Vol 53; 1592-1594.
7. Jennifer M. Yentes, Karen L. Perell; "Diabetic peripheral neuropathy and exercise". Clinical Kinesiology: Journal of the American Kinesiotherapy



- Association.2006.
8. R. W M. van Deursen, G. G. Simoneau; "Foot and Ankle Sensory Neuropathy, Proprioception, and Postural Stability". *Journal of Orthopaedic & Sports Physical Therapy*.1999; Vol 29(12); 718-726.
  9. M.S Ajimsha, J.K Paul, S. Chithra; "Efficacy of Stability Trainer in Improving Balance in Type II Diabetic Patients with Distal Sensory Neuropathy". *Journal of Diabetology*. 2011; Vol 1(6); 1-6.
  10. Santos AA, Bertato FT; "Effect of Proprioceptive Training Among Diabetic Women". *Rev Bras Fisioter*, São Carlos. 2008; Vol 12(3);183-187.
  11. Janet L Ruhland,Richard K Shields; "The Effects of a Home Exercise Program on Impairment and Health-Related Quality of Life in Persons With Chronic Peripheral Neuropathies".*Physical Therapy*.1997 October;Vol 77(10); 1026-1039.
  12. Carolyn Kisner, Lynn Allen Colby. *Therapeutic Exercise Foundations and Techniques*. Jaypee. 4; 2002. 59,131,133,134 pp.

## PEAK AEROBIC CAPACITY IN PATIENTS WITH CHRONIC LOW BACK PAIN: A COMPARISON WITH NORMAL SUBJECTS

Shikha Chulliyil<sup>1</sup>, Neeta Vyas<sup>2</sup>, Megha Sheth<sup>3</sup>

1<sup>1st</sup> Year MPT-Rehabilitation, S.B.B College Of Physiotherapy, Ahmedabad

2 Principal, S.B.B College Of Physiotherapy, Ahmedabad

3Lecturer, S.B.B College Of Physiotherapy, Ahmedabad

### ABSTRACT

**INTRODUCTION:** Decreased functional capacity has physiological and psychological implications that impair the subject's physical performance. Reported data in the literature with respect to aerobic capacity in patients with chronic low back pain (CLBP) are not conclusive. Objective of the study was to compare the peak aerobic capacity of patients with chronic low back pain with controls.

**METHODOLOGY:** A comparative study was conducted with 50 subjects that included 25 patients with CLBP (Group-A) and 25 age & gender matched normal asymptomatic subjects (Group-B). Subjects with low back pain for at least 3 months with or without referred or radiating pain between ages 18-55 years were included. Subjects were asked to complete questionnaires regarding demographics and perform 6-minute walk test & mean VO<sub>2</sub> peak calculated from 6-minute walk distance was compared between groups. Subjects with CLBP were also asked to complete the MODI questionnaire.

**RESULTS:** Unpaired 't'-test was used for comparing VO<sub>2</sub> peak between 2 groups. The mean VO<sub>2</sub> peak of group-A was 16.39 ml/kg/min & that of group-B was 17.60 ml/kg/min. The difference was found to be statistically significant ( $t=2.639$ ,  $p=0.011$ ). Pearson's correlation between VO<sub>2</sub> peak & MODI was found to be ( $r=-0.68$ ;  $p<0.001$ ) and Spearman's correlation between VO<sub>2</sub> peak & chronicity of pain was found to be ( $r=-0.556$ ;  $p=0.004$ ). Both were statistically significant.

**CONCLUSION:** Peak aerobic capacity of subjects with CLBP was found to be significantly less than that of normal subjects. Peak aerobic capacity had a moderate inverse correlation with disability & chronicity of pain in subjects with CLBP which was found to be significant.

**KEYWORDS** - Chronic low back pain, peak aerobic capacity, 6- minute walk test.

### INTRODUCTION

Low back pain (LBP) is a common symptom, affecting more than 80% of the general population in the industrialized world<sup>1</sup>. It is the most frequent cause of disability in people under 45 years of age<sup>2</sup>.

Low back pain with or without motion limitation that persists for 3 to 6 months is considered to be chronic. It never leaves completely, although the severity, duration, & region of pain may vary. Often in chronic pain, the specific movement or position that initially caused or aggravated the pain may become unclear or nonspecific<sup>3</sup>.

Chronic low back pain (CLBP) is a disabling disease which restricts quality of life. Psychological factors may have a larger impact on disability and quality of life than pain itself<sup>4</sup>. CLBP affects both younger and older adults with potentially significant consequences regardless of age. Among younger adults, chronic back pain is associated with disability, unemployment and lost productivity, whereas for older adults chronic back pain is associated with functional limitations, economic difficulty and social isolation<sup>5-7</sup>.

Oxygen consumption at the higher exercise levels does not readily plateau. The term 'Peak oxygen consumption' or 'VO<sub>2</sub> peak' applies when levelling off does not occur or test performance appears limited by local muscular factors rather than central circulatory dynamics. VO<sub>2</sub> peak refers to the highest value of oxygen consumption measured during a graded exercise test. Often the highest oxygen consumption occurs in the last minute of exercise<sup>8</sup>.

Cardiopulmonary Exercise Testing (CPET) with the measurement of peak oxygen uptake (VO<sub>2</sub> peak) is the "gold standard" for assessing aerobic capacity. However,

the test is relatively expensive and time consuming. Although CPET may be used periodically during a study, generally the 6 Minute Walk Test is used for the routine following of study patients' exercise capacity<sup>9</sup>.

The relation between physical fitness and low-back pain is unclear. Studies have explored this relationship by examining such measures of physical fitness including flexibility, aerobic capacity, strength, muscle endurance, and body composition. Scientific data have provided evidence both for<sup>10, 11, 12</sup> and against<sup>12, 13, 14, 15</sup> an association with LBP. So the aims and objectives of the present study were

- To compare the peak aerobic capacity (VO<sub>2</sub> peak) of patients with chronic low back pain with normal asymptomatic controls matched for age & gender, and
- To evaluate the correlation between
- Peak aerobic capacity & disability
- Peak aerobic capacity & chronicity of pain (years) in subjects with chronic LBP.

### METHODOLOGY

A comparative study was conducted at out-patient department of S.B.B College of Physiotherapy, Ahmedabad using convenient sampling.

50 subjects were included. Group-A had 25 subjects with CLBP & Group-B included 25 controls. Inclusion criteria for Group-A was presence of low back pain for at least 3 months with or without referred or radiating pain in the age group of 18-55 years including both genders. There should also be absence of any other medical condition that would affect the ability to complete

the 6-minute walk test (6-MWT) while aggravating the back pain. In Group-B age & gender matched normal asymptomatic adults without a sports practice more than twice a week and absence of medical history of chronic diseases or events related to cardiovascular health were included. All subjects were asked to fill PAR-Q before the test. Outcome measures taken were VO<sub>2</sub> peak calculated from the 6-minute walk test for peak aerobic capacity & Modified Oswestry Disability Index (MODI) for disability score.

## PROCEDURE

Nature and purpose of the study was explained. Informed written consent was obtained from the participants prior to the study. All subjects were examined and asked to complete a questionnaire about demographics. All subjects were asked to perform 6-minute walk test. Those with chronic LBP were asked to complete the MODI questionnaire also. Level of significance was kept at 5%.

## STATISTICAL ANALYSIS & RESULT

Data was analyzed using SPSS 16.0 Inc. & Microsoft Excel 2007. Data was tested for normal distribution using Kolmogorov-Smirnov test. Table-1 shows the demographic data of both groups. Unpaired 't'-test was used for comparing VO<sub>2</sub> peak between 2 groups (Table-2) and for comparing VO<sub>2</sub> peak between males & females of group-A (Table-3). Pearson's correlation test was used to find the correlation between VO<sub>2</sub> peak & MODI i.e. disability score & Spearman's correlation test was used to find correlation between VO<sub>2</sub> peak & chronicity of pain.

**TABLE-1: DEMOGRAPHIC DATA**

	GROUP-A	GROUP-B
AGE in years (MEAN $\pm$ SD)	37.08 $\pm$ 11.3	39.52 $\pm$ 10.85
NO. OF MALES	9	10
NO. OF FEMALES	16	15

**TABLE-2: COMPARISON OF MEAN VO<sub>2</sub> PEAK BETWEEN GROUP A AND B**

	MEAN $\pm$ SD	T	p	95% CI
GROUP-A	16.39 $\pm$ 2.01	2.639	0.011	0.28-2.13
GROUP-B	17.60 $\pm$ 1.08			

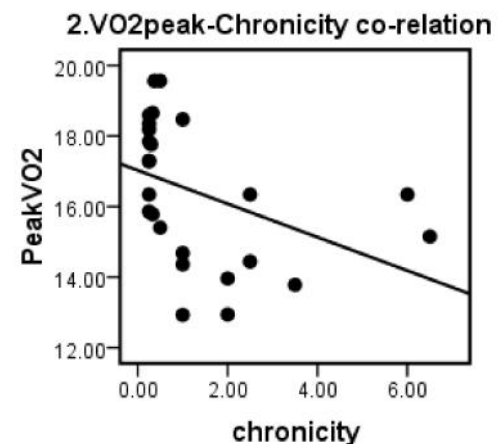
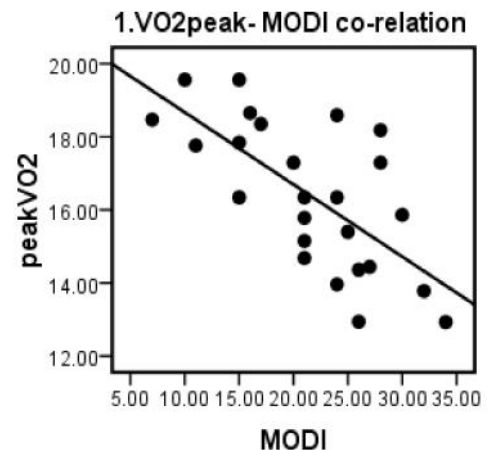
The mean VO<sub>2</sub> peak of group-A was 16.39 ml/kg/min & that of group-B was 17.60 ml/kg/min. As shown in table-2 difference in VO<sub>2</sub> peak between groups A & B was found to be statistically significant.

**TABLE-3: COMPARISON OF VO<sub>2</sub> PEAK BETWEEN MALES & FEMALES OF GROUP-A**

	N	MEAN $\pm$ SD	t	p	95% CI
MALES	9	17.95 $\pm$ 1.29	3.894	0.001	1.13-3.74
FEMALES	16	15.51 $\pm$ 1.82			

The mean VO<sub>2</sub> peak of males was 17.95 ml/kg/min & that of females was 15.51 ml/kg/min in Group A as shown in table-3, the difference in VO<sub>2</sub> peak between them was statistically significant.

VO<sub>2</sub> peak had a moderate inverse correlation with MODI ( $r = -0.68$ ;  $p < 0.001$ ) indicating that less the VO<sub>2</sub> peak more the disability. VO<sub>2</sub> peak had a moderate inverse correlation with chronicity of pain ( $r = -0.556$ ;  $p = 0.004$ ) indicating that more chronic was the pain, less was the VO<sub>2</sub> peak. Both the correlations were found to be statistically significant. Figures 1 & 2 show the graphs of correlation between the outcome measures.



## DISCUSSION

In this study, it was found that, compared with the asymptomatic population matched for gender and age, patients with chronic low back pain had a significantly lower peak aerobic capacity. It was also found that more chronic was the back pain, less was the peak aerobic capacity & more the disability & that women had less peak aerobic capacity compared to men in CLBP group.

In this study, patients with chronic low back pain had a significantly lower peak aerobic capacity ( $t=2.639$ ,  $p=0.01$ ) compared to controls.

A reduced aerobic fitness level in CLBP patients compared with the normative population was reported by Nielens and Plaghki<sup>16</sup>, Smeets et al<sup>17</sup>, Van der Velde &

Mierau<sup>18</sup>, Wittink et al<sup>19</sup> and Hoch et al<sup>20</sup> also reported lower VO<sub>2</sub>max values in patients with CLBP than those of the reference population.

A long-term pain-induced inhibition of physical activity like that induced by chronic low back pain leads to further deconditioning affecting mainly cardiovascular and respiratory capacity. This deconditioning can perpetuate the sensation of pain and create a vicious cycle from which the patient may never escape<sup>21</sup>. It has been established that active physical deconditioning significantly decreases maximal oxygen uptake<sup>22</sup>. Though there is controversy as to whether physiologic deconditioning takes place in patients with longstanding LBP, some suggest that a perceived decline in conditioning does exist<sup>23</sup>.

Additionally, Han TS et al found that body mass index was significantly increased in patients with CLBP. From a public health perspective, this association has been previously described in the literature demonstrating a link between overweight and low back pain<sup>24</sup>. Increased mechanical demands resulting from obesity have been suspected to cause low back pain and, in this case, this finding can be secondary to a diminished level of physical activity. Finally, the nature and severity of spinal changes responsible for specific low back pain could contribute to the poor VO<sub>2</sub>max value achieved<sup>21</sup>.

The mean VO<sub>2</sub> peak was found to be less than normal in the control group too. Regarding the control group, it is considered that their aerobic capacity is in line with categories proposed by Shvartz and Reibold<sup>28</sup> in healthy, but not highly trained, subjects. Men and women of healthy group were placed in the category “medium” of aerobic conditioning, confirming that the reference data in their study correspond as expected in a normative population which may be considered similar to the present study.

Strong evidence is still lacking about assumed disuse and a decrease in physical conditioning in patients with chronic LBP<sup>25</sup>. In the studies of Wittink et al<sup>26</sup> and Hurri et al<sup>15</sup> the levels of aerobic fitness in patients with CLBP were comparable with those of healthy persons. Wittink et al demonstrated that maximum oxygen consumption in patients with chronic LBP is equal to healthy sedentary men and active women<sup>26</sup>. Also, no significant relation was found between pain intensity and predicted oxygen uptake<sup>19</sup>. Among several components of physical fitness, aerobic capacity had no predictive value in the course of LBP<sup>15</sup>. This could be because those who agreed to participate in the study were not representative of all patients with chronic low back pain, or it might simply demonstrate the poor aerobic fitness of sedentary people in general. Perhaps this poor fitness level is related more to lifestyle than to back pain<sup>27</sup>.

