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## Health Care Needs Across Different Age Groups in Children with Cerebral Palsy: A Survey

Riya Sony<sup>1</sup>, Jasrah Javed<sup>2</sup>, Divya Mohan<sup>3</sup>, R. Vasanthan<sup>4</sup>

<sup>1,2</sup>Student, <sup>3</sup>Professor, <sup>4</sup>HOD, The Oxford College of Physiotherapy, Bangalore, Karnataka

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### Abstract

**Background:** Cerebral palsy (CP) is the most common chronic childhood disability of today. Health care needs are present in these children who require health services to manage their functional disability. It can change according to the age group and severity of the condition. In the current healthcare system, little is known about priorities and needs for the children with cerebral palsy especially in reference to Indian contextual situations and how these needs may differ based on the child's age and motor function.

**Methods:** A cross sectional survey design is used in the study. 83 parents of children with cerebral palsy and their treating physiotherapists were selected in the study based on the inclusion and exclusion criteria. Participants were divided into 3 groups based on the age of the children. Self designed questionnaire was given to the parents and the physiotherapists to select the health care needs for the children. One time data collection was done over the period of 3 months.

**Conclusion:** The study also shows that mostly parent's needs are considered by physiotherapists for their goal settings. Most of the time parents' needs and the physiotherapist's goals are found to be similar.

**Key Words:** Cerebral Palsy, Health care needs, parents, physiotherapists.

### Introduction

Cerebral palsy (CP) is the most common chronic childhood disability.<sup>(1)</sup> CP is described as a group of permanent disorders of the developing movement and posture, causing activity limitation, that are attributed to nonprogressive disturbances that occur in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior by epilepsy, and by secondary musculoskeletal problems.<sup>(2)</sup> The overall prevalence of CP is 2.11 per 1000 live births.<sup>(3)</sup> In

India the overall prevalence of cerebral palsy per 1000 children surveyed is 2.95.<sup>(4)</sup> Contrary to the previous studies, prenatal factors seem to be responsible for nearly 75% of CP, whereas infant and neonatal period risk factors account for 10% to 18% of all CP cases.<sup>(5)</sup> Premature birth is considered as one of the major CP incidence risk factors.<sup>(6)</sup> Impairment in CP tends to evolve and become evident as the child grows.<sup>(7)</sup> These impairment in CP have been classified as primary, secondary, or tertiary. The primary impairments are disturbance of muscle tone, strength, balance and posture that are directly related to damage in

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**Corresponding Author:** Jasrah Javed, Student, The Oxford College of Physiotherapy, 6/9 A, Begur Road, Hongasandra, Bangalore, Karnataka, 560068

**E-Mail:** [jasrah.javed04@gmail.com](mailto:jasrah.javed04@gmail.com)

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the CNS. Secondary impairments may present as muscle contractures and deformities that develop over time in consequence to the primary problems. Tertiary impairments are adaptive mechanisms or coping responses that the child develops, to adapt to the primary and secondary problems.<sup>(1)</sup> In infancy, the child may show symptoms like irritability, lack of alertness and irregular sleep patterns. Delayed or absence of motor developmental milestones is an early feature of CP. It includes rolling, sitting, crawling, standing and walking.<sup>(2)</sup> Additionally children may have abnormal tone, muscle weakness and also persistence of primitive reflexes.<sup>(8)</sup> The motor problems tend to be more noticeable as the baby grows. In childhood muscle tone may increase in spastic cerebral palsy and fluctuate in dyskinetic CP. Abnormal movement patterns may develop in hypertonic or hypotonic limbs and there might be delay in postural reactions, hyperreflexia which are required for balance and mobility. Sensations may also be affected, mainly the proprioceptive and movement sensation<sup>(1)</sup>. The children may also demonstrate sign of intellectual disability, cognitive impairments, language dysfunction, perceptual difficulties, attention deficit, mental retardation and epilepsy<sup>(9)</sup>. In adolescence, body functional and structural problems become more prominent like increased spasticity leading to contractures or deformities, excessive contraction of muscles, impaired selective motor control which create a negative impact on locomotion. There are certain problems related more to function and ADLs that hold more priority. Difficulty in performing activities of daily living, limitation in mobility in home and community and difficulty in transportation are more often quoted.<sup>(10)</sup>

### **Methodology**

The study was conducted on 83 parents of children with cerebral palsy and their treating physiotherapist across 3 different age groups(3-7, 8-12, 13-18 years) in order to collate different health care needs of their children and to compare the health care needs between parents and physiotherapists. The participants were selected from special schools with CP children, Rehabilitation centers where parents/guardians of children with cerebral palsy and their treating physiotherapists are available.

The information was collected from the Parents / guardians of the children with spastic diplegic and quadriplegic CP and physiotherapists who are treating these patients. Both male and female children between the age group of 3-18 years with level of literacy were included in the study. Physiotherapists who treated the above children for at least 3 months were included.

#### *Procedure:*

The study procedure was submitted to the ethical committee and the approval to conduct the study was obtained. Selection of the study settings and permission to conduct the study will be taken prior from the institutions from where the study is conducted. The information regarding the health care needs were gathered from various websites, literature searched through databases (PubMed, scholar), ICF, blogs and also from textbooks. Based on the above information various health care needs were identified. The questionnaire was prepared based on the various health care needs of the children with CP. The same questionnaire was given for the parents of the children with CP and the physiotherapists treating those children.

Later the questionnaire was handed over to the experts for their opinion for intense content clarity of items and incorporation of suggestions. Five experts were selected who have master's degrees in pediatric physiotherapy with 5 years of experience in treating pediatric patients. The questionnaire was then corrected and arranged according to the opinion and views of the experts.

It was then translated to local languages including kannada, hindi, tamil and malayalam for the better understanding of the parents. The answers were then back translated to english to evaluate the efficacy of translation without changing the meaning of the content. The participants were then explained about the purpose of the study. Informed consent was obtained for the approval of participants. Later the survey questionnaire was given to the participants to be filled for the study. Data collection was conducted by either directly meeting the participants or through different online methods (email, whatsapp).

**Questionnaire:**

Questionnaire For Measurement of Healthcare Needs in Children with Cerebral Palsy was used to collect the data. It measures 9 domains which include needs for feeding and speech, cardiovascular and physical fitness, mobility of lower limb, movement of upper limb, neurological issues, functional activities, degenerative and lifestyle issues, social and community barriers and psychological and emotional factors.

**Statistical Analysis:**

The data was carefully collected and calculated. The Kruskal Wallis H test was used to compare the health care needs among parents of children with CP according to their age groups. The Wilcoxon signed rank test was used to compare the health care needs between parents and physiotherapists.

**Results****Table 1. Comparison of health care needs among parents according to age groups.**

Parents (n = 83)	3-7		8-12		13-18		Kruskal Wallis H test	p value
	Median	IQR	Median	IQR	Median	IQR		
Feeding/speech	3	0 to 5	2	0.75 to 5	3.5	1 to 5	1.296	0.523
Cardiovascular/ physical endurance	1	0 to 3	2	0.75 to 2.25	2	1 to 2.25	1.075	0.584
Mobility	11	7 to 13	10.5	7 to 13	9.5	7 to 10.75	1.091	0.580
Upper limb	3	2 to 4	3	1.5 to 4	4	2 to 4	1.523	0.467
Neurological	1	0 to 3	1	0.75 to 3	0.5	0 to 2	3.155	0.206
Functional training	3	1 to 4	4	3 to 5	4	2.75 to 5	5.315	0.070
Degenerative	1	0 to 4	0.5	0 to 1.25	2	2 to 2	9.636	0.008*
Social & community barriers	5	3 to 5	4.5	3 to 5.25	5	4 to 7	0.898	0.638
Psychological	1	1 to 3	2	2 to 4	4	2.75 to 5	11.376	0.003*

(\* Significant)

The Kruskal Wallis H test was used to compare the health care needs among parents according to age groups. There was a difference ( $p < 0.05$ ) in the health

care needs such as Degenerative and lifestyle issues and Psychological and emotional factors among parents according to age groups.

**Table 2. Comparison of health care needs among parents and physiotherapists across different age groups**

Age: 3 to 7 years (group A)	Parents		Physiotherapists		"Z"	p value
	Median	IQR	Median	IQR		
Feeding/speech	3	0 to 5	3	1 to 3	-0.518	0.604
Cardiovascular/ physical endurance	1	0 to 3	2	2 to 3	-2.709	0.007*
Mobility	11	7 to 13	11	9 to 13	-1.026	0.305
Upper limb	3	2 to 4	5	3 to 5	-2.507	0.012*
Neurological	1	0 to 3	3	0 to 4	-1.783	0.075
Functional training	3	1 to 4	3	2 to 4	-0.541	0.588
Degenerative	1	0 to 4	0	0 to 1	-2.142	0.032*
Social & community barriers	5	3 to 5	4	3 to 6	-0.420	0.675
Psychological	1	1 to 3	2	1 to 3	-0.998	0.318

(\* Significant)



**Table 3. Comparison of health care needs among parents and physiotherapists in age group 8 to 12 years**

Age: 8 to 12 years ( group B)	Parents		Physiotherapists		“Z”	p value
	Median	IQR	Median	IQR		
Feeding/speech	2	0.75 to 5	1.5	0 to 3.25	-2.763	0.006*
Cardiovascular/ physical endurance	2	0.75 to 2.25	1	1 to 2	-0.646	0.518
Mobility	10.5	7 to 13	12	9.75 to 13.25	-1.804	0.071
Upper limb	3	1.5 to 4	4	3 to 5	-2.351	0.019*
Neurological	1	0.75 to 3	2	1 to 3	-0.873	0.382
Functional training	4	3 to 5	3	3 to 4	-1.092	0.275
Degenerative	0.5	0 to 1.25	1	0 to 1	-1.153	0.249
Social & community barriers	4.5	3 to 5.25	4.5	2 to 6	-0.162	0.871
Psychological	2	2 to 4	2	1 to 3	-1.124	0.261

(\* Significant)

**Table 4. Comparison of health care needs among parents and physiotherapists in age group 13 to 18 years**

Age: 13 to 18 years (group c)	Parents		Physiotherapists		“Z”	p value
	Median	IQR	Median	IQR		
Feeding/speech	3.5	1 to 5	3	2 to 4.25	-0.122	0.903
Cardiovascular/ physical endurance	2	1 to 2.5	2	0.75 to 2	-0.053	0.958
Mobility	9.5	7 to 10.75	11	8.75 to 12	-2.033	0.042*
Upper limb	4	2 to 4	3	2 to 5	-0.087	0.931
Neurological	0.5	0 to 2	3	2 to 4	-2.877	0.004*
Functional training	4	2.75 to 5	4	3 to 4.25	-0.366	0.715
Degenerative	2	2 to 2	1	1 to 2	-2.132	0.033*
Social Community barriers	5	4 to 7	5.5	4 to 7	-1.314	0.189
Psychological	4	2.75 to 5	2	1.75 to 3	-1.903	0.057

(\* Significant)

There was a difference ( $p < 0.05$ ) in the health care need domains such as degenerative and lifestyle issues management ( $p$  value-0.008) and psychological and emotional support ( $p$  value-0.003).

### Discussion

The present study was conducted to collate health care needs as reported by the parents/ guardians and therapists of children with CP across 3 different age groups and also to compare agreement between the health care needs identified by the caregiver of the children and goals set by the therapist for rehabilitation. A self designed questionnaire was used to collect the data. According to current study, there is no significant difference found among the 3 age groups in most of the domains except degenerative

and lifestyle issues management (H test- 9.636,  $p$  value- 0.008) and psychological and emotional support (H test- 11.376,  $p$  value- 0.003). The parents of children in the group C placed higher demand on management of degenerative and lifestyle issues and psychological and emotional factors. The parents of group C focused more on the management of degenerative diseases followed by group A as they were more concerned about the future impairment or disabilities that may affect their child. Parents in group B were more concerned about management of other issues like mobility, neurological disorder etc than the degenerative issues. Concentrating on the psychological and emotional domain, high demand was expressed by the parents of children in group C followed by group B and then by group A. This can be

due to the fact that as the age progresses psychological factors like depression, anxiety may affect an individual with disability. Children in group C might consider their lives as more challenging compared to children in other age groups as they are physically and emotionally weak. Parents of children in group B might also consider this as an important factor as the disability prevents their children from being normal when compared to the children of the same age group. The health care needs identified by the caregiver of the children and goals set by the physiotherapist for rehabilitation were also compared and analyzed in different age groups. From 3 different age groups, parents and physiotherapists were in agreement in most of the domains except few. Group A showed difference in parent's and physiotherapist's view on domains cardiovascular and physical fitness (p value-0.007), movement of upper limb (p value-0.012) and degenerative and lifestyle issues (p value 0.32). Group B showed difference only in feeding/speech (p value-0.006) and movement of upper limb (p value-0.19). Group C showed differences in mobility (p value-0.42), neurological issues (p value-0.004) and degenerative and lifestyle issues (p value-0.33). In group A, physiotherapists expressed more importance for the improvement of cardiovascular/physical endurance and management of upper limb impairment compared to parents. In group B, parents showed management of feeding and speech problems as an important need whereas the physiotherapists focus less when compared to other domains. In group C, physiotherapists focus on management of mobility issues and movement of hand functions when parents are more focused on other domains.

### Conclusion

Health care needs among the cerebral palsy remains same throughout their age except few which are noticeable during the later stages of their life. Domains such as feeding and speech, cardiovascular and physical fitness, mobility of lower limb, movement of upper limb, neurological issues, functional activities and social and community barriers are the common needs which are required for all the children irrespective of their age. Degenerative and lifestyle issues, and psychological and emotional factors are few needs which are more expressed by the parents of children at their late adolescent age group. The study also shows that mostly parent's

needs are considered by physiotherapists for their goal settings. Most of the time parents' needs and the physiotherapist's goals are found to be similar.

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# To Study the Impact of Wrist Splints and Nerve Tendon Gliding Exercises on Carpal Tunnel Syndrome in Women who Work at Computers and in Women Who Do Not

Kalpana Jain<sup>1</sup>, Namrata Srivastava<sup>2</sup>, Kartik Chhonker<sup>3</sup>

<sup>1,3</sup>Assistant Professor, <sup>2</sup>HOD, Career College Bhopal, India

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## Abstract

**Background:** To study the difference between the effects of wrist splint and nerve tendon gliding exercises for carpal tunnel syndrome in women with computer desk job and the difference between the effects of wrist splint and nerve tendon gliding exercises in non computer desk job women with carpal tunnel syndrome.

**Methods:** 34 Females objects with symptomatic carpal tunnel syndrome were selected randomly with age group between 25-30 years with due consideration to inclusion and exclusion criteria. In this study 34 subjects are selected. They were randomly divided into two groups using lottery method. In group A (Non Computer desk job women) wrist splint & Exercises was given. In group B (Computer desk job women) Nerve tendon gliding technique & exercises was done for 6 weeks. The beneficial effect of gliding exercises may be the mobilization of the nerve directly or facilitation of venous return or oedema dispersal. The pressure in the carpal tunnel is lowest in neutral wrist flexion extension range, with the pressure rising significantly as the wrist is moved into flexion or extension. Splint with the wrist in a neutral position, at night and during the day is used for starting 3 weeks and any at night during rest of period. Analyzing scores after 6 weeks the mean and SD values for pre and post FSS Sores of group A were 27 & 21.64 and 1.36 & 1.80 respectively.

**Conclusion:** The study showed that there was decrease in the pain and improvement in the functional ability statistically in carpal tunnel syndrome women with computer desk job by performing nerve and tendon gliding exercises and wrist splinting for both the groups for a period of 6 weeks. This concluded that there was equal improvement in pain in both the groups but the functional ability is more improved after the nerve and tendon gliding exercises in group B. Therefore this study is rejecting the null hypothesis and accepts the alternate hypothesis.

**Key Words:** Carpal Tunnel Syndrome, Nerve Tendon Gliding, Functional Status Scale, VAS

## Introduction

Carpal tunnel syndrome (CTS) is defined as median nerve dysfunction due to compression at the level of the carpal tunnel. Patients experience pain, numbness and motor weakness in median

distribution, and a burning sensation in the hand extending up the forearm into the neck and shoulder.<sup>2</sup> CTS occur as the symptoms manifested when the median nerve, the major sensory and motor nerve of the hand, becomes compressed as it travels from

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**Corresponding Kalpana Jain**, Assistant Professor, Career College, Bhopal, India.

**E-Mail:** drkalpanajainbpl@gmail.com

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the forearm to the hand through the carpal tunnel. To best understand this syndrome, the anatomy of the carpal tunnel and the median nerve, along with the factors that lead to median nerve compression should be well understood.<sup>[3,4,5.]</sup>

Carpal tunnel syndrome is a painful hand and arm condition caused by compression of a nerve in wrist bones (carpal bones) and a ligament (transverse carpal ligament). The median nerve and several tendons pass through the carpal tunnel from the forearm to the hand. Sitting in front of desk all day can make you more prone to carpal tunnel syndrome because all the extra fluid you retain can put pressure on that nerve. It occurs most frequently in the second trimester but can develop at any time. CTS is typically bilateral and occurs commonly in relatively older women (mean age of 30 years), who are square wristed, nulliparous, or suffer with generalized oedema.<sup>6</sup> CTS is caused by factors that increase pressure on the median nerve, causing entrapment of the nerve, or in extreme cases, ischemia of the median nerve. Carpal Tunnel Syndrome is more frequent when women keep on sitting on the chair for longer duration because the systemic process increases the extra capsular fluid retention by the hormone Prolactin and produce soft tissue swelling in the later stages. The Carpal Tunnel Syndrome can thus be produced by compression or swelling of the median nerve in its synovial sheath. The exercises relieve pressure on the median nerve and stretch the carpal ligaments, which also helps decrease pressure. They are also thought to help blood flow out of the carpal tunnel, which can help decrease fluid pressure.<sup>15,16,17,18</sup>

The pressure in the carpal tunnel is lowest in neutral wrist flexion extension range, with the pressure rising significantly as the wrist is moved into flexion or extension. Splints that hold the wrist in neutral are often helpful in controlling symptoms of mild to moderate severity. They can be particularly useful in cases of early carpal tunnel syndrome, when the patient is repeatedly woken at night by painful paraesthesia splinting the wrist in this position, places the carpal tunnel in its most open position, allowing for restoration of maximal circulation to the median nerve. Further compression to the median nerve with prolonged wrist flexion while sleeping, or during daily/occupational activities are prevented

with the use of a wrist splint. For optimal effect splints should be chosen and fitted by experienced hand therapists from a range of available options, with the opportunity for further visit to audit outcome and allow for additional adjustments.<sup>22</sup>

Nerve tendon gliding exercises are also seen to be effective with carpal tunnel syndrome. Neural gliding is a treatment technique that may improve symptoms related to CTS. Sometimes referred to as "neural flossing" or "neurodynamic mobilization," the technique of neural gliding is movement based and attempts to take the nerve throughout the available range of motion, potentially affecting the nerve both mechanically and physiologically. These exercises are thought to relieve pressure on the median nerve and stretch the carpal ligaments, which also helps decrease pressure. They are also thought to help blood flow out of the carpal tunnel, which can help decrease fluid pressure.<sup>19,20,21,22</sup>

## Materials and Methods

34 Females objects with symptomatic carpal tunnel syndrome were selected randomly with age group between 25-30 years with due consideration to inclusion and exclusion criteria. Study area of our research was CIMS Bhopal. All patients presented with symptoms of median nerve compression with mild to moderate symptoms. They were electrophysiologically confirmed with CTS. All subjects fill the consent form and a brief demonstration was given about wrist splinting and tendon and nerve gliding techniques for the patient. They were randomly divided into two groups using lottery method. In group A (Non Computer desk job women) wrist splint & exercises was given. In group B (Computer desk job women) Nerve tendon gliding exercises was done for 6 weeks.

Wrist Splint was given for neutral-angle initiated at 24 weeks of gestation. Bilateral splints were applied throughout the day and night for 3 weeks and then nocturnally for the remainder of duration. Length of time for splint use may also be determined by the causes of the individuals CTS's and their response to treatment. For example, a patient demonstrating CTS symptoms during pregnancy may only require splinting during this time.<sup>26</sup> While for nerve tendon gliding exercise, Tendon gliding and median nerve

gliding exercises are two types of exercises that may help with carpal tunnel syndrome.

#### Fist Flexion Exercises

Fist flexion Exercises (also known as tendon gliding exercises) move your fingers through five positions while your wrist stays in a neutral position (meaning it is not bend).

Exercise performed by:

1. Start with your fingers straight.
2. Make a hook fist and then return to a straight hand.
3. Make a straight fist and then return to a straight hand.
4. Make a full fist and then return to a straight hand.

Hold each position for seven seconds and do 10 repetitions. Repeat three times a day.

#### Median Nerve Gliding Exercises

For median nerve gliding exercises move out thumb through 6 positions while your wrist stays a neutral position. To perform the exercise:

1. Begin by making a fist with your wrist in the neutral position.
2. Straighten your fingers and thumb.
- 2 Bend your wrist back and move your thumb away from your palm.
- 4 Turn your wrist palm up,
5. Use your other hand to gently pull out thumb farther away from your palm. Hold each position for seven seconds, and do five repetitions. Repeat three times a day.

Effectiveness of the Tendon and nerve gliding exercises used as conservative treatment approached in relieving the symptoms of the carpal tunnel syndrome. (Lamia Pinar, Asgel Enhos, et.al.)

Ergonomic education: Repetitiveness of work tasks, and poor posture during repetitive tasks are commonly cited risk factors for the development of CTS. (Asdiscussed above, during the assessment of these patients, occupational tasks and the patient's posture during these activities should be identified.) Ongoing education should include avoidance

of wrist postures (i.e., prolonged wrist flexion), repetitive wrist motions such as gripping or pinching objects while flexing the wrist, and performing repetitive wrist flexion-extension exercise motions. It is important to evaluate the work environment and to suggest alternatives such as ergonomically designed workstations designed to limit postural stresses.<sup>23</sup>

Patients were assessed at the baseline and at the end of treatment session after Six weeks with functional status scale (FSS) & VAS

### Results and Discussion

The paired and unpaired t test is used for analysis. However few limitations were observed in this study like monitoring of wrist splint wearing is not done in home, other interventions like carpal mobilization can be compared with neural mobilization etc. Thus after analysing all the data of group A&. B after 6 weeks it suggests that both groups shows equal improvement in VAS scores and thus in pain level but group B shows more significant improvement in Functional status then compared to group A.

Carpal Tunnel Syndrome (CTS) is defined as median nerve dysfunction due to compression at the level of the carpal tunnel. The primary aetiology is varied but idiopathic form is the most common. Occupational women are also susceptible canal tunnel syndrome even if they do not type or play music all day. CTS are common in working women with desk job and is considered to have a short and benign course.<sup>1</sup> Working on computers can make you more prone to carpal tunnel syndrome because all the extra fluid you retain can put pressure on that nerve. It occurs most frequently while working on desk job but can develop at any time. CTS is typically bilateral and occurs commonly in relatively older women (mean age of 30 years), who are square wristed, nulliparous, or suffer with generalized edema.<sup>6</sup> CTS can also be seen may be due to fluid retention by the hormone, prolactin. Symptoms may include numbness, tingling, pain, or a dull ache in the fingers, hand, or wrist. These symptoms tend to come and go and are often worse at night. Occasionally, the discomfort may even extend to the forearm and upper arm. Symptoms of median nerve compression include pain, numbness or tingling on the anterior surface of the index, middle or radial half of the

ring finger. It is often associated with weakness of handgrip or nocturnal symptoms including hand or arm pain and numbness. Symptoms are often worse at night and can be exacerbated by forceful activity and extreme wrist positions.<sup>26</sup> The symptoms resolve after delivery in most women with pregnancy related carpal tunnel syndrome.<sup>34</sup> Treatment of CTS depends on the severity of symptoms. **Ante Jurjevic et al.**, studied on Early Onset of Carpal Tunnel Syndrome: Case Report, Conservative treatment was sufficient for symptom relief in this case, which is in accordance with other reports of complete improvement achieved by conservative therapy.

Paired 't' test was used the p values <0.0001 considered extremely significant, the t value 15.71 which shows significant improvement in functional status after 6 weeks. The mean and SD values of pre and post VAS scores of group A are 7.94 & 3.41 and 0.74 and 0.93 respectively. Paired 't' test was used the p value <0.0001 considered extremely significant, the t value 18.53 which shows significant improvement in pain after 6 weeks. The mean and SD values for pre and post VAS scores of group B were 7.94 & 3.47 and 0.82 & 1.06 respectively. Paired 't' test was used the p value <0.0001 considered extremely significant, the t value 15.63 which shows significant improvement in pain after 6 weeks. The mean and SD values for pre and post FSS scores of group B were 27.05 & 14.70 and 0.96 & 1.64 respectively. Paired 't' test was used the p value <0.0001 considered extremely significant, the t value 26.32 which shows significant improvement in functional status after 6 weeks.

When compared the mean and SD values for post VAS scores of group A and group B were 3.4 & 3.47 and 0.93 & 1.06 respectively. Unpaired 't' test was used the p value =0.86 considered not significant, the t value 0.17, which shows equal improvement in pain for both the groups after 6 weeks. The mean and SD values for post FSS scores of group A and group B were 21.64 & 14.70 and 1.80 & 1.64 respectively. Unpaired 't' test was used the p value <0.0001 considered extremely significant, the t value 11.72.

The outcome measure of all two groups are taken by at first day of study and end day of the study i.e., 6 weeks by using visual analogue scale and functional status scale after this the analysis was done by Instate software. The paired and unpaired t test is

used for analysis. However few limitations were observed in this study like monitoring of wrist splint wearing is not done in home, other interventions like carpal mobilization can be compared with neural mobilization etc.

Thus after analysing all the data of group A & B after 6 weeks it suggests that both groups shows equal improvement in VAS scores and thus in pain level but group B shows more significant improvement in Functional status then compared to group A.

## Conclusion

The study showed that there was decrease in the pain and improvement in the functional ability statistically in carpal tunnel syndrome during pregnancy by performing nerve and tendon gliding exercises and wrist splinting for both the groups for a period of 6 weeks. This concluded that there was equal improvement in pain in both the groups but the functional ability is more improved after the nerve and tendon gliding exercises in group B.

**Ethical Clearance:** This study was approved by our institutional ethical committee.

**Source of funding:** Self

**Conflict of interest:** Nil

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## Two Case Studies of Pediatric Traumatic Brain Injury: An Interdisciplinary Approach

Blair Carsone<sup>1</sup>, Rita Lenhardt<sup>2</sup>

<sup>1</sup>Doctoral Capstone Coordinator and Assistant Professor, Occupational Therapy Doctorate Program, Gannon University, Ruskin Campus, 105 Commercial Center Drive, Ruskin, Florida, <sup>2</sup>Assistant Professor, NSSLHA Chapter Advisor, Speech-Language Pathology Program, Gannon University, Ruskin Campus, 105 Commercial Center Drive, Ruskin, Florida.