In this study it was found that more chronic was the back pain, less was the peak aerobic capacity ( $r=-0.556$ ;  $p=0.004$ ). Bousema et al<sup>25</sup> found that a poor affect and perceived decline in physical activity in the sub-acute phase predicted a decreased level of physical activity over a 1-year period.

It was also found that more chronic was the back pain, more was the disability ( $r=-0.68$ ;  $p<0.001$ ). According

to Andersson, the longer the pain persists the greater the risk for long-term disability<sup>5</sup>. The level of aerobic fitness determines one's quality of life to the extent that adequate fitness allows one to perform activities of daily living<sup>21</sup>. Low back pain, which precipitates decreased activity and fear avoidance beliefs, may lead to an actual or perceived decline in conditioning. A progressive decrease in activity can cause patients to be less equipped to perform their normal activities of daily living<sup>23</sup>. Decreased functional capacity also has physiological and psychological implications that impair the subject's physical performance in the context of employment, sports practice and daily life<sup>17</sup>.

In the present study women were found to have lower peak aerobic capacity compared to men in CLBP group ( $t=3.894$ ,  $p=0.001$ ).

Women with CLBP were categorized as “very poor” according to Shvartz and Reibold<sup>28</sup> a lower category than men with CLBP. This difference could be explained by a more restricted physical activity in women compared to men. This diminishment in physical activity could be due to a greater perception of back pain intensity, as demonstrated by its measurement using visual analog scale.

Physical performance limitations during treadmill testing in patients with chronic LBP are largely attributed to an increase in pain intensity<sup>29</sup>. Therefore; fitness testing has its limitations due to the patient's potential fear avoidance behaviors, which would limit performance. Regardless of whether there is an actual decline in conditioning, the patient's perceptions are likely play a role. Furthermore, a perceived decline in physical activity, rather than an actual level of physical activity itself, is necessary to assess the impact of activity-related changes on disability in LBP<sup>30</sup>.

## LIMITATION

Instead of VO<sub>2</sub>max, VO<sub>2</sub> peak was measured. VO<sub>2</sub>max indicates the functional capacity of cardiorespiratory function and is considered as the benchmark indicator of cardio-respiratory fitness<sup>31</sup>. VO<sub>2</sub> peak, in addition to evaluating functional capacity in healthy and diseased individuals, is used to prescribe endurance exercise and monitor physical training adaptations<sup>32</sup>.

## CONCLUSION

Peak aerobic capacity of subjects with chronic LBP was found to be less than that of normal subjects. Peak aerobic capacity had a moderate, inverse correlation with disability & chronicity of pain in subjects with LBP which was found to be significant. Women with CLBP had a lower peak aerobic capacity than men.

## ACKNOWLEDGEMENT

The authors are grateful to all the subjects who donated their time and effort to participate in the study.

## CLINICAL IMPLICATION

Conditioning programs to improve physical fitness should be routinely recommended for individuals with CLBP to improve their functional capacity. Low-impact aerobic exercise like walking, swimming or riding a stationary cycle which are gentle on the back can provide effective conditioning.

## REFERENCES

1. Lively MW. Sports medicine approach to low back pain. *South Med Journal*. 2002; 95, 642–646.
2. Luo X, Pietrobon R, Sun SX, Liu GG, Hey L. Estimates and patterns of direct health care expenditures among individuals with back pain in the United States. *Spine*. 2004; 29, 79–86.
3. Rene Cailliet. Understand your backache- A guide to prevention, treatment & relief. F A Davis Co; 1984.
4. Scholich SL, Hallner D, Wittenberg RH, Hasenbring MI, Rusu AC. The relationship between pain, disability, quality of life and cognitive-behavioural factors in chronic back pain. *Disability and Rehabilitation*. 2012; November, Volume 34, Number 23, 1993–2000(8) doi:10.3109/09638288.2012.667187
5. Andersson GB: Epidemiological features of chronic low-back pain. *Lancet* 1999, 354(9178):581–585.
6. Weiner DK, Haggerty CL, Kritchevsky SB, Harris T, Simonsick EM, Nevitt M, Newman A: How does low back pain impact physical function in independent, well-functioning older adults? Evidence from the Health ABC Cohort and implications for the future. *Pain Medicine* 2003, 4(4):311–320.
7. Jacobs JM, Hammerman-Rozenberg R, Cohen A, Stessman J: Chronic back pain among the elderly: prevalence, associations, and predictors. *Spine* 2006, 31(7):E203–207.
8. McArdle WD, Katch FI, Katch VL. Exercise Physiology: Energy, Nutrition and Human Performance. Lippincott Williams & Wilkins. 2010; 235.
9. Ross RM, Murthy JN, Wollak ID, Jackson AS. The six minute walk test accurately estimates mean peak oxygen uptake. *BMC Pulmonary Medicine*; 2010.
10. Cady LD, Bischoff DP, O'Connell ER, Thomas PC, Allan JH. Strength and fitness and subsequent back injuries in firefighters. *J Occup Med*. 1979; 4:269–272.
11. Frost H, Klaber Moffet JA, Moser JS, Fairbank JCT. Randomised control trial for evaluation of fitness programme for patients with chronic low back pain. *Br Med J*. 1995; 310:151–154.
12. Kellett DA, Nordholm LA. Effects of an exercise program on sick leave due to back pain. *Phys Ther*. 1991; 71:283–291
13. McQuade KJ, Turner JA, Buchner DM. Physical fitness and chronic low back pain. *Clin Orthop*. 1988; 233:198–204.
14. Battie MC, Bigos SJ, Fisher LD, Hansson TH, Nachemson AL, Spengler DM, et al. A prospective study of the role of cardiovascular risk factors and fitness in industrial back pain complaints. *Spine*. 1989; 14:141–146.
15. Hurri H, Mellin G, Korhonen O, Harjula R, Harkapaa K, Luoma J. Aerobic capacity among chronic low-back-pain patients. *J Spinal Disord*. 1991; 4:34–38.
16. Nielens H, Plaghki L. Cardiorespiratory fitness, physical activity level, and chronic pain: are men more affected than women? *Clin J Pain*. 2001; 17:129–137.
17. Smeets RJ, Wittink H, Hidding A, Knottnerus JA. Do patients with chronic low back pain have a lower level of aerobic fitness than healthy controls? Are pain, disability, fear of injury, working status, or level of leisure time activity associated with the difference in aerobic fitness level? *Spine*. 2006; 31:90–97 discussion 98.
18. Van der Velde G, Mierau D. The effect of exercise on percentile rank aerobic capacity, pain, and self-rated disability in patients with chronic low-back pain: a retrospective chart review. *Arch Phys Med Rehabil*. 2000; 81:1457–1463.
19. Wittink H, Michel TH, Sukiennik A, Gascon C, Rogers W. The association of pain with aerobic fitness in patients with chronic low back pain. *Arch Phys Med Rehabil*. 2002; 83:1467–1471.
20. Hoch AZ, Young J, Press J. Aerobic fitness in women with chronic discogenic nonradicular low back pain. *Am J Phys Med Rehabil*. 2006; 85:607–613.
21. Ivan Duque, Jose´-Herna´n Parra, Alain Duvallet. Maximal aerobic power in patients with chronic low back pain: a comparison with healthy subjects. *Eur Spine Journal*. 2011. 20:87–93. DOI 10.1007/s00586-010-1561-0.
22. Raven PB, Welch-O'Connor RM, and Shi X. Cardiovascular function following reduced aerobic activity. *Med Sci Sports Exerc*. 1998; 30:1041–1052.
23. Hanney WJ, Kolber MJ, Beekhuizen KS. Implications for Physical Activity in the Population with Low Back Pain. *American Journal of Lifestyle Medicine*. 2009; 3(1):63–70.
24. Han TS, Schouten JS, Lean ME et al. The prevalence of low back pain and associations with body fatness, fat distribution and height. *Int J Obes Relat Metab Disord*. 1997 21:600–607.
25. Bousema EJ, Verbunt JA, Seelen HA, Vlaeyen JW, Knottnerus JA. Disuse and physical deconditioning in the first year after the onset of back pain. *Pain*. 2007; 130:279–286.
26. Wittink H, Hoskins Michel T, Wagner A, Sukiennik A, Rogers W. Deconditioning in patients with chronic low back pain: fact or fiction? *Spine*. 2000; 25:2221–2228.
27. Randall L Braddom. Physical medicine & Rehabilitation. Elsevier; 2007; 41:905.
28. Shvartz E, Reibold RC. Aerobic fitness norms for males and females aged 6–75 years: a review. *Aviat Space Environ Med*. 1990; 61:3–11.
29. Wittink H, Rogers W, Gascon C, Sukiennik A, Cynn D, Carr DB. Relative contribution of mental health and exercise-related pain increment to treadmill test intolerance in patients with chronic low back pain.

- Spine. 2001; 26:2368-2374.
30. Verbunt JA, Sieben JM, Seelen HA, et al. Decline in physical activity, disability and pain-related fear in sub-acute low back pain. *Eur J Pain*. 2005; 9:417-425.
31. McArdle WD, Katch FI and Katch VL. Exercise Physiology: Energy, Nutrition, and Human Performance. 4th edition. 1996. Philadelphia: Lea and Febiger. pp 188-213.
32. Shephard RJ. Tests of maximum oxygen intake: a critical review. *Sports Medicine*. 1984; 1, 99-124.

## TO FIND THE INTRA-RATER RELIABILITY AND CONCURRENT VALIDITY OF TWO METHODS OF MEASURING PECTORALIS MINOR TIGHTNESS IN PERIARTHRITIC SHOULDER PATIENTS

Setoo N. Jain<sup>1</sup>, Yagna U. Shukla<sup>2</sup>

1 2<sup>nd</sup> year MPT(Musculoskeletal), Government Physiotherapy college, Ahmedabad  
2 MPT(Musculoskeletal), Senior Lecturer, Government Physiotherapy College, Ahmedabad

### Abstract

**Background:** Postural abnormality and muscle imbalance are thought to contribute to pain & loss of normal function in the upper body. A shortened pectoralis minor muscle is commonly identified as a part of this imbalance. Shoulder Periarthritis is one such condition in which there is less scapular posterior tilt due to short pectoralis minor. Clinical tests have been recommended to test for shortening of this muscle.

**Objectives:** To evaluate the intra-rater reliability & concurrent validity of pectoralis minor length test.

**Study Design:** Observational study

**Method:** 50 patients having periarthritis of shoulder, aged 40-60 years, both male & female having unilateral affection were selected for the study. The linear distance between posterior border of Acromion & Table(AT-distance), measurement of Pectoralis Minor Length(PMI), Forward Shoulder Angle(FSA) was measured. AT-distance & PMI was measured twice by same assessor on the same day at interval of 30 minutes to find out intra-rater reliability & then AT-distance & PMI was co-related with FSA for concurrent validity.

**Results:** ICC of AT-distance is 0.97 & ICC of PMI is 0.96. Pearson Correlation Co-efficient(r) of AT-distance-FSA is 0.32 & Pearson Correlation Co-efficient(r) of PMI-FSA is -0.90.

**Conclusion:** Both the methods have good intrarater reliability and validity. But AT-distance is more reliable and PMI is more valid.

**Keywords:** Pectoralis Minor tightness, Periarthritis of shoulder, AT-distance, PMI, FSA

## INTRODUCTION

Shoulder pathology is the third most common musculoskeletal condition. In the absence of a specific or identifiable cause of symptoms, poor upper body posture, colloquially referred to as a 'forward head posture', 'slouched posture', 'poking chin posture', or 'rounded shoulder posture' has been cited as a potential etiological factor in the pathogenesis and perpetuation of many clinical syndromes involving the shoulder. Postural abnormality and muscle imbalance are thought to contribute to pain & loss of normal function in the upper body. A shortened pectoralis minor muscle is commonly identified as a part of this imbalance<sup>1</sup>. The pectoralis minor attaches at the coracoid process of the scapula and at the third, fourth, and fifth ribs near their sternocostal junctions.

Decrease in resting length of pectoralis minor muscle would increase the muscles passive tension with arm elevation causing restriction of normal scapular movements such as upward rotation, posterior tipping & external rotation<sup>2</sup>. The pectoralis minor muscle is the sole muscle connecting the scapula & anterior side of thoracic region. Therefore shortening of this muscle is expected to restrain scapular motion in the superior & posterior direction<sup>3</sup>. Shoulder Periarthritis is one such condition in which there is less scapular posterior tilt due to short pectoralis minor. Other clinical Syndromes associated with short Pectoralis minor are Thoracic outlet syndrome, Scapular downward rotation syndrome, Scapular winging & tilting syndrome. Clinical tests have been recommended to test for shortening of this muscle.

Sahrmann has stated that the shoulders tilt anteriorly because of a shortness of pectoralis minor and

that the lateral border of the spine (posterior aspect of the acromion) should be no more than 2.54 (2.6) cm from the treatment table when the subject is in supine.

Borstad and Ludewig proposed an alternative method for assessing the pectoralis minor length by measuring the distance from the caudal edge of the fourth rib at the sternum and the inferomedial aspect of the coracoid process. In a cadaver study (n = 11) Borstad and Ludewig reported that the external measurement correlated with the length of pectoralis minor length following dissection. However, confounding variables such as postural sway and respiration cannot be controlled for in cadaveric investigations. To normalize the measurement the pectoralis minor length Borstad and Ludewig recommended dividing the measurement by the subject's height and multiplying by 100. Of relevance, Borstad and Ludewig reported that asymptomatic subjects with a relatively shorter normalized pectoralis minor length demonstrated significantly less scapular posterior tilt at 90° and 120° sagittal plane, scapular plane and coronal plane humeral elevation<sup>1</sup>.

Kendall et al stated that posture and relative alignment of body segments are affected by muscle shortening and weakness. They describe forward shoulder posture as the result of the shoulders being pulled forward by overdeveloped, shortened, or tight anterior shoulder girdle muscles, such as the serratus anterior, pectoralis major, pectoralis minor, and upper trapezius muscles or may be caused by weakness and lengthening of the muscles that function to pull the scapulae toward the spine, such as the middle and lower trapezius muscles. According to Knudsen, forward shoulders can be attributed to the presence of excessive and habitual flexion of the back<sup>9</sup>.

Pectoralis minor adaptive shortening has been implicated as a mechanism for forward shoulder posture<sup>9</sup> and for shoulder impingement.

Frozen shoulder<sup>8</sup> also known as Periarthritis Shoulder, is a disorder in which the shoulder capsule, the connective tissue surrounding the glenohumeral joint of the shoulder, becomes inflamed and stiff, greatly restricting motion and causing chronic pain. It appears to be more common in females than males. It causes Capsular pattern of restriction. It can be primary or secondary. There are mainly 3stages:

Stage 1:- Preadhesive: 0-3mnths

Stage 2:- Freezing: 3-9mnths,

Stage 3:- Frozen: 9-15mnts

Stage 4:- Thawing: 15-24mnths

## NEED OF THE STUDY

Periarthritis is common condition in which pectoralis minor is tight & checking muscle tightness is important part of examination. There are various methods for testing pectoralis minor tightness. Earlier the studies have been done on healthy adults & cadavers. So it was necessary to find out which method is best & easily performed on patients.

## AIMS & OBJECTIVES

To evaluate the intra-rater reliability of Acromion to Table (AT) distance and Pectoralis Minor length Index (PMI).

To validate AT-distance and PMI using Forward Shoulder Angle (FSA).

## METHODOLOGY

### MATERIALS

- Consent Form
- Rigid Plastic Right angle
- Measure Tape
- Adhesive marker
- Camera
- Plinth
- Pen

**SAMPLE SIZE:** 50

**STUDY DESIGN:** Observational Study

**STUDY SETTING:** OPD of Government Physiotherapy College, Civil Hospital, Ahmedabad

**SAMPLING DESIGN:** Convenient sampling

### INCLUSION CRITERIA

- Patients willing to participate in the study
- Patients with unilateral Periarthritis stage 2
- Presence of capsular pattern ER>ABD>IR
- Age 40-60yrs

### EXCLUSION CRITERIA

- Trauma and surgery around shoulder
- Cervical Radiculopathy
- Rheumatoid arthritis
- Any neurological condition

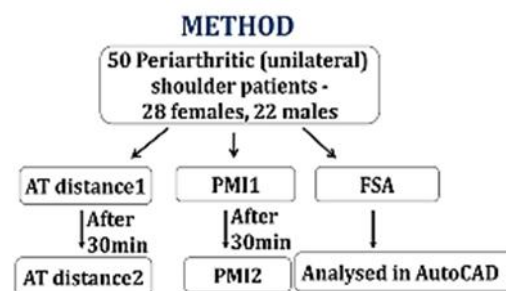
### TECHNIQUE

Prior to the study, all patients were explained about the procedure, written informed consent taken & approval from ethical committee taken.

AT distance: Acromion to Table distance

PMI: Pectoralis Minor length Index

FSA: Forward Shoulder Angle



**FIGURE 1**

### AT Distance<sup>4, 7</sup>

The patient is supine, arms by side, elbows flexed and instructed to relax. The assessor measures the linear distance in millimeters using a rigid standard plastic transparent right angle with a height of 10cm and a base of 6cm between the posterior border of the acromion and the table. Without exerting any downward pressure into the table, the base was placed on the treatment table and the vertical side was placed adjacent to the lateral aspect of the acromion. Distance should not exceed 2.54 cm (1 inch). A distance greater than this would suggest a muscle imbalance had occurred and the muscle had shortened.

It was observed by the researchers that the distance did not change if the subjects arms were by the side, actively held by the side with the fingers pointing to the ceiling or resting as described above gently on the abdomen. In addition to this attention to ensure that the plastic right angle did not bend during the investigation was carefully adhered to.

### PMI<sup>3, 4, 7</sup>

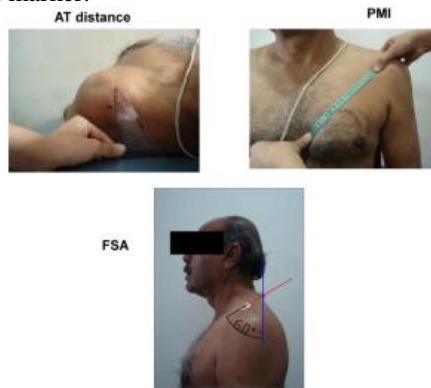
The PMI is calculated by dividing the resting muscle length measurement by the subject height and multiplying by 100. The resting muscle length is measured between the caudal edge of the 4th rib to the inferomedial aspect of the coracoid process with a measuring tape or sliding caliper. PMI is suggested to reflect a shortened pectoralis minor when 7.65 or lower.

### FSA<sup>5</sup>

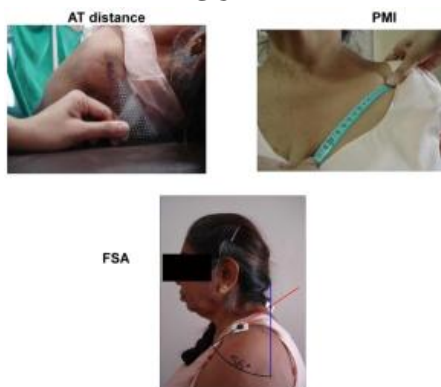
The ideal posture group criteria was defined as FSA < 22°. The FSP group criteria was defined as FSA > 52°.



Shoulder angle: measured from the vertical posteriorly to a line connecting the C7 marker and the acromial marker.



**FIGURE 2**



**FIGURE 3**

## RESULTS

Data analysis was done by SPSS 16 version.

The intra-rater reliability was assessed by Intra-Class Correlation (ICC).

Concurrent validity was assessed by Pearson's correlation co-efficient (r).

**TABLE 1**

	Mean±SD
Age(yrs)	51.56±6.47

**TABLE 2**

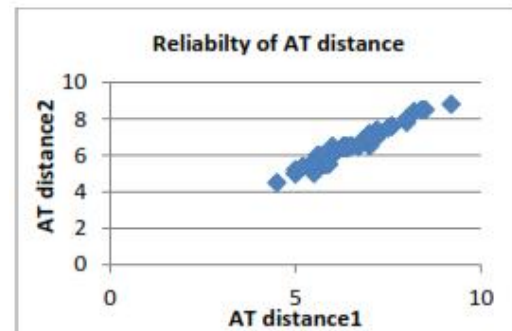
	Mean±SD
AT distance1	6.56±1.01
AT distance2	6.54±0.99
PMI1	7±0.54
PMI2	6.99±0.53
FSA	57.52°±6.47

**TABLE 3**

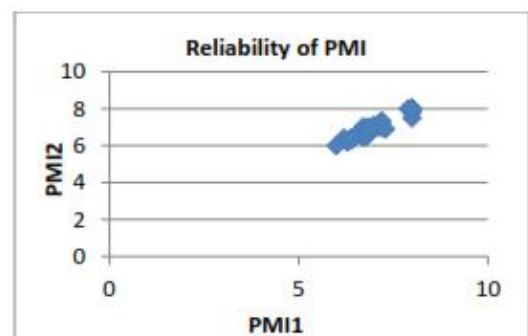
	Intra-class Correlation Co-efficient (ICC)	95% Confidence Interval(CI)
AT distance	0.97	0.96 to 0.98
PMI	0.96	0.93 to 0.97

**TABLE 4**

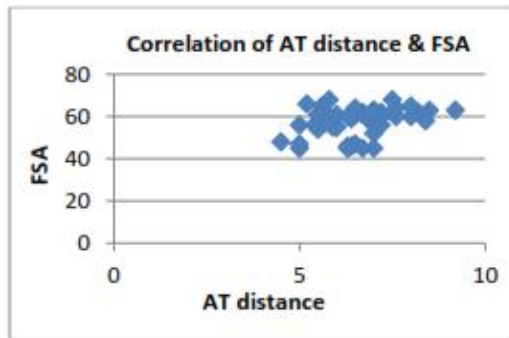
	Pearson's Correlation Co-efficient(r)	p-value
AT distance-FSA	0.32	<0.05
PMI-FSA	-0.90	<0.01



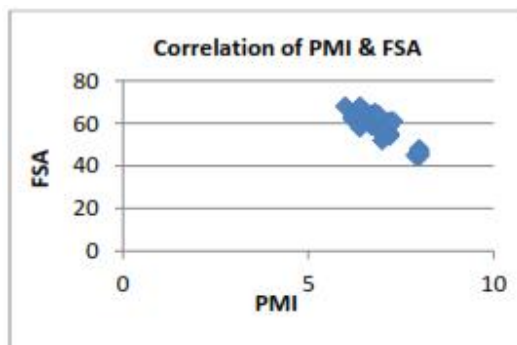
**GRAPH 1**



**GRAPH 2**



**GRAPH 3**



**GRAPH 4**

## DISCUSSION

With Pectoralis Minor tightness, combination of postures has been associated with a reduction in glenohumeral movement and a number of clinical conditions including SIS<sup>4</sup>. The pectoralis minor has also been identified as a muscle requiring stretching in individuals with forward shoulder posture<sup>6</sup>.

The Intra-Class Correlation Co-efficient (ICC) for AT-distance is 0.97 & 95% Confidence Interval (CI) is 0.96 to 0.98. The Intra-Class Correlation Co-efficient (ICC) for PMI is 0.96 & 95% Confidence Interval (CI) is 0.93 to 0.97. Portney and Watkins has suggested that ICC values above 0.75 are indicative of good reliability and those below 0.75 should be considered as poor to moderate. Portney and Watkins state; "For many clinical measurements reliability should exceed 0.90 to ensure reasonable validity"<sup>4</sup>. All the ICC measurements in this investigation exceeded 0.90 which suggests they have exceeded the threshold for both good reliability and reasonable validity. However ICC value of AT-distance is more than PMI.

The single measure ICC results ranged from 0.96 to 0.98 for AT-distance and 0.93 to 0.97 for PMI. The mean measurements ranged from 5.55cm to 7.57cm for AT-distance, 7.54cm to 6.46cm for PMI and 51.05° to 63.99° for FSA. These results compare closely to those reported by Borstad who recorded mean pectoralis length test; AT-distance ranges from 5.96 cm to 6.57 cm in 50 asymptomatic subjects that had been subdivided into two separate groups. Borstad et al<sup>4</sup> carried out study on 82 subjects and he found the mean PMI was 8.24, with a standard deviation of 0.80. Patients with a PMI lower than

7.44 (mean PMI – 1 SD) could be considered to have a relatively short pectoralis minor.

Pearson's Correlation Co-efficient (r) for AT-distance-FSA shows Positive Correlation  $r = 0.32$  which is significant at  $p < 0.05$ . Pearson's Correlation Co-efficient (r) for PMI-FSA shows Negative Correlation  $r = -0.90$  which is significant at  $p < 0.01$ . Clinically significant ranges for the Correlation Co-efficient (r) were designated  $< 0.25$  as little or no relationship; 0.25-0.50 as fair; 0.50-0.75 as moderate to good; and  $> 0.75$  as good to excellent<sup>9</sup>. PMI shows more Correlation than AT-distance. The findings of this investigation suggest that although the AT-distance test is reliable but it lacks the diagnostic accuracy.

## LIMITATIONS

Postural alterations & soft tissue contour during measurement may affect the results.

## CONCLUSION

Thus above findings suggest that for measuring pectoralis minor tightness

- Both methods AT-distance & PMI are found to be reliable. But when compared, AT-distance is more reliable.
- When both are correlated with FSA, PMI is accurate & valid than AT-distance.
- FSA measurement requires tedious work & may not be possible at every clinical setup, so one can use any 1 of the above methods, but better to use PMI.

## ACKNOWLEDGEMENTS

The authors would like to thank the support of the staff of Government Physiotherapy College, Ahmedabad and also like to thank the patients for their willingness to participate in the study.

## CLINICAL APPLICATION

The clinical measurement of the pectoralis minor resting length may guide the Physiotherapist to know which method is best & thereby assist in assessment, treatment planning & assessing intervention effectiveness at every clinical setup.

## REFERENCES

1. Lewis J.S., Valentine R.E. "The Pectoralis minor length test: a study of the intra-rater reliability & diagnostic accuracy in subjects with & without shoulder symptoms." *BMC Musculoskeletal Disorders*. 2007; 8:64.
2. Borstad J.D. "Resting position variables at the shoulder: Evidence to support a posture-impairment association." *Journal of the American Physical Therapy Association*. 2006; 86(4):549-557.

3. Muraki T, Aoki M., Izu.mi T, Fujii M., Hidaka E., Miyamoto H. "Lengthening of the pectoralis minor muscle during passive shoulder motions & stretching techniques: a cadaveric biomechanical study." *Phys Ther.* 2009; 89(4).
4. Borstad J.D. "Measurement of Pectoralis Minor Muscle Length: Validation and Clinical Application." *Journal of Orthopaedic and Sports Physical Therapy.* 2008; 38(4):169-174.
5. Thigpen CA., Padua D., Michener L., Guskiewicz K., Giuliani C., Keener J., Stergiou N. "Head and Shoulder posture affect scapular mechanics and muscle activity in overhead tasks." *J Electromyogr kinesol.* 2010.
6. Borstad J., Ludewig P. "The Effect of Long Versus Short Pectoralis Minor Resting Length on Scapular Kinematics in Healthy Individuals." *J Orthop Sports Phys Ther.* 2005;35(4).
7. Struyf F., Nijs J., Mottram S., Roussel N., Ann M J Cools, Meeusen R. "Clinical assessment of the scapula: a review of the literature." *Br J Sports Med* 2012;0:1–8.
8. Kelley M., McClure Pw, Leggin B. "Frozen Shoulder: Evidence and a Proposed Model Guiding Rehabilitation." *J Orthop Sports Phys Ther.* 2009; 39(2):135-148.
10. Debra P., Blankenship K., Robb B., Walker, Bryan L., Stetts D., Mincey L., Simmons G. "Investigation of the Validity and Reliability of Four Objective Techniques for measuring Forward Shoulder posture." *J Orthop Sports Phys Ther.* 1997; 25(1)34:42.