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### Abstract

**Background:** Physical and neurological deficits after a pediatric traumatic brain injury can result in significant functional limitations in all areas of daily living. A child's ability to generalize learning may be limited. Comprehensively assessing a client's skills through physical, occupational, and speech therapies may help to establish a baseline understanding about the importance of an interdisciplinary approach.

**Methods:** These two case studies describe the impact of interdisciplinary outpatient therapy services for two boys with traumatic brain injuries who received services before and after the pandemic.

**Conclusion:** The negative impact of the pandemic is demonstrated for both boys regarding functional progression and skill acquisition. However, the results after two years of an interdisciplinary approach resulted in improvements in both clients' overall functioning. Additional studies are recommended to validate the findings.

**Keywords:** traumatic brain injury, interdisciplinary approach, outpatient therapy

### Introduction

Traumatic brain injury (TBI) is defined by the Centers for Disease Control and Prevention<sup>1</sup> as an injury that impacts how the brain functions. While those 75 years and older had the highest numbers and rates of TBI-related hospitalizations and deaths, children had 16,070 TBI-related hospitalizations in 2019 and 2,774 TBI-related deaths in 2020<sup>2</sup>. Therapies can help children with TBI recover function, relearn skills, and practice new ways to engage that account for their new health status. Rehabilitation can include several different kinds of therapy for physical, emotional, and cognitive difficulties and for a variety

of activities, such as daily self-care, driving, and interacting with others. Depending on the severity of the injury, therapy treatments may be needed only briefly, occasionally throughout a person's life, or on an ongoing basis<sup>3</sup>.

Rehabilitative pediatric outpatient services can address a variety of performance skills in children with traumatic brain injuries. Occupational therapy can address activities of daily living and instrumental activities of daily living. Occupational therapists and assistants facilitate the development and refinement of fine motor coordination, visual perceptual, visual-motor integration, upper extremity strength, upper

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**Corresponding Author:** Blair Carsone, Doctoral Capstone Coordinator and Assistant Professor, Occupational Therapy Doctorate Program, Gannon University, Ruskin Campus, 105 Commercial Center Drive, Ruskin, Florida.

**E-Mail:** carsone001@gannon.edu

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extremity coordination, and sensory processing skills that may have been impacted by the brain damage. Physical therapy can address motor skills. Physical therapists and assistants facilitate the development and refinement of gross motor skills, balance, coordination, strength, range of motion, and movement patterns that may have been affected by the trauma. Speech therapy may address communication and speech. Speech therapists and assistants facilitate the development and refinement of language social skills, communicating with others, speaking, listening, and utilization of voice altered by the insult on the brain.

Therapy services will often overlap regarding implementing techniques, strategies, and carryover but remain true to their scope of practice which is critical to the progression of clients with traumatic brain injuries. Therapy providers within the same field (e.g., occupational therapists and occupational therapy assistants) work towards the therapeutic goals established for each client. However, the therapist will evaluate and reassess the client, update goals, and eventually discharge the client when goals have been met.

### Materials and Methods

Data were obtained from one pediatric outpatient clinic in the United States. Patient charts of Mike\* and Bob\* were reviewed with diagnosis of TBI confirmed. Therapy attendance, initial evaluation scores, and re-evaluation scores were recorded with relevant information (e.g., age and gender). Attendance was calculated by totaling the number of therapy sessions attended in between the initial evaluation and re-evaluation assessment sessions. Evaluation scores and re-evaluation scores were recorded for each respective discipline's assessment(s).

The Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT-2) was utilized to assess Mike throughout his two years of physical therapy services. The BOT-2 covers fine and gross motor skills and provides six composite scores as well as one comprehensive measure of overall motor proficiency<sup>4</sup>. The Pediatric Balance Scale (PBS) is a modified version of Berg's Balance Scale was utilized to assess BOB The PBS was developed as a balance measure for school-age children with motor impairments<sup>5</sup>.

Both Mike and Bob received physical therapy interventions such as therapeutic exercises. Through therapeutic exercises, physical therapists and assistants facilitated the development and refinement of gross motor skills, balance, coordination, strength, range of motion, and movement patterns. Development and refinement were the focus of the physical therapy interventions due to the deficits illustrated on the BOT-2 and PBS.

The Beery-Buktenica Developmental Test of Visual Motor Integration (Beery VMI) was utilized to assess Mike and Bob during the course of their two years of occupational therapy services. The Beery VMI evaluates the extent to which individuals can integrate their visual and motor abilities<sup>6</sup>.

Both Mike and Bob received occupational therapy interventions such as therapeutic activities. Through therapeutic activities, occupational therapists and assistants facilitated the development and refinement of fine motor coordination, visual perceptual, visual-motor integration, upper extremity strength, upper extremity coordination, and sensory processing skills. Development and refinement were the focus of the occupational therapy interventions due to the deficits illustrated on the Beery VMI.

The Clinical Evaluation of Language Fundamentals Fourth Edition (CELF-4) combines core subtests with supplementary subtests to get a comprehensive assessment of a student's language skills<sup>7</sup>. The Clinical Evaluation of Language Fundamentals Fifth Edition (CELF-5) provides therapists with a comprehensive battery to assess semantics, morphology, syntax, and pragmatics for children ages 5-21<sup>8</sup>. The CELF-4 and CELF-5 were utilized to assess Mike throughout his two years of speech language therapy services. Whereas the CELF-5 was utilized to assess Bob during his two years of speech language therapy services.

Both Mike and Bob received speech language therapy interventions such as language activities. Through language activities, speech therapists and assistants facilitated the development and refinement of language social skills, communicating with others, speaking, listening, and utilization of voice. Development and refinement were the focus of the speech language therapy interventions due to the deficits illustrated on the CELF-4 and CELF-5.

## Results and Discussion

These two case studies describe the impact of interdisciplinary outpatient therapy services for two boys with traumatic brain injuries who received services before and after the pandemic. Both Mike and Bob had personal setbacks as well as enduring the pandemic. Mike had an increase in negative behaviors with poor frustration tolerance, which is noted during his second re-evaluation. Bob experienced a left distal tibial fracture in March 2021, which is noted during his second re-evaluation. Fluctuations in positive score increases are evident in both cases.

For physical therapy, Mike demonstrated a 9-point increase in bilateral coordination and 13-point increase in balance as measured by the BOT-2 after attending 31 physical therapy treatment sessions (an average of 1.3 sessions a month). For occupational therapy, Mike demonstrated a 0-point change in visual motor integration, 12-point increase in visual perceptual, and 0-point change in motor coordination as measured by the Beery VMI after attending 27 occupational therapy treatment sessions (an average of 1.1 sessions a month). For speech language therapy, Mike demonstrated an 8-point increase in word structure as measured by the CELF-4 and CELF-5 after attending 52 speech language therapy sessions (an average of 2.2 sessions a month).

For physical therapy, Bob demonstrated an 8-point increase in balance as measured by the PBS after attending 84 treatment sessions (an average of 3.5 sessions a month). For occupational therapy, Bob demonstrated a 4-point increase in visual motor integration, 4-point increase in visual perceptual, and a 2-point decrease in motor coordination as measured by the Beery VMI after attending 103 occupational therapy treatment sessions (an average of 4.3 sessions a month). For speech language therapy, Bob demonstrated a 1-point decrease in formulated sentences and a 17-point increase in recalling sentences as measured by the CELF-5 after attending 31 speech language therapy sessions (an average of 1.3 sessions a month).

Two years of an interdisciplinary approach resulted in improvements in both clients' overall functioning. Mike did not demonstrate positive change in visual motor integration and motor

coordination. Bob did not demonstrate positive change in motor coordination and formulated sentences. However, children with a history of TBI can present with cognitive problems years after the injury as developmental demands on the child increase<sup>9</sup>.

## Conclusion and Acknowledgment

Mike and Bob are two boys who experienced severe brain injuries and subsequently received outpatient therapy services at the same clinic where an interdisciplinary approach was utilized to ensure positive client outcomes. Therapists and assistants at the clinic Mike and Bob attended emulate an interdisciplinary team by meeting regularly to discuss and collaboratively set treatment goals for both boys<sup>10</sup>.

Mike started outpatient therapy services including physical, occupational, and speech language therapies in 2019 when he was 7 years 8 months. His primary diagnosis was diffuse traumatic brain injury with loss of consciousness of unspecified duration. Unfortunately, in 2015 Mike accidentally inflicted a gunshot wound to himself, resulting in a TBI. Whereas Bob started outpatient therapy services including physical, occupational, and speech language therapies in 2020 when he was 12 years 3 months. His primary diagnosis traumatic brain injury with loss of consciousness of unspecified duration. Bob sustained a TBI in 2019 after being struck by a car. Mike and Bob both had subsequent complications after sustaining their TBIs including meningitis, developing cerebrospinal fluid leak, revision of cranioplasty, and insertion of lumbar drain.

After two years of receiving therapy services and enduring the impact of the pandemic on in person interventions, Mike and Bob both demonstrated improvements. The negative impact of the pandemic is demonstrated for both boys regarding functional progression and skill acquisition. However, the results after two years of an interdisciplinary approach resulted in improvements in both clients' overall functioning. Additional studies are recommended to validate the findings.

**Ethical Clearance:** This case report was intended for quality improvement for team building at the

outpatient clinic and did not need IRB approval. All families at the clinic sign a waiver, allowing data to be collected.

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# Survey on Awareness of Antenatal Physiotherapy among Women from Rural and Urban Populations of Maharashtra

Akshata Sandeep Shinde<sup>1</sup>, Jyoti S. Jeevannavar<sup>2</sup>

<sup>1</sup>Intern, <sup>2</sup>Professor, SDM College of Physiotherapy, SDM University, Dharwad, Karnataka, India.

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## Abstract

**Background:** Antenatal physiotherapy is very essential for maternal and fetal health. Adequate knowledge and awareness in pregnant women plays an important role to promote its practice.

**Objective:** The aim of this study was to assess the awareness of antenatal physiotherapy among pregnant women in rural and urban population of Maharashtra.

**Study design:** Survey or descriptive cross-sectional study

**Methods:** A descriptive cross-sectional study was conducted using a self generated questionnaire which included questions related to awareness of antenatal physiotherapy among 500 pregnant women in any trimester attending regular antenatal checkups in primary health centers and private maternity clinic in rural and urban populations of Maharashtra.

**Results:** The 406 women included 208 (51%) rural women and 198 (49%) urban women with a mean age of was 23.5 ( $\pm 3.39$ ) and 26 ( $\pm 2.59$ ) respectively. Educational level influenced the awareness of physiotherapy positively.

**Conclusion:** The study concludes that the awareness of antenatal physiotherapy and rate of referral was found to be greater in urban women. Hence the study would like to highlight the need to create greater awareness of antenatal physiotherapy at all levels of health care systems.

**Keywords:** Antenatal Physiotherapy; Rural; Urban; Awareness; Women.

## Introduction

Physiotherapy in Obstetrical and Gynecological Health is a fairly neglected area in India. This fact prevails even though the profession has grown very fast and has established in many other specialties related to health. Self-neglect is documented to be very common among Indian Women, especially

those hailing from lower socioeconomic strata. Further the male partner or the in-laws are decision makers in availing medical facilities for women if needed. In many Indian rural/tribal areas, pregnancy is considered normal physiology hence does not require any medical health care. Pregnancy, labor, and postnatal status are not pathological but being highly vulnerable; prevention is needed during all the

**Corresponding Author:** Akshata Sandeep Shinde, Intern, SDM College of Physiotherapy, SDM University, Dharwad, Karnataka, India.

**E-Mail:** akshatas131@gmail.com

**Contact No.:** 7719980199

three stages. Each labour can be a unique experience. Owing to the alteration in the physiological function of gastrointestinal, cardiovascular, psychosomatic system in addition to musculoskeletal function, and taking into account, the need of preparation of breasts for lactation after child birth; the antenatal care program is generally formulated to address all such issues encountered during pregnancy. Physiotherapeutic antenatal program specifically focuses on the care of abdominal capsule, mother's education and exercises which include joint protection methods, specific breathing techniques, specific flexibility exercises, lumbar core stability and pelvic floor muscle exercises.<sup>1</sup>

Antenatal Physiotherapy becomes essential in managing pain as an effect of increased relaxin. The specific antenatal training not only alleviates muscular pain but also maintains the muscle strength.<sup>2</sup> However, awareness of antenatal physiotherapy among the general population is not known.

### Objective

The objective of this study was to assess the awareness of antenatal physiotherapy among pregnant women in rural and urban population of Maharashtra.

### Methodology

Ethical clearance was obtained for this study which was conducted in rural and urban areas of Maharashtra, India. As exact details of the region wise birth registrations per month in Maharashtra could not be obtained, a sample size for this survey was determined as a convenient sample of 500 pregnant women (250 each from rural and urban areas). Rural places included were Nerle (District: Sangli), Islampur, Kodoli (District: Kolhapur), Yelur (District: Sangli), Chikurde (District: Sangli), Kameri (District: Sangli), peripheral parts of Kolhapur district, Talegaon Dabhade (District: Pune) whereas urban areas included the cities Kolhapur and Pune. Participants in rural population were included from women attending regular ante-natal check-ups to Primary Health Centre's (PHC's), nursing homes and tertiary referral health centers. Participants in Urban population were from Private obstetric hospitals and maternity homes. Permission to conduct the study

at respective places was obtained from the Heads of the Obstetrics and Gynecology private clinics, PHC's and Tertiary Health Centers. A self-generated questionnaire was prepared keeping the aims of the study in view. The questionnaire contained closed ended questions and included information about the demographic details, environmental history, education, parity, awareness of physiotherapy in general and in pregnancy. The questionnaire was reviewed by 3 local obstetricians for cultural and social acceptability of the questions included. All the 3 reviewers had an experience of more than 10 years. Pregnant women during their 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> trimester who were willing to participate in the study were included. Women were explained about the survey and consent to participate was obtained from them. 500 pregnant women were randomly selected (250 from rural and 250 from urban areas) from the hospital registers for participation in the study. Women who could read and write were given the form to be filled by self. Data from women who could not read and write was obtained through interview method. Only 437 women agreed for participation at a response rate of 87%. However, 31 of the self filled questionnaires, on screening for completeness were found to have incomplete data. Finally data from 406 (208 rural & 198 urban) questionnaires was subjected to statistical analysis.

### Inclusion criteria:

Pregnant women of all gestational ages and any status of parity above the age of 18 years were included in the survey.

### Exclusion criteria:

Women with a history of high risk pregnancies as diagnosed by the consulting obstetrician were excluded from participation.

### Results

The sample of data analyzed using Statistical Package for Social Sciences (SPSS) 23 was from 406 pregnant women which included 208 women from rural and 198 women from urban areas. The mean age of the 208 (51%) rural women and 198(49%) urban women was 23.6 ( $\pm 3.39$ ) and 26 ( $\pm 2.59$ ) respectively. The proportion of rural and urban women was not significantly different at a z-score of -0.7019 at

a p-value of 0.48392. The mean ages of pregnant women in rural areas was significantly lower than the urban women with a z-score of -7.40054 at a p-value of <0.00001. Among the rural women 195 (94%) were housewives while 13 (6%) were working. The number of working women in the rural areas who were aware of general physiotherapy was 9 (70%), whereas those unaware were 4 (30%). The number of housewives who were aware of general physiotherapy was 98 (50%) and those unaware were 97 (50%).

Among the urban women 115 (58%) were housewives while 83 (42%) were working. The number of working women in the urban areas who were aware of general physiotherapy was 77 (93%), whereas those unaware were 6 (7%). The number of housewives who were aware of general physiotherapy was 68 (59%) and those unaware were 47 (41%).

Urban women aware about antenatal physiotherapy were significantly higher than women in rural area with a z-score of -3.4675 and a p-value of 0.00052. The women unaware of antenatal physiotherapy consisted of a significant number of those from rural population at the z-score of 5.6023 and p-value of < 0.00001.

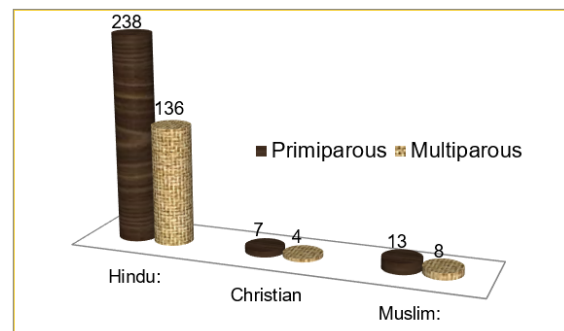
Urban women among primi-para were significantly older than rural women at a t-value of 8.1812 and p-value of <0.00001. The number of women with first pregnancies was also significantly higher among urban women as compared to rural with a z score of -2.9935 and p-value of 0.00278. The urban women were significantly lower in number among the multiparous women when compared with rural at a z-score of 5.1149 and p-value of <0.00001.

**Table1: Education level and awareness about antenatal physiotherapy.**

Education	Unaware n (%)	Aware n (%)
Less than equal to 10 <sup>th</sup>	33(21.5%)	32 (12.65%)
Less than equal to 12 <sup>th</sup>	15 (9.80%)	44(17.40%)
Degree	105(68.70%)	177(69.95%)
Total	153	253

Table 1 show that the educational level influenced the awareness of physiotherapy positively. The greater the educational level greater was the awareness of physiotherapy.

Women in the rural population being referred for antenatal exercises were not significantly different from those not being referred with a z-score of 0.9806 and p-value of 0.32708. However women being referred for antenatal exercises were significantly higher than those not referred with a z-score of 5.8292 and p-value of <0.00001. The comparison between rural and urban references for antenatal exercises showed that women in the urban population had a significantly greater chance of being referred for antenatal physiotherapy with a z-score 3.4588 and p-value 0.00054.



### Discussion

The number of participating rural and urban women was proportionately distributed. However the mean age of the urban women was higher than the rural women. This result could be due to the greater number of women getting married at a later age according to various other studies. (3)

As the educational level increased the awareness of physiotherapy among the women increased significantly. This result is supported by other researches which also report similarly. (4)

All the women who reported being aware of exercises in general were reporting “walking” as the only exercise known.

The greater awareness about antenatal physiotherapy among urban women could be due to the greater exposure to and presence of centers catering to antenatal exercises.

### Conclusion

The study concludes that the awareness of antenatal physiotherapy and rate of referral was found to be greater in urban women. Hence the

study would like to highlight the need to create greater awareness of antenatal physiotherapy at all levels of health care systems. The awareness among the caregivers and associated health care delivery systems is also equally essential.

Future studies trying to awareness among grass-root level healthcare workers can be undertaken.

**Ethical clearance:** Ethical clearance was obtained from the institutional ethical committee.

**Informed consent:** Written informed consent was obtained from the participants.

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**Conflict of interest:** The authors have no potential conflicts of interests to disclose with respect to the research, authorship, and/or publication of this article.

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# The Impact of Regular Salah Practice on Balance and Fall Prevention among Community Dwelling Elderly Population

Roshina Mohd Azam Khan<sup>1</sup>, Rincy Sibi Joseph<sup>2</sup>

<sup>1</sup>Intern at YMT college of physiotherapy, Kharghar, <sup>2</sup>Associate professor at YMT college of physiotherapy.

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## Abstract

**Background:** In older population, the incidence of fall is high and balance disorder is one of the high-risk factors in them. Falls may result in various drastic episodes. Due to fear of fall the older people tends to be more immobile and stay indoors, hence their physical activities are reduced. one of the religious physical activities in muslims are salah.

Salah is a form of slow and moderate exercise. This research aims to examine the impact of regular salah practice on balance & fall prevention among community dwelling elderly population.

**Methods:** A case control study is carried out in sample size of 162 community dwelling elderly. The assessment of balance is done with berg balance scale, fear of fall with fall efficacy scale respectively. the statistical analysis is done with spss.v.20.

**Conclusion:** The result of the present study supports the assumption that religious prayers (such as Islamic prayers) beneficially influence human performance, particularly balance and also prevents falls in elderly population. Therefore, any exercise protocol proven to be beneficial to humans should be consider beyond its religious aspect.

**Key words:** Salah, Namaaz, community dwelling elderly, balance, fall prevention.

## Introduction

Ageing is “the accumulation of diverse deleterious changes occurring in cells and tissues with advancing age responsible for the increased risk of disease and death”.<sup>[1]</sup> As age passes, physical activity and cognitive capabilities are reduced. Aging causes a reduction in strength, endurance, agility and flexibility, coordination, and balance, fear of falling is increased and their day-to-day activities are hampered.<sup>[2][3]</sup>

The elderly population in India, age 60 and above has risen from 6.0 to 8.6 percent. The prevalence of falls ranged from 18.8% to 53%, according to various studies conducted in India and abroad. Falls are a major health problem for older people, with 30–35% of those who live in the community falling at least once a year. In the older population, the incidence of falls is high and balance disorder is one of the high-risk factors in them.<sup>[4]</sup> There is multifactorial causation of falls. It can be due to age-related

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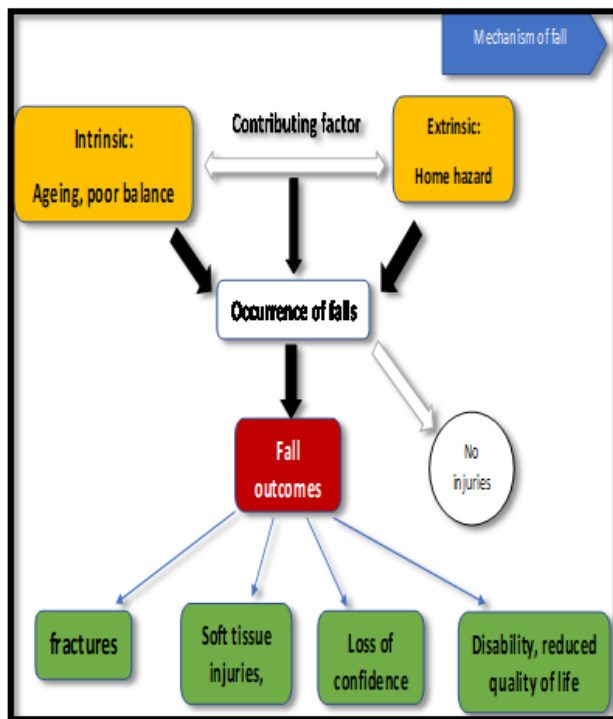
**Corresponding Author:** Roshina Mohd Azam Khan, Intern at YMT college of physiotherapy.

**E-Mail:** [khanroshina22@gmail.com](mailto:khanroshina22@gmail.com)

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problems, like hearing problems, poor vision, balance deficits, dizziness, vertigo, postural hypotension, syncope, changes in the central nervous systems, or musculoskeletal problems like gait disturbance and muscle weakness. Environmental factors like obstacles, slippery surfaces or improper footwear, etc, also play an important role in falls. Other than these, pathological conditions and comorbid diseases like osteoporosis and physiological decline due to age (e.g., slower reflexes) increase the high chances of fall-related injury.<sup>[5]</sup> Falls may result in a laceration, contusions, soft tissue bruising, joint dislocations, fractures (femoral neck fracture is common), hospitalization, disability,<sup>[1][2]</sup> immobility, and fear of fall.<sup>[4][5]</sup>



The fear of fall is devastating. Due to fear of fall the older people tends to be more immobile and stay indoors hence their physical activities are reduced, there joint motion and muscle strength is decreased by 40%. Aerobic capacity is also reduced. Injurious falls leading to severe medical, psychological, and social sequelae are associated with high treatment costs. Although many factors, such as aging, chronic illness, sedentary lifestyle, and medication, may contribute to the risk of falling.<sup>[5]</sup> Due to all these factors their quality of life is generally affected.<sup>[6]</sup>

Prevention of fall became the important factor by improving balance, giving various interventions such as tai chi, dynamic balance, stepping, and yoga etc.<sup>[7][9]</sup>

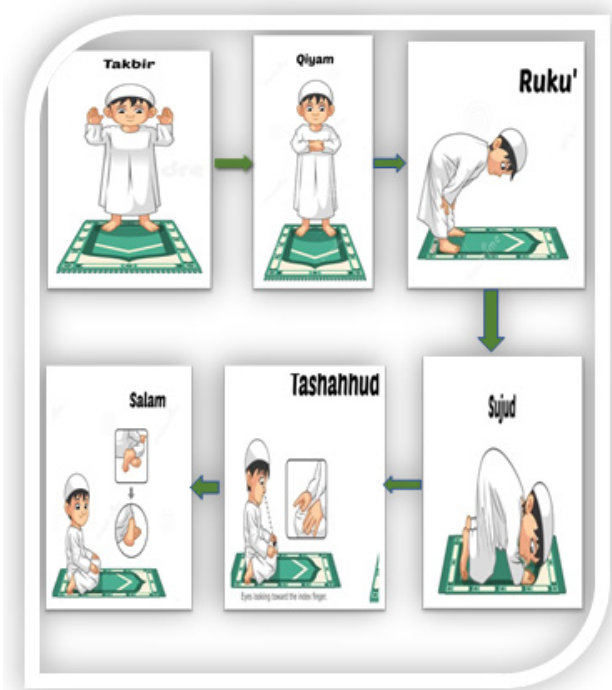
As the age passes, few people tend to adapt the low to moderate physical activities like brisk walking, jogging, yoga, meditations or religious activities. One of the religious physical activities in muslims are salah /namaaz.