## PREVALENCE AND SOURCE OF STRESS IN POSTGRADUATE PHYSIOTHERAPY STUDENTS

**Bhakti Trivedi<sup>1</sup>, Megha Sheth<sup>2</sup>, Neeta Vyas<sup>3</sup>**

*1 MPT-Rehab, S.B.B.College of Physiotherapy, Ahmedabad*

*2 Lecturer, S.B.B.College of Physiotherapy, Ahmedabad*

*3 Principal, S.B.B.College of Physiotherapy, Ahmedabad*

### ABSTRACT

**INTRODUCTION:** Postgraduate training has always been regarded as highly stressful to the students. Stressors are associated to the mental, emotional and physical health consequences. Many studies have been done to evaluate stress at undergraduate level, however limited data is available at postgraduate level. The study was conducted to find the prevalence and source of stress in postgraduate physiotherapy students.

**OBJECTIVE:** 1.To determine the stress level in postgraduate physiotherapy students using general health questionnaire 12 (GHQ 12). 2. To determine the sources of stress using postgraduate stressors questionnaire (PSQ).

**METHOD:** 100 Postgraduate physiotherapy students of Gujarat University were recruited in the study. General health questionnaire 12(GHQ 12) and postgraduate stressors questionnaire (PSQ) were explained in brief to the students and, they were asked to fill up the questionnaire.

**RESULT:** 45% of the sample of postgraduate students was found to be under stress and 23 % were facing severe problems and psychological distress. Sources of stress were analyzed using principal component of analysis and they were mainly related to poor job prospects, poor relationship with superiors and colleagues and academics.

**CONCLUSION:** Study has shown that the prevalence of stressed postgraduate physiotherapy students is high with the society and superiors being major stressors.

**KEY WORDS:** Postgraduate physiotherapy students, general health questionnaire 12(GHQ 12), postgraduate stressors questionnaire (PSQ), stress

### INTRODUCTION

Psychological stress is described as “a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being”<sup>1</sup>. Stress is the significant cause of many physiological, psychological and mental illnesses. It can lead to occupational boredom, potential inhibition and professional burnout<sup>2,3</sup>. It affects the work capacity and performance of the individual, and reduces self-esteem<sup>4,5</sup>. It can also lead to unwanted fear of making mistakes. It may affect postgraduate students’ academic achievement, personal and professional development<sup>6</sup>. It is a complex, dynamic process of interaction between a person and his or her life. It is the way one reacts physically, mentally and emotionally to the various conditions<sup>7</sup>.

Stress is not just a stimulus or a response but it is a process by which we perceive and cope with environmental threats and challenges<sup>8</sup>. Personal and environmental events that cause stress are known as stressors<sup>9</sup>. Stress which can promote and facilitate learning is called ‘favorable stress’ and stress which can inhibit and suppress learning is called ‘unfavorable stress’. An acceptable level of stress, referred earlier as ‘favorable stress’, can enhance learning ability.<sup>4</sup> However, excessive stress can lead to physical, emotional and mental health problems<sup>10</sup>.

Physiotherapy is a professional field. Professional education can be a stressful experience for some individuals, and may impact negatively on emotional well-being and academic performance<sup>11</sup>. Students come from the

undergraduate level and suddenly expectations increase from the superiors and the load of work and responsibility increases. Vocational stress as the name suggest, is related to the stress arising from the nature of work and more often from the expectations and the outcomes from the work done<sup>12</sup>.

Students have to put up with excessive workloads, emotional drain, family interference, sleep disturbances, problematic professional relationships, unsupportive superiors, uncooperative patients, organizational changes, fear of future prospects, lack of medical back up and moreover most importantly pressure of completing successfully their post-graduation and to become a good professional.

In a news article published by Kevin Pho in the national American daily newspaper, "USA today", it was mentioned that a high level of work-related stress exists among doctors and they are prone to depression<sup>13</sup>. Chronic stress is known to cause deficits in working memory and increases the chances of developing obesity and elevated blood pressure levels<sup>14</sup>. "While burnout can happen in any profession, the performance of stressed-out doctors can hurt someone else: Patients"<sup>13</sup>. Because of this, there tends to be reduced quality of care and increased medical errors<sup>15</sup>.

Many studies have been done for resident doctors, postgraduate dental students. Studies were also done for the undergraduate physiotherapy students. So there is a need to study the prevalence and source of stress in postgraduate physiotherapy students.

## AIMS AND OBJECTIVES

- To determine the stress level in postgraduate physiotherapy students using general health questionnaire 12 (GHQ 12).
- To determine the sources of stress using postgraduate stressors questionnaire (PSQ).

## METHOD

A cross sectional survey study was carried out in Gujarat. 100 postgraduate physiotherapy students of Gujarat University were recruited in the study by convenient sampling. Students were recruited from different colleges of Gujarat University. Students of other universities, other fields and undergraduate students were excluded. Students unwilling to participate were excluded.

Outcome measures were the General Health questionnaire 12 (GHQ-12) and Postgraduate stressors questionnaire (PSQ).

General Health questionnaire (GHQ12) is a measure of current mental health. It focuses on two major areas—the inability to carry out normal functions and the appearance of new and distressing experiences. Originally developed as a 60-item instrument, a range of shortened versions of the questionnaire including the GHQ-30, GHQ-28, GHQ-20 and GHQ-12 are now available. The questionnaire asks whether the respondent has experienced a particular symptom or behavior recently. Each item is rated on a four-point scale. The GHQ-12 is a well-validated instrument used to measure overall emotional wellbeing and commonly used in studies looking into distress in populations. It is one of the most widely used measurement tool to measure stress level. Reliability coefficients of the questionnaire have ranged from 0.78 to 0.95 in various studies<sup>16</sup>.

Postgraduate stressors questionnaire contains 7 domains, under each domain there are 4 questions. Thus the questionnaire contains 28 questions. Domains are related to academics, poor relationship with superiors, bureaucratic constraints, work-family conflicts, poor relationship with colleagues, performance pressure and job prospects.

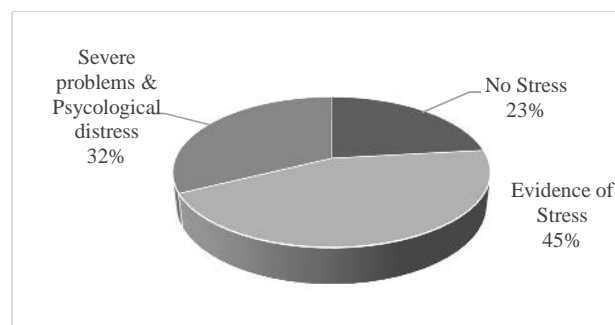
Students were explained about the purpose of the study. GHQ-12 and PSQ were also explained to the students in brief. Written informed consent was obtained. It took 10 to 15 minutes for the student to fill up the questionnaire.

## DATA ANALYSIS

Data was analyzed using SPSS version 16 and Microsoft Excel 2010. Prevalence of stress was analyzed and stressors were analyzed using principal component of analysis which is a method of data reduction.

## RESULT

100 postgraduate physiotherapy students participated in the study. All the students belonged to different colleges of Gujarat University.



**GRAPH 1: PREVALENCE OF STRESS**

**TABLE 1: LIST OF STRESSORS**

Sr no	STRESSORS	ROTATED COMPONENT MATRIX
1	Society does not think highly of the profession	0.837
2	Unfair assessment from superiors	0.837
3	Unable to make full use of my skill	0.818
4	Difficulty in maintaining relationship with superiors	0.807
5	Fear of making mistakes that can lead to serious consequences	0.804
6	Having difficulty in understanding content	0.803
7	Lack of support from the superior	0.707
8	Lack of promotion prospect in future	0.78
9	Feeling of being underpaid	0.775
10	Competition among colleagues	0.774
11	Working with incompetent colleagues	0.774
12	Relationship problems with colleague and superiors	0.766
13	Cannot participate in decision making	0.727
14	Work demand affects home/personal life	0.71
15	Time pressure and deadlines to meet	0.685
16	Belief contradicts with those of superiors	0.679
17	Working with uncooperative colleague	0.659
18	Advancing career at the expenses of home/personal life	0.659
19	Feeling insecure in job	0.654
20	Work is mentally straining	0.639
21	Having to do work out of my competence	0.612
22	My life is too concentrated on my work	0.585
23	Large amount of content to be learnt	0.501
24	Lack of authority to carry out my job duty	0.487
25	Lack of time to review what has been learnt	0.482
26	Tests/examinations	0.481
27	Work overload	0.378
28	Absence of emotional support from family	0.347

For the prevalence of the stress, GHQ 12 was taken of all the students. Graph 1 shows the prevalence of stress which shows that 32% of the students faced severe stress

and evidence of psychological distress. Another 45% of the students were having evidence of some stress.

Postgraduate stressors questionnaire was analyzed using principal component of analysis (PCA). Table 1 shows the stressors as listed by the students. Top ten stressors were the society does not think highly of the profession, unfair assessment by the superiors, unable to make full use of my skill, difficulty in maintaining relationships with superiors, fear of making mistakes that can lead to serious consequences, having difficulty in understanding content, lack of support from the superior, lack of promotion prospect in future, feeling of being underpaid and competition among colleagues.

## DISCUSSION

The present study was aimed to find the prevalence of stress and sources of stress in postgraduate physiotherapy students. It was found that stress was faced by the postgraduate physiotherapy students with different intensity. There were many stressors with most common source of stress being society and poor relationship with superior.

The study also shows that top ten stressors were the society does not think highly of the profession, unfair assessment by the superiors, unable to make full use of my skill, difficulty in maintaining relationships with superior, fear of making mistakes that can lead to serious consequences, having difficulty in understanding content, lack of support from the superior, lack of promotion prospect in future, feeling of being underpaid and competition among colleagues.

The present study shows that 32% students were under severe stress and psychological distress and 45 % of students were showing evidence of stress. The alarming finding suggests a sense of growing pressure on the postgraduate physiotherapy students.

The major stressor was the attitude of the society towards the profession suggesting a lack of awareness of the physiotherapy field in the society which was causing the stress to the students. It is also important to highlight that major stressors were also related to unfair assessment from superiors, difficulty in maintaining relationship with superiors, fear of making mistakes that can lead to serious consequences and lack of support from the superior. It follows that fair assessment, appropriate, clear tasks and support should be given to the students which would reduce their stress level.

It is also remarkable that the absence of family support is the least stressor for the postgraduate student. This may be because family plays an important role in Indian society and Indian parents always support their children in any circumstances.

JM Walsh et al in 2010 found that academic and personal issues were the greatest sources of stress among Irish undergraduate physiotherapy students<sup>11</sup>. In the above study academic performance was among the top five sources of stress too.

Mane AB et al in 2011 found the main stressors were the interpersonal relationships and environmental and

academic in the undergraduate dental students<sup>17</sup>. Relationship with colleagues was a source of stress in present study. However environmental factors were not considered.

Muhamad Saiful Bahri Yusoff et al in 2010 found postgraduate stressors were related to test/examination, lack of time to review what they have learnt, having difficulty in understanding content, large amount of content to be learnt, time pressure and deadlines to meet, work overload, fear of making mistakes that can lead to serious consequences, mental strain of work. So the stressors were related to academic and performance pressure. The present study found that the major stressors in postgraduate training were related to academic and performance pressure.<sup>16</sup>

A study done on orthodontist students in India in 2011, found major stressors were related to personal life and work overload.<sup>18</sup> Work overload was not one of the stressors in the present study. The reason could be a sufficient number of post graduate students in each college that was studied.

It is researched that there is an association between mental health and physical activity. Regular physical exercise has been an effective stress buster. Knowledge of how stress affects performance and health and how it changes over time can be used by schools to counsel first-year PG students and stimulate the implementation of stress reduction programs.

## LIMITATION

Only postgraduate physiotherapy students of Gujarat University were included in this study.

## CONCLUSION

Study has shown that the prevalence of distressed postgraduate physiotherapy students is high with the society and superiors being major stressors.

## REFERENCES

1. Lazarus RS, Folkman S, Stress, Appraisal and Coping. New York: Springer Publishing Company Inc., 1984;28: 97-113.
2. Silverstein ST, Kritz-Silverstein D, A longitudinal study of stress in first-year dental students. J Dent Educ 2010; 74(8): 836-48. 3.
3. Wicks RJ. Overcoming secondary stress in medical and nursing practice: A guide to professional resilience and personal well- Being. New York: Oxford University Press, 2005.
4. Kaplan HI, Saddock BJ, Learning theory, in: Synopsis of Psychiatry: Behavioral Sciences/Clinical Psychiatry, Philadelphia, Lippincott Williams & Wilkins, 2000;8:148-154.
5. Silver HK, Glick AD, Medical student abuse. Incidence, severity, and significance. Jama, 1990;

- 263(4), 527- 532.
6. Sherina MS, Lekhraj R, Nadarajan K, Prevalence of emotional disorder among medical students in a Malaysian university, *Asia Pacific Family Medicine*, 2003; 2; 213- 217.
7. Gyan MA, Study on perceived stress, its impact and the coping strategies. *The International Journal of Interdisciplinary Social Sciences*, 2011 November ;5(6): 1228-1233
8. Myers DG, Stress and Health, in: *Exploring Psychology* 6<sup>th</sup> edition, pp. 402. New York, Worth Publishers, 2005.
9. Lazarus RS, Theory-Based Stress Measurement, *Psychology Inquiry*, 1990; 1 (1), 3-13.
10. Niemi PM, Vainiomaki PT, Medical students' academic distress, coping and achievement strategies during the pre- clinical years, *Teaching & Learning in Medicine*, 1999; 11(3), 125-134.
11. Walsh JM, Feeney C, Hussey J, Donnellan C, Sources of stress and psychological morbidity among undergraduate physiotherapy students. *Physiotherapy*, 2010;96(3), 206–212.
12. PavithraRajan, BharatiBellare, Sources of stress and psychological morbidity among undergraduate physiotherapy students. *Indian journal of medical science*, 2011;65(3)
13. Pho K. Burnout hurts doctors as well as their patients. *USA Today* 2010. Available from: [http://usatoday30.usatoday.com/news/opinion/forum/20100719column19\\_ST1\\_N.htm](http://usatoday30.usatoday.com/news/opinion/forum/20100719column19_ST1_N.htm) opinion section. [Last Accessed on 2012 Nov 18].
14. Hinwood M, Tynan RJ, Charnley JL, Beynon SB, Day TA, Walker FR, Chronic Stress Induced Remodeling of the Prefrontal Cortex: Structural Re-Organization of Microglia and the Inhibitory Effect of Minocycline. *Cereb Cortex* 2012. In Press.
15. Mayo clinic, Burnout and mental distress strongly related to errors by U.S. surgeons. *Minnesota: Rochester*; 2010;251(6):995-1000.
16. Muhamad Saiful Bahri Yusoff and Ahmad Fuad Abdul Rahim, Prevalence and sources of stress among postgraduate medical trainees: initial findings, *Asian journal of psychiatry*, 2010;11(2),1-10.
17. Mane Abhay B, Krishnakumar MK, Niranjana Paul C, Hiremath Shashidhar G. Differences In Perceived Stress and Its Correlates Among Students In Professional Courses. *Journal of Clinical and Diagnostic Research*. 2011; Vol-5(6): 1228-1233.
18. Balasubramanian Madhan, Alok Ojha, Haritheertham Gayathri. Perceived sources of psychological stress in post-graduate orthodontic students in India: a multicenter survey. *Journal of International Dental and Medical Research*, 2011; 4(3),214-231.



## EFFECT OF STABILIZATION EXERCISE ON CROSS-SECTIONAL AREA OF LUMBAR MULTIFIDUS MUSCLE IN PATIENTS WITH CHRONIC LOW BACK PAIN

Akodu AK<sup>1</sup>, Akinbo SRA<sup>2</sup>, Odebiyi DO<sup>3</sup>

*1 Lecturer, Department of physiotherapy, College of Medicine, University of Lagos, Nigeria,*

*2 Professor, Department of physiotherapy, College of Medicine, University of Lagos, Nigeria,*

*3 Senior Lecturer, Department of Physiotherapy, College of Medicine, University of Lagos, Nigeria,*

### ABSTRACT

**BACKGROUND/OBJECTIVE:** Low back pain (LBP) is a highly prevalent problem and one of the main causes of disability in the society. Although the etiology is diverse, many causes have been related to weakness or injury of the soft tissue in the lumbar area. This study sought to investigate the effect of stabilization exercise on cross-sectional area of lumbar Multifidus (LM) in patients with Chronic LBP.

**MATERIAL AND METHODS:** A total of 122 individuals (44 males, 78 females) with non-specific chronic low pain back (NCLBP) participated in this study. They were recruited from Orthopaedic Clinic of Lagos University Teaching Hospital (LUTH), Idi- Araba, Lagos and National Orthopaedic Hospital Igbobi, Lagos, Nigeria. They were assigned to four different groups (1, 2, 3&4). 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. Participant went through this protocol twice weekly for 8 consecutive weeks. Measurement of Cross-Sectional Area (CSA) using Ultrasound scanning machine was done at baseline and end of 8th week. Analysis of variance was used to determine significant difference at  $P < 0.05$ .

**RESULTS:** There was predominant increase in the CSA at 4th and 5th lumbar vertebrae, with more increment in group 1 with a mean and standard deviation of  $11.85 \pm 1.99$  at 4th lumbar vertebrae and  $12.10 \pm 2.19$  at 5th lumbar vertebrae within three groups (1,2,3) except the control.

**CONCLUSION:** The study established that stabilization exercise only and in combination with TENS and massage is effective in increasing the CSA of LM muscle. The assessment of CSA can therefore be used as a measure of treatment improvement or progression in patients with NCLBP.

**KEY WORDS:** Stabilization exercise, Cross- sectional area, Lumbar multifidus, Low back pain.

### INTRODUCTION

Low back pain (LBP) is one of the most common and costly medical problems in the society<sup>1</sup>. Nearly 80-90% of people suffer LBP during their lifetime<sup>2,3</sup> and about 10% of patients with prolonged symptoms that is pain severity and functional disability (3 months or more) are responsible for 80% of the total cost<sup>3</sup>. Considering the serious economic and social implication of chronic low back pain (CLBP), appropriate management is highly required. Different treatment modalities have been used, but with temporary relief of symptoms and lack of improvement of the atrophy of lumbar multifidus muscle which improves the stability of the lumbar spine. Symptoms are relieved with the use of physiotherapy modalities such as Transcutaneous Electrical Nerve Stimulator (TENS), massage and manipulative therapy. Temporary effects of these modalities have increased the attention being paid to preferential retraining of the local stabilizing muscles of the spine<sup>4, 5</sup>.

The correct alignment required to stabilize and accommodate movements depends on adequate strength and endurance on abdominal musculature<sup>6</sup>. It is the activation of the dynamic spinal support system that is exposed and which provides the basis for the concept of stabilization training<sup>5</sup>. Hodges et al.<sup>7</sup> reported on the anatomical, biomechanical and neurophysiological characteristics of Transversus abdominis (TrA) and Lumbar multifidus (LM), which are important components of the local stability system. Ultrasound imaging of LM muscle is of increasing interest to physiotherapists, both for clinical and research purposes. Measurement of muscle size using

ultrasound has provided accurate assessment of muscle wasting in various muscles<sup>8</sup>. In a recent study Ultrasound measurement of LM muscle has been reported to be a potentially valuable, fast and easy way to evaluate muscle size at different levels of lumbar vertebrae in clinical settings<sup>9</sup>. The technique was also useful in demonstrating that LM size does not recover when pain subsides unless it undergoes specific exercises<sup>10</sup>. The aim of the present study was to determine the effect of stabilization exercise on cross-sectional area of lumbar multifidus muscle in patients with NCLBP.

### METHODOLOGY

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 cross-sectional area of lumbar multifidus muscle was measured at 4th and 5th lumbar vertebrae. 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 weekly for 8 consecutive weeks. Measurement of Cross-Sectional Area (CSA) using Ultrasound scanning machine was done at baseline and end of 8th week.



**FIGURE 1: BILATERAL TRANSVERSE ULTRASOUND IMAGE AT THE L4 VERTEBRAL LEVEL, WITH CSA AREA TRACINGS.**

## STATISTICAL ANALYSIS

Statistical package for social science SPSS version 17 was used for statistical analyses. Summary of the socio demographic data was done. Analysis of variance (ANOVA) was used to analyze CSA pre and post treatment intervention across the groups. A least significant difference post hoc analysis was carried out to determine the exclusively significant group in the CSA. Paired t-test was used to compare the CSA within groups. Level of significance was set at  $p < 0.05$ .

## RESULT

### DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

The mean age of subjects in groups 1, 2, 3 and 4 were  $45.84 \pm 9.95$  years,  $47.03 \pm 12.07$  years,  $44.57 \pm 11.82$  years and  $50.83 \pm 13.03$  respectively. The four groups did not differ significantly in age and height (Table 1).

	All subjects X $\pm$ SD N=122	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 $\pm$ 11.84	45.84 $\pm$ 9.95	47.03 $\pm$ 12.07	44.57 $\pm$ 11.82	50.83 $\pm$ 13.03	1.59	0.19
Height (m)	1.72 $\pm$ 0.10	1.71 $\pm$ 0.89	1.71 $\pm$ 0.98	1.71 $\pm$ 0.10	1.75 $\pm$ 0.11	1.41	0.24
Weight (kg)	74.85 $\pm$ 11.14	78.10 $\pm$ 11.70	74.23 $\pm$ 14.16	75.83 $\pm$ 9.31	75.27 $\pm$ 7.91	0.72	0.54
BMI(Kg/m <sup>2</sup> )	25.45 $\pm$ 3.97	26.57 $\pm$ 3.76	25.50 $\pm$ 3.42	26.31 $\pm$ 4.47	24.81 $\pm$ 3.88	1.28	0.28

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

**TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF THE SUBJECTS**

### COMPARISON OF THE PRE-TREATMENT (BASELINE) AND POST-TREATMENT (END OF 8TH WEEK) ASSESSMENT OF LUMBAR MULTIFIDUS CSA (CM<sup>2</sup>) ACROSS AND AMONG THE GROUPS.

Analysis of variance (ANOVA) showed that there was no significant difference in the pre-intervention assessment and there was significant difference in the post intervention assessment of cross-sectional area (CSA) at L4 and L5 across the four groups (Table 2).

Paired t- tests showed a significant difference in the CSA between pre-and post-intervention assessment within groups 1, 2 and 3 while there was no significant difference in group 4 (control) at L4 and L5 vertebrae level (Table 2). 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 (Figure 2 and 3).

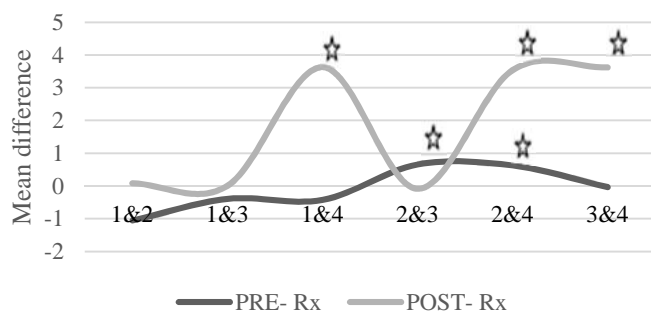
**TABLE 2: COMPARISON OF THE PRE- TREATMENT (BASELINE) AND POST- TREATMENT (END OF 8TH WEEK) ASSESSMENT OF LUMBAR MULTIFIDUS CSA (CM2) ACROSS AND AMONG THE GROUPS.**

CSA	GRP1 X±SD	GRP2 X±SD	GRP3 X ± SD	GRP4 X±SD	F	p – value
L4						
PRE- Rx	7.79± 2.69	8.84± 1.58	8.18± 2.39	8.21±0.91	1.42	0.24
POST- Rx	11.85± 1.99	11.76± 1.93	11.84±2.46	8.22±0.91	26.72	0.01*
t	9.46	9.24	10.12	0.04		
p – value	0.001*	0.001*	0.001*	0.97		
L5						
PRE- Rx	7.73± 3.00	9.19± 1.63	8.43± 2.29	7.99±0.94	2.96	2.84
POST-Rx	12.10± 2.19	11.80± 1.69	11.90±2.09	7.94±0.66	36.29	0.01*
t	8.67	11.97	8.83	0.00		
p – value	0.001*	0.001*	0.001*	1.00		

\* Significant difference at P &lt; 0.05

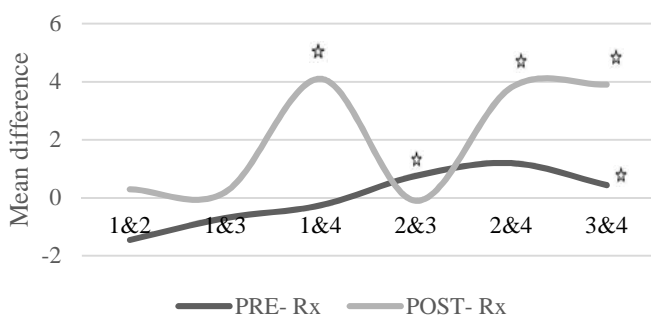
KEY:

X±SD - Mean ± Standard deviation  
 GRP1 - Group 1 – Stabilization exercise only  
 GRP2 - Group2 – Stabilization exercise with TENS only  
 GRP 3 - Group 3 – Stabilization exercise with TENS and Massage  
 GRP 4 - Group4 - Control  
 CSA - Cross-sectional area  
 L4 - 4th Lumbar vertebra level  
 L5 - 5th Lumbar vertebra level  
 PRE - Rx – Baseline treatment,  
 POST - Rx – End of 8th week treatment  
 t - Paired test



\* Significant difference p&lt; 0.05

1. Group 1 - Stabilization exercise only  
 2. Group2 - Stabilization exercise with TENS only  
 3. Group 3 - Stabilization exercise with TENS and Massage  
 4. Group 4 - Control, L5- 5th lumbar vertebra,  
 PRE-Rx - Baseline treatment,  
 POST - Rx – End of 8th week treatment

**FIGURE 2: SCHEMATIC REPRESENTATION OF POSTHOC ANALYSIS OF THE PRE-TREATMENT (BASELINE) AND POST-TREATMENT (END OF 8TH WEEK) ASSESSMENT OF LUMBAR MULTIFIDUS CSA (CM2) AT L4.**

\* Significant difference p&lt; 0.05

1. Group 1 - Stabilization exercise only  
 2. Group2 - Stabilization exercise with TENS only  
 3. Group 3 - Stabilization exercise with TENS and Massage  
 4. Group 4 - Control, L5- 5th lumbar vertebra,  
 PRE-Rx - Baseline treatment,  
 POST - Rx – End of 8th week treatment

**FIGURE 3: SCHEMATIC REPRESENTATION OF POST HOC ANALYSIS OF THE PRE-TREATMENT (BASELINE) AND POST-TREATMENT (END OF 8TH WEEK) ASSESSMENT OF LUMBAR MULTIFIDUS CSA (CM2) AT L5.**

## DISCUSSION

The result of the present study demonstrated that the use of stabilization exercise in the treatment of patients with non-specific chronic low back improves lumbar multifidus cross sectional area (CSA). 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 result conforms to the study of Hides et al.<sup>11</sup> 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 difference in the age and physical characteristics of the groups that were studied.

The results also showed that all the participants in this study presented with atrophy of lumbar multifidus muscle pre-intervention, implying that individuals with NCLBP have associated atrophy of lumbar multifidus muscle. This may be due to the disuse atrophy resulting from inactivity of the back muscles as a result of pain and instability. This shows the clinical relevance of CSA in the assessment of treatment efficacy in patients with NCLBP. This finding supports previous studies<sup>12, 13, 11, 14</sup> who reported that atrophy of the lumbar multifidus muscle has been attributed to low back pain and instability.

All subjects (that is groups 1, 2 and 3) in this study had a corresponding improvement in the CSA of LM muscle post treatment intervention, because enhanced stability of the lumbar spine segment is the mechanism for pain relief.

This result was in agreement with previous study that, increase in CSA of lumbar multifidus muscle automatically lead to pain reduction & improvement of functional ability in patients with LBP<sup>11</sup>.

## CONCLUSION

The study established that stabilization exercise only and in combination with TENS and massage is effective in increasing the cross-sectional area of lumbar multifidus. The assessment of CSA can therefore be used as a measure of treatment improvement or progression in patients with NCLBP.

## ACKNOWLEDGEMENT

The authors appreciate and acknowledge the support of Dr AO Adeyomoye a consultant radiologist and Dr FY Daji a senior registrar in the Department of radiobiology, radiotherapy, radiography, radio diagnosis, Lagos University Teaching Hospital, Idi-Araba Lagos, Nigeria.