Salah is the arabic term for prayers offered by muslims at least five times a day.<sup>[8]</sup> It is considered as second pillar of the Islamic faith. Muslims perform salah on various times of day - Fazr, zuhr, Asr, maghrib, Esha. Salah involves recitation of qur'anic verses with certain postures standing, bowing, prostration and sitting. Joints involved in prayer are shoulders, elbow, wrist, metatarsophalangeal, proximal and distal interphalangeal, jaw joint, temporomandibular joint, atlantoaxial joint, spinal cord, pelvis, hip, knee, ankle, and subtalar. Salah is physical and spiritual act which nearly activates all muscles of the human body, induces serenity on body and soul, without muscle fatigue.<sup>[9]</sup> Salah has following steps - takbir and qayyam, ruk'u /forward bending, jalsa / sitting, sajdah / prostration, salaam /neck turns.<sup>[9]</sup>

These are the following steps in performing salah:

Standing for prayer starting position is standing and worshippers should concentrate their minds on praying. In the comfortable standing position, the center of pressure is usually midway between the in step of the two feet. In a standing position, they have to raise their hands up to the ears and bring them down. Then they hold the left wrist with the right hand on the abdomen, above the navel, or on the chest.<sup>[9]</sup>

Bowing is done after standing. In this there is forward movement of the vertebral column, which results in activation of the back muscles especially the paraspinal muscles. This movement is supported by two straight hands grasping the hyperextended knees. In this position they recite some verses from the Quran and after this, the worshipper gradually reverts to their normal standing position.<sup>[9]</sup>



Prostration is done by putting the head down and touching the ground with forehead after the standing position, with the palms touching the ground and remaining parallel to the ears with the flexed elbows for a few seconds.<sup>[9]</sup>

Sitting and finishing salah after standing and bowing, and proceeding to prostration, sitting is done on the left leg knee flexed with the inverted dorsi-flexed ankle and flexed right knee and metatarsophalangeal joint for a couple of minutes. After that, salat is concluded by looking over one's right and left shoulder wishing peace for mankind.<sup>[8]</sup> <sup>[7][9]</sup> There are rakaats in salah, each rakaat consists of 7 postures. E.g., Farz consist of two rakaat of farz salah which means 14 postures are performed.<sup>[10]</sup> Salah is a form of slow and moderate exercise. It makes muscles contracts isometrically and isotonicly, similarly as gentle exercise does. Prayers have been shown to have a positive effect on the psychological as well as the physical health of the human body. <sup>[9]</sup>

Salah has many benefits on musculoskeletal, each Raq'aa after the first has to start by standing up from either the position of prostration or from deep squatting position and it is concluded by rotating the neck to the right and to the left. Such regular repeated movements for years strengthen the overall body muscular system. These gentle

movements are helpful in maintaining joint mobility and elasticity of its surrounding structures and act as a form of endurance exercise which help to protect the joints from osteoarthritis <sup>[9][11]</sup> Cardiovascular, regular salat practices may help promote relaxation, minimize anxiety, and reduce cardiovascular risk. <sup>[10]</sup> postural benefits, like stretching, increasing the range of motion, enhances balance and coordination, promotes relaxation <sup>[6][8][9]</sup> Due to parasympathetic stimulation, effect of intestinal tract, modulate breath, during prostration frontal cortex of the brain is stimulated. <sup>[9][10][11]</sup>

Hence, in current study we tried to explore in the community, the impact of regular salah practice on balance and fall prevention among community dwelling elderly population.

## Materials and Methods

### Study Design

*Type of study:* Case control study

*Study setting:* Mumbai and Navi Mumbai

*Study population:* 60 years or above elderly male and female (written consent was taken from the participants)

*Sampling method:* Convenience sampling

*Sample size:* 81 cases and 81 controls in 1:1 ratio

Total: 162, open epi software was used.

### Definition

- A case was defined as community dwelling elderly people of age 60 years or above who performs regular salaah five times a day with at least 3 positions
- A control was defined as community dwelling elderly people of age 60 years or above who does not perform any specific balance training

### Inclusion criteria for cases

- Community dwelling elderly of age 60 years or above.
- Both male and female
- Performing regular salaah
- Performing all positions of salaah

- Practicing salaah five times a day
- Performing salaah regularly at least for 3 months

**Inclusion criterion for controls**

- Community dwelling elderly of age 60 years or above.
- Not performing salaah and any balance training at least for 3 months
- Both male and female

**Exclusion criteria for cases and controls**

- Performing balance training
- Those who could not give consent
- Could not comprehend to the questionnaire due to neurophysiological disorders.
- Severe medical conditions (musculoskeletal, cardiovascular, neurological.)
- On medications such as sedative, hypnotics, anxiolytics, antidepressants.
- History of recent surgery
- Bed ridden elderly
- Severely ill and admitted

**Materials used:** Case report sheet, pencil, pen

**Selection of controls**

Controls were recruited simultaneously with the cases. All the older persons old age home during the study period satisfying the inclusion and exclusion criteria were recruited as controls without matching.

**Matching**

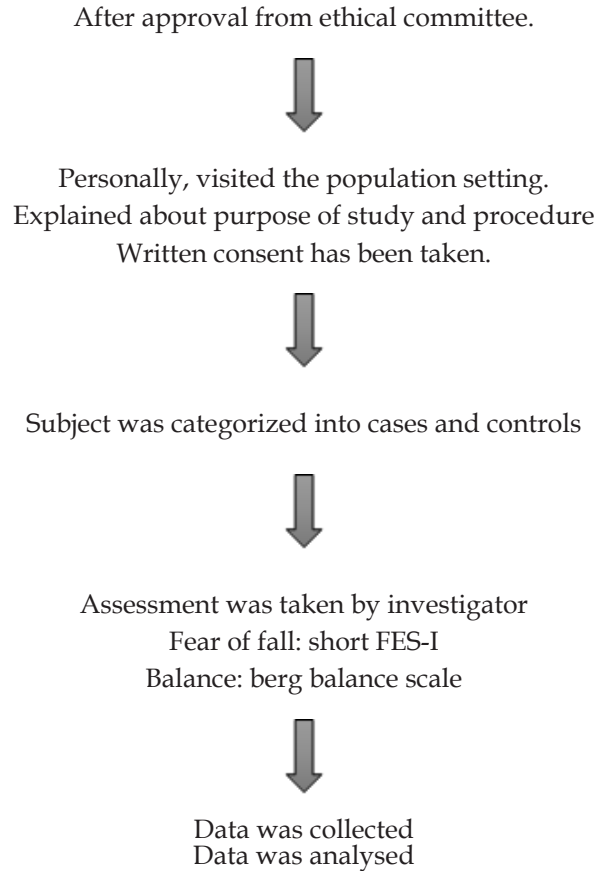
Matching was done for selection of controls.

Two confounding variables in the design stage: age, gender and BMI because they are strong independent risk factors.

**Outcome measures**

Assessment	Instrument	Psychometric property
Personal factor		Case report sheet
Fall event	Fes-i	Cronbach's alpha 0.92, intra-class coefficient 0.83
Balance assessment	Berg balance scale	(cronbach's $\alpha=0.77$ ), (icc2,1 = 0.87)

**Data collection procedure**



### Results and Discussion

**Table 1: Age in years frequency distribution in two groups of patients studied**

Age in Years	Cases	Control	Total
60-70	62(76.5%)	49(60.5%)	111(68.5%)
71-80	17(21%)	26(32.1%)	43(26.5%)
81-90	2(2.5%)	6(7.4%)	8(4.9%)
Total	81(100%)	81(100%)	162(100%)
Mean $\pm$ SD	67.48 $\pm$ 5.90	69.49 $\pm$ 7.15	68.48 $\pm$ 6.61

Samples are age matched with  $p=0.100$ , student t test

**Table 2: Gender- frequency distribution in two groups of patients studied**

Gender	Cases	Control	Total
Female	50(61.7%)	49(60.5%)	99(61.1%)
Male	31(38.3%)	32(39.5%)	63(38.9%)
Total	81(100%)	81(100%)	162(100%)

**Table 3: OCCUPATION- frequency distribution in two groups of patients studied**

OCCUPATION	Cases	Control	Total	P Value
HOUSEWIFE	60(74.1%)	44(54.3%)	104(64.2%)	0.014*
RETIRED	4(4.9%)	29(35.8%)	33(20.4%)	<0.001**
BUSINESS	13(16%)	6(7.4%)	19(11.7%)	0.142
BROKER	1(1.2%)	0(0%)	1(0.6%)	1.000
CA	1(1.2%)	0(0%)	1(0.6%)	1.000
DOCTOR	0(0%)	1(1.2%)	1(0.6%)	1.000
DRIVER	1(1.2%)	0(0%)	1(0.6%)	1.000
ENGINEER	1(1.2%)	0(0%)	1(0.6%)	1.000
MAID	0(0%)	1(1.2%)	1(0.6%)	1.000
Total	81(100%)	81(100%)	162(100%)	-

Chi-Square Test/Fisher Exact Test

**Table 4: FES score- frequency distribution in two groups of patients studied**

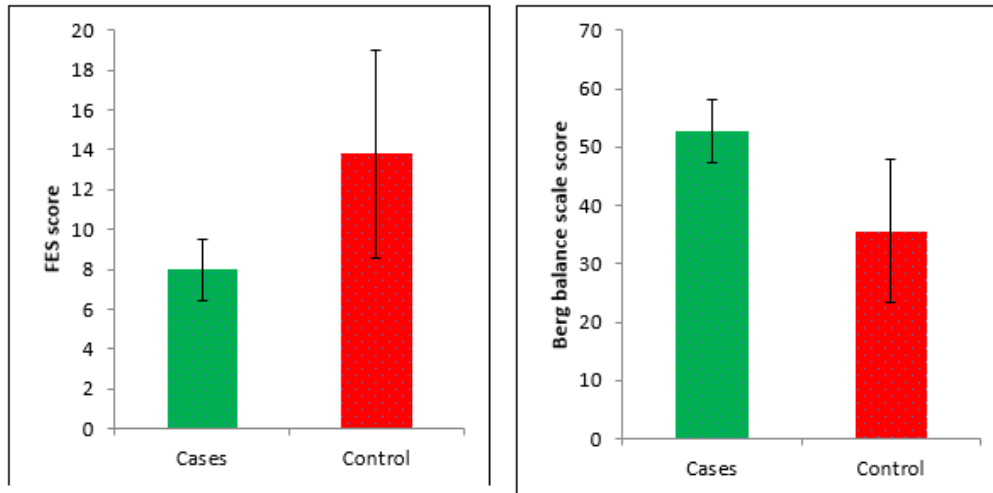
FES score	Cases	Control	Total
LOW	62(76.5%)	11(13.6%)	73(45.1%)
MEDIUM	19(23.5%)	28(34.6%)	47(29%)
HIGH	0(0%)	42(51.9%)	42(25.9%)
Total	81(100%)	81(100%)	162(100%)

$P \leq 0.001^{**}$ , Significant, Chi-Square Test

**Table 5: Berg balance scale score- frequency distribution in two groups of patients studied**

Berg balance scale score	Cases	Control	Total
LOW	78(96.3%)	35(43.2%)	113(69.8%)
MEDIUM	3(3.7%)	33(40.7%)	36(22.2%)
HIGH	0(0%)	13(16%)	13(8%)
Total	81(100%)	81(100%)	162(100%)

$P \leq 0.001^{**}$ , Significant, Chi-Square Test

**Table 6: Comparison of FES score and BBS score in two groups of patients studied**

## Discussion

The results of the current study show that the balance and stability of the subjects practicing Islamic prayer was significantly better than that of the non-practicing individuals. The results could be related to the physical and mental activities associated with Islamic prayer. Religious meditation and prayers have been found to promote relaxation and a healthier, more balanced condition of the human mind and body [7]

Islamic 'salat' prayers include both spiritual meditation and physical movements of various parts of the body and they are believed to improve equilibrium, balance, and joint flexibility as well as maintain lower limb performance [9]

Studies have revealed that salah has many benefits. It improves spiritual well-being, but also physical as well as mental health. It improves joint mobility, muscle strength, and blood circulation, when performed correctly with the right postures. [11] A study reported that the movement of the joints, concentric and eccentric muscle actions, during the

prayer play an important role in balance and postural stability. [12]

To regulate upright control of the center of mass, the central nervous system has to integrate information received from several sensory inputs. These inputs come from visual, vestibular, and somatosensory sources and originate from a number of different body segments. [14]

For the preparation of 'salah', worshippers clean and wash their hand, face, head, neck and feet for several seconds with water five times daily. This action of washing the feet is believed to facilitate the plantar sensory organs thereby improving dynamic balance. An instinctive relationship exists between increasing loss of balance and loss of foot sensibility. The range of somatosensory inputs and tactile sensitivity within the foot strongly influences the maintenance of standing balance. [12]

There are some evidences suggestive of that receptors in the feet may provide significant sensory input to control standing. The source of sensory stimulation which is increasing the sensory input

and improving the balance of subjects practicing the Islamic prayer regime are may be the act of regularly cleaning and massaging he feet during ablution in preparation for the prayer ritual. [12]

Poor adjustment of the center of gravity is known to impair balance, so the movement from standing to bowing to standing during prayer may function as an exercising help the worshipper adjust the center of gravity over the feet and to control balance when the center of gravity falls out of the base support. [12]

The vestibular system is responsible for balance control. The paired vestibular organs include three orthogonal semi-circular canals and two otolith organs, which provide continuous input to the brain about rotational and translational head motion and the head's orientation relative to gravity [13]. The movements performed during salat from the vertical natural position to prostration at different speeds may improve the sensitivity of the vestibular system, which maintains the steadiness of postural equilibrium. [12]

The results of the present study show that **within the non-practicing cluster** the balance and stability was affected and the fear of fall was comparatively more as their physical activity was reduced compared to the practicing group. Decreased physical activity may indicate that there is impaired muscle fiber recruitment and adaptive behaviour to minimize risk. Therefore, the postural control during a functional activity, like leaning towards a target, could be improved by daily Islamic prayer in the same manner as passive coping strategies such as external locus control and chance locus control. The non-practicing subjects seemed to exhibit less postural control and perception because of infrequent activation of the trunk and lower extremity flexor and extensor muscles and limited facilitation of the vestibular and somatosensory systems compared with subjects actively practicing Islamic prayers five times daily. [12]

### Conclusion

- The result of the present study supports the assumption that religious prayers (such as Islamic prayers) beneficially influence human performance, particularly balance and also prevents falls in elderly population.

- Islamic prayer routines may present beneficial training protocols for improving balance and preventing falls. Therefore, any exercise protocol proven to be beneficial to humans should be consider beyond its religious aspect.

### Clinical Implications

- Can spread awareness regarding benefits of salaah positions.
- Can be used as treatment protocol for treating various musculoskeletal and neurological conditions.

**Conflict of interest:** None declared

**Source of funding:** No funding sources

**Ethical clearance:** The study was approved by Institutional Ethics committee

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# Comparative Study of Extinguishing and Upcoming Manual Therapy Techniques in Dentists Having Stage II of Carpal Tunnel Syndrome

Chitvanjeet Kaur<sup>1</sup>, Aman Navneet Kaur<sup>2</sup>

<sup>1</sup>Assistant Professor, Guru Nanak Dev University, <sup>2</sup>Assistant Professor, Khalsa College Amritsar.

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## Abstract

**Background:** Carpal Tunnel Syndrome occurs when median nerve is compressed as it travels through the wrist. The syndrome is characterized by pain in the hand, numbness, and tingling in the distribution of the median nerve and leads to reduction in grip strength and hand function. Stage II Carpal Tunnel Syndrome occurs when patient is involved in activities of repetitive movement of wrist during day. The study aimed to compare functional improvement in results after treating with Extinguishing manual therapy techniques and Upcoming manual therapy techniques.

**Materials and Methods:** In this experimental study 30 dentists having Stage II Carpal Tunnel Syndrome were treated first with extinguishing manual therapy techniques (Phase I) for 10 days and then there was a gap of 1 week to decondition the effects of Phase I. After deconditioning same group of patients were treated with Upcoming manual therapy techniques for 10 days. In both the Phases Conservative therapy was also included. Patient specific activity scoring scheme and Boston scale were used to compare the results.

**Conclusion:** The study concluded that Upcoming manual therapy are more effective than extinguishing manual therapy techniques in treating dentists having Stage II Carpal Tunnel Syndrome.

**Keywords:** *Carpal Tunnel Syndrome, Osteopathy, Reflexology, Cyriax mobilization, Nerve flossing.*

## Introduction

Carpal Tunnel Syndrome is a common medical condition that remains one of the most frequently reported forms of median nerve compression. Carpal Tunnel Syndrome occurs when the median nerve is squeezed or compressed as it travels through the wrist. The syndrome is characterized by pain in the hand, numbness, and tingling in the distribution of the median nerve<sup>1</sup>. Both Dental and Dental hygienists have been reported to have a high prevalence of upper extremity musculoskeletal disorders,

including Carpal Tunnel Syndrome. Carpal Tunnel Syndrome is 10 times more frequent in women than men. Overall, Carpal Tunnel Syndrome is ranked sixth among recognized occupational diseases. The Primary sign is pain in the wrist, tingling sensation, pain or numbness in the thumb, index finger, medial finger and radial side of the tiny finger, also there is a reduction of the grip strength and function of the affected hand **Dental Procedures and their biomechanics Involved in Stage II Carpal Tunnel Syndrome<sup>3</sup>**

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**Corresponding Author:** Chitvanjeet Kaur, Assistant Professor, Dept of Physiotherapy, Guru Nanak Dev University, Amritsar, Punjab.

**E-Mail:** [chitvanjeet@gmail.com](mailto:chitvanjeet@gmail.com)

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Occupational reasons leading to Carpal Tunnel Syndrome include repetitive bending movements of wrist to catch devices forcefully with ulnar deviation and repetitive pressure on palm. In dentistry practices, these movements (especially repetitive movements of wrist) are used during exfoliation and canal cleaning that can compress median nerve. Scaling and root planning pose a high ergonomic risk for both, dentists and dental hygienists<sup>4</sup>.

For smaller to larger activities muscle has to constantly work. Drilling activity needs the tool to be held strongly for which muscle work increases. In all the three activities the dentists use a precision grip for holding the instruments. This requires proper stabilization of the wrist which is brought about by the extensors and the flexors of the forearm; thus, it places more demand on the extensor carpi radialis longus and brevis as well as the flexor carpi ulnaris muscle<sup>8</sup>.

Drilling activity needs the tool to be held strongly for which muscle work increases. In all the three activities the dentists used a precision grip for holding the instruments. This requires proper stabilization of the wrist which is brought about by the extensors and the flexors of the forearm; thus, it places more demand on the Extensor Carpi Radialis Longus and Brevis as well as the Flexor Carpi Ulnaris muscle. Also, the movements of the wrist consisted mainly of wrist extension (which remained static) along with repetitive ulnar and radial deviation which indicates that there is a specific arc of movement that is followed by the wrist which demands stability along with mobility and is achieved by the Extensor Carpi Radialis Longus<sup>4</sup>.

While drilling, continuous vibration is felt in the fingers and along with the vibrations working in a specific dimension can impose more work on the forearm muscles for stabilization which can explain the maximum activity of the muscles in drilling. Thus, even though pulp excavation needs stabilization it does not need much of wrist movements which could be the reason that the muscle work of the Flexor Digitorum Superficialis and Flexor Pollicis Longus is significant in this activity<sup>4</sup>. Filling is another activity which is performed most frequently in the Conservative Dentistry department. Prolonged working periods may be associated with the increased risk of the Carpal Tunnel Syndrome<sup>5</sup>

Thus, the aim of this present study was to to evaluate that upcoming manual therapy are giving better results than extinguishing manual therapy in dentists having Stage II of Carpal Tunnel Syndrome. To compare both types of manual therapies (upcoming and extinguishing) on dentists having Stage II of Carpal Tunnel Syndrome.

## Methods

### Research Design

Quantitative Research Design (Solomon four group design)

### Research Type:

True Experimental Research (Cause and Effect type)

### Research Setting:

Various dental clinics of Batala and Amritsar

### Research Sample and Population:

30 dentists were selected on the basis of inclusion and exclusion criteria

### Sampling Method:

Stratified Random sampling method was used for selecting sample of 30 dentists having Stage II of Carpal tunnel syndrome.

### Selection criteria:

#### *Inclusion criteria*

- Dentists having stage II Carpal tunnel syndrome and who are willing to participate
- Dentists who work more than 20 hours in a week
- Age group (25-45 years)
- Dentists having Carpal tunnel due to mechanical stress (repetitive work Stage II Carpal tunnel syndrome)
- Both males and female

#### *Exclusion criteria:*

- Other conditions that involve repetitive stress other than Stage II carpal tunnel.
- Trauma to the wrist
- Post-surgical complications involving wrist

- Dentists having symptoms of any other musculoskeletal, visceral underlying pathology of variable origin except Stage II Carpal tunnel syndrome.
- Median nerve impingement excluding carpal tunnel syndrome.
  - Under age 25 and above age 45

### Variables

#### Dependent variables:

- Boston carpal tunnel questionnaire
- Dentists who are working for more than 20 hrs a week.
- Age
- Patient specific activities scoring scheme

#### Independent variables:

- Nerve flossing technique
- Mobilization technique(cyriax)
- Reflexology technique
- Osteopathy technique
- Dentists having Stage II Carpal tunnel syndrome

#### Instruments and Tools:

- Questionnaire (Boston carpal tunnel questionnaire)
- Patient specific activity scoring scale
- Therapeutic Ultrasound

### Procedure

A total of 30 subjects were selected on the basis of inclusion and exclusion criteria. Subjects were asked to fill Patient specific activity scoring scale for Functional Assessment and the Boston Carpal Tunnel Questionnaire.

**PHASE I:** Patients were treated using extinguishing manual therapy techniques (Nerve flossing and Cyriax mobilization) for 10 days and then there was a gap of 7 days to decondition the effects of previous treatment

#### For Nerve Flossing

**Patient's position:** Standing

**Therapist's position:** Standing at alongside of patient

**Procedure:** Hold each position for 3 to 7 seconds

- Make a fist with thumb outside your fingers
- Extend your fingers while keeping your thumb close to the side of hand
- Keep your fingers straight and extend your wrist
- Keep your fingers and wrist in position and extend your thumb
- Keep your fingers, wrist and thumb extended and turn your forearm palm up.
- Keep your fingers, wrist and thumb extended and use your other hand to gently stretch the thumb.

#### For Deep Friction Massage (Cyriax mobilization):

**Patient's position** -Sitting on chair arm resting on table.

**Therapist's position** - Sitting along affected side of patient.

**Procedure** - Deep transverse friction massage on the carpal tunnel site at the wrist joint for 5 mins, by the thumb of therapist in position of extension and press during massage.

**DECONDITIONING PHASE:** After phase I treatment there was a gap of 7 days to decondition the effects of phase I treatment.

**PHASE II:** Same patients were treated using Upcoming manual therapy techniques (reflexology and osteopathy) for 10 days.

#### For Osteopathy

**Patient's position-** Supine lying

**Therapist's position-** Sitting along affected side of patient.

**Procedure** -With the patient in the supine position, with a pronated forearm (with the patient's palm facing the ground), the physician places their thumb pads on the proximal carpal row while their fingertips are in contact with the thenar and hypothenar eminences of the affected hand. The physician then brings the wrist through full flexion and extension while adding radial and ulnar gliding. An important component of the treatment is when

the patient’s wrist is brought into full extension the physician’s fingers, which are applying lateral traction to the thenar and hypothenar eminences and simultaneously applying a distraction pressure to gently separate the carpal bones.

**For Reflexology**

**Patient’s position-**Sitting on chair with affected side resting on table

**Therapist’s position-** Sitting on chair facing at patient’s affected side

**Procedure**

- Therapist will roll his thumb over complete hand area on whichever hand is afflicted and wherever there is pain.
- The first one is on the inner wrist crease, there is a depression right in the middle. That’s the point which you need to knead. And on the other side, again on the outer wrist crease, there is an indentation in the middle. Hold these points for up to one minute as you breathe deeply.
- The second set of points is three finger widths below those points. And again, on the other side three finger widths below those points. Press the points for about one minute as you continue to breathe deeply.
- The last one is below the thumb on the outer wrist crease. More specifically, it’s between the two tendons when you tend to open your thumb. Press this point for up to one minute as you focus on your breathing.

**Results**

The data was statistically analysed by using IBM SPSS Statistics Software package (version 16.0). Level of significance was considered as 5 percent (p<0.05). Data was reported as mean +\_ standard deviation (SD). Paired student t-test was used to compare the improvement (Result) in Phase I and Phase II.

**Table 1: Describes the Initial I and After phase I mean and standard deviation of Group A that significantly changed from 4.59 to 5.12 and 1.031 to 1.029 respectively.**

Paired T Test	Group A (Patient Specific Activity Scoring Scheme)	
	R1 (Extinguishing Techniques)	
	Initial 1	After phase I
Mean	4.59	5.12
S.D.	1.031	1.029
Number	30	30
Maximum	7	7.8
Minimum	3	3.4
Range	4	4.4
Mean Difference	0.53	
Paired T Test	7.308	
P value	<0.001	
Table Value at 0.05	2.05	
Result	Significant	

**Table 2: Describes the Initial I and After phase I mean and standard deviation of group B that significantly changed from 2.09 to 1.95 and 0.292 to 0.248 respectively**

Paired T Test	Group B (Boston Scale)	
	R1 (Extinguishing Techniques)	
	Initial 1	After phase I
Mean	2.09	1.95
S.D.	0.292	0.248
Number	30	30
Maximum	2.54	2.54
Minimum	1.63	1.63
Range	0.91	0.91
Mean Difference	0.14	
Paired T Test	5.139	
P value	<0.001	
Table Value at 0.05	2.05	
Result	Significant	

**Table 3: Describes Initial 2 and After phase II mean and standard deviation of group A that significantly changed from 4.96 to 6.18 and 1.017 to 0.990 respectively**

Paired T Test	Group A (Patient Specific Activity Scoring Scheme)	
	R2 (Upcoming Techniques)	
	Initial 2	After phase II
Mean	4.96	6.18
S.D.	1.017	0.990
Number	30	30
Maximum	7.8	7.8
Minimum	3.2	3.4
Range	4.6	4.4
Mean Difference	1.22	
Paired T Test	9.985	
P value	<0.001	
Table Value at 0.05	2.05	
Result	Significant	

**Table 4:** Describes Initial 2 and After phase II mean and standard deviation of group B that significantly changed from 1.98 to 1.48 and 0.244 to 0.327 respectively

Paired T Test	Group B (Boston Scale)	
	R2 (Upcoming Techniques)	
	Initial 2	After phase II
Mean	1.98	1.48
S.D.	0.244	0.327
Number	30	30
Maximum	2.54	1.81
Minimum	1.72	0
Range	0.82	1.81
Mean Difference	0.50	
Paired T Test	9.279	
P value	<0.001	
Table Value at 0.05	2.05	
Result	Significant	

**Table 5:** Describes the mean and standard deviation of improvement of group A in Phase I and Phase II that significantly changed from 0.53 to 1.22 and 0.395 to 0.669 significantly.

Paired T Test	Group A (Patient Specific Activity Scoring Scheme)	
	Improvement in	
	Phase I	Phase II
Mean	0.53	1.22

S.D.	0.395	0.669
Number	30	30
Maximum	1.2	2.6
Minimum	-0.4	-0.6
Range	1.6	3.2
Mean Difference	0.69	
Paired T Test	5.059	
P value	<0.001	
Table Value at 0.05	2.05	
Result	Significant	

**Table 6:** Describes the mean and standard deviation of improvement of group B in Phase I and Phase II that significantly changed from 0.14 to 0.50 and 0.149 to 0.297 significantly.