## CLINICAL APPLICATION

This study established that stabilization exercise increases the CSA of LM muscle and this can be used as an index for the assessment of improvement level of patients with NCLBP.

## REFERENCES

- O'Sullivan P (2000). Lumbar segmental instability: clinical presentation and specific stabilizing exercise management. *Manual Therapy* 5 (1): 2-12.
- Bakhtiary AH; Safavi-Farokhi Z; Rezasoltani A (2005). Lumbar stabilizing exercises improve activities of daily living in patients with lumbar disc herniation. *Journal of Back and musculoskeletal Rehabilitation* 18: 55-60.
- Kasai R (2006). Current trend in exercise management for chronic low back pain: comparison between strengthening exercise and spinal segmental stabilization exercise. *Journal of physical therapy science*.18: 97-105
- Danneels LA; Vanderstraeten GG; Cambier DC; Witvrouw EE; Bourgois J; Dankaerts W and De Cyper HJ (2001). Effects of three different training modalities on the cross sectional area of the lumbar multifidus muscle in patients with chronic low back pain. *British journal sports Medicine* 35(3):186-191.
- Hides JA; Jull GA; Richardson CA (2001). Long term effects of specific stabilization exercises for first episode low back pain. *Spine* 26:243-248.
- Hodges PW and Richardson CA (1997). Contraction of the abdominal muscles associated with movement of the lower limb. *Physical Therapy* 77:132-144.
- Hodges PW; Kaigie-Holme A; Holme S; Ekstrom L; Cress well A; Hansson T and Thorstensson A (2003). Intervertebral stiffness of the spine is increased by evoked contraction of the transversus abdominis and the diaphragm. *Spine* 28:2594-601.
- Stoke M; Hide J; Nassiri D (1997). Musculoskeletal ultrasound imaging: diagnostic and treatment aid in rehabilitation. *Physical therapy Review* 2: 73-92.
- Larrie-Baghal M; Bakhtiary AH; Rezasoltani A; Hedayati R; Ghorbani R (2012). Multiplying linear dimension techniques may predict the cross-sectional area of Multifidus muscle at all levels of lumbar spine. *Journal of Back and Musculoskeletal Rehabilitation*. 25(3) 171-176.
- Hides JA; Richardson CA; Jull GA (1996). Multifidus recovery is not automatic following resolution of acute first episode low back pain. *Spine* 11:2763-2769.
- Hides J; Craig G; Warren S; Emma B (2008). Multifidus size and symmetry among chronic low back pain and healthy asymptomatic subjects. *Manual Therapy* 13(1): 43-49.
- Hauggard A; Persson, AL (2007). Specific spinal stabilisation exercises in patients with low back pain - a systematic review. *Physical Therapy Reviews* 12: 233-248.
- Standaert CJ; Weinstein SM; Rumpeltes J (2008). Evidence informed management of chronic low back pain with lumbar stabilization exercise. *Spine Vol* 8 (1): 114-120
- Wallwork TL; Stantorn WR; Freke M; Hides JA (2009). The effect of chronic low back pain on size and contraction of the lumbar multifidus muscle. *Manual Therapy* 14(5): 496-500.

# REHABILITATION OF STROKE PATIENTS IN INDIAN SCENARIO: ACTIVITY AND PARTICIPATION PERSPECTIVE

Ipsit Brahmachari<sup>1</sup>

<sup>1</sup> Physiotherapist

## ABSTRACT

*The study was targeted to find out the effect of hemiparesis and rehabilitation on sexual functions, psychological status, social interactions, vocational status, and their spiritual concepts. A total of 81 stroke patients were randomly selected and given questionnaire regarding their activities and participation. There seems to be lack of proper education of the patient regarding sexual functions post hemiparesis. The matter is more over complicated by the presence of the psychological disturbances and fear of non-acceptance in the society. Lack of vocational guidance above all does not help in reaching the ultimate goal of returning back to the full and satisfied life.*

## INTRODUCTION

A true paradigm shift is taking place in the field of neurology. Earlier it was regarded as the science of exact diagnosis of incurable illnesses, resigned to the dogma that damage to the central nervous system could not be repaired: "Once development is complete, the sources of growth and regeneration of axons and dendrites are irretrievably lost. In the adult brain the nerve paths are fixed and immutable- everything can die, but nothing can be regenerated"<sup>1</sup>.

Due to new findings about the plasticity of the nervous system<sup>2</sup> and new pharmacological possibilities, but above all through the systematic application of neuro-rehabilitation, neurology has in fact become a therapy-driven specialty<sup>3</sup>. Research into cells and their connections as well as into neurotransmitter systems, the description of functional changes by means of imaging procedures<sup>4</sup> show that the central nervous system of the adult has an astounding potential for regeneration and adaptability, which can be specifically enhanced.

A lot has been said about the patient care and rehabilitation in the books published by the developed countries like the USA, the UK and Australia etc., but, they become not so relevant in Indian scenario of today. The study targets to find out the effect of hemiparesis and rehabilitation on sexual functions, psychological status, social interactions, vocational status, and their spiritual concepts.

## MATERIALS AND METHODS

A total of 81 patients were randomly selected who were undergoing physiotherapy rehabilitation. The patients were included who had hemiparesis due to any cause and duration of at least 6 months. The subjects who had incidence of transient ischemic attack were not included. Consent forms were obtained from all subjects and questionnaire were given to them which had sets of questions including questions regarding the awareness of the physiotherapy rehabilitation and its approaches, as well as their impact of hemiparesis on their functional status including sexual functions, psychological status, social interactions, vocational status, and their spiritual concepts.

## DATA ANALYSIS AND RESULTS

**TABLE: GENDER DISTRIBUTION AND AFFECTED SIDE OF TOTAL 81 HEMIPARETIC PATIENTS**

Gender	Male	52
	Female	29
Side	Right	45
	Left	36

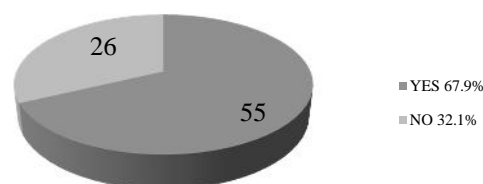
## SEXUAL FUNCTIONS

Only 28 patients out of 81 chose to answer the question regarding their sexual function. Out of 28 patients, 4 patients were sexually inactive in pre-morbid state. 24 patients were sexually active and all of them faced positional problems during the act. 20 patients complained of spasticity of hemiparetic upper limb coming in way of enjoyment. On the other hand, they also reported of a feeling of relaxation post coitus. Decreased orgasm was present in only 4 cases. The average time post hemiparesis to become sexually active was around 6 to 8 months.

## MOOD SWINGS

Of the 81 patients, 55 patients admitted of having mood swings and 26 patients had none.

**GRAPH 1: MOOD SWINGS**

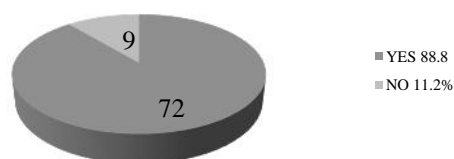


## ACCEPTANCE OF CONDITION

72 patients had accepted their condition well, whereas 9 patients said, they cannot accept their present disability status. Almost all of them complained of

increased irritability and decreased tolerance in inter personal relationship.

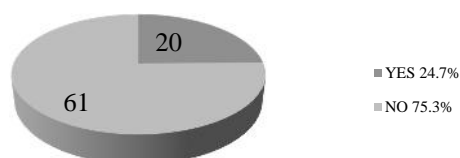
**GRAPH 2: ACCEPTANCE OF CONDITION**



## TOTALLY GIVING UP ATTITUDE

20 Patients out of 81 showed an attitude of totally giving up every effort to fight with their present condition of hemiparesis while 61 patients showed courage to fight till the full recovery.

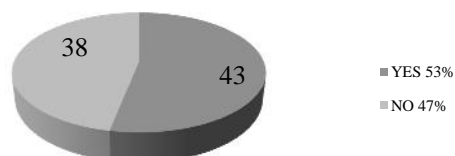
**GRAPH 3: TOTALLY GIVING UP ATTITUDE**



## FEAR OF NON ACCEPTANCE IN THE SOCIETY

Out of 81 patients, 43 had fear of non acceptance in the society due to their disability status and hence, their spasticity increased in public places and 38 patients had no fear.

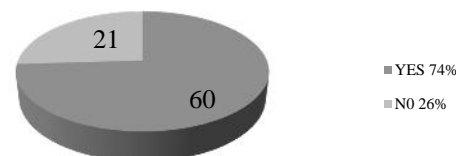
**GRAPH 4: FEAR OF NON ACCEPTANCE**



## MINGLING WITH PEOPLE

Out of the 81 patients, due to fear of non acceptance and disability, 21 patients had difficulty in mingling with other people easily, i.e., they were unable to socialize with people with the same ease as before. 60 patients had no problems with the communication.

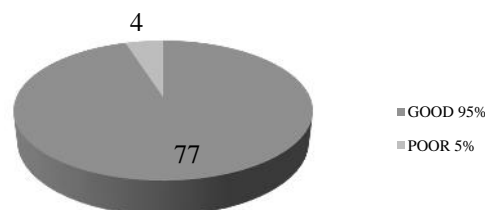
**GRAPH 5: MINGLING WITH PEOPLE**



## FAMILY SUPPORT

Almost all of the patients who were coming to Physiotherapy and rehabilitation clinics had good family support for themselves. Only 4 patients out of 81 had problems with the family support whereas 77 patients had an excellent family support.

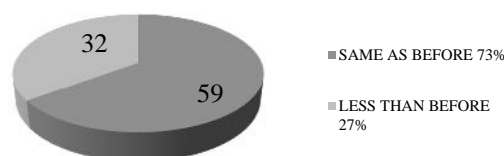
**GRAPH 6: FAMILY SUPPORT**



## RECREATIONAL OUTING

Disability of body and mind did interfere with the recreational outing of the patients who were more sensitive towards their disability. Out of 81 examined, 32 patients went for recreational outing 50% less than before whereas 59 patients went out as before.

**GRAPH 7: RECREATIONAL OUTING**

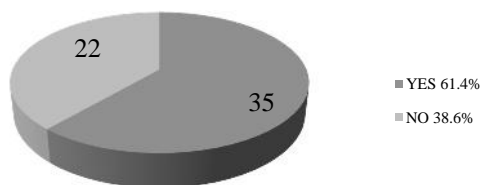


## RETURN TO WORK PLACE

Out of 81 patients examined, 24 of the patients were not going for any work. Out of remaining 57, 35 had returned to their workplace while 22 had still not resumed their duties.

Here, the students who go for their studies are also counted as going back to work.

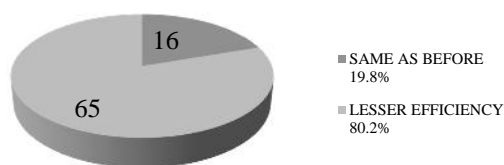
**GRAPH 8: RETURN TO WORK**



## WORK EFFICIENCY

Regarding the efficiency at the workplace as compared to pre morbid stage, 65 patients complained of lesser efficiency than before due to their hemiparesis status whereas 16 patients had similar efficiency as compared to pre morbid state. Female patients who did domestic work were considered as working at home and hence, they were also counted in finding out the work efficiency; domestic work, in their case.

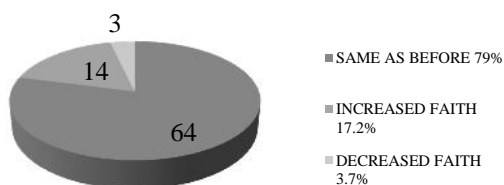
**GRAPH 9: WORK EFFICIENCY**



## SPIRITUALITY

Patients were asked about their spiritual practices and beliefs pre and post hemiparesis. Out of 81 patients, 14 patients reported increase faith as compared to pre morbid state, 64 reported no change in their spiritual inclination and faith, whereas 3 patients reported of decreased faith and increased disbelief.

**GRAPH 10: SPIRITUALITY**



## DISCUSSION

A lot has been said about the people living in developed countries, but still, people of developing countries and underdeveloped countries are somewhat neglected; more so with the patients. India is fast emerging

as a global social and economic power and hence, it is important that the needs of people and the patients are looked upon in a different light focusing on the individualistic and holistic approach integrating the modern scientific procedures and ancient eastern wisdom.

The data of 81 hemiparetic patients was collected over few years where all the patients were going for Physiotherapy treatment. As earlier suggested, there is a vast pool of the hemiparetic patients who do not receive Physiotherapy and rehabilitation treatment. It was not easily possible for this researcher to collect the data from the patients not receiving the Physiotherapy due to certain unavoidable circumstances. Thus, the study limits itself to a closed group of patients receiving Physiotherapy treatment. Almost all the patients out of 81 were educated in reading and writing and their minimum educational qualification was education up to standard 8. It is thus clear that the patients and their relatives were aware persons of the society at large.

In India, till today, the word 'sex' has got a taboo attached to it and people are not comfortable talking about it in general public or they are not ready to discuss their problems with any one. All the patients who were active faced positional problems during the act. While they could reach up to orgasm, they were not enjoying the act as before due to their physical disability status and the chief reason being the upper limb spasticity. They also did not ask their Doctors or neither did they discuss it with their friends due to embarrassment. This was due to the fact that both the partners were apprehensive regarding the physical disability rather than the physiological loss of the sexual excitation. The drive decreased due to the feeling of physical disability. Engaging in sexual act did increase the overall confidence of the patient. No change was found in the satisfaction level after the act.

Juha et al found out after a study of 192 stroke patients that psychological and social implications were the main reasons for the decrease on libido and a fear of impotency post stroke which impaired their sexual life<sup>5</sup>. The right side brain damaged patients had more problems in arousal, vaginal lubrication and orgasm than the left side brain damage patients<sup>6</sup>. A proper guidance to the spouse of the patient and the patient themselves will provide a good education regarding the problems associated with hemiparesis and their implications on the sexual life.

It is a proven fact that all the hemiparetic patients suffer from some or the other kind of psychological problem. This includes mood swings, depression, lack of concentration, decreased initiation, distortion of self-image, loss of confidence and totally giving up attitude for the recovery. Depression is more common after 6 to 8 months of the initiation of hemiparesis. Nevertheless, it is the duty of the treatment provider to diagnose the problem and help patient cope up with it or if it is absent then, to prevent it altogether.

This suggests that as the time passes, more and more numbers of patients learn to cope up with their disability which was difficult initially. The distortion of the self-image was the biggest factor for such a kind of condition. The thought that when they would get full



recovery bogged all the patients. The patients who had more frequent mood swings were the ones who had a negative thought process that they would never recover.

It was a pleasant surprise to know that most patients had accepted their condition. The acceptance doesn't mean that the patients accepted the disability and did not want to do anything for that. In fact, they were the patients who were really motivated for trying out all the measures which will make them as normal as possible. The persons who did not accept the condition blamed many factors for their condition and hence, their concentration and zeal for carrying out Physiotherapy was not as good. This in turn reduced the output of their therapy and they lagged behind in every aspect of their rehabilitation.

Some patients had a vague feeling of totally giving up every measure for their recovery due to frustration and longer time of the recovery. This type of feeling was not a constant one on many of them, but, was a passing feeling sometimes. It was commonly seen that the immediate relatives of the patient complained that the patient has become increasingly irritable and short tempered. Though all of them take it lightly, this feeling should be curbed with proper counselling of the patient and the care takers before it takes a definite form of some psychological condition. The irony is that, most of the patients denied of becoming irritable, clearly showing that they themselves were not happy about this feeling and were not therefore accepting it.

Many patients have a feeling of fear of non acceptance in the society due to the disability status. They feel inferior to the so called normal individuals and hence they feel low in their presence and hence, avoid going to places where they are not feeling absolutely comfortable. Out of 81 patients, 53% patients had a fear of non acceptance. This feeling can be tackled by a sensitive approach towards the patient and proper counselling. The patients should be encouraged to move out of the house as early as possible, due to which, they would come in contact with the world early in the rehabilitation process. The real life situations would put demands on them, and by successfully tackling them, they would feel confident and the fear would minimize. General public should be taught to be more sensitive towards the disabled or differently abled persons and their behavior should be of helping and not ridiculing. It is commonly seen that if these patients are given too much of attention and if people feel too sorry for them, they do not like it and hence, such a type of behavior should be totally avoided. They should not be talked to as if talking to a child. This is a common mistake people make. One should remember that the patient is an adult and is differently abled; not a child or a mentally challenged person.

The fear of non-acceptance may not always mean that the patients do not mingle with others easily. The study suggests that only a 26% of people have difficulty in mingling with others. The main reason is the feeling of inferiority and a fear of non acceptance. The interaction of the environment and the response of the patient towards them influence this factor. Almost all the patients reported a significant increase in spasticity when they went to a

newer place. The gait or the walking pattern also changed significantly. The apprehension and anxiety towards newer places increases manifold even in chronic cases. A positive attitude and self-suggestion or auto suggestions may minimize the problem to a greater extent.

All the patients had an excellent family support; which is evident from the study. 95% patients reported of having a very good family support. This is very important because, when the patient is having disability and is dependent, there is an acute need of love and care which is provided best by the immediate family members and the friends.

73% patients went for the recreational outing as before. This included the visits to relatives, restaurants, movie halls, shopping and others. This is a good index as a person will feel fit only if he can move out of the house for recreation and merry making. This kind of routine will ease out undue stress in the mind of the patient and he will become free and light. This will ensure an increased zeal in carrying out the required task for the recovery. The remaining 27% patients could not go out for recreation mainly due to the physical status and the feeling that they were dependent and will have to take assistance from somebody for their recreation.

All the patients, disrespect of their faith and religion, told of having faith in the almighty. It was seen that 16% of the patients had increased faith in the God. The reason for the same was the fact that they had accepted their condition well as their 'karma' and saw the presence and will of the Lord in their condition. 79% of the patients did not find any change in their faith, and were as religious as before. Only 5% patients reported of having decreased faith. These patients had a grudge that why they were given this problem by the Lord. They found it very difficult to accept their condition. Also, they had a higher chance of feeling of depression than others. It is a known fact that faith can heal and modify most of the problems<sup>7,8</sup>. The religious faith can increase the acceptance of the condition and can prepare the patient to be patient and face the challenges which are posed by the disability. Faith induces an increase in inner strength of the person. It is a known fact that the positive thinking and auto suggestions along with the religious practices help in speedy recovery of the patient<sup>9,10</sup>. Chanting of the Lord's name along with meditation can decrease spasticity by providing deep relaxation and increase in alpha rhythm activity in the brain.

The study suggests that approximately 40% patients were unable to resume their work due to their physical disability status. Most of them had lack of confidence and inability to cope up with the work place. In India, most of the public places including the offices and the recreational areas are not accessible easily for the disabled or differently abled individuals. The public transport system is not disabled person friendly even in a developed city like Ahmedabad. The towns and villages lack basic public transport altogether. Thus, for the patient, going to the work place is difficult if he/she is unable to drive their own vehicle. Otherwise they have to utilize auto rickshaw or taxi which is not economical for daily use and hence, such patients cannot resume their work.

## CONCLUSION

The purpose of the study was intended to find out various facts about the scenario of the neurological rehabilitation of the person suffering from hemiparesis from a chronic state. There seems to be lack of proper education of the patient regarding sexual functions post hemiparesis. The matter is more over complicated by the presence of the psychological disturbances and fear of non-acceptance in the society. Lack of vocational guidance above all does not help in reaching the ultimate goal of returning back to the full and satisfied life. Spirituality and faith helps the patients in fighting this dreadful disease and condition. Family support is the main pillar and family is the most important rehabilitation team member in Indian scenario. Strong cultural values and ethics combined with faith and dedication from the part of the treatment provider will ensure best results for the chronically suffering hemiparesis person.

## REFERENCES

1. S. R. Y. Cajal, *Degeneration and Regeneration of the Nervous System*, vol. 1, M. May, Ed., New York: Oxford University Press, 1928.
2. Stein, "Concepts of CNS Plasticity in the Context of Brain Damage and Repair," *Journal of Head Trauma Rehabilitation*, vol. 18, no. 4, p. 317-341, 2003.
3. K. J., "NEUROLOGY 1997 - A THERAPEUTIC SPECIALTY," *Schweizerische medizinische Wochenschrift*, vol. 127, no. 51-52, pp. 2140-2142, 1997.
4. F. R. P. U. P. R. Fink GR, "Multiple non-primary motor areas in the human cortex." *J Neurophysiol*, vol. 67, p. 1264-2174, 1997.
5. N. P. M. V. Korpelainen JT, "Sexual functioning among stroke patients and their spouses," *Stroke*, vol. 4, no. 30, pp. 715-9, 1999.
6. L. N. V. C. Parry RH, "Effect of severity of arm impairment on response to additional physiotherapy early after stroke," *Clin. Rehabil.*, vol. 3, no. 13, pp. 187-98, 1999.
7. "Advances in Stroke Regenerative Medicine 2007," *Stroke*, vol. 2, no. 39, pp. 273-5, 2008.
8. L. M. K. A. D. P. A. J. Jehkonen M, "Fluctuation in spontaneous recovery of left visual neglect: a 1-year follow-up.," *Eur Neurol*, vol. 4, no. 58, pp. 210-4, 2007.
9. C. N. M. I. T. A. I. B. Bernhardt J, "Not all stroke units are the same: a comparison of physical activity patterns in Melbourne, Australia, and Trondheim, Norway.," *Stroke*, vol. 7, no. 39, pp. 2059-65, 2008.
10. K. H. H. N. E. L. D. C. A. M. Volpe BT, "Robot training enhanced motor outcome in patients with stroke maintained over 3 years.," *Neurology*, vol. 53, no. 8, pp. 1874-6, 1999.

## PREVALENCE OF MUSCULOSKELETAL DISORDERS AMONG NURSES

**Mamta Israni<sup>1</sup>, Neeta J Vyas<sup>2</sup>, Megha S Sheth<sup>3</sup>**

*1Post Graduate Student, S.B.B. College of Physiotherapy, Ahmedabad*

*2Principal, S.B.B. College of Physiotherapy, Ahmedabad*

*3Lecturer, S.B.B. College of Physiotherapy, Ahmedabad*

### ABSTRACT

**INTRODUCTION:** Nurses are at risk of musculoskeletal disorders (MSD) due to their occupation. Prolonged hours of standing in operation theatre, frequent forward bending for dressing, I.V. line insertion and giving injections & carrying heavy weight are common risk factors.

**OBJECTIVE:** The purpose of this study was to determine the prevalence of MSD in nurses and to investigate relationship between MSD and work experience.

**STUDY DESIGN:** A cross-sectional survey study

**METHODOLOGY:** 100 female nurses working in a general hospital, above the age of 25 years willing to participate in the study were explained the study and written informed consent was taken. Student nurses, nurses with history of lower limb fracture or lower limb trauma and nurses who underwent any lower limb surgery were excluded. A self-structured questionnaire having close ended questions concerning profile, menstrual history, professional experience, PT treatment & ergonomics training taken for same earlier and including Nordic musculoskeletal questionnaire was filled by the subjects. The data of 100 nurses was analyzed using graph pad.

**RESULT:** Prevalence of pain in neck(16%),shoulders(4%),elbows(1%), wrists/hands(6%), upperback(1%), lowerback(23%), hips/thighs(0%), knees(33%) & ankles/feet(9%) was found. (13%) nurses had multiple joint pain and (24%) nurses had no pain. The correlation of MSD and work experience was ( $r=0.47$ ) moderate, which was not statistically significant ( $p=0.79$ )

**CONCLUSION:** The prevalence of MSD among nurses was found to be 76 %. The attempt to improve the ergonomics of nursing activities and more effective methods of implementing changes of better work system are needed. The findings from this study may help to understand the need for prevention and coping strategies for MSD among nurses in order to reduce rate of occupation hazards and also improve patient care.

**KEYWORDS:** musculoskeletal disorders, nurses, prevalence

### INTRODUCTION

The term musculoskeletal disorders (MSD) encompass a gamut of inflammatory and degenerative conditions that affect the muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels with consequent ache, pain or discomfort<sup>1,2</sup>. The significant effects of MSD include difficulty in performing manual tasks, difficulty in exerting forces and restrictions of movement due to pain or loss of function<sup>3</sup>.

Investigations have demonstrated that Musculoskeletal disorders (MSDs) represent one of the leading causes of occupational injury, disability, absenteeism and incapacity among workers in developed and industrially developing countries<sup>4, 5, 6</sup>.

Nurses are at risk of musculoskeletal disorders (MSD) due to their occupation. Hospital nursing tasks are generally complex and involve many physical activities that can lead to acute and chronic work related musculoskeletal disorders<sup>7, 8</sup>. A number of studies have indicated that many nurses report musculoskeletal symptoms resulting from tasks involving musculoskeletal load<sup>9</sup>. The high prevalence of musculoskeletal disorders among nurses may have even larger societal impact in the future as nursing shortages become major health care delivery issues in many developed countries.

Among healthcare workers, MSDs represent a major occupational problem and a significant cause of morbidity<sup>10, 11</sup>. Many studies have shown an association between MSDs and workplace factors. Some studies have shown that physical and psychological demands might

cause health care workers to leave their profession<sup>12</sup>. For managing and reducing the risk of MSDs among high risk group of work forces such as nurses, estimation of prevalence of MSDs is mandatory.

### OBJECTIVE

The purpose of this study was to determine the prevalence of MSD in nurses and to investigate relationship between MSD and work experience.

### METHODOLOGY

A cross-sectional survey study was conducted in V.S general hospital, Ahmedabad using convenient sampling which included 100 subjects. This study was approved by the Institutional ethics committee. Female nurses above the age of 25 years willing to participate in the study were explained the study and written informed consent was taken. Student nurses, nurses with history of limb fractures, trauma, and limb surgeries were excluded. A self-structured questionnaire having close ended questions concerning profile (including name, age, weight, height, BMI), menstrual history, professional experience, PT treatment & ergonomics training taken for same earlier and including standardized Nordic musculoskeletal questionnaire was filled by 100 subjects. The data of 100 nurses was analyzed using graph pad.

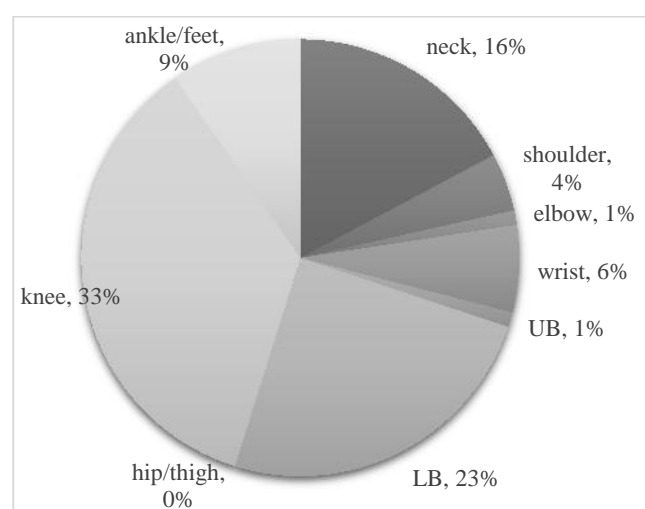
The MSDs' Nordic questionnaire which specifies the organ involvement of the persons who have or have had

MSDs, in recent 7 days or during the last 12 months according with the attached picture was used to demonstrate the pain or any discomfort from head, neck, shoulder, elbow, wrist and hand, upper back, lower back, hip and thigh, knee and ankles.

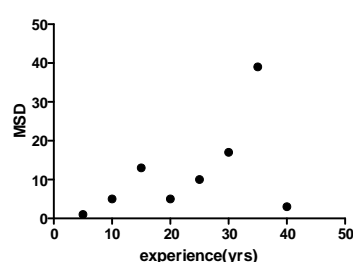
## RESULT

The prevalence of MSD among nurses was found to be 76 %. Prevalence of pain in neck (16%), shoulders (4%), elbows (1%), wrists/hands (6%), upper back (1%), lower back (23%), hips/ thighs (0%), knees (33%) & ankles/feet (9%) was found. (13%) nurses had multiple joint pain and (24%) nurses had no pain. (Graph 1)

The co-relation of MSD and work experience was moderately significant. ( $r=0.47$ )  $p=0.728$  (graph 2)



**GRAPH 1-PREVALENCE OF MSDS IN NURSES**



**GRAPH 2: CO-RELATION BETWEEN MSD AND WORK EXPERIENCE**

## DISCUSSION

The reported prevalence of MSDs is high in the studied nurses so that more than 75% of them reported at least one MSD in the last week. MSD was more commonly increased with age and years of service. Knee had highest prevalence (33%) followed by back (23%).