Paired T Test	Group B (Boston Scale)	
	Improvement in	
	Phase I	Phase II
Mean	0.14	0.50
S.D.	0.149	0.297
Number	30	30
Maximum	0.37	1.72
Minimum	-0.19	0.09
Range	0.56	1.63
Mean Difference	0.36	
Paired T Test	5.437	
P value	<0.001	
Table Value at 0.05	2.05	
Result	Significant	

## Discussion

Dental professionals are amongst the most target group for repetitive stress injury such as Carpal Tunnel Syndrome because of the repetitive movement of the wrist during. Alessia Genova and Olivia Dix stated that Stage II Carpal Tunnel Syndrome occurs when the patient engages in a repetitive activity involving the hand or wrist or when a specific position is maintained for extended periods such as when dentists are doing their dental procedures such as canal cleaning and exfoliation. as stated by Valachi certain dental procedures such as biomechanical shaping of the root canals, constant use of ultrasonic scalers, Urmi Parmar and Krupa

Soni in a study stated that Carpal Tunnel Syndrome is most often seen in age group between 25-45 years and so is the age group of the present study. There are variety of treatment options available to treat Carpal Tunnel Syndrome. Manual therapy techniques such as Reflexology seem to be very effective in relieving symptoms caused by Repetitive wrist movements as described by Yani Shivachev. This technique also reduces the risk of exacerbation of local neuropathic pain and also avoids eventual side effects caused by unconventional medicine. Carpal mobilization technique as stated by Thomas R. Mehner and Faten Ismail resulted in substantial improvement of Visual analog scale and Function severity scale in patients having Carpal Tunnel Syndrome. Another study by A.Tal-Akabi and A.

It is evaluated in the present study that Reflexology and Osteopathy resulted in significant improvement in functional capabilities of the dentists having Stage II Carpal Tunnel Syndrome as shown in table 5 and 6 of the study.

In another study by Ashraf Ramadan Hafez there was significant improvement of pain, range of motion of wrist flexion and extension and hand grip in a group that included nerve flossing techniques in combination with Ultrasonic therapy and Active range of motion exercises.

In another group being treated with deep friction massage (Cyriax mobilization) there was significant improvement of pain, range of motion of wrist flexion and extension due to using of deep friction massage, which modulates of the nociceptive impulses at the level of the spinal cord: "gate control theory".

It is evaluated that when compared to nerve flossing and Cyriax mobilization in the present study results showed significant improvement as shown in Table 1 and Table 2.

Urmi Parmar found that Boston Functional Status Scale showed a significant improvement in the post-treatment stage as compared to the pre-treatment stage. In this present study, Boston Scale and Patient specific activity scoring scheme were used to check improvement in phase I and phase II respectively.

It has been observed that though there was improvement in both groups i.e. in phase I and

phase II when compared with initial assessment scores according to Patient specific activity scoring scheme and Boston scale but in phase II that involved Upcoming Manual therapy techniques results showed significant improvements in functional abilities of dentists having stage II Carpal Tunnel Syndromes as compared with phase I group that involved extinguishing manual therapy techniques as shown in tables 5 and 6 of this study.

## Conclusion

This study concluded that Upcoming Manual Therapy Techniques i.e., Osteopathy and Reflexology showed better results in improving functional capabilities as compared with Extinguishing Manual Therapy Techniques i.e., Nerve flossing and Cyriax mobilization in dentists having Stage II Carpal Tunnel Syndrome. Though Extinguishing Manual Therapy Techniques also gave positive results but when same group of patients were treated with Upcoming manual therapy techniques their functional outcomes had improved more significantly.

Thus, we can conclude that Upcoming Manual Therapy Techniques should be brought into practise to improve functional abilities among patients suffering from Stage II Carpal Tunnel Syndrome.

**Conflict of Interest:** None

**Source of funding:** Self

**Ethical Clearance:** A written informed consent was obtained from the patient and the study was performed with the approval of ethical committee at Khalsa college Amritsar.

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# Efficacy of Neural Tissue Mobilization Versus Cervical Mobilization Along with Manualtraction and Surged Faradic Current on Pain, Disability and Rom in Chronic Cervical Radiculopathy Patients

Kartik Chhonker<sup>1</sup>, Kalpana Jain<sup>2</sup>, Namrata Srivastava<sup>3</sup>

<sup>1,2</sup>Assistant Professor, <sup>3</sup>HOD, Career College, Bhopal

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## Abstract

**Background:** Cervical radiculopathy (CR) caused by disc disease is a disabling condition characterized by radicular pain in one or both upper extremities, in combination with sensory, motor, and reflex changes in one or several affected nerve-root distribution. Cervical mobilization refers to low velocity, sustained or oscillatory passive movements of varying amplitude applied at different range give by therapist to reduce pain and improve joint mobility. Neuro-physiological effect of cervical mobilization helps in reduction of pain through gentle small amplitude rhythmic oscillatory movement which stimulates the mechanoreceptors that inhibit the transmission of nociceptive stimulus at the level of spinal cord or brain stem and thus pain get reduced. All this helps in the normal functioning of the nervous tissue in the body.

**Methods:** The study was conducted at Department of Physiotherapy, Rajeev Gandhi College, Bhopal. 30 subjects meeting the inclusion criteria were recruited for the study. They were allocated randomly into two equal groups, Group A and Group B respectively. Subjects in both the group received Surged Faradic Stimulation & Manual Cervical Traction as a baseline treatment. In Group A, subjects received neural tissue mobilization in addition while in Group B subjects received Cervical Mobilization in addition. Treatment was given for 6 day per week for 4 week.

**Conclusion:** The results of this study show that neural tissue mobilization and cervical mobilization, in combination with manual traction and pulsed faradic stimulation, are equally beneficial in reducing pain, disability, and ROM.

**Keywords:** Chronic Cervical Radiculopathy, Neural Tissue Mobilization, Cervical Mobilization, Surged Faradic Stimulation, Manual Cervical Mobilization, Cervical ROM, Neck pain and Disability, Northwick Park Pain Questionnaire, Goniometry.

## Introduction

Cervical radiculopathy (CR) caused by disc disease is a disabling condition characterized by radicular pain in one or both upper extremities, in

combination with sensory, motor, and reflex changes in one or several affected nerve-root distribution<sup>1</sup>. Typically, individual complains of neck pain and also physical-psychological disability present due to pathology. Reduced health and quality of life are

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**Corresponding Author:** Kartik Chhonker, Assistant Professor Career College, Bhopal.

**E-Mail:** [kartikchetan@gmail.com](mailto:kartikchetan@gmail.com)

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often reported by patients with CR<sup>2</sup>.

Epidemiological reported prevalence is 83 people per 100000 people and incidence of men is 107.3/100000 which is greater than female population that is 63.5/100000 and a peak in the age group 40-50 years was reported in some studies in a general population<sup>3</sup>.

In patients with CR, neck muscle strength and neuro-muscular endurance (NME). Such impairments may contribute to the development of pain and disability in patients with CR is impaired.<sup>5</sup>

Patients commonly describe sharp radicular pain and tingling or burning sensations in the arm, and they sometimes have sensory, motor changes that correspond to the involved nerve root. Typically axial neck pain is also present, and some patients report headaches and dizziness<sup>6</sup>. Cervical nerve roots pass through the intervertebral foramina, which are located between the vertebral and facet joints; these joints are involved in degenerative processes in the cervical spine and in the intervertebral discs in patients with CR. The foramina are widest in the upper cervical spine and gradually narrow distally, which may explain why C7 (46.3 percent to 69 percent) is the most prevalent level of root compression, followed by C6 (17.6 percent to 19 percent)<sup>7</sup>.

Physical therapy includes cervical traction and mobilization, exercises, and other electrotherapy modalities such as TENS, IFT, and Ultrasound to reduce pain. If significant compression on the nerve exists to the extent that motor weakness results, surgery may be necessary to relieve the pressure<sup>11</sup>.

The study's neck pain and impairment were assessed using the Northwick Park Neck Pain Questionnaire. The questionnaire will be straightforward to complete and assess for patients with acute or chronic neck pain, and it will provide an objective measure of outcome. The Northwick Park Neck Pain Questionnaire evolved from the Oswestry Questionnaire (NPQ). In the appendix, the questionnaire was presented.<sup>12</sup>

MCT (Manual Cervical Traction) is one of the techniques used on CR patients to enhance vertebral body distance and foraminal space, reducing nerve root pressure<sup>13</sup>. Neural tissue mobilization (NTM) promotes joint range of motion (ROM), elevating

dynamic adaptability and assisting body movement without resistance by improving neural flexibility, lowering dynamic sensitivity of the nervous system, and increasing blood flow, relieving pain<sup>14</sup>.

Cervical Spine Mobilization (CSM) by oscillatory movements and traction to the cervical segments helps to break adhesion and stretch the hypo-mobile shortened structures. It also helps to maintain the extensibility and tensile strength of articular tissues<sup>15</sup>.

Faradic type current is short duration interrupted direct current with pulse duration of 0.1-1 ms and frequencies between 50-100 Hz, used for the stimulation of innervated muscles. Although its effects have been proven in treating muscle spasm due to inflammation and pain gate induced pain relief<sup>16</sup>.

## Material and Methods

30 subjects of chronic cervical radiculopathy were taken [15 in Group A treated with Neural mobilization along with Manual cervical traction and Surged Faradic Stimulation and 15 in Group B treated with Cervical Spine Mobilization (CSM) along with Manual cervical traction and Surged Faradic Stimulation. Following techniques mentioned below:

### Goniometry

#### 1. Cervical Extension:

Motion occur in the sagittal plane around a medial lateral axis. Mean cervical extension ROM measured by goniometer is about 50 to 60 degrees.

**2. Cervical Lateral Flexion:** Motion occurs in the frontal plane around an anterior- posterior axis. ROM for lateral flexion to one side measured by the goniometer is about 22 degrees in adults.

#### 3. Cervical Rotation:

Motion occurs in the transverse plane around a vertical axis. ROM measured with goniometer is between 70-90 degrees.

### Neural Tissue Mobilization

The patient was told to lie supine after receiving a neural tissue mobilization procedure for the median nerve. The 'sliding' approach works by lengthening the median nerve bed with motions (elbow and



wrist extension alone or combined with neck lateral flexion or rotation away from the symptomatic arm). Shoulder abduction up to 90 degrees will preload the neural tissues in preparation for additional therapies and nerve gliding. Shoulder depression and abduction, elbow extension, forearm supination, wrist and finger extension, and cervical spine contralateral side flexion. Per session, two 20-30 slow oscillation repetitions with a 10-second hold will be delivered.



**Fig 1: Neural Tissue Mobilization**

## CERVICAL SPINE MOBILIZATION (CSM)

### (1) Cervical Postero-Anterior Central Vertebral Mobilization :

The subject lies face downwards and the therapist stands at the head of the subject/ table. Therapist with his/her thumbs held in opposition and back to back, with the tips of the thumb pads on the spinous process of the vertebra to be mobilized. Apply symmetrical pressure through the articular pillars with both the thumbs. The therapist should progress to grade IV mobilizations for 30 seconds or 15-20 repetitions at desired level.



**Fig 2: Cervical Poster-Anterior Cervical Vertebral Mobilization**

### (2) Cervical Rotation Mobilization:

The subject is positioned supine with the head and neck extending over the end of the treatment table. The therapist cradles subject's head between the left forearm and chest wall with one arm, while the right hand's metacarpophalangeal area of the index finger is placed so that its radial side rests firmly against the articular pillar at the desired level. With the right hand, the therapist rotates the subject's head to end range while the left hand accentuates the rotation pressure in the plane of the apophyseal joints. The pressure is repeated rhythmically with a progressive increase of force to grade IV mobilizations for 30 seconds or 15-20 repetitions.



**Fig 3: Cervical Rotation Mobilization**

### (3) Cervical lateral glides:

Scapular depression, shoulder abduction, forearm supination, wrist and finger extension, shoulder external rotation, and elbow extension are all ULTT1 (median nerve bias) positions that a second clinician applies to the subject's upper extremities. The therapist cradles the subject's head and neck and conducts a lateral translation towards the contralateral side with the affected upper extremity in this position (away from the side of symptoms). Oscillatory translational mobilizations of the neck in the plane of the apophyseal joints are performed rhythmically for 30 seconds or 15-20 repetitions at each desired level, with a progressive increase in force to grade IV for 30 seconds or 15-20 repetitions at each desired level.



**Fig 4: Cervical Lateral Glide Mobilization**

### MANUAL CERVICAL TRACTION

Position of patient was supine. The traction can be timed with the exhalation during a breathing cycle providing the traction force during exhalation. 5 repetitions of manual cervical traction was done by the therapist with 10 seconds of hold time.



**Fig 5: Manual Cervical Traction**

### SURGED FARADIC STIMULATION

The patient is made to sit in a chair, provided with back rest. Strong contractions are given in pulse mode with pulse duration of 1ms and frequency is set in between 50 - 100 Hz. Surging is at its maximum and intensity is slowly increased till the strong visible contraction is seen. The time duration is 15 min.

### Results

In the present study, for data analysis SPSS v25 was used. Both the groups had 15 subjects each and all the subjects were assessed pre and post treatment by Northwick Park Pain Questionnaire (NPQ) for neck Pain, disability and Goniometer for Neck ROM. As the no. of sample in one group was 15 (<100), therefore Shapiro-Wilk test was used in the study.

To determine the significance of data of Group A and B normality test was done which showed non-significant value i.e. less than 0.05.

Therefore, in the present study both Group A and Group B were analyzed using parametric test. To compare the mean values within the groups Paired t-test was used while to compare the mean values between the groups i.e. Group A and Group B independent t- test was used.

**Table 1: Comparison of Mean values of Pre- Pre & Post- Post data of NPQ and Goniometer in Group A & Group B using Independent t- test**

Variables		N	Mean	S.D.	t= value	Sig. (2 tailed)
Pre NPQ	Group A	15	70.57	3.11	-0.307	0.761
	Group B	15	70.91	2.93		
Post NPQ	Group A	15	46.26	3.11	0.007	0.995
	Group B	15	46.21	3.44		
Pre Extension	Group A	15	37.46	1.92	0.092	0.927
	Group B	15	37.40	2.02		
Post Extension	Group A	15	56.60	2.19	-0.162	0.873
	Group B	15	56.73	2.31		
Pre Lateral Flexion	Group A	15	18.40	2.16	0.513	0.612
	Group B	15	18.00	2.10		
Post Lateral Flexion	Group A	15	38.80	1.37	-1.054	0.301
	Group B	15	39.33	1.39		

Continue.....

Variables		N	Mean	S.D.	t= value	Sig. (2 tailed)
Pre Rotation	Group A	15	46.80	2.21	0.324	0.748
	Group B	15	46.53	2.29		
Post Rotation	Group A	15	72.26	2.15	-0.355	0.725
	Group B	15	72.53	1.95		

## Discussion

In the present, total 30 patients of age 35-50 years that were diagnosed with chronic cervical radiculopathy are included. These 30 patients were selected after pre-screening done using NPQ for neck pain and disability and goniometry for neck ROM and they were randomly assigned into two groups i.e. Group A and B; where Group A underwent Neural tissue Mobilization along manual traction and surged faradic current and Group B underwent Cervical Mobilization along with manual traction and surged faradic current to improve pain, disability and range of motion in cervical radiculopathy patients.

After completing 4 weeks protocol, when mean values of post treatment data were compared of both the group using Independent t test, it revealed non-significant result that means both the groups had similar improvement in terms of pain, disability and ROM.

RJ Nee and D Butler Neural mobilization enhances intraneural circulation, which improves axoplasmic flow, therefore enhancing neural connective tissue visco-elasticity and lowering AIGS sensitivity (Abnormal impulse generating sites).

Kim DG, Chung SH, Jung HB In their study concluded that there was significant difference between the pre intervention and post intervention in NPRS, NDI, ROM and deep flexor endurance in the group who received neural tissue mobilization.

Based on the statistical analysis, while comparing the vas between group A and group B the result of the study shows that the average improvement in group A was 1.6000 with S.D is 1.18766. in group B the average improvement was 3.0000 with the S.D 1.2390 and t-value was 3.829, p-value 0.000  $p < 0.05$  which shows that there is significant improvement in group B than group A on VAS score.

Based on the statistical analysis, while comparing

the NDI between group A and group B the result of the study shows that the average improvement in group A was 4.7000 with S.D is 1.52523. in group B the average improvement was 6.6500 with the S.D 1.72520 and t-value was 3.727, p-value 0.000  $p < 0.05$  which shows that there is significant improvement in group B than group A on NDI score The results of this study demonstrate that both the cervical mobilization alone versus cervical mobilization with thoracic thrust manipulation experienced significant improvements in pain, functional status following 12 treatment sessions (3 days /week for 4 weeks). But the group B experienced better outcomes for all variables in comparison to one another.

Gore V in their study states that cervical manual traction is effective in relieving pain due to cervical radiculopathy. The study is concluded that the effect of cervical manual traction, TENS and Neural Tissue Mobilization are more effective than the only cervical manual traction.

Mehta, et. al, their study was designed to determine and compare the effect of low level laser therapy and strong surge faradic current on trapezius spasm.

Group A consisted of 15 subjects who received Low Level Laser Therapy and Group B consisted of 15 subjects who received Strong Surge Faradic current. On the 1st and 5th day Numerical pain rating scale (NPRS) was taken to measure pain intensity, Hubbard's "Tenderness grading scale" was used for assessment of soft tissue tenderness and Cervical side flexion and rotation range of motion was measured using universal goniometer.

The results of this study demonstrated that LLLT and SSF current both the interventions are effective for treatment of trapezius spasm. But SSF current is more effective than LLLT in improving cervical rotation range of motion.

## Conclusion

The present study concludes that application of neural tissue mobilization and cervical mobilization along with manual traction and surged faradic stimulation is equally effective in improving pain, disability and ROM. The study shows non significant result and thus we accept the null hypothesis.

**Consent:** Informed consent was taken from all participants in the study for the publication work in the journal.

**Ethical Clearance:** This study was approved by our institutional ethical committee.

**Source of funding:** self

**Conflict of interest:** Nil

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# Effect of Kinesiotaping for Hand Function in Children with Cerebral Palsy: A Randomized Controlled Trial

Jeena James<sup>1</sup>, Jasrah Javed<sup>2</sup>, Divya Mohan<sup>3</sup>, R. Vasanthan<sup>4</sup>

<sup>1,2</sup>Student, <sup>3</sup>Professor, <sup>4</sup>HOD, The Oxford College of Physiotherapy, Bangalore, Karnataka.

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## Abstract

**Background:** Cerebral palsy is the most common chronic disability. Lesions or defects in the immature brain cause sensori motor impairment, which compromise the development of upper limb function in cerebral palsy. Restricted movement of the upper limbs may cause limitation in the functions and performance of ADL which affect their quality of life. Recent studies have proven that kinesiotape plays an important role in the management of hand functional activity.

**Design:** Randomized controlled trial was conducted on 28 cerebral palsy children with impaired hand function were included in the study based on the inclusion and exclusion criteria. Participants were randomly divided into 2 groups, group a. kinesiotaping with functional hand activities and group b. sham taping (Kinesiotape without tension) along with functional hand activities. Control group received sham tape (kinesiotape without tension). Outcomes were measured using quality of upper extremity skill test (QUEST) and Upper limb physician rating scale (ULPRS).

**Conclusion:** The study proved that the short term effect of kinesiotaping application along with functional hand activities has no significant effect on improving hand function in children with cerebral palsy.

**Key Words:** Cerebral palsy, Hand function, Kinesiotaping, CP, disability.

## Introduction

Cerebral palsy (CP) is a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to nonprogressive disturbances that occurred in the developing fetal or infant brain. The motor disorder of cerebral palsy is often accompanied by disturbances of sensation, perception, cognition, communication, and behavior by epilepsy, and by secondary musculoskeletal problems.<sup>1</sup>

Globally, studies have reported the prevalence

range of cerebral palsy from 1.5 to 4 per 1000 live births or children.<sup>2</sup> A recent study has stated that in India children aged between 2 to 9 years are highly affected by neurodevelopmental disorder including cerebral palsy. The percentage ranges from 6.5% to 18.5%.<sup>3</sup>

Lesions or defects in the immature brain cause sensorimotor impairment, which compromise the development of upper limb function in cerebral palsy.<sup>4</sup> Restricted movement of the upper limbs may cause limitation in the functions and performance of ADL

which affect their quality of life. These impairment which leads to poor hand function in both hemiplegic and diplegic CP that include pinch, grip, prehension, dexterity, grasp, reach, hold, release, manipulation, push, pull, lift, displace and fixate.<sup>5</sup>

The motor impairment of the hand include muscle weakness, spasticity (hypertonia) or dystonia, reduced muscle length, restricted passive and active ROM, impaired motor planning, decreased dissociation of fingers and reduced hand arches.<sup>6,7,8,9</sup> Decreased muscle strength result in reduced grip strength, pinch force and reduction in force generation to grasp different objects.<sup>9</sup> Spasticity can results in spasm or contracture. Abnormal posture can also leading to joint deformities which results in grasp difficulty across wrist and fingers. The most common abnormal posture is elbow flexion, pronation of forearm, wrist flexion, finger flexion and thumb in palm is noted. The thumb held flexed inside the palm impairs grip and grasp and lack of abduction and extension limits the size of the object the patient can grasp<sup>10</sup>. The presence of thumb in the palm will obstructs the function of other fingers. It may even contribute to rejection of the hand and cause problems in ADL. Swan neck deformity, intrinsic minus and intrinsic plus deformity are other common deformities seen in children with CP. Degree of upper limb deformity significantly affect the function of the upper limb.<sup>10</sup><sup>11</sup> The impaired hand function originates from the deficiencies in motor coordination, and selective motor control as well as muscle weakness, and deficient integration of sensory motor function.<sup>6,7,8,9</sup> Motor planning and fine motor coordination are required for grasping to control multiple degrees of freedom available in the hand and fingers. Children with CP deficits in motor planning and execution that impact the timing and coordination of joint movements, orientation of the hand to object size and use.<sup>9</sup> Many therapeutic methods are used to treating the sign of CP including botulinum toxin injection, orthopedic surgery, medications, physical therapy, occupational therapy etc.<sup>12,13</sup>. Physical therapy use various dynamic approaches including bobath approach, sensory integration (SI), neurodevelopmental therapy (NDT), bimanual therapy, CIMT, stretching and strengthening and functional hand activities which shows significant improvement in hand functions.<sup>12</sup> However, there are

limitation in using above methods as some of them require longer treatment durations, higher degree of co-operation and motor practice from the child, which may be reduce efficacy due to their poor co-operation and motivation. While some approaches tend to be less focused to retraining hand functions.<sup>12,13</sup> A method used for reducing problems of hand and upper limb in children with spastic cerebral palsy is Kinesio taping (KT).<sup>14</sup> The application of kinesiotape will enhance skin receptor output, stimulating supraspinal centers, and thus improves joint position and kinesthetic senses and proper development of the motor control. And also it strengthen weakened muscles, control joint instability, assist with postural alignment, and relax an over-used muscle, increase sensory stimulation, increase functional motor skills, and improve functional independence.<sup>12,13,14,15,16,17</sup> A review conducted on therapeutic effects of kinesio taping in children with cerebral palsy and explained about the characteristics of kinesiotape, physiological effect of kinesiotaping and the various type of kinesiotape using in pediatric population has also shown the effectiveness in recovery of upper limb, motor function and solving dysphagia.<sup>16</sup>

## Methodology

A Randomized controlled trail was conducted on 28 cerebral palsy children from Oxford College of physiotherapy, Samarthanam Trust for disabled and Fame India Special School having impaired hand function. All the subjects who gave consent for participation and who fulfilled the selection criteria were randomized. Randomization was done by another therapist. Consent for the participation in the study was obtained form the parents of the children participated by signing a consent form.

Treatment was carried out for a period of 3 weeks on each group. Outcomes were measured using quality of upper extremity skill test (QUEST) and Upper limb physician rating scale (ULPRS).

Participants included in the study were children with spastic unilateral and bilateral cerebral palsy, both male and female, of age group between 4 to 8 years, according to Manual Ability Classification System (MACS) grade 2 and 3 and Spasticity, according to Modified Ashworth Scale 1, +1 and 2. They were able to follow and accept verbal

instructions. Selected children had proper functional vision. Children excluded from the study were those who had taken botox therapy or muscle relaxant past 3 months, who underwent any surgery for upper limb within past 6 months, those with active seizure disorder (High frequency of seizure disorder) or those having allergic (systemic) reaction to tape.

#### **Procedure:**

Ethical clearance was obtained from the ethical committee of The Oxford College of the physiotherapy. Baseline assessment was done at the commencement of the protocol. Participants were allocated to one of the two groups according to the inclusion criteria, either Group A (Kinesiotaping + Functional hand activities) or Group B (Sham Application of sham taping [Kinesiotape without tension-2 days, 3 sessions weekly] + functional hand activities with tape on (2 times per day, 45 minutes/3 weeks. Application of kinesiotape) [KT-2 days, 3 sessions weekly] + Functional hand activities with tape on (2 times per day, 45 minutes/3 weeks).

#### **Procedure for group A**

The experimental group (Group A): participated in kinesiotape application along with functional hand activities program three times in a week. The children performed hand functional activities with the kinesiotape on. Instructions were also given to the caregiver of the children. Demonstrations for ten exercises (Switch on a bedside lamp, turn a single page of kid's book, push a hole in clay with finger, hold a bottle or glass with half filled water, transfer small ball (textured ball) & put into a bowl, pick up nuts and release in a plate, slide the coins from flat surface, put into purses, open a lid of tiffin

box, sharpen a pencil, push a cardboard box from the table) were done under the supervision of parents at the home. Hand activities performed twice a day and each session were at least 45 minutes in duration for a period of 3 weeks.

#### **Procedure for group B**

The Control group (Group B): received sham tape (kinesiotape without tension) followed by the same procedure as experimental group carried for 3 weeks. Functional hand activities primarily focusing on the forearm, wrist and hand movements were given after application of sham taping. It was measured by same functional outcome measures used for experimental group.

#### **Statistical Analysis**

Paired t test and independent sample t test were used as a statistically tool for detecting the significant difference within the group and between the group. Descriptive statistics (mean and standard deviation) were also calculated for all the measurements consideration for the study.

## **Results**

**Table 1: The mean and SD of pre and post test scores outcome measures of experimental and control group.**

(n = 28)		Mean	SD
QUEST	Pre	55.71	14.60
	Post	55.51	14.11
ULPRS	Pre	24.20	5.39
	Post	24.50	5.40

**Table.2. Comparison of QUEST and ULPRSat pre test between the groups.**

Pre-Test	Groups	Mean	SD	t	p-value
QUEST	Experimental	52.29	12.73	-1.051	0.307
	Control	59.14	16.19		
ULPRS	Experimental	24.40	5.99	0.162	0.873
	Control	24.00	5.03		

\*p=0.05

The Independent sample "t" test was used to compare QUEST and ULPRS at pre test between the

groups. There was no difference ( $p > 0.05$ ) in QUEST and ULPRS at pre test between the groups.