The 12-month prevalence of MSDs among Japanese nurses was 85.5%; the most frequently reported

discomfort was that of shoulder (71.9%) followed by low back (71.3%), neck (54.7%), and upper back (33.9%)<sup>13, 14</sup>. In another study by Choobineh, the 12-month prevalence of MSDs among Iranian nurses was 84.4% which is more than what we found in our study; low back symptoms were the most prevalent MSDs in their report which is similar to this study<sup>15</sup>.

According to Sheikhzadeh, the most prevalent MSDs among nurses was low back pain (84%) followed by ankles/feet (74%) and shoulders (74%)<sup>16</sup>. These findings are in keeping with our finding though the order of sites affected was not similar.

In the study by Karahan, nurses reported the highest prevalence of low back pain (77.1%) among the studied Turkish hospital workers while in our study the prevalence rate of low back pain reported by the nurses was 23%. The finding in all previous studies is that MSDs are very common among nurses with a prevalence rate of more than 70% but the body sites affected have different orders, although in most of them, the frequent site affected is low back. In our findings the frequent disorder was that of knee pain and back pain.

There are some investigations to support that MSDs are more common among nurses than other groups of work forces. For example in the study by Karahan<sup>17</sup> it is demonstrated that MSDs are common among Turkish hospital staff and in comparison to other employees in hospital, the nurses have the highest prevalence. According to this study the prevalence of low back pain in hospital staff has been overall 65.8% while the highest prevalence (77.1%) was reported by the nurses. Studies of back-related worker compensation claims in USA reveals that nursing personnel have the highest claim rate of any occupation or industry, and 12 percent of nurses leave their profession annually as a result of back injuries, and more than 52 percent of them complain of chronic back pain<sup>18</sup>. Also the prevalence of musculoskeletal disorders is increased by work volume; work hours per week and job experiences<sup>19</sup>. It should be considered that there are some non occupational components such as leisure, play and daily physical activities and psychosocial disorders that contribute to occurrence of MSDs.

According to a prospective cohort study among nurses by Nidd hammer<sup>20</sup> the risk factors associated with cervical, dorsal and lumbar pain are smoking, experience symptom of psychological disorders and physical work load. In another study by Harcombe et al<sup>21</sup> in New Zealand nurses, job strain had the strongest association with neck and wrist/hand pain. It means that addressing job strain could provide significant benefit for those with neck and wrist/hand pain.

The high prevalence of musculoskeletal disorders among nurses is thought to be due to physical work demands, as well as to work organizational factors, of which scheduling is an important component. Experienced and older nurses have increased level of knowledge about injury prevention, avoid harmful physical load, and have developed better coping strategies for musculoskeletal problems than the less experienced and younger nurses. Our finding on the high prevalence of work-related knee and

back pain among nurses is consistent with the pattern reported in literature.

The knees and back have been recognized as common body sites of WMSDs among health care practitioners. An explanation for this occurrence is that being in static posture for long time, the veins and capillaries inside the muscles are compressed resulting in lack of oxygen and nutrition in the tissues causing micro trauma of those muscles. Micro trauma can cause imbalance, fatigue, discomfort and pain of the tissues<sup>22</sup>. MSD had been associated with psychosocial work factors such as gender, mood, work stress, premenstrual & menstrual tension, high mental pressure and job dissatisfaction.

Why is the prevalence rate of MSDs among hospital nurses so different in various countries and even in different centers of the same country? The probable answer would be that the work-place hazards including psychological and physical factors are different. For example, in some hospitals implementing the policy of "minimal manual lift" and use of devices to change the position of patients reduce the risk of MSDs<sup>23</sup>. In this way, the risk of injuries related to lifting (*e.g.*, low back pain) is reduced. In another example, seating for a long time and using computer and other video display terminals for monitoring the patients' vital signs increase the risk of head, neck and shoulders discomfort.

In our study standing in operation theatre for prolonged hours, frequent forward bending for dressing, I.V. line insertion and giving injections & carrying heavy weight might be leading factors for knee and back pain. It seems that depending on the policy, work regulation, psychosocial environment and use of new technologies, the prevalence of MSDs as overall and ranking of each site of body affected by MSDs are different. The Pan-European research suggests that early detection of, and intervention in MSDs, eventually reduces the burden on governments' health and disability budgets<sup>24</sup>.

The findings from this study may help to understand the need for prevention and coping strategies for MSD among nurses in order to reduce rate of occupation hazards and also improve patient care. Different work distribution, shift organization, a better ratio between nurses and patients, an improvement of equipment provision, and specific nurse-training with application of ergonomic methods could improve work efficiency radically and decrease injury rates.

## LIMITATION

Small sample size.

## CONCLUSION

The prevalence of MSD among nurses was found to be 76 % with knee having highest prevalence (33%) followed by back (23%).

## IMPLICATIONS

An attempt to improve the ergonomics of nursing station and more effective methods of implementing changes of better work system are needed.

## REFERENCES

1. Punnett L, Wegman DH: Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. *Journal of Electromyography and Kinesiology* 2004, 14:13-23
2. Smith DR, Leggat PA: Musculoskeletal disorders in nursing. *Australian Nursing Journal* 2003, 11:1-4.
3. Nurul, Ikhmar, Ibrahim and Devinthiram Mohandas. Prevalence of musculoskeletal disorders among staffs in specialized healthcare centre. WOR-2012 - 04802452. IOS press
4. Shahnavaaz H. workplace injuries in developing countries. *Ergonomics* 30.(1987) 397-404
5. Genaidy AM, Al shedi AA, Shell RL Ergonomics risk assessment: preliminary guidelines for analysis of repetition, force and posture. *J Hum Ergol.* 22(2003)45-55
6. Kemmlert K, Labour inspectorate investigation for prevention of occupational musculo- skeletal injuries (licentiate thesis) National Institute of Occupational Health. Solna 1994
7. Ando S, Ono Y et al. Associations of self estimated workloads with musculoskeletal symptoms among hospital nurses. *Occup Environ Med* 2000; 57 ,211-6
8. Nelson A, Lloyd J, Gross C. Redesigning patient handling tasks. *AAOHN J* 2003 ; 51 ; 126-34
9. Lee JE, Kim SL. Work related musculoskeletal risk level with nursing tasks in hospital. *Korean J Occup Health Nurs* 2003; 12 ,31-8
10. Menzel NN, Brooks SM, Bernard TE , Nelson A(2004). The physical workload of nursing personalle: association with musculoskeletal discomfort. *Int J Nurs stud* 41, 857-67
11. Larese F, Fiorito A(1994) Musculoskeletal disorders in hospital nurses: a comparision between two hospitals. *Ergonomics* 37, 1205-11
12. Trinkoff AM, Lioscomb JA, Geiger- Brown J.(2003) Percieved physical demands and reported musculoskeletal problems in registered nurses. *Am J Prev Med* 24,275-5
13. Smith DR, Mihashi M, Adachi Y, *et al.* A detailed analysis of musculoskeletal disorder risk factors among Japanese nurses. *J Safety Res* 2006; 37:195- 200.
14. McGee R, Bevan S, Quadrello T. Fit for work? Musculoskeletal Disorders and the Greek Labour Market, 2010
15. Choobineh A, Rajaeefard A, Neghab M. Association between perceived demands and musculoskeletal disorders among hospital nurses of Shiraz University of Medical Sciences: a questionnaire survey. *Int J Occup Saf Ergon* 2006; 12:409-16.
16. Sheikhzadeh A, Gore C, Zuckerman JD, Nordin M.

- Perioperating nurses and technicians' perceptions of ergonomic risk factors in the surgical environment. *Appl Ergon* 2009; 40: 833-9.
17. Karahan A, Kav S, Abbasoglu A, Dogan N. Low back pain: prevalence and associated risk factors among hospital staff. *J Adv Nurs* 2009; 65:516-24
  18. Rubenowitz, Survey and intervention of ergonomic problems at the workplace. *International Journal of Industrial Ergonomics*, 1997, Vol-19, 271-275
  19. Mary McNamara, Mary Stewart. ANA Launches 'Handle with Care' Ergonomic Campaign. American nurses association. September 2003(online accessed)
  20. Nied Hammer I .Back pain and associated factors in French nurses. *International Archives of Occupational and Environmental Health*.1994,66 (5):349-357
  21. Harcombe H, McBride D, Derrett S, Gray A. Physical and psychosocial risk factors for musculoskeletal disorders in New Zealand nurses, postal workers and office workers. *Inj Prev* 2010; 16:96-100.
  22. Engels JA, van Der Gulden JW, Senden TF Work related risk factors for musculoskeletal complaints in the nursing profession: results of questionnaire survey .*Occup Environ Med* 53, 635-41
  23. Lusted MJ, Carrasco CL, Mandryk JA, Healey S, Self reported symptoms in nurses. *Applied Ergonomics* 1996; 27 :381-387
  24. Smith DR, Mihashi M, Adachi Y, *et al.* Menstrual disorders and their influence on low back pain among Japanese nurses. *Ind Health* 2009;47: 301-1







# Indian Journal of Physical Therapy

[www.indianjournalofphysicaltherapy.com](http://www.indianjournalofphysicaltherapy.com)

## **Publish your Article / Call for Papers**

### **Guidelines for Authors**

- Title of article should be “bold” with font size of 14 with authors’ name/names with their designations and working institutes. Article should be sent in Microsoft Word format in single file as attachment with font type “Times New Roman” with font size of 12.
- The graphs should be in 2 dimensions only with data label.
- Word limit for abstract and full article is 300 and 3000 respectively.
- Along with article, author has to send declaration form that it is original work done and has not been sent to another journal at the same time in another separate file in Microsoft Word format.
- Article should contain:
  - Title
  - Name(s) of Author(s) and Co-Author(s)
  - Abstract (including key words)
  - Introduction,
  - Aims & Objectives
  - Methodology (including Materials, Sample size, Study design, Study settings, Sampling design, Inclusion criteria, Exclusion criteria, Technique etc)
  - Results (including Tables, Graphs etc)
  - Discussion (including Additional findings if any, Supporting and opposing articles, Possible theoretical reasoning if any, Limitations, Future recommendations etc)
  - Conclusion
  - Acknowledgement if any
  - Clinical application
  - Reference (in Vancouver style)
- Policy of Reviewing

Indian Journal Of Physical Therapy is peer reviewed by panel of subject experts who are duly blinded. The process of referring is anonymous and minimum of two independent notions are taken on all the submitted papers. Associate editors are in the know of the authorship.
- Ethics

Indiana Journal Of Physical Therapy is bounded and following code of conduct given by WCPT. This code will guide the editorial board and reviewers in their approach to any ethical issues arising in respect of papers submitted to Indiana Journal Of Physical Therapy.

Send your article at [editor@indianjournalofphysicaltherapy.com](mailto:editor@indianjournalofphysicaltherapy.com) as word file attachment



# Indian Journal of Physical Therapy

www.indianjournalofphysicaltherapy.com

## Article Subscription

Institute	1000 INR (Print Only)
Individual	700 INR (Print Only)

### Please Note

- Subscription rates are given here are for one year (2 Issues)
- Advance payment should be made by cheque/demand draft in the name of “Indian Journal of Physical Therapy” payable at Rajkot.
- We do not currently have option for online subscription.
- Please contact the editor on details given on the website for subscription enquiry

## Advertisement Rates

### Internal Pages

	Black and White	Color
Full Page	3000 INR	4500 INR
Half Page	1600 INR	-----
Quarter Page	1000 INR	-----

### Cover Pages (Color)

First	-----
Second	6000 INR
Third	6000 INR
Fourth	7000 INR (Upper 7/8 area)

### Please Note

- For Advertisement, advertiser should provide with either jpeg or pdf file
- The full page size mentioned here means standard letter/A4 size (8.5"x11")
- Half Page - half of full page by horizontal
- Quarter Page - half of half page by vertical
- Ads for cover page is only full page. No ad. for first page
- The Advertiser should pay in advance by Cheque/DD in name of "Indian Journal of Physical Therapy" Payable at Rajkot
- For assistance contact editor on the details given on the website

# INDIAN JOURNAL OF PHYSICAL THERAPY

## SUBSCRIPTION FORM

### Subscription Type (select the bracket for options)

( ) Individual

( ) Institution

### Subscription Term (select the bracket for options)

( ) 1 Issue (Volume no \_\_\_\_\_ Issue no \_\_\_\_\_)

( ) \_\_ Year

Name: \_\_\_\_\_

Postal Address: \_\_\_\_\_

\_\_\_\_\_

Pin Code: \_\_\_\_\_

Contact no: Office \_\_\_\_\_ Residence \_\_\_\_\_ Mobile no \_\_\_\_\_

Email: \_\_\_\_\_

Profession: \_\_\_\_\_ Designation: \_\_\_\_\_

Payment by: (cheque or DD should be in favor of Indian Journal of Physical Therapy payable at Rajkot, Gujarat, India)

( ) Cheque (No: \_\_\_\_\_, Date: \_\_\_\_\_)

( ) DD (No: \_\_\_\_\_, Date: \_\_\_\_\_)

( ) Cash (Ref No: \_\_\_\_\_, Date: \_\_\_\_\_)

Note:- Cash can be directly deposited in following bank account (quote ref no. of transaction)

Bank Name : Indian Bank

Account No : 6156194288

Account Type : Current

Name : Indian Journal Of Physical Therapy

Branch : Rajkot Main Branch, Gujarat, India

IFSC Code : IDIB000R007

MICR Code: 360019002

Branch Code : 00473

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Please fill in this order form duly & completely & mail it to

**Dr Dinesh Sorani (MPT)**

**Editor (Indian Journal of Physical Therapy)**

**"MATRU ASHISH"**

**4-Kanaknagar Society,**

**Near Sant Kabir road,**

**Rajkot-360003**

**Gujarat, India**