**Table 3: Within group comparison of QUEST and ULPRS**

	Experimental Group					Control				
	Groups	Mean	SD	t	p-value	Groups	Mean	SD	t	p-value
QUEST	Pre	52.3	12.7	0.498	0.630	Pre	59.1	16.2	0.745	0.475
	Post	52.2	12.3			Post	58.9	15.6		
ULPRS	Pre	24.4	6.0	-0.361	0.726	Pre	24.0	5.0	-1.861	0.096
	Post	24.5	6.3			Post	24.5	4.6		

\*p=0.05

The Paired “t” test was used for the within group comparison of QUEST and ULPRS. There was no

difference ( $p > 0.05$ ) in QUEST and ULPRS within experimental group as well as control group.

**Table 4: Comparison of effectiveness (pre - post) in QUEST and ULPRS between the groups.**

(Pre-Post)	Groups	Mean	SD	t	p-value
QUEST	Experimental	0.13	0.82	-0.328	0.747
	Control	0.28	1.19		
ULPRS	Experimental	-0.10	0.88	1.037	0.314
	Control	-0.50	0.85		

The Independent sample “t” test was used to compare the effectiveness (pre - post) in QUEST and ULPRS between the groups. There was no difference ( $p > 0.05$ ) in the effectiveness in QUEST and ULPRS between the groups.

### Discussion

In the current study, primary objective was to find out the short term effectiveness of kinesiotope application while training of functional hand activities in children with unilateral and bilateral cerebral palsy in improving hand function. According to the result when compared between and within the Group A (KT+ functional hand activities) and Group B (Sham taping +functional hand activities) has no significant improvement on hand activities in children with cerebral palsy.

The current study discovered that kinesiotope and functional hand activities had no discernible effect on hand function in children with unilateral and bilateral cerebral palsy.

The results of all previous studies were favorable and they were long term studies. But the current study is short term, which may be the cause of the unfavorable outcome or result. This study can be

useful in the future if conducted over long term and in a conducive environment. KT and functional hand exercise have their own value from a rehab standpoint. It will be great in the future to combine the effectiveness of both for a efficient rehab.

Kinesiotaping and functional hand exercises can hasten the child’s recovery and help them develop better neuromuscular coordination over time, which will greatly increase their ability to lead a normal life. Giving children useful hand exercises is crucial from a rehabilitation perspective, and it can be more effective when combined with the evidence-supported benefits of kinesiotope, such as increased range of motion (ROM), improved function, reduced pain, and improved quality of life (QL).

### Conclusion

The study concludes that, short term effect of KT along with functional hand activity exercise programme has no improvement in hand function in children with cerebral palsy. This study hereby accepts the null hypothesis that there is a no significant effect of KT along with functional hand activities on improvement of hand activities in children with cerebral palsy.



**Conflict of Interest:** Nil.

**Source of Funding:** None

**Ethical Clearance:** Ethical committee of The Oxford College of Physiotherapy, Bangalore, Karnataka

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## Prevalence of Musculoskeletal Disorders among Self-Employed Female Tailors in Selected Places of Bengaluru

Pavana<sup>1</sup>, Smrithi. A<sup>2</sup>, Pruthviraj. R<sup>3</sup>

<sup>1</sup>Associate Professor, RV College of Physiotherapy, Bangalore, Karnataka, India, <sup>2</sup>III B.P.T Student, RV College of Physiotherapy, Bangalore, Karnataka, India, <sup>3</sup>Professor, Principal, R V College of physiotherapy, Bengaluru.

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### Abstract

**Background & purpose:** Work -related musculoskeletal disorders have been known to affect workers in a wide variety of occupations and are major causes of lost time from work, worker's disability, increase in compensation claims and health care costs. The pattern of work-related musculoskeletal disorders has been reported to vary among different occupational groups. Tailoring involves monotonous, highly repetitive tasks like cutting, assemble, pressing and finishing performed in sitting working posture with upper back curved and head bent over the sewing machine. The aim of this study is to assess the prevalence of musculoskeletal disorders and risk of low back pain among self-employed female tailors.

**Methods:** A cross sectional study was conducted at selected places of Bengaluru. 70 subjects were selected based on the inclusion and exclusion criteria and were screened for work-related musculoskeletal disorder using Nordic Musculoskeletal Disorder Questionnaire and low back pain using Modified Oswestery lower back disability index.

**Results:** The results were statistically analyzed. The study found high rate of musculoskeletal disorders among self-employed female tailors. More than 79.2% of tailors suffered from musculoskeletal pain and lower back were the most prevalent site.

**Conclusion:** The study found high rate of musculoskeletal disorders among self-employed female tailors. More than 79.2% of tailors suffered from musculoskeletal pain and lower back were the most prevalent site. Frequent breaks during work period and back support would reduce the musculoskeletal stress on lumbar region. Based on the observations made, the study concluded that there is ample scope for ergonomic improvement keeping in view the need for maximum comfort to the tailors to promote their health and well-being and enhance their productivity and quality of work.

**Key Words:** Self-Employed Female Tailors, W-Rmsd, Low Back Pain, Modified Oswestery Lower Back Disability Index, Standardised Nordic Questionnaire.

### Introduction

Musculoskeletal disorders (MSD) include a wide

range of inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints,

**Corresponding Author:** Pavana, HOD & Associate professor, Community Health Physiotherapy Department, RV College of Physiotherapy, No. CA 2/83-3, 9th Main Road, 4th Block, Jayanagar, Bengaluru.

**E-mail:** pavanaholla.rvcp@rvei.edu.in

peripheral nerves and supporting blood vessels. Work related MSDs (WRMSDs) usually occur when there is a mismatch between the requirements of the job and the physical capacity of the human body, depending upon the physical movement characteristics, ergonomics, and mechanical design of work tasks.<sup>1</sup> Work-related musculoskeletal disorders have been known to affect workers in a wide variety of occupations and are major causes of lost times from work, worker's disability, increase in compensation claims and health care costs.<sup>2</sup> The pattern of work-related musculoskeletal disorders has been reported to vary among different occupational groups.

Tailoring involves monotonous, highly repetitive tasks like cutting, assemble, pressing and finishing performed in sitting working posture with upper back curved and head bent over the sewing machine. Working in this awkward posture for a long duration increases the chance of developing work-related musculoskeletal disorders in them.<sup>3</sup> The tailoring industry of India is an unorganized sector, mostly run by private establishments provides employment for both men and women majority from the lower economic classes. The employees of this industry hardly ever benefit from occupational health-and-safety provisions. They lack any type of social security, so their ill-health and poverty go hand-by-hand and create a stupendous pressure from which they can hardly come out.

The present study highlights the burden of musculoskeletal disorder among the females engaged in tailoring occupation as well as their discomfort related to ergonomically deranged workstation. Although majority of musculoskeletal disorders are benign and self-limiting in nature, the consequences of its persistent presence led to chronic (and persistent) disabling pain, sickness absence, work disability and increasing health care costs. If not corrected early, this health problem can seriously undermine their physical capacity hence leading to permanent physical disability. All these can adversely affect their earning power, thus setting a vicious cycle of no work, no money, malnutrition, and weakness. Intervention at work site like providing the workers with improvised workstation combined with ergonomic education and training, frequent short breaks to stretch and/or change position in

between their working hours and jobs/task rotation through tasks that do not require constant leg pressure and awkward leg posture would go a long way in reducing the incidence of musculoskeletal disorders among them. Concerted efforts by the government and nongovernmental agencies as well as the employers to bring them under the umbrella of an organized sector with provision of social security measures and quality health care coverage would be helpful to mitigate their suffering.

Every occupation has its own adverse effects on health. Low back pain is considered to be one of the most common occupational health problems. It is defined by Last JM et al as "a non-specific condition that refers to complaints of acute or chronic pain and discomfort in or near the lumbosacral spine".<sup>4</sup> Kraemer et al 1985 stated prolonged sitting leads to isometric contractions of back muscles leading to endow muscular pressure restricted blood flow, resulting in ischemia which reduces energy requirements of the muscles causing fatigue.<sup>5</sup> Prolong flexion of the spine leads to increase intervertebral joint laxity and fluid loss in the intervertebral discs.<sup>6</sup> and the intra-discal pressure at the lumbar region is high both in sitting and trunk-bent-forward posture.<sup>7</sup> Insufficient recovery time is the contributing factor to developing low back pain.<sup>8</sup>

Over two decades ago, Kuorinka and colleagues presented the general Standardized Nordic Questionnaire as a screening instrument that comprised just three questions regarding musculoskeletal pain that is been widely utilized in the absence of any other rigorously reliable assessment tool. The Nordic Musculoskeletal Disorder Questionnaire tool used in this study was adapted from Dawson et al<sup>9</sup> which collects reliable information regarding the point, 12-month, and lifetime prevalence and consequences of musculoskeletal symptoms in nine body regions.

This study aims to estimate the prevalence of work-related musculoskeletal disorders among female tailors and the severity of the disability due to low back pain among female self-employed tailors populations.

### Objectives of the Study

- To estimate the prevalence of musculoskeletal disorders among self-employed female tailors.

- To assess the prevalence of severity of disability due to low back pain among self-employed female tailors.

## Methodology

### Materials and Methods

**Source of Data:** Self-employed female tailors

**Definition of study subjects:** Female tailors from selected places of Bengaluru based on inclusion and exclusion criteria.

#### Inclusion Criteria:

- Age of respondents > 18 years
- More than 8 hours of work
- Subjects willing to participate and ready to sign consent form.

#### Exclusion Criteria:

- Subjects with neurological dysfunction, musculoskeletal dysfunction, psychiatric disorder
- Subjects with gynecological conditions
- Subjects who had already participated in similar kind of study.
- Pregnant women and lactating mother
- People with disabilities

### Method of Collection of Data

#### Sampling Method:

Purposive sampling technique

**Sampling Size:** Subjects matching up inclusion and exclusion criteria.

#### Materials Required

- Consent form
- Screening form
- Questionnaire form
- Stationaries

#### Duration of the Study:

Data was collected over a period of in 3 months' time.

### Procedure

Investigator personally contacted the self-employed female tailors and subjects that fulfilled the inclusion and exclusion criteria and were recruited for the study. Interviewer presented a structured questionnaire along with a pretested checklist for assessment of the seeing workstation that were used. The questionnaire consisted of four sections; the first part included questions on sociodemographic characteristics and background information of the respondents; second part included questions related to occupational variables like working duration, years of work, hours of working per day and days per week and whether her job is part time or full time. The third part of the questionnaire dealt with the presence and pattern of musculoskeletal disorder which was assessed by Nordic Musculoskeletal questionnaire. The fourth part was to assess the severity of lower back pain by using Modified Oswestry Lower back disability Index.

## Result Analysis

#### Descriptive statistics:

All the categorical variables were presented in the form of frequency tables and graph wherever necessary. The quantitative variables were summarized using.

Mean  $\pm$  standard deviation with 95% confidence interval.

#### Inferential statistics:

The prevalence of work-related musculoskeletal disorder among self-employed female tailors from selected places of Bengaluru.

#### Statistical software:

The data was entered using statistical software namely SPSS Version 25.0, Microsoft Excel 2016 and Microsoft word 2016 was used to draw tables and graphs.

**Table 1: Distribution of SNQ Neck**

Pain and Disability	Nature of musculoskeletal disorder	Number (n=70)	Prevalence (%)
Trouble in last 12 months (such as ache, pain, discomfort, numbness)	Yes	33	47.1
Trouble during last 7 days	Yes	35	50
ADL affected in last 12 months (Eg. job, housework, hobbies) because of this trouble	Yes	39	55.7

**Table 2: Distribution of SNQ Shoulder, Elbow, Wrist**

Pain and Disability	Nature of musculoskeletal disorder		Number (n=70)	Prevalence (%)
Trouble in last 12 months (such as ache, pain, discomfort, numbness)	Right Shoulder		32	45.7
	Left shoulder		32	45.7
	Both Shoulders		1	1.4
	Right Elbow		39	55.7
	Left Elbow		30	42.9
	Both Elbow		1	1.4
	Right Wrist		38	54.3
	Left Wrist		29	41.4
	Both Wrist		3	4.3
Trouble during last 7 days	Right Shoulder		43	61.4
	Left shoulder		26	37.1
	Both shoulders		1	1.4
	Right Elbow		56	80.0
	Left Elbow		14	20.0
	Both Elbow		53	75.7
	Right Wrist		40	57.1
	Left Wrist		29	41.4
	Both Wrist		1	1.4
ADL affected in last 12 months. (Eg. job, housework, hobbies) because of this trouble	Shoulder	Yes	38	54.3
	Elbow	Yes	17	24.3
	Wrist	Yes	45	64.3

**Table 3: Distribution of SNQ Upper back, Lower Back**

Pain and Disability	Nature of musculoskeletal disorder		Number (n=70)	Prevalence (%)
Trouble in last 12 months (such as ache, pain, discomfort, numbness)	Upper Back	Yes	41	58.6
	Lower Back	Yes	15	21.4
Trouble during last 7 days	Upper Back	Yes	34	48.6
	Lower Back	Yes	30	42.9
ADL affected in last 12 months. (Eg. job, housework, hobbies) because of this trouble	Upper Back	Yes	50	71.4
	Lower Back	Yes	30	42.9

**Table 4: Distribution of SNQ Hip, Knee, Ankle**

Pain and Disability	Nature of musculoskeletal disorder		Number (n=70)	Prevalence (%)
Trouble in last 12 months (such as ache, pain, discomfort, numbness)	Hip	Yes	35	50.0
	Knee	Yes	31	44.3
	Ankle	Yes	46	65.7
Trouble during last 7 days	Hip	Yes	35	50.0
	Knee	Yes	31	44.3
	Ankle	Yes	47	67.1
ADL affected in last 12 months. (Eg. job, housework, hobbies) because of this trouble	Hip	Yes	31	44.3
	Knee	Yes	28	40.0
	Ankle	Yes	48	68.6

**Table 5: Distribution of M-OSW Score: The present study states that the mean score of low back pain is 32.59.**

Age (In years)	Years in tailoring	M-OSW Score
44.66	14.2286	32.59
11.913	8.94131	8.697
25	3.00	18
78	46.00	62

### Discussion

A cross sectional study was conducted to measure the prevalence of work-related musculoskeletal disorders and to assess the prevalence of severity of disability due to low back pain among self-employed female tailors. The study group included subjects aged above 18 years. The prevalence of low back pain was measured using Modified Oswestery Scale and the prevalence and consequences of musculoskeletal system was measured using Standardized Nordic questionnaire.

A total of 70 subjects participated in this study after signing the informed consent forms. They were assessed for the variables along with the demographic data and the findings were recorded.

Several cross-sectional studies stated that the low back and the musculoskeletal system were the most commonly affected among the garment workers, were at higher risk of developing musculoskeletal disorders and MSDs were highly prevalent especially in the upper extremity among sewing profession population.

The findings of this study confirm the work-related stress on musculoskeletal system on self-employed female tailors. In the present study, it was observed that the prevalence of neck trouble in last 12 months was 47.1%, trouble during last 7 days was 50 % and ADL affected in last 12 months was 55.7%. The prevalence of Shoulder trouble during last 12 months in right shoulder was 45.7%, in left shoulder was 45.7% and both the shoulders was 1.4%. Trouble during last 7 days in right shoulder was 61.4%, left shoulder 37.1% and both the shoulders was 1.4%. 54.3% tailors reported ADL getting affected in last 12 months.

The prevalence of troubles in last 12 months in right Elbow was 55.7%, in left Elbow was 42.9% and both the Elbow was 1.4%. Trouble during last 7 days in right Elbow was 80.0%, left Elbow was 20.0% and both the Elbow was 75.7%. The ADL affected in last 12 months was 24.3 %. The prevalence of trouble in last 12 months in right Wrist was 54.3%, left Wrist 41.4% and both the Wrist was 4.3%. Trouble during last 7 days in right Wrist was 57.1%, left Wrist was 41.4% and both the wrist was 1.4%. 64.3% of tailors reported that their ADL was affected during the last 12 months due to trouble in wrist. Prevalence of Upper back trouble in last 12 months was 58.6%, trouble during last 7 days was 48.6% and ADL affected in last 12 months was 71.4%. The prevalence of Low back trouble in last 12 months was 21.4%, trouble during last 7 days was 42.9% and ADL affected in last 12 months was 42.9%. The prevalence of Hip trouble in last 12 months was 50.0%, trouble during last 7 days was 50.0% and ADL affected in last 12 months was 44.3%. The prevalence of Knee trouble in last 12

months was 44.3%, trouble during last 7 days was 44.3% and ADL affected in last 12 months was 40.0%. The prevalence of Ankle trouble in last 12 months was 65.7%, trouble during last 7 days was 67.1% and ADL affected in last 12 months was 68.6%. The secondary objective was the find out the prevalence of low back pain using Modified Oswestery lower back disability index. The analysis of this study presented a mean score of 32.59.

### Scope of the Present Study Was:

A high prevalence of musculoskeletal disorders exists among self-employed female tailors that affects their ADLs, productivity, and quality of work. Further studies are needed to identify the specific risk factors for the ergonomic changes to bring about and to assist in planning management strategy including awareness, education, and treatment to prevent work-related musculoskeletal disorders.

### Conclusion

The study found high rate of musculoskeletal disorders among self-employed female tailors. More than 79.2% of tailors suffered from musculoskeletal pain and lower back were the most prevalent site. Frequent breaks during work period and back support would reduce the musculoskeletal stress on lumbar region. Based on the observations made, the study concluded that there is ample scope for ergonomic improvement keeping in view the need for maximum comfort to the tailors to promote their health and wellbeing and enhance their productivity and quality of work.

### Limitation

Sample size could have been more in number to give a better result. Study set up can be at rural community to get better understanding of work-related musculoskeletal disorders and lower back pain involvement. Use of questionnaire in regional language could have given better results.

**Conflict Of Interest:** There was no personal or institutional conflict of interest for this study.

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**Ethical Clearance:** Ethical clearance was taken from R.V. COLLEGE OF PHYSIOTHERAPY, Bengaluru

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# Prevalence of Upper Quadrant Musculoskeletal Disorders among Healthcare Professionals in a Tertiary Care Hospital

Ridham Sharma<sup>1</sup>, Suman Mehra<sup>2</sup>

<sup>1</sup>PG Student, <sup>2</sup>Assistant Professor, College of Physiotherapy, Pt. B.D.S, University of Health Sciences, Rohtak, India.

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## Abstract

**Background:** Healthcare professionals (HCPs) are vulnerable to acquire musculoskeletal disorders during their work routine. Shortage of HCPs, long working hours and mandatory overtime results in overburden on those available, especially during pandemic such as in COVID -19. Objective of the study was to evaluate the prevalence of upper quadrant musculoskeletal disorders (UQMSDs) among HCPs.

**Methodology:** A total of 370 HCPs including doctors, dentists, physiotherapists and nurses were evaluated for the presence of trigger points (TrPs) in upper trapezius, levator scapula, infraspinatus and sternocleidomastoid muscles, severity of pain (NPRS), neck disability (NDI) and cervical and shoulder ROM (goniometer).

**Results:** The prevalence rate of UQMSDs was found to be high among HCPs. TrPs were more prevalent in upper trapezius muscle (46.21%) followed by levator scapulae, infraspinatus and sternocleidomastoid muscles. 4.1% of HCPs reported severe pain, 16.7% reported moderate pain and 48.36% reported mild pain in upper quadrant. 0.8% of HCPs had complete, 1.2% had severe, 5.3% had moderate and 37.6% had mild neck disability. The cervical rotation and shoulder horizontal adduction ROM were found to be more restricted among HCPs.

**Keywords:** upper quadrant musculoskeletal disorders, myofascial trigger points

## Introduction

Musculoskeletal disorders (MSDs) in healthcare professionals (HCPs) represents a widespread series of disorders, which can differ in severity from minor periodic symptoms to major chronic symptoms occurring due to overuse, repetitive micro-injury, psychosocial factors and workplace characteristics.<sup>1</sup> HCPs are susceptible to acquire musculoskeletal disorders during the course of their work routine due to extended night work, longer shifts (greater than 8 h per day), on-call work and mandatory overtime

to deliver care around the clock, which become even more demanding during pandemic such as COVID-19.<sup>2,3</sup> Shortage of HCPs results in overburden on those available, which further increase their mechanical workload than load bearing capacity of musculoskeletal system.<sup>4</sup> The WHO in 2006 recognized the occupational hazards and stress in healthcare providers and stated that MSDs contribute to high sickness absent rates among HCPs.

Upper quadrant musculoskeletal disorders (UQMSDs) include the MSDs of upper quadrant

**Corresponding Author:** Ridham Sharma, PG Student, College of physiotherapy, Pt. B.D.S, University of Health Sciences, Rohtak, India.

**E-mail:** [ridhamsharma1160@gmail.com](mailto:ridhamsharma1160@gmail.com)



including occiput, cervical and upper thoracic spine counting the clavicles and scapulae.<sup>5</sup> Different postures and poor ergonomics acquired during performing operations, patient care can significantly influence the head/neck posture resulting in stiffness of soft tissue, restriction in ROM, impaired motor recruitment, local muscle weakness and formation of myofascial trigger points (MTrPs). Simons et al. (1992) described myofascial trigger points as a hyperirritable spot, a taut band in skeletal muscle or in the muscle fascia which are painful on compression. An adequate amount of healthy HCPs are crucial for the effective and efficient working of health care systems. Studies specifically investigating UQMSDs among HCPs are limited.

Therefore, there is need to evaluate prevalence of UQMSDs among HCPs. Finding out the prevalence may help to find out strategies for effective and efficient working of healthcare system.

### Materials and Methods

Ethical clearance was taken from Institutional Ethical Committee (No. - BREC/21/163) of Pandit Bhagwat Dayal Sharma University of Health sciences, Rohtak, India. A total of 370 HCPs of age 24-65, both male and female including doctors, dentists, physiotherapists and nurses were recruited from among the staff working in Post Graduate Institute of Medical Sciences (PGIMS), Rohtak. Subjects with current musculoskeletal trauma, having history of injury to upper quadrant, upper limbs and back and medical graduates having less than 1 year of experience of working in a hospital set up were excluded from the study. On the bases of inclusion and exclusion criteria the illegible participants were requested to sign an informed consent. The participants were evaluated for MTrPs, pain, neck disability and restricted cervical and shoulder ROM.

**Pain** - Pain was assessed using Numeric Pain Rating Scale (NPRS).<sup>6</sup>

#### Assessment of myofascial trigger points

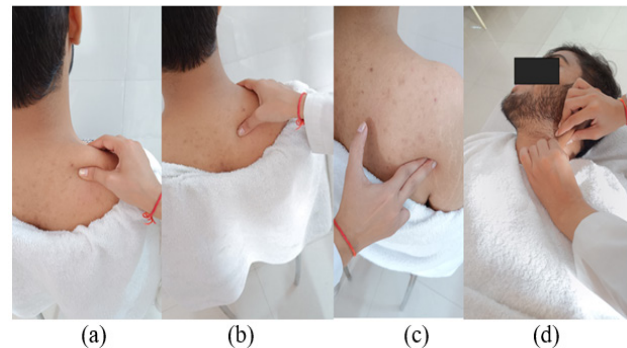
-Upper trapezius (UT), levator scapulae (LS), sternocleidomastoid (SCM), infraspinatus (IS) muscle

were palpated on both side for the presence of MTrPs. (Figure 1) Trigger points were diagnosed using three criteria (Presence of taut band, hypersensitive spot and referred pain) recommended by a panel of 60 international experts. Presence of any two criteria out of these were considered to have MTrPs.<sup>7,8</sup>

**Neck disability** - Neck disability was assessed using Neck Disability Index (NDI) self-reporting questionnaire which is a valid and reliable to assess the effect of neck pain on subject ability to manage his/her everyday life.<sup>6</sup>

**Measurement of range of motion (ROM)** - The physical measurements of cervical spine and shoulder ROM were carried out by using universal goniometer. American Medical Association for cervical spine and shoulder joint range of motion were considered for reference ranges.<sup>9</sup> For horizontal adduction Luttgens et al. 1997 horizontal adduction normative value was taken as reference range.<sup>10</sup>

Data analysis was carried out using the software SPSS 26 version to determine frequency distribution, means and proportions.



**Figure 1. Procedure for palpation of trigger points in (a) upper trapezius (b) levator scapulae, (c) infraspinatus (d) sternocleidomastoid**

### Results

A total of 370 HCPs were included in the study. The mean age of HCPs was  $32.5 \pm 8.54$  years with a minimum age of 25 years and maximum of 61 years. The mean value of BMI was  $24.16 \pm 3.39$  Kg/m<sup>2</sup> with minimum Body Mass Index (BMI) of 14.50 Kg/m<sup>2</sup> and maximum of 34.96 Kg/m<sup>2</sup> (Table 1).

**Table 1: shows the distribution of socio demographic characteristics of the healthcare professionals**

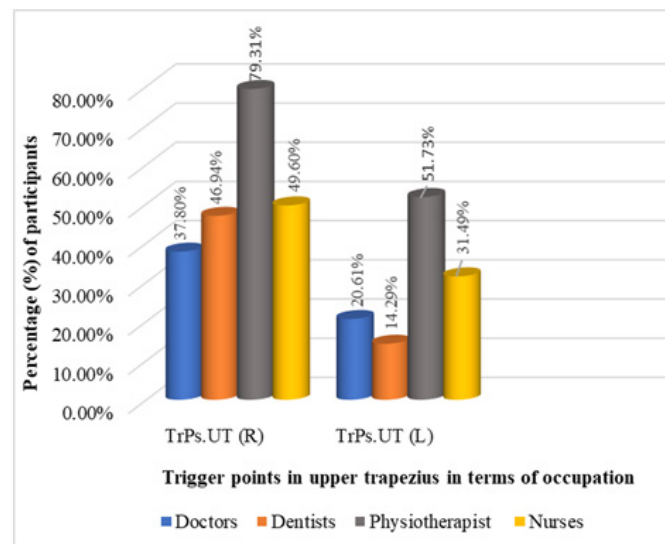
Socio-demographic characteristics	Frequency (n)	Percentage (%)
Age-		
25-34	277	74.86%
35-44	53	14.32%
45-54	27	7.29%
55-65	13	3.51%
Gender -		
Males	110	29.7%
Females	260	70%
BMI-		
Normal	228	57.83%
Underweight	12	3.2%
Overweight	107	28.9%
Obese	23	6.21%
Occupation-		
Doctors	165	44.59%
Dentists	49	13.24%
Physiotherapists	29	7.83%
Nurses	127	34.32%

Physical activity	Frequency	Percentage
Yes	213	57.56%
No	157	42.43%

The prevalence of MTrPs was found to higher in right upper trapezius (46.21%) followed by in right levator scapulae (27.56%), left upper trapezius (25.9%) left levator scapulae (16.48%), infraspinatus (7.8% right side, 7.56% left side) and sternocleidomastoid (6.21% right side, 2.9% left side). Physiotherapists had higher percentage of MTrPs in upper trapezius (79.31% right side, 51.73% left side) and in right levator scapulae (41.38%). Dentists had higher percentage of MTrPs in left levator scapulae (26.53%). Nurses had higher prevalence of MTrPs in left sternocleidomastoid (39.37%) and infraspinatus (11% right side and 10.24% left side). (Table 2, Figure 2 a-d)

**Table 2: Prevalence of myofascial trigger points**

Myofascial Trigger points in muscles	Frequency (n)	Percentage (%)
Upper trapezius (R)	171	46.21%
Upper trapezius (L)	96	25.9%
Levator scapulae (R)	102	27.56%
Levator scapulae (L)	61	16.48%
Sternocleidomastoid(R)	23	6.21%
Sternocleidomastoid (L)	11	2.9%
Infraspinatus (R)	29	7.8%
Infraspinatus (L)	28	7.56%

**Figure 2(a) - Prevalence of MTrPs in upper trapezius in term of occupation**

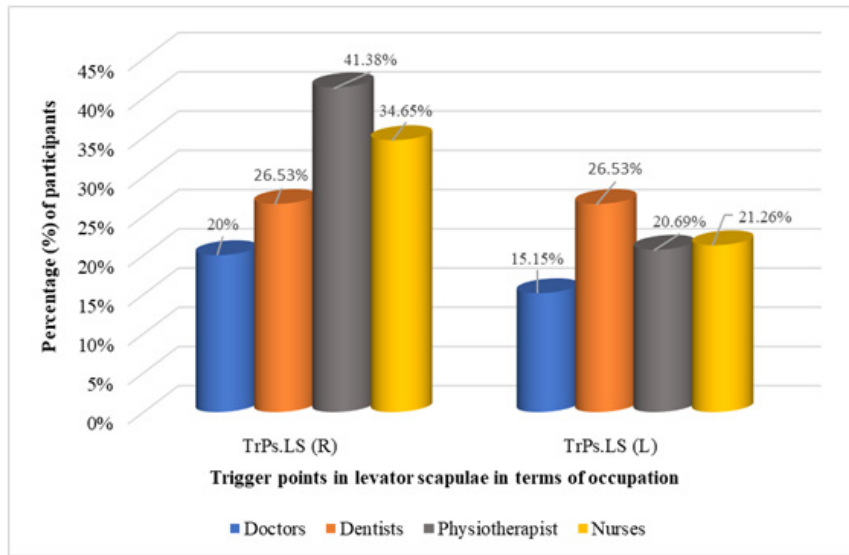


Figure 2(b) - Prevalence of MTrPs in levator scapulae in term of occupation

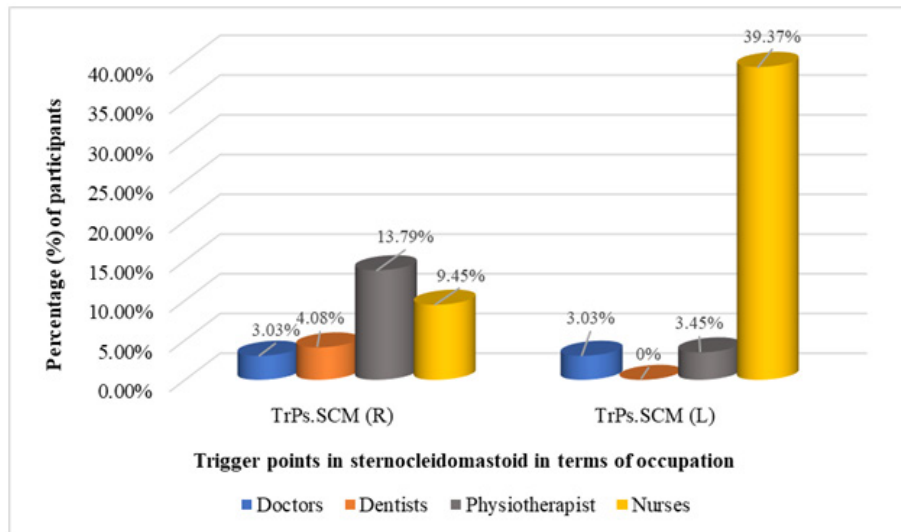


Figure 2(c) - Prevalence of MTrPs in sternocleidomastoid in term of occupation

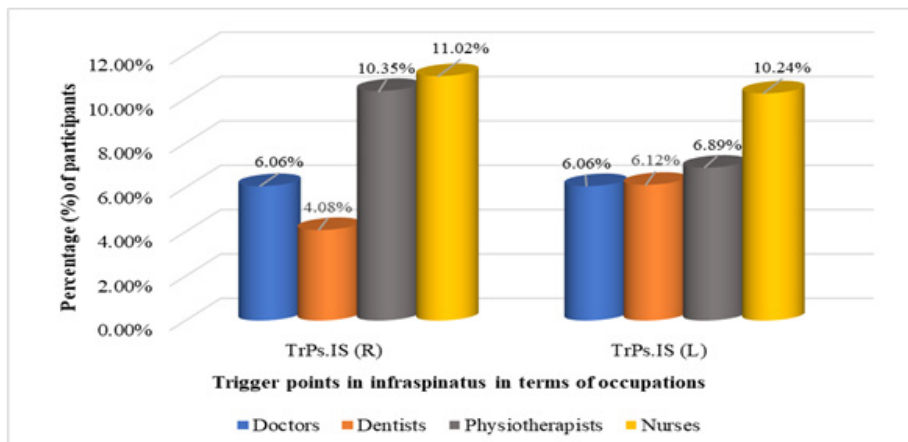


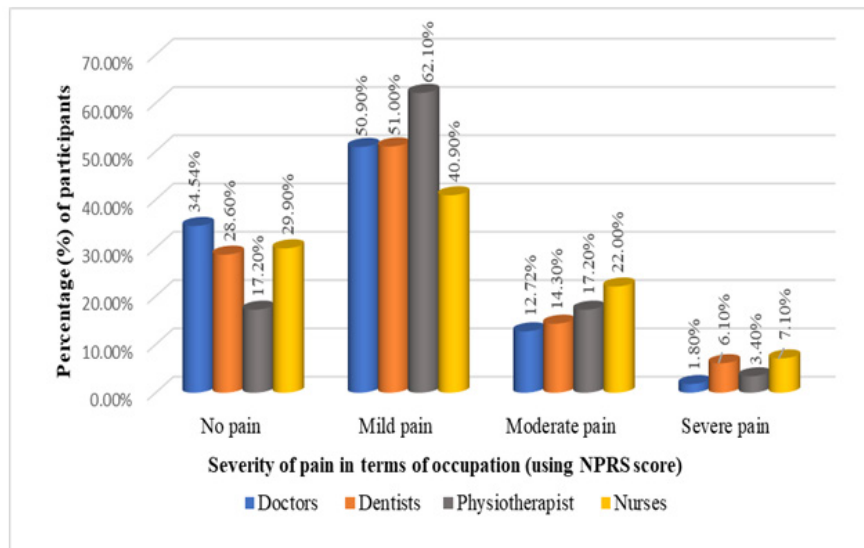
Figure 2(d) - Prevalence of MTrPs in infraspinatus in term of occupation

Interpretation of NPRS scores of HCPs revealed, 4.1% (n = 16) had severe pain, 16.7% (n = 62) had moderate pain, 48.36% (n =179) had mild pain and 30.54% (n = 113) had no pain. Interpretation of NPRS data in terms of occupation revealed, The

high prevalence of moderate (22%) and severe (7.1%) musculoskeletal pain in upper quadrant was found in nurses and high prevalence of mild (62.1%) musculoskeletal pain in upper quadrant was found in physiotherapists. (Table 3 and Figure 3).

**Table 3. Prevalence of pain among HCPs**

Pain (NPRS score)	Doctors	Dentists	Physiotherapists	Nurses
	% (n)	% (n)	% (n)	% (n)
No pain (0 score)	34.54% (57)	28.6% (14)	17.2% (5)	29.9% (38)
Mild pain (1-3 score)	50.9% (84)	51.0% (25)	62.1% (18)	40.9% (52)
Moderate pain (4-6 score)	12.72% (21)	14.3% (7)	17.2% (5)	22.0% (28)
Severe pain (7-10 score)	1.8% (3)	6.1% (3)	3.4% (1)	7.1% (9)



**Figure 3: Severity of pain among HCPs**

Interpretation of NDI scores of HCPs revealed high prevalence of mild neck disability (37.6%, n = 139) in HCPs followed by moderate disability (5.3%, n = 20), severe disability (1.2%, n = 4) and complete (0.8%, n = 3) neck disability. Interpretation of NDI data in terms of occupation revealed, high

prevalence of complete neck disability in doctors (1.2%, n= 2). High prevalence of moderate (7.87%) and severe (2.36%) neck disability was seen in nurses. High prevalence of mild neck disability (48.27%) was seen in physiotherapists (Table IV and Figure 4).

**Table 4: Description of neck disability in terms of occupation**

N.D.I. score	Doctors Percentage(n)	Dentists Percentage (n)	Physiotherapists Percentage (n)	Nurses Percentage (n)
0-4	60% (99)	61.22% (30)	48.27% (14)	48.03% (61)
5-14	33.9% (56)	34.69% (17)	48.27% (14)	40.94% (52)
15-24	4.8% (8)	2.04% (1)	3.44% (1)	7.87% (10)
25-34	0% (0)	2.04% (1)	00% (0)	2.36% (3)
35-50	1.21% (2)	0% (0)	00% (0)	0.78% (1)

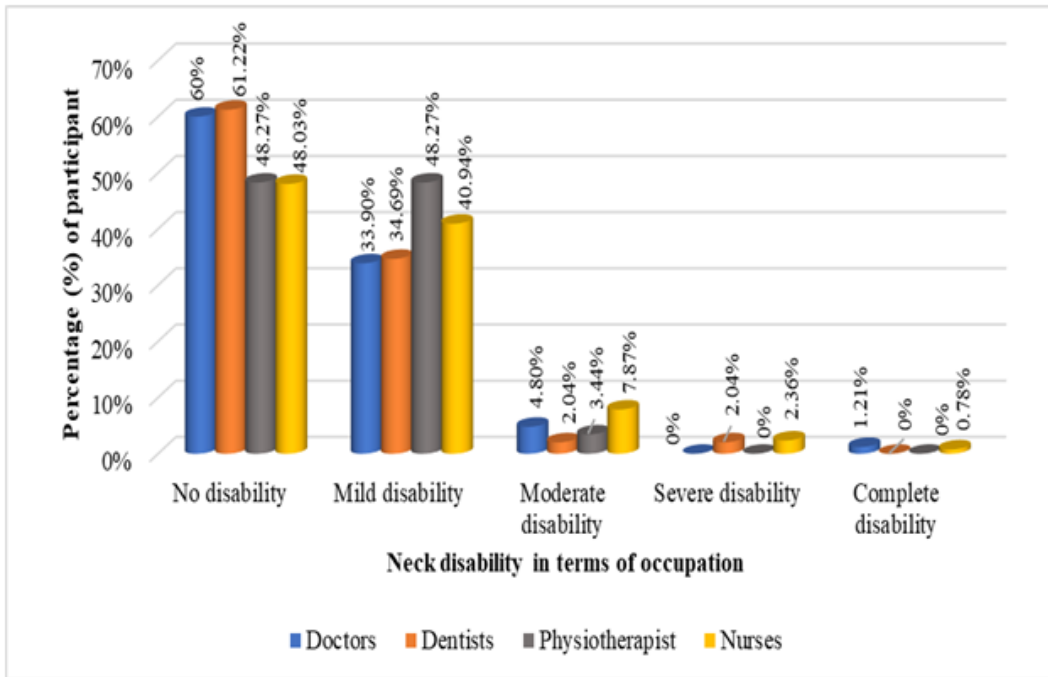


Figure 4: Prevalence of neck disability in terms of occupation

As per AMA reference range prevalence of restriction in cervical ROM among HCPs was found to be greater in cervical rotation ROM (98% both side) followed by cervical extension (71%), lateral flexion (53% in right side and 47% in left side) and cervical flexion (40%). Prevalence of restriction in shoulder ROM among HCPs was found to be greater in horizontal adduction (29% in left side, 28% in right side) followed by shoulder flexion (21.3% in left side

and 20.8% in right side), shoulder internal rotation (13.5% in right side and 10.5% in left side), shoulder extension (10.2% in right side, 10% in left side) and shoulder abduction (7% in left side and 6% in right side). Regarding cervical ROM, physiotherapist had more restriction followed by doctors, nurses and dentists. Regarding restriction of shoulder ROM, nurses had higher restriction followed by doctors, physiotherapists and dentists. (Figure 5 (a),(b))

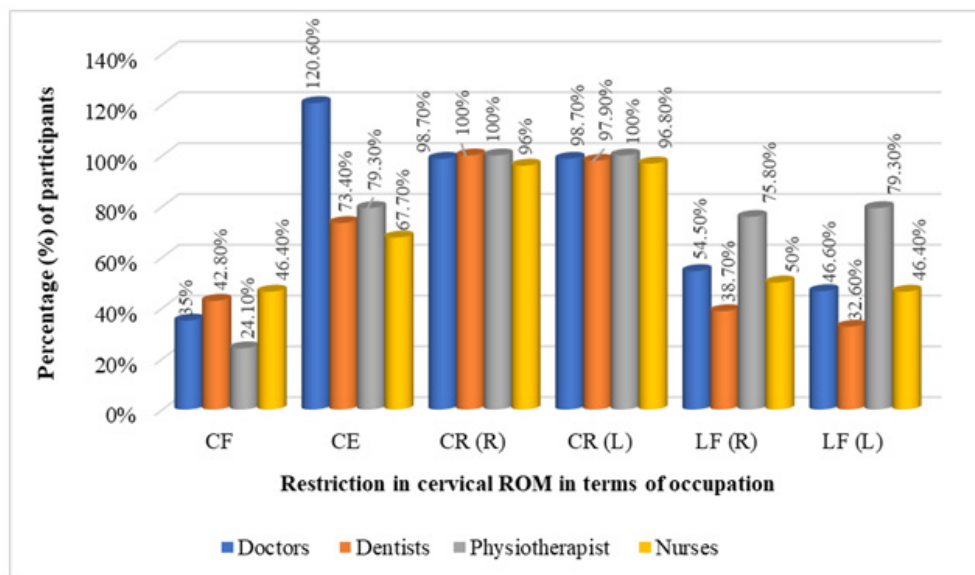


Figure 5(a): Prevalence of cervical ROM in terms of occupation

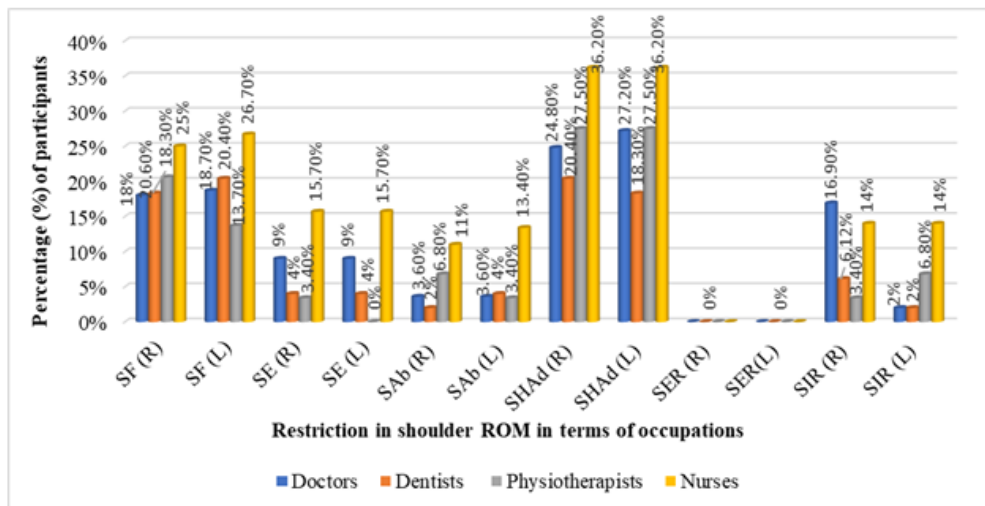


Figure 5(b): Prevalence of shoulder ROM in terms of occupation

## Discussion

This study found high prevalence of UQMDS among HCPs. MTrPs were higher in upper trapezius (46.21% on right side, 25.9% on left side) followed by in levator scapulae, infraspinatus and sternocleidomastoid. Physical workload and psychological stresses in HCPs might be the cause of higher percentage of MTrPs in upper quadrant muscles. Lundberg U. et al. (2002) reported a significant increase in trapezius electromyography activity during mental stress and cognitive task performance.<sup>11</sup> Fernández-De-LasPeñas et al. (2012) also reported high prevalence of MTrPs in upper trapezius, infraspinatus, levator scapulae, and extensor carpi radialis brevis muscles in both manual (blue collar) and office (white-collar) workers with nonspecific neck or shoulder pain.<sup>12</sup> In terms of occupation, physiotherapists had higher percentage of MTrPs in upper trapezius and in right levator scapulae. Dentists had higher percentage of MTrPs in left levator scapulae. Nurses had higher prevalence of MTrPs in left sternocleidomastoid and infraspinatus. Latif et al. (2020) also reported that 70.5% physiotherapists had MTrPs in upper trapezius and only 13.7% of them maintain their ideal posture during treating patients.<sup>13</sup> In case of nurse, working with poor postural adaptations, performing more of twisting movements, working with lying patients and transferring patients from bed might be the reason for development of MTrPs in upper quadrant muscles.<sup>14</sup> Dentists usually had to work with the arms abducted away from the body, hunched shoulder, sitting in

strained positions and poor physical ergonomics of workspace all attribute to the higher incidence of MTrPs.<sup>15</sup>

When considering pain, 69.16% (n = 257) of HCPs had pain in upper quadrant. Long et al. (2013) also found prevalence rate of neck and upper back pain among physician, nurses and midwives to be 70%.<sup>16</sup> Occupation wise, pain was more prevalent among physiotherapists (82.7%) followed by dentists (71.4%), nurses (70%) and doctors (65.42%). Wang et al. (2015) concluded, compared with dentists, physical therapists, registered nurses, and doctors also show higher risk of MSDs.<sup>17</sup> The high prevalence among physiotherapists might be due to physical therapy practice which involve more manual techniques, performing the same task over and over, patient treatment in different positions. Poor ergonomic knowledge and practice have been reported to be one of the reasons for MSDs. El-sallamy et al. (2018) reported that 48.9% of undergraduate dental students had fair knowledge regarding ergonomics, but only 5% had good practice of ergonomics in their routine dental practices.<sup>18</sup> Rahman et al. (2017) found that nurses (77.6%) had greater percentage of musculoskeletal pain as compared with doctors (61.3%).<sup>19</sup>

On the bases of neck disability, 37.6% had mild, 5.3% had moderate, 1.2% had severe and 0.8% had complete neck disability. As per NDI score, complete neck disability was more prevalent among doctors. Severe and moderate neck disability was more prevalent among nurses. Mild neck disability was

more prevalent in physiotherapists. Babar et al. (2020) found that, 44% of dentists had mild neck disability and 35% had moderate neck disability.<sup>20</sup> Khadim et al. (2018) also reported high prevalence of moderate disability among nurses.<sup>21</sup>

MTrPs have been found to be associated with reduced flexibility which might lead to restriction of shoulder and cervical ROM in various planes. Fernández-de-las-Peñas et al. (2005) found significant relationship between MTrPs in upper trapezius muscle and the presence of joint hypomobility at the C3-C4 segment.<sup>22</sup> Abnormal thoracic posture also effects shoulder and cervical ROM.<sup>23</sup>

### Conclusion

In this study, the prevalence rate of UQMSDs was found to be high among HCPs. In future prevalence of UQMSDs can be minimized by adopting various strategies such as awareness about general exercise, timely treatment and implication of ergonomic knowledge in clinical practice for effective and efficient working of healthcare system.

**Conflict of interest:** none

**Source of funding:** none

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# Effect of Physical therapy and Visceral Osteopathic Manipulation in Lower Back Pain: A Comparative Study

Sharath Hullumani V<sup>1</sup>, Abin Abraham Mammen<sup>2</sup>, Jakka Rahul<sup>3</sup>

<sup>1</sup>Lecturer, Acharya's NR Institute of Physiotherapy, Dr Sarvapelli Radhakrishnan Road, Soladevanahalli, Bengaluru, Karnataka, India. <sup>2</sup>Physical Therapist, WohlPhysio Physical Therapy Center, Panampilly Nagar, Kochi, Kerala, India. <sup>3</sup>Senior Physical Therapist, UCCHVAS Rehabilitation, Hyderabad, Telangana, India.

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## Abstract

**Background:** Lower back pain the most prevalent conditions that leads to a visit to a pain specialist. Individuals with lower back pain or traumatic back / spine injury compliant triage compliance will first discuss patient presentations and patient attributes.

**Methods/Deign:**An comparative study was conducted in Cuttack from September 2020 to January 2022. The total sample size was 30 and we used convenient sampling in which 10 in each group were recruited. Then the patient was screened according to inclusion and exclusion criteria with which informed consent was given if the patient agrees to give the consent. Then the patient was selected by convenient sampling based on eligibility criteria. Procedure of study was explained to all the patients and written consent was taken from them. Patients with low back pain were allocated for the study. Amongst this, group1 was given conventional physical therapy, Group 2 was given osteopathy techniques and group 3 was given combined both physical therapy and osteopathy techniques for 6 days a week for 6 weeks.

**Results:** Significant difference ( $p < 0.001$ ) were seen in group 3 in both outcome measures from 2<sup>nd</sup> week.

**Conclusion:** The combination of both conventional physical therapy and osteopathy manipulative techniques will help in better way in patients with lower back pain.

**Key words:** Low back pain, Physiotherapy, Physical therapy, Manipulation, Osteopathy, Alternative medicine.

## Introduction

One of the most frequent ailments that prompts a visit to a pain specialist is lower back pain. Patients who have experienced low back pain or a severe back or spine injury will first talk about their patient

presentations and patient features. According to clinical standards, there are three different types of low back pain: pain without a possible nerve root involvement, pain that may involve a nerve root, and pain brought on by trauma or other secondary causes.<sup>1</sup>

**Corresponding Author:** Sharath Hullumani V, Lecturer, (Ph.D Scholar), Acharya's NR Institute of Physiotherapy, Dr Sarvapelli Radhakrishnan Road, Soladevanahalli, Bengaluru, Karnataka, India.

**E-mail:** sharathhullumani@gmail.com

### Physiotherapy for low back pain:

Physical therapists assess patients with musculoskeletal conditions before administering a range of treatments, including manipulation, stretching, strengthening, and aerobic conditioning. Other methods used by physical therapists include ultrasound, transcutaneous electrical nerve stimulation, and applying ice and heat (TENS). Despite the fact that exercise therapy for LBP can be provided in a variety of formats and settings, PT is frequently recommended to patients with LBP.<sup>2</sup>

Physical therapists can use a variety of evidence-based clinical recommendations for the treatment of LBP. According to the American Pain Society/American College of Physicians clinical practise recommendation, exercise treatment has a moderate effect on LBP.<sup>3</sup>

Significant evidence for trunk coordination, strengthening, and endurance exercises has been identified in the Low Back Pain Clinical Practice Guidelines of the American Physical Therapy Association as well as in a number of European guidelines. Systematic reviews and meta-analyses support the recommendations in these guidelines.<sup>4-12</sup>

### Osteopathy for lower back pain:

Osteopathy is a type of manual treatment that aims to rehabilitate the musculoskeletal system through a series of interventions. The American Osteopathic Association recommends osteopathic manipulation treatment for people with low back discomfort (AOA). Licciardone found that osteopathic manipulation treatment considerably reduces low back pain in their meta-analysis. Franke et al. (2014) concluded in a recent meta-analysis that osteopathic manipulation treatment is useful for chronic low back pain and functional impairment. In contrast, the authors of two recently published systematic reviews determined that osteopathic manipulation treatment has no greater benefit in relieving low back pain than other procedures and/or a placebo.<sup>13-16</sup>

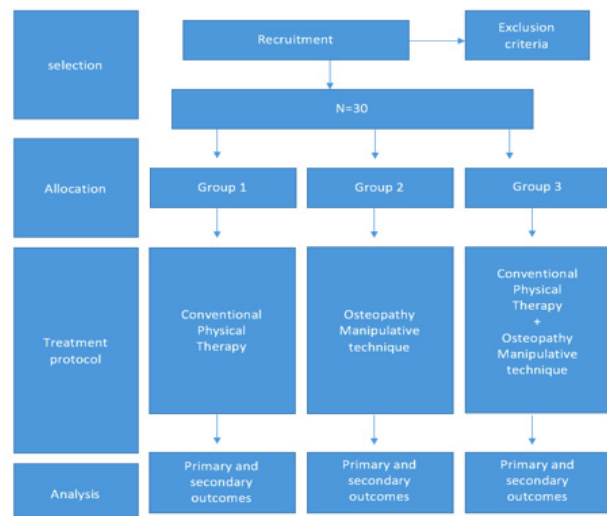
### Material and Methods

An comparative study was conducted in Cuttack from September 2020 to January 202 Institutional ethics committee approve the study to conduct. The total sample size is 30 and we used convent sampling in which 10 in each group is recruited. Then the patient was screened according to inclusion and exclusion criteria with which informed consent was given if the patient agrees to give the consent. Then the patient was selected by convenient sampling based on eligibility criteria. Procedure of study was explained to all the patients and written consent was taken from them. Patients with low back pain were allocated for the study.

The *inclusion criteria* were Individuals with age 18-50 years and both male and females, No previous osteopathic treatment, history of low back pain since 6 months were included in this study, patient whose VAS is more than 5.

The *exclusion criteria* were pregnancy, menstruation, recent trauma, spinal tumours, sign of nerve involvement, weakness, bladder and bowel symptoms, unexplained thoracic pain, any neurological condition.

### Study design:



**Group 1 treatment protocol<sup>17</sup>**

Week 1, Week 3, Week 5	<ul style="list-style-type: none"> <li>• 30 repetitions of abdominal bracing with an 8 second hold</li> <li>• 20 repetitions of heel slides with a 4 second hold</li> <li>• 20 repetitions of leg lifts with a 4 second hold</li> <li>• Bracing with bridging, 30 reps with an 8-second hold, then switching to one leg</li> <li>• 20 repetitions of a standing row workout with a 6-second hold are bracing.</li> <li>• 10 minutes of bracing while walking with 8-second holds and 10-second rests</li> </ul>
Week 2, Week 4, Week 6	<ul style="list-style-type: none"> <li>• Quadruped alternative arm and leg lifts with bracing, 30 repetitions with 8 s hold on each side</li> <li>• Side support with knees flexed, 30 repetitions with 8 s hold on each side</li> <li>• Side support with knees extended, 30 repetitions with 8 s hold on each side</li> <li>• Quadruped arm lifts with bracing, 30 repetitions with 8 s hold on each side</li> <li>• Quadruped leg lifts with bracing, 30 repetitions with 8 s hold on</li> <li>• 30 repetitions with an 8-second hold on each side of the side support with extended knees</li> </ul>

**Intensity:** 45 minutes for 6 days a week for 6 weeks, pre and post same outcome measure were used

**Group 2 treatment protocol<sup>18</sup>**

Week 1, Week 3, Week 5	<ul style="list-style-type: none"> <li>• Cardia manipulation for 1 minute</li> <li>• Pylorus manipulation for 1 minute</li> <li>• Oddi sphincter manipulation for 1 minute</li> <li>• Duodeno-jejunal valve manipulation for 1 minute</li> <li>• MET for lumbar vertebra,</li> <li>• Cranio Sacral harmonisation for 15 minutes</li> </ul>
Week 2, Week 4, Week 6	<ul style="list-style-type: none"> <li>• 1 minute of manipulation of the ileocecal valve,</li> <li>• 1 minute of manipulation of the sigmoid colon, and 1 minute of manipulation of the entire liver</li> <li>• Cranio Sacral harmonisation for 15 minutes</li> <li>• Global hemodynamic manipulation (10 repetitions with pressure during inspiration and another 10 during expiration)</li> <li>• Functional method for the lumbar vertebrae</li> </ul>

**Intensity:** 45 minutes for 6 days a week for 6 week, pre and post same outcome measure were used

**Group 3:** combined both group 1 and group 2 exercises and it lasts for 1 hour for 6 days a week for 6 weeks, pre and post same outcome measure were used.

**Outcome measures:** VAS and Oswestry low back pain disability questionnaire, Outcomes were collected every week on the last day for six weeks.

**Results**

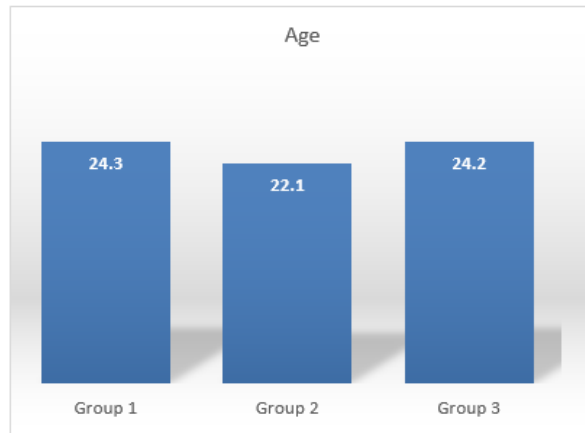
- A total of 30 participants within the age

group of 18-35 both male and female were recruited for the study. All of the participants were having problem in there lower back.

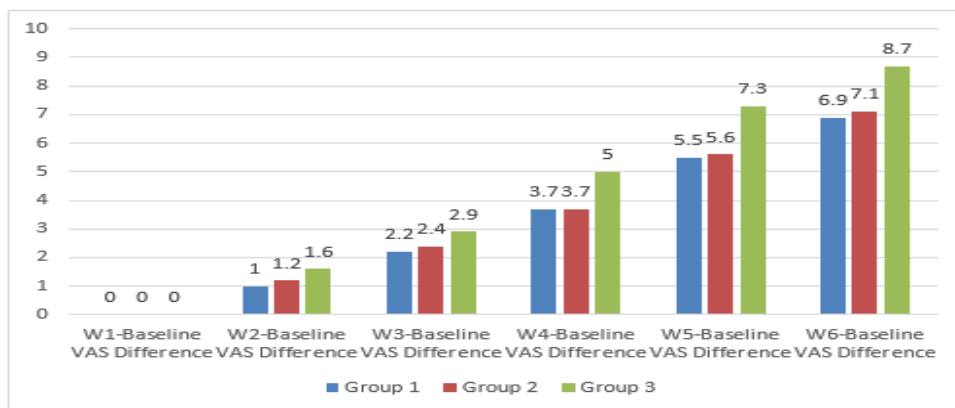
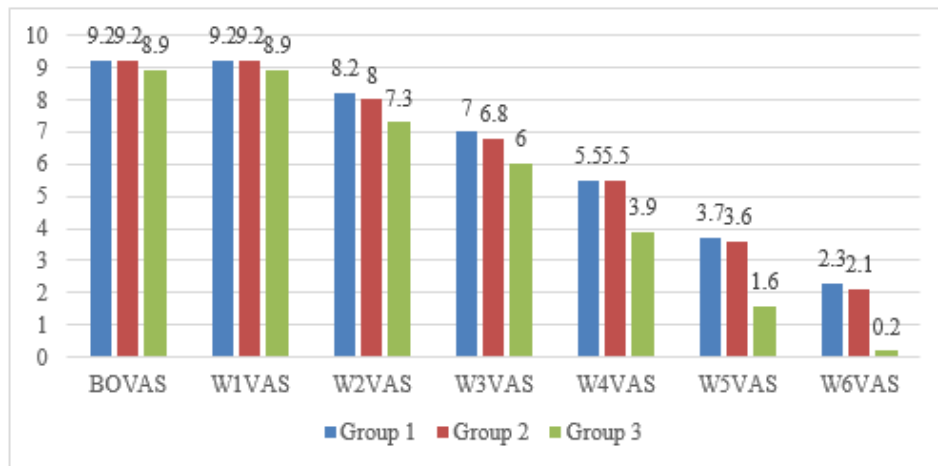
- The demographic data (Age, Gender,) were analyzed using descriptive statistics.
- The Posthoc Tukey test was used comparing groups
- One way anova and posthoctukey test used for comparison of the three groups by using SPSS Software 20.0

**Table 1: showing age wise distribution in all groups**

	Group 1 (n=10)	Group 2 (n=10)	Group 3 (n=10)	ONE WAY ANOVA		POSTHOC TUKEY TEST		
				F value (*=welch test)	P-VALUE	Group 1 vs Group 2 difference (p value)	Group 1 vs Group 3 difference (p value)	Group 2 vs Group 3 difference (p value)
Age	24.3±5.25	22.1±2.64	24.2±2.25	1.911*	0.179	2.2 (0.379)	0.1 (0.998)	-2.1 (0.412)



**Graph 1: showing age wise distribution in all groups**



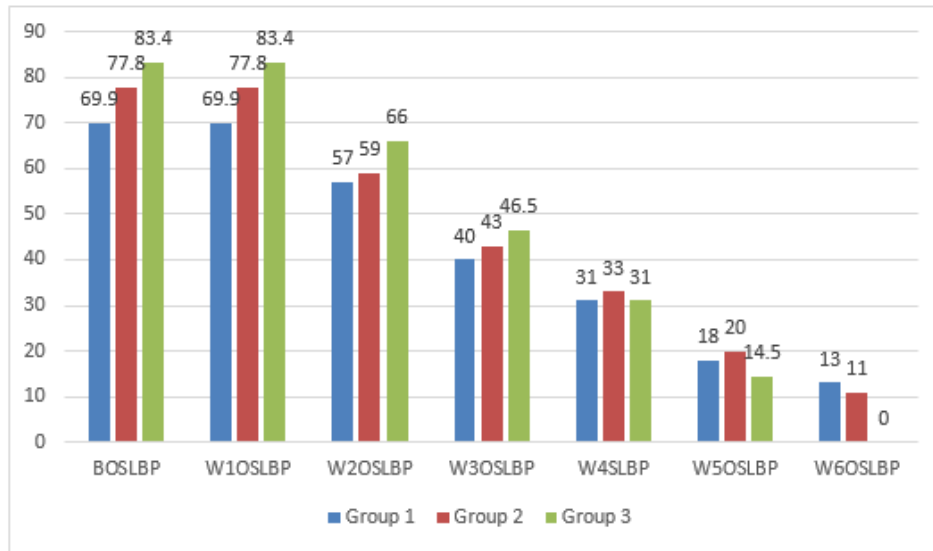
**Graph 2: showing difference of VAS in all groups**

**Table 2: Showing VAS difference in all groups**

	Group 1 (n=10)	Group 2 (n=10)	Group 3 (n=10)	ONE WAY ANOVA		POSTHOC TUKEY TEST		
				F value (*=welch test)	P VALUE	Group 1 vs Group 2 difference (p value)	Group 1 vs Group 3 difference (p value)	Group 2 vs Group 3 difference (p value)
BOVAS	9.2±0.63	9.2±0.79	8.9±0.99	0.448	0.644	0 (1)	0.3 (0.694)	0.3 (0.694)
W1VAS	9.2±0.63	9.2±0.79	8.9±0.99	0.448	0.644	0 (1)	0.3 (0.694)	0.3 (0.694)
W2VAS	8.2±0.79	8±0.82	7.3±0.95	3.061	0.063	0.2 (0.861)	0.9 (0.065)	0.7 (0.178)
W3VAS	7±0.82	6.8±0.79	6±1.05	3.5	0.045	0.2 (0.872)	1 (0.048)	0.8 (0.132)
W4VAS	5.5±0.53	5.5±0.53	3.9±1.29	11.578	<0.001	0 (1)	1.6 (0.001)	1.6 (0.001)
W5VAS	3.7±0.95	3.6±0.84	1.6±1.27	13.111	<0.001	0.1 (0.975)	2.1 (<0.001)	2 (0.001)
W6VAS	2.3±0.95	2.1±0.74	0.2±0.63	21.849	<0.001	0.2 (0.837)	2.1 (<0.001)	1.9 (<0.001)
W1-Baseline VASDifference	0±0	0±0	0±0					
W2-Baseline VASDifference	1±0.82	1.2±1.03	1.6±0.52	1.4	0.264	-0.2 (0.849)	-0.6 (0.245)	-0.4 (0.525)
W3-Baseline VASDifference	2.2±0.92	2.4±0.84	2.9±0.57	2.077	0.145	-0.2 (0.84)	-0.7 (0.137)	-0.5 (0.348)
W4-Baseline VASDifference	3.7±0.68	3.7±1.06	5±1.05	6.285	0.006	0 (1)	-1.3 (0.013)	-1.3 (0.013)
W5-Baseline VASDifference	5.5±0.97	5.6±1.35	7.3±1.16	7.468	0.003	-0.1 (0.98)	-1.8 (0.005)	-1.7 (0.008)
W6-Baseline VASDifference	6.9±0.99	7.1±1.37	8.7±1.16	6.934	0.004	-0.2 (0.925)	-1.8 (0.006)	-1.6 (0.015)

**Table 3: Showing VAS difference in all groups**

	Group 1 (n=10)	Group 2 (n=10)	Group 3 (n=10)	ONE WAY ANOVA		POSTHOC TUKEY TEST		
				F value (*=welch test)	P VALUE	Group 1 vs Group 2 difference (p value)	Group 1 vs Group 3 difference (p value)	Group 2 vs Group 3 difference (p value)
BOSLBP	69.9±9.71	77.8±12.46	83.4±8.13	4.372	0.023	-7.9 (0.215)	-13.5 (0.018)	-5.6 (0.452)
W1OSLBP	69.9±9.71	77.8±12.46	83.4±8.13	4.372	0.023	-7.9 (0.215)	-13.5 (0.018)	-5.6 (0.452)
W2OSLBP	57±11.6	59±14.49	66±10.75	1.457	0.251	-2 (0.931)	-9 (0.253)	-7 (0.427)
W3OSLBP	40±0	43±6.75	46.5±7.47	3.132	0.06	-3 (0.49)	-6.5 (0.048)	-3.5 (0.383)
W4SLBP	31±7.38	33±7.15	31±7.38	0.25	0.781	-2 (0.815)	0 (1)	2 (0.815)
W5OSLBP	18±4.22	20±8.16	14.5±8.96	1.411	0.261	-2 (0.819)	3.5 (0.549)	5.5 (0.239)
W6OSLBP	13±4.83	11±5.68	0±0	26.46	<0.001	2 (0.559)	13 (<0.001)	11 (<0.001)



When the BOSLBP values of the three groups are compared, Group 3 has the highest value (83.4), while Group 1 has the lowest value (69.9). With a test value of 4.372 and a p value of 0.023, this difference is statistically significant. With a p value of 0.215, posthoc Tukey tests comparing Group 1 and Group 2 groups show a mean difference of -7.9 and are NOT statistically significant. The mean difference between Group 1 and Group 3 groups is -13.5, and the difference is statistically significant with a p value of 0.018. With a p value of 0.452, the comparison of Group 2 and Group 3 groups reveals a mean difference of -5.6 that is NOT statistically significant.

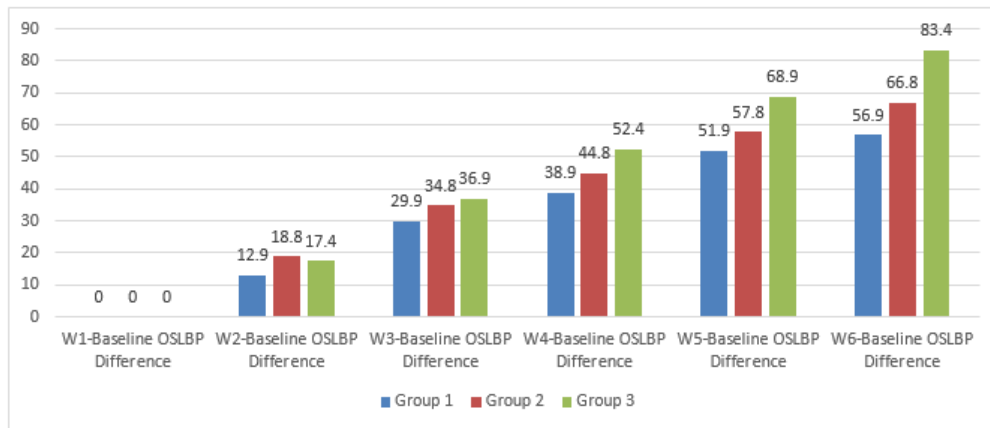
When W1OSLBP is compared amongst the three groups, Group 3 has the highest value (83.4), while Group 1 has the lowest value (69.9). Posthoc Tukey tests comparing Group 1 and Group 2 groups indicate a mean difference of -7.9 and are NOT statistically significant with a p value of 0.215. This difference is statistically Significant with a test value of 4.372 and

p value of 0.023. The mean difference between Group 1 and Group 3 groups is -13.5, and the difference is statistically significant with a p value of 0.018. With a p value of 0.452, the comparison of Group 2 and Group 3 groups reveals a mean difference of -5.6 that is NOT statistically significant.

When the three groups are compared using W6OSLBP, Group 1 has the greatest value, 13, and Group 3 has the lowest value, 0. With a test value of 26.46 and a p value of 0.001, this difference is statistically significant. With a p value of 0.559, posthoc Tukey tests comparing Group 1 and Group 2 groups show a mean difference of 2 but are NOT statistically significant. With a p value of 0.001, the comparison between Group 1 and Group 3 groups reveals a mean difference of 13 and is statistically significant. A mean difference of 11 is seen between Groups 2 and 3, which is statistically significant with a p value of 0.001.

	Group 1 (n=10)	Group 2 (n=10)	Group 3 (n=10)	ONE WAY ANOVA		POSTHOC TUKEY TEST		
				F value (*=welch test)	P VALUE	Group 1 vs Group 2 difference (p value)	Group 1 vs Group 3 difference (p value)	Group 2 vs Group 3 difference (p value)
W1-Baseline OSLBP Difference	0±0	0±0	0±0					

	Group 1 (n=10)	Group 2 (n=10)	Group 3 (n=10)	ONE WAY ANOVA		POSTHOC TUKEY TEST		
				F value (*=welch test)	P VALUE	Group 1 vs Group 2 difference (p value)	Group 1 vs Group 3 difference (p value)	Group 2 vs Group 3 difference (p value)
W2-Baseline OSLBP Difference	12.9±4.28	18.8±11.6	17.4±4.74	1.625	0.216	-5.9 (0.214)	-4.5 (0.399)	1.4 (0.912)
W3-Baseline OSLBP Difference	29.9±9.71	34.8±10.41	36.9±7.37	1.506	0.24	-4.9 (0.473)	-7 (0.227)	-2.1 (0.868)
W4-Baseline OSLBP Difference	38.9±14.05	44.8±10.83	52.4±8.51	3.549	0.043	-5.9 (0.486)	-13.5 (0.034)	-7.6 (0.309)
W5-Baseline OSLBP Difference	51.9±10.61	57.8±10.74	68.9±6.85	8.133	0.002	-5.9 (0.366)	-17 (0.001)	-11.1 (0.039)
W6-Baseline OSLBP Difference	56.9±13.55	66.8±9.68	83.4±8.13	15.66	<0.001	-9.9 (0.115)	-26.5 (<0.001)	-16.6 (0.005)



W2-Baseline OSLBP comparison When comparing the three groups, it can be seen that Group 2 has the biggest difference, 18.8, and Group 1 has the lowest difference, 12.9. With a test value of 1.625 and a p value of 0.216, this difference is statistically insignificant. With a p value of 0.214, posthoc Tukey tests comparing Group 1 and Group 2 groups show a mean difference of -5.9 but are NOT statistically significant. With a p value of 0.399, the comparison between Group 1 and Group 3 groups reveals a mean difference of -4.5 and is NOT statistically significant. With a p value of 0.912, the comparison between Group 2 and Group 3 groups reveals a mean difference of 1.4 and is NOT statistically significant.

W6-Baseline OSLBP Comparison When comparing the three groups, it can be seen that Group 3 has the highest score (83.4), while Group 1 has the lowest value (56.9). With a test value of 15.663 and a p value of 0.001, this difference is statistically significant. With a p value of 0.115, posthoc Tukey tests comparing Group 1 and Group 2 groups show a mean difference of -9.9 and are NOT statistically significant. With a p value of 0.001, the comparison between Group 1 and Group 3 groups reveals a mean difference of -26.5 and is statistically significant. A mean difference of -16.6 is seen between Group 2 and Group 3 groups, which is statistically significant with a p value of 0.005.

## Discussion

The study's goal, as previously mentioned, is to evaluate the effectiveness of traditional physical therapy and osteopathic approaches in treating patients with low back pain and to look into the neurophysiological mechanisms underlying visceral manipulation. Very little information we got will doing literature review on osteopathy and physiotherapy in lower back pain

It is hypothesised that the visceral techniques used in osteopathy treatments will affect the relevant segment somato-viscerally in addition to peripheral, spinal, and central nociceptor stimulation, or neurophysiological consequences. According to studies, visceral procedures can make healthy individuals more sensitive to pain. There have been no studies on the use of visceral operations on people with lower back pain, other from the study protocol that called for its use to 30 patients. Our study, which demonstrated that during the sixth week of therapy, the visceral methods applied had an impact on all quality-of-life measures as well as a reduction in pain, revealed the benefits of visceral applications on function and quality of life.

In order to assess the impact of six weeks of traditional physical therapy and osteopathy procedures on persons with idiopathic low back pain, a pre- and post-test experimental inquiry was carried out. This paper provides a detailed summary of that investigation. It will also enable us to investigate potential neurophysiologic and biomechanical contributors to the therapeutic advantages of visceral osteopathy.

We discovered that the severity of pain decreased after therapy when we examined the pain data from our study. We think that our treatment, which is supported by the visceral technique method, inhibits pain by reducing muscle spasms and sympathetic system activation. The investigations have not extensively delved into the mechanism of pain reduction with manual treatment approaches at the spinal and supraspinal levels. It was stated that osteopathic manual therapy was a breakthrough in manual treatment methods when paired with a range of other treatments. Due to biomechanical strain on the corticospinal system, patients with idiopathic

low back pain experience somatic function and pain that is controlled by the 1a reflex route in different segments.

The study found that the stimulation of internal organs caused the muscles between the thoracic vertebrae and the lumbosacral joint to contract. As a result, the extra stimulation brought on by visceral applications in our study may have improved while also reducing spasticity in the pertinent segment and regulating peripheral and central pathways through the visceral somatic reflex arc.

In our study, we found that the vOMT group had a higher effect on energy, physical limitations, and the overall score of physical limitations from quality-of-life ratings than the PRE TEST group, in addition to boosting POST TEST results. We believe that the techniques we used for each patient during visceral treatments improved blood flow, facilitated body fluid discharge, and improved the person's feeling of well-being.

After doing our study, we found that treating patients with lower back pain with visceral osteopathy and traditional physical therapy reduced pain, enhanced function, and enhanced quality of life. These therapeutic methods' great effects on quality of life have demonstrated the potential benefits of visceral applications. The objective of the study is to improve and disseminate these findings by using them on a larger population over a longer period of time.

**Ethical clearance** given by Sri Sri UNIVERSITY Ethical committee dated 06-06-2021 with reference number FHW/MOS/2020-22/004

**Conflict of interest:** None

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# To Study the Effects of Muscle Energy Technique with Conventional treatment along with Cellular Nutrition in Patients with Knee Osteoarthritis

Namrata Srivastava<sup>1</sup>, Kartik Chhonker<sup>2</sup>, Kalpana Jain<sup>3</sup>

<sup>1</sup>HOD, <sup>2,3</sup>Assistant Professor, Career College, Bhopal, India.

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## Abstract

**Background:** Osteoarthritis (OA) is also called Osteoarthrosis or degenerative joint diseases; it represents a vital cause of dejection and defects. With the help of Muscle Energy Technique (MET) claimed to be effective for improvement in flexibility and strength along with cellular nutrition and conservative treatment in knee joint.

**Methods:** According to the inclusion and exclusion criteria; 60 unilateral participation OA knee patients were randomly placed into two groups, pre and post-test calculation of KOOS scale and knee extension and flexion were done. Group A had MET with conservative treatment along with cellular nutrition.

**Conclusion:** Both Group A and B improves the strength and flexibility of knee joint but in Group A was shown more improvement than Group B.

**Key words:** Knee osteoarthritis, MET, conservative treatment, cellular nutrition, KOOS scale, flexion, extension

## Introduction

A involve the breakdown of cartilage in joints, which causes bones to rub together. Sometimes bones grow abnormal spurs in response to cartilage breakdown.<sup>1,3</sup> This can make joints swollen, painful and stiff. Arthritis introduce to biomechanical changes within a joint. Osteoarthritis (OA) is the most frequent kind of arthritis.<sup>11,13</sup> There are a number of advance factors to osteoarthritis, including age. Its most prominent feature is the progressive destruction of articular cartilage which results in impaired joint motion, severe pain, and, ultimately, disability.<sup>1,3,16</sup>

Cellular nutrition is providing all nutrients to the cells at optimal levels. This approach could correct

nutritional deficiencies over a few months. Cellular nutrition helps to clean the cells of toxins to keep them active and be able to absorb all the essential nutrients it needs to function properly. Cellular nutrition is obtained only by a few companies worldwide. These few companies have a seed-to-feed philosophy, meaning they are growing the plants in-house, extraction of the super nutrients and manufacturing of high-quality food supplements is done in-house as well as research and innovation, in order to control quality, effectiveness and cost.<sup>2,8,10</sup>

Muscle energy techniques use an active contraction of deep muscles that attached near the joint and whose line of pull can cause the desired

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**Corresponding Author:** Namrata Srivastava, HOD Career College, Bhopal, India.

**E-mail:** [nam.fdi@gmail.com](mailto:nam.fdi@gmail.com)

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accessory motion. The technique requires the therapist to provide stabilization to the segment on which the distal aspects of the muscle attaches. A command for an isometric contraction of muscle is given, which causes the accessory movement of joint.<sup>3,6,12</sup>

Conservative treatment includes physiotherapy means. It aims at reducing the pain and symptoms and introducing active exercises. Patients with osteoarthritis of hips and knees should avoid sitting at soft, deep armchairs. They should sit on simple, hard chairs, sleep on hard beds, remember about correct posture, remain physically active and decrease stress onto the joint by having some rest and later by using a cane or crutches.<sup>4,9,14</sup>

The Knee Injury and Osteoarthritis Outcome Score (KOOS) is a questionnaire orient to assess short and long-term patient-relevant outcomes following knee injury. The KOOS is self-management and assesses five outcomes: pain, symptoms, activities of daily living, sport and recreation function, and knee-related quality of life. The KOOS meets basic criteria of outcome measures and can be used to analyze the course of knee injury and treatment outcome.<sup>5</sup>

### Materials and Methods

After the baseline measurement we proceed the treatment protocol.

Include 60 patients, age group of 40-70 years random and equally divided into group A and group B, each group divided in n=30.

Group A having those patients who have MET+ conservative treatment +cellular nutrition.

Group B having those patients who have conservative treatment +cellular Nutrition.

CONSENT: Informed consent was taken from all participants in the study for the publication work in the journal.

#### MET Exercise

#### PIR Exercise

Post Isometric Relaxation is a technique that was later expands by Karel Lewitt. Post Isometric Relaxation (PIR) is the effect of the decrease in muscle tone in a single or group of muscles, after a small period of submaximal isometric contraction of the same muscle. PIR tasks on the concept of autogenic inhibition. The PIR technique is performed as follows:

The hypertonic muscle is taken to a length just low pain, or to the point where resistance to movement is first noted.<sup>3,6,12,15</sup>

A sub maximal (10-20%) contraction of the hypertonic muscle is act away from the barrier for between 5 and 10 seconds and the therapist applies resistance in the opposite direction.<sup>13</sup>

The patient must inhale during this effort. After the isometric contraction, the patient is asked to relax and exhale while doing so. Following this, a forbearing stretch is applied to take up the slack till the new barrier. Starting from this fresh barrier, the procedure is repeated two or three times.<sup>3,6,12,18</sup>

### Conservative Treatment

The moist hot pack or fermentation is a moist heating technique which holds its heat for a longer time, moist heat packs are typically used for about 10 minutes. The prolonged application of a dry heat pack has advantages for certain conditions, but moist heat packs produce more of a skin-reddening effect which can relieve internal blood congestion from inflammation. Moist heat aids in the heat's ability to penetrate into the muscles, and therefore, may provide better pain relief in some instances, and also has the beneficial effect of increasing blood circulation in the skin. The moist hot pack technique works best to relieve pain and increase flexibility when it is combine with other modalities such as physical therapy and exercise. Using hot packs is appealing to many people due to the fact that it's non-invasive and non-pharmaceutical intervention.<sup>4,9,16</sup>

Quadriceps Setting exercise helps to strengthen the quadriceps muscle (the big muscle on the front of the thigh), an important stabilizer of the knee. Lie on your back with the leg you want to exercise straight. Place a small rolled towel underneath the knee. Slowly tighten the muscle on top of the thigh (quadriceps) and push the back of the knee down into the rolled towel. Hold contraction for 5 seconds and then slowly release, resting 5 seconds between each contraction. Perform 10 repetitions, once daily.<sup>4,9,14</sup>

SLR also helps to strengthen the quadriceps muscle. Lie on your back with the leg you want to exercise straight. The other knee should be bent to support your lower back. Tighten the muscle on the top of your thigh and lift to the level of your other knee. Slowly lower your leg. Perform 10 repetition, 1 time daily.<sup>4,9</sup>

Knee OA, the hamstring muscles tend to get tight. This exercise helps to stretch the hamstring muscles, improving the range of motion of your knee and helping you feel more flexible. Lie on back with the leg to be stretched straight with a strap around the bottom of your foot. Using the strap for support, elevate your leg until you feel a gentle stretch at the back of knee and thigh.<sup>4,9</sup>

Hold for up to 30 seconds. Slowly lower. Perform 10 repetitions, once daily.

Gluteus Strengthening exercise will help strengthen the gluteus muscles (the large muscles at the back of your hip), aiding in trunk control, leg stability and balance while you stand and walk. Lie on your stomach with hips over a pillow to support your back. Keeping the leg to be exercised straight, squeeze buttocks and lift the leg slightly off the bed. Slowly lower.<sup>4,9</sup> Perform 10 repetitions, once daily.

Calf Stretch exercise will help lower leg and ankle stay flexible, helping to improve balance and the way you walk. Stand facing a wall with the leg to be stretched behind and the other leg in front. Place hands or forearms on the wall for support. Slowly bend the front knee, keeping the heel of the leg behind down on the floor. Once feel a stretch in calf muscle at the back of ankle, hold for 30 seconds. Slowly relax. Perform 3 repetitions, once daily.<sup>4,14</sup>

Calcium is an essential mineral that maintains strong bones and teeth; regulates muscle. Experts recommend 1,200 mg a day for healthy adults, but people with inflammatory arthritis may need more – up to 1,500 mg for men and postmenopausal women.

Low-fat milk, yogurt and cheese; leafy greens and vegetables such as kale, broccoli and spinach; canned sardines and salmon with bones; calcium-fortified cereals, soy products (including tofu), orange juice and nut milks.<sup>2,8,10</sup>

Vitamin A is an antioxidant that maintains the immune system protects eyesight; keeps skin and tissues of the digestive tract and respiratory system healthy; and supports bone growth. Recommended dietary allowance (RDA) = 3,000 international units (IU) for men and women. Liver, eggs, fortified milk; richly colored fruits and vegetables, such as carrots, cantaloupes, sweet potatoes and spinach.<sup>2,8,10</sup>

## Result and Discussion

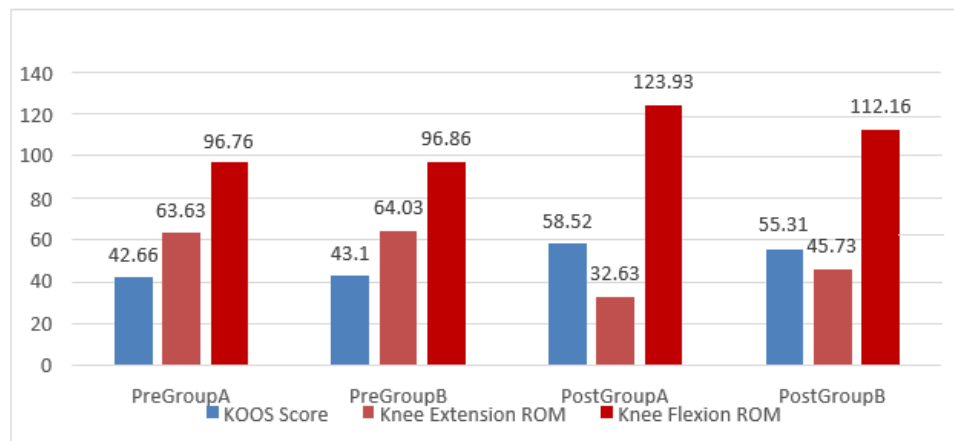
In the present study, for data analysis SPSS v25 was used. Both the groups had 30 subjects each and all the subject were assessed pre and post treatment by Knee Injury and Osteoarthritis Outcome Score (KOOS) & Goniometer for Knee Flexion -Extension ROM.

Age and Gender distribution comparison for Group A and B was done using the descriptive statistics.

As the no. of samples in one group was 30 (<100), therefore Shapiro-Wilk test was used in the study for normality test to determine the significance of data of Group A and B was done which showed insignificant values i.e., more than 0.05.

Therefore, in the present study both Group A and Group B were analyzed using parametric test. To compare the mean values within the groups Paired t-test was applied while to compare the mean values between the groups i.e., Group A and B; independent t-test was applied.

Graph 1 showing Comparison of Mean values of Pre- Pre & Post-Post data of KOOS Score, Knee Extension ROM & Knee Flexion ROM in Group A & Group B.



In the present study, for data analysis SPSS v25 was used. Both the groups had 30 subjects each and all the subject were assessed pre and post treatment by Knee Injury and Osteoarthritis Outcome Score (KOOS) & Goniometer for Knee for between group comparison Independent t-test was applied which showed significant difference in KOOS Score, Knee Extension ROM & Knee Flexion ROM post treatment as compared to baseline i.e. p=value showed 0.001. So, when post-test mean comparison was done of group A and B showed Group A more effective improvement than Group B. In future this study may leads to strengthen the joint of knee osteoarthritis patient though which patient will concern about his/her health diet and strengthening exercises of knee joints. In past article, there is some conflicts about nutrition and exercises. As per this study, in future without any help of nutrition and exercises which need in joint there is no success. MET is one of the more effective exercises for joint to flexibility and strength in joint.

MET group or experimental group is more improved than the control group. In future, MET is one of the biggest and effective exercises in any cases. Other than this the conservative treatment and cellular nutrition is

helping to control the weight and flexibility in joint, whereas MET is doing the main work in joints i.e. strengthen the muscle of knee joints.

Conclusion: Group A shows more effective improvement than Group B. Patients belonging to MET group were able to increase the range of motion in knee joint with the help of conservative treatment and cellular nutrition strength and flexibility compared to the control group.

**Ethical Clearance:** This study was approved by our institutional ethical committee.

**Source of funding:** Nil

**Conflict of Interest:** Nil

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# Effect of Proprioception Exercise versus Focused Regimen Exercise on Balance and Quality of Life in Subjects with Diabetic Neuropathy

V. PradhapSankar<sup>1</sup>, R. Janani<sup>2</sup>, M. Manoj Abraham<sup>3</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>BPT Intern, <sup>3</sup>Principal, KG College of Physiotherapy (Affiliated to The TN Dr MGR Medical University), KG Hospital & PG Medical Institute, Coimbatore, Tamil Nadu, India.

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## Abstract

**Background:** Diabetic peripheral neuropathy is a polyneuropathy that can cause damage to the peripheral nerve fibers, sensorimotor and autonomic nervous system. Neuropathy causes somatosensory dysfunction of the lower extremities, such as decreased ankle position and vibration sensations. The sensation of the skin on the feet and the proprioceptive sense are two important factors in standing balance, postural control and coordination. As this condition progresses, this can lead to increased postural sway, gait disturbance, abnormal neuromuscular control and increased reaction time leading to falls in balance impaired patients.

**Objective:** To determine the effect of proprioception exercise versus focused regimen exercise on balance and quality of life in subjects with diabetic neuropathy.

**Methods:** 20 Subjects with diabetic neuropathy of both genders, in the age group of 40 – 60 years were conveniently assigned into 2 groups. Group A (n = 10) received Proprioception exercise and Group B (n = 10) received Focused regimen exercise, 3 sessions a week for 8 weeks. Balance and quality of life were evaluated with Berg Balance Scale and SF – 36 Survey questionnaire.

**Results:** The difference in the post-test mean scores of group A and group B in Berg Balance Scale was 32 and 28.3 and SF – 36 Survey questionnaire was 61.4 and 56.6 respectively. The result showed a significant improvement in Group A than in Group B at  $p < 0.0001$ .

**Conclusion:** Therefore, the study concludes that the Proprioception exercise training is better management to improve balance and quality of life in subjects with diabetic neuropathy.

**Keywords:** Diabetic Peripheral Neuropathy, Proprioception exercise, Focused regimen exercise, Quality of life, Balance, Berg Balance Scale.

## Introduction

Farida Chentli, Said Azzoug & Souad Mahgoun argued that, Diabetes Mellitus, a chronic metabolic

condition is characterized by excessive levels of glycated hemoglobin and hyperglycemia, either with or without glycosuria.<sup>[1]</sup>

**Corresponding Author:** V. Pradhapsankar, Assistant Professor, KG College of Physiotherapy, Saravanampatti, Coimbatore, Tamil Nadu, India.

**E-mail:** pradhapsankar3@gmail.com

**Contact number:** 9003569812

Michael J. Fowler argued that, the harmful effects of hyperglycemia are generally classified into macrovascular complications (Coronary artery disease, Peripheral arterial disease and stroke) and microvascular complications (Diabetic nephropathy, neuropathy and retinopathy).<sup>[2]</sup>

Pavana, Nair Anjali Premranjan & Amrita Ghosh argued that, Diabetic peripheral neuropathy is a polyneuropathy that can cause damage to the peripheral nerve fibers, sensorimotor and autonomic nervous system.<sup>[3]</sup>

Eva L. Feldman, Brian C. Callaghan, Rodica Pop-Busui et al. argued that, Diabetic neuropathy is a very common illness that has a significant impact on patients by raising the risk of falls, causing discomfort, and lowering the quality of life.<sup>[4]</sup>

Gabriella Deli, Edit Bosnyak, Gabriella Puschet al. argued that, Diabetic peripheral neuropathy is a common complication and affects an estimated 30-50% of diabetic patients.<sup>[5]</sup>

Manoj Abraham M, Ennapadam S Krishnamoorthy & Vivek Misra Bargued that, Distal symmetric polyneuropathy is the most common, accounting for about 75% of Diabetic neuropathy.<sup>[6]</sup>

Brian C Callaghan, Hsinlin T Cheng, Catherine L Stables et al. argued that, Distal symmetric polyneuropathy patient has one or more of the following symptoms - numbness, tingling, pain or weakness.<sup>[7]</sup>

Zahra Rojhani-Shirazi, Fatemeh Barzintaj & Mohamad Reza Salimifard argued that, Neuropathy causes somatosensory dysfunction of the lower extremities, such as decreased ankle position and vibration sensations. The sensation of the skin on the feet and the proprioceptive sensation are two important factors in standing balance, postural control and coordination. Therefore, loss of sensation leads to loss of balance. Where, balance is a necessary element of daily life.<sup>[8]</sup>

Irshad Ahmad, Ejaz Hussain, Deepika Singla et al. argued that, Balance is the ability to maintain or return the body's center of gravity within the limits of stability that are determined by the base of support. Balance training is considered to be an important tool for preventing falls.<sup>[9]</sup>

Luis Espejo-Antúnez, José Manuel Pérez-Mármol, M. de los Ángeles et al. argued that, Proprioception is the perception of joint and body movements and the position of body segments in space. Kinesthetic sensation is the sensation of movement of limbs. Proprioceptive and kinesthetic sensations are involved in maintaining position, balance and movement when the eyes are opened and closed.<sup>[10]</sup>

Pavana, Nair Anjali Premranjan & Amrita Ghosh argued that, Proprioception exercise mainly focus on the sense of joint position that helps to maintain joint stability and posture that helps to improve somatosensory system.<sup>[3]</sup>

Abeer El-Wishy; PTD and Enas Elsayed; PTD argued that, Proprioceptive training augments increased proprioceptive firing from the cutaneous receptors from the feet and also from mechanoreceptors of the muscle during co-contraction produced by the swaying movement. Thus, it improves balance and quality of life in diabetic neuropathy subjects.<sup>[11]</sup>

Quality of life is a major issue in diabetic neuropathy.

James K. Richardson, David Sandman & Steve Vela argued that, the focused regimen exercise was designed to increase rapidly available ankle strength which in turn improves balance among older persons with mild to moderate peripheral neuropathy.<sup>[12]</sup>

The aim of the study is to find out the effect of proprioception exercise versus focused regimen exercise on balance and quality of life in subjects with diabetic neuropathy.

## Materials and Methodology

### Study Design:

Pre and Post Experimental study design.

### Study Setting:

Department of Physiotherapy, K.G. Hospital, Coimbatore, Tamil Nadu, India.

### Study Duration:

6 months.

### Materials Required:

- Michigan Diabetic Neuropathy Scoring Sheet.



- 36 - item short form survey (SF 36) questionnaire.
- Reflex Hammer.
- Tuning Fork.
- 10g Monofilament.
- Hot and Cold test tubes.
- Berg Balance Scale Scoring Sheet.
- Stop Watch.
- One standard chair with arm rest.
- Foot Stool.
- Pen / Pencil.

#### Sample Size:

20 Diabetic neuropathy subjects were divided into 2 groups - Group A [10 subjects] and Group B [10 subjects].

#### Sampling Technique - Convenient Sampling.

#### Inclusion Criteria:

- Age group between 40 - 60 years.
- Ability to walk household distances without assistance or without an assistive device.
- Patients diagnosed with Diabetic peripheral neuropathy  $\geq 1$  year and Type 2 Diabetes  $\geq 10$  years.
- Patients with mild to moderate neuropathy in Michigan Diabetic Neuropathy Score.
- Patients with Berg Balance Score of low and medium risk.
- Patients with diabetes having symptoms of neuropathy such as numbness and tingling sensation of extremities, loss of sensations and abnormal sensation.
- Gender - both males and females are included.

#### Exclusion Criteria:

- Central nervous system dysfunction [Hemiparesis, Cerebellar Ataxia, Myelopathy etc..]
- Neuropathies due to non - diabetic cause.
- Patients with severe diabetes with foot ulcers or foot deformities.
- Patients with any kind of lower limb amputation.

- Lower extremity arthritis or pain that limits standing or weight bearing.
- Symptomatic Postural hypotension.
- Vestibular dysfunction.
- Patients who are visually impaired as it may affect walking.
- Patients with systemic illness.
- Severe cardiopulmonary insufficiency.
- Psychiatric illness.

#### Outcome Measures:

- Berg Balance Scale.
- 36 - item short form survey.

#### Procedure:

A total of 20 Diabetic Peripheral Neuropathy subjects were taken after getting a written consent from each and conveniently divided into 2 groups, group A and group B with 10 subjects in each group. On day 1 pre-test score were recorded after that, treatment session for 8 weeks, 3 times per week, 1 hour per session was provided and post-test score were recorded.

GROUP-A [PROPRIOCEPTION EXERCISE] = 10 Subjects.

#### • Proprioception Exercise:

Exercises included One leg balance, Forward leg swings with knee extension, Backward leg swings with knee flexion, Toe walking, Heel walking, Cross body leg swing right side, Cross body leg swing left side, Partial squat, Blind advanced one leg balance, Side lunge.<sup>[3]</sup>

#### • Duration:

Each exercise was done for 5 minutes with 1 minute rest in between for a 1-hour treatment session.

GROUP-B [FOCUSED REGIMEN EXERCISE] = 10 Subjects.

#### • Focused Regimen Exercise:

Exercises included Warm up (Open chain active ankle range of motion exercises), Bipedal toe raises, Bipedal heel raises, Bipedal inversion, Bipedal eversion, Unipedal toe raises, Unipedal heel raises, Unipedal inversion, Unipedal eversion, Wall slides (Knee flexion maximum of about 45°).<sup>[12]</sup>

**• Duration:**

Each exercise was done for 5 minutes with 1 minute rest in between for a 1-hour treatment session.

At the end of 8 weeks, balance is measured with Berg Balance Scale and quality of life is measured with 36-item short form survey and compared with the respective pre intervention scores to know the effect of exercises.

Patient consent: After getting a written consent from each subject.

**Data Analysis and Results**

Student ‘t’ test was used for statistical analysis. Unpaired ‘t’ test has been used to find significance of

the study parameters between groups. While paired ‘t’ test has been used to find significance of the study within the groups.

This study results shows that there is statistically significant improvement in Berg Balance Score and 36-item short form survey questionnaire score between pre and post – test mean values in group A and group B. Group A shows an improvement than that of group B in the post – test mean values of Berg Balance Score and 36-item short form survey questionnaire score.

**Table 1: Age distribution of subjects.**

The table 1 shows that majority of study subjects, such that 70% in 41 – 50 years followed by 30% in 51 – 60 years in both group A and group B respectively.

Age (years)	Proprioception Exercises (Group A)		Focused Regimen Exercises (Group B)	
	Number	Percent	Number	Percent
41 – 50 years	7	70	7	70
51 – 60 years	3	30	3	30
Total	10	100	10	100

**Table 2: Gender distribution of subjects.**

The table 2 shows that 60% males and 40%

females are present in both group A and group B respectively.

Gender	Proprioception Exercises (Group A)		Focused Regimen Exercises (Group B)	
	Number	Percent	Number	Percent
Males	6	60	6	60
Females	4	40	4	40
Total	10	100	10	100

**Table 3: Paired ‘t’ test values of Berg Balance Score in group A and group B.**

The table 3 shows the analysis of Berg Balance Score in group A and group B. Using paired ‘t’ test with 9 degrees of freedom and 5% level of significance

the calculated ‘t’ value is 25.66 in group A and 12.33 in group B, which were greater than the tabulated ‘t’ value 2.262. The results shows that there is a marked difference between pre and post-test values in group A and group B.

Berg Balance Score	Pre-test Mean	Post-test Mean	Mean Difference	Pre-test Standard Deviation	Post-test Standard Deviation	‘t’ values
Group A	24.3	32	7.7	2.83	3.46	25.66
Group B	24.6	28.3	3.7	2.63	2.79	12.33

**Table 4: Unpaired 't' test values of Berg Balance Score in group A and group B.**

The table 4 shows the analysis of Berg Balance Score in group A and group B. Using unpaired 't'

Berg Balance Score	Mean	Mean Difference	Standard Deviation	't' value
Group A	32	3.7	3.46	2.63
Group B	28.3		2.79	

**Table 5: Paired 't' test values of 36-item short form survey questionnaire score in group A and group B.**

The table 5 shows the analysis of 36-item short form survey questionnaire Score in group A and group B. Using paired 't' test with 9 degrees of

36-item short form survey questionnaire score	Pre-test Mean	Post-test Mean	Mean Difference	Pre-test Standard Deviation	Post-test Standard Deviation	't' values
Group A	44.2	61.4	17.2	2.39	3.31	16.86
Group B	44.4	56.6	12.2	2.8	2.22	23.82

**Table 6: Unpaired 't' test values of 36-item short form survey questionnaire score in group A and group B.**

The table 6 shows the analysis of 36-item short form survey questionnaire Score in group A and

36-item short form survey questionnaire score	Mean	Mean Difference	Standard Deviation	't' value
Group A	61.4	4.8	3.31	3.81
Group B	56.6		2.22	

## Discussion

The aim of the study was to examine the effect of proprioception exercise versus focused regimen exercise on balance and quality of life in subjects with diabetic neuropathy. A total of 20 diabetic neuropathy subjects in the age group of 40-60 years participated in the study. The participants who satisfied the selection criteria were conveniently assigned into 2 groups. Measurements were taken at baseline using Berg Balance Scale and 36-item short form survey questionnaire for both groups, Group A received Proprioception exercise and Group B received Focused regimen exercise for 8 weeks. At the

test with 18 degrees of freedom and 5% as a level of significance the calculated 't' value is 2.63, which was greater than the tabulated 't' value 2.101. The result shows that there is a marked difference between post-test values of group A and group B.

freedom and 5% level of significance the calculated 't' value is 16.86 in group A and 23.82 in group B, which were greater than the tabulated 't' value 2.262. The results shows that there is a marked difference between pre and post-test values in group A and group B.

group B. Using unpaired 't' test with 18 degrees of freedom and 5% level of significance the calculated 't' value is 3.81, which was greater than the tabulated 't' value 2.101. The results shows that there is a marked difference between post-test values of group A and group B.

end of 8 weeks the participants again underwent the evaluations using the outcome measures mentioned above.

Pavana, Nair Anjali Premranjan & Amrita Ghosh argued that, Proprioception exercise mainly focus on the sense of joint position that helps to maintain joint stability and posture that helps to improve somatosensory system which is affected in subjects with diabetic neuropathy.<sup>[3]</sup>

Abeer El-Wishy; PTD and EnasElsayed; PTD argued that, Lack of accurate proprioceptive information from the lower extremities in diabetic neuropathy subjects has resulted in postural

instability during static and dynamic situations, especially when the body is exposed to unexpected postural perturbations. Proprioceptive training augments increased proprioceptive firing from the cutaneous receptors from the feet and also from mechanoreceptors of the muscle during co-contraction produced by the swaying movement. Thus, it improves balance and quality of life in diabetic neuropathy subjects.<sup>[11]</sup>

Mahdiah Ravand, Mehri Ghasemi, Abbas Rahimi et al. argued that, Ankle reflexes are induced by lower limb proprioception, which also aids in triggering other automatic postural reactions to the necessary postural strategy. Compromise in the lower limb proprioception in turn lowers the effectiveness of balance responses. So that proprioceptive training improves balance and proprioception sense of lower limb.<sup>[13]</sup>

James K. Richardson, David Sandman & Steve Vela argued that, the focused regimen exercise was designed to increase rapidly available ankle strength which in turn improves balance among older persons with mild to moderate peripheral neuropathy.<sup>[12]</sup>

This shows the superiority of proprioception exercise given to group A over the focused regimen exercise given to group B.

### Conclusion

This study was focused on analysing the effect of proprioception exercise versus focused regimen exercise on balance and quality of life in subjects with diabetic neuropathy.

Based on statistical analysis at 5% level of significance, the 'p' value is less than 0.0001 and calculated value is greater than tabulated value, thereby showing significant improvement in balance and quality of life on group A compared with group B. There is a significant difference between proprioception exercise and focused regimen exercise in improving balance thereby reducing the fall risk and improving quality of life in subjects with diabetic neuropathy.

Therefore, the study concludes that the proprioception exercise is better management to improve balance and quality of life in subjects with diabetic neuropathy.

### Limitations:

The period of time allotted for the study was found to be insufficient for the inclusion of greater number of subjects. There was lack of long term follow up of the patients to find out the carry over effects of the interventions. Individual variation in age range, gender difference and handedness has not taken into account.

### Recommendations:

Large sample size can be used to demonstrate the effect of intervention. Long term follow up should be made to find out which exercise is so effective. Similar study can be done by comparing various other types of balance exercises. Can use other outcome measures to assess balance and quality of life in subjects with diabetic neuropathy.

**Ethical Concern:** The study was approved by the college ethics committee, K.G. College of Physiotherapy, Coimbatore.

**Conflict of Interest:** There was no personal or institutional conflict of interest for this study.

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# A Study to Assess the Risk of Cardiovascular Disease among Post-Menopausal Apartment Dwelling Women

Pavana<sup>1</sup>, Ayesha Afreen<sup>2</sup>

<sup>1</sup>Associate Professor, <sup>2</sup>Post Graduate Student, RV College of Physiotherapy, Bangalore, Karnataka, India.

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## Abstract

**Background:** The permanent cessation of ovarian function and the transition of a woman from a reproductive to a nonreproductive life is defined as Menopause. This period is characterized by remarkable changes in menstruation and hormonal patterns as well as psychological and physiological symptoms.

**Objectives:** The objectives of this study was to assess the Body-Mass Index, Waist-Hip Ratio, Submaximal Aerobic Capacity, Ankle-Brachial Index and Quality of Life using the SF-12 questionnaire among post-menopausal apartment dwelling women.

**Design:** Descriptive Study

**Methods:** 110 subjects meeting the inclusion and exclusion criteria were included in the study. The subjects were assessed based on the screening tools Body-Mass Index (BMI) and Waist- Hip Ratio. The outcome tools used to assess the risk of cardiovascular disease among post-menopausal apartment dwelling women were Ankle-Brachial Index (ABI), Six-Minute Walk Test (6MWT) and health related quality of life SF-12 Questionnaire.

**Results:** Out of 110 subjects, 59 subjects had a BMI of 25-29.9 kg/m<sup>2</sup> and 36 subjects had a BMI of  $\geq 30$  kg/m<sup>2</sup>. 56 (51%) subjects had substantially higher waist- hip ratio ( $\geq 0.85$  cm). 61 (55.5%) subjects had mild to moderate peripheral arterial disease on left side and 67 (60.9%) subjects had mild-moderate peripheral arterial disease on right side. The range of 6MWD is between 490-900 m. The correlation between MCS 12 and PCS 12 has an intermediate poor correlation.

**Conclusion:** The study shows that Post- Menopausal Apartment Dwelling Women are at risk of Cardiovascular Disease.

**Key Words:** Menopause, Cardiovascular Diseases, Body-Mass Index, Waist- Hip Ratio, Six- Minute Walk Test, Health Related Quality of Life, SF-12 Questionnaire.

## Introduction

Menopause is defined as the end of the reproductive phase in a woman. In this period, there is

reduction of ovarian function, followed with gradual decrease of female sex hormones which leads to interruption in menstrual cycle. Natural Menopause

**Corresponding Author:** Pavana, HOD & Associate Professor, Community Health Physiotherapy Department, RV College of Physiotherapy, No.CA 2/83-3, 9th Main Road, 4th Block, Jayanagar, Bengaluru.

**E-mail:** pavanaholla.rvcp@rvei.edu.in

is defined as the experience of 12 consecutive months of amenorrhea. The time after the absence of menstrual cycles for twelve months is Post-Menopause.<sup>1</sup>

Cardiovascular diseases (CVD) is one of the leading causes of mortality and morbidity worldwide. CVDs consists of congestive heart failure (CHF), coronary heart diseases, congenital heart diseases. Factors like tobacco exposure, ageing, diet and lifestyle factors hypertension, ethnicity, stress, physical inactivity elevates the risk of developing cardiovascular diseases.<sup>2</sup>

According to the INTERHEART study that included subjects from 52 countries, including high, middle, and low-income countries, 9 modifiable risks factors accounted for 90% of the risk of having a first Myocardial infarction: dyslipidemia, hypertension, smoking, diabetes, psychosocial factors, abdominal obesity, regular alcohol consumption, consumption of vegetables and fruits, and physical inactivity. The researchers concluded that 36% of the population-attributable risk of myocardial infarction was accounted to smoking.<sup>3</sup>

Due to the cardioprotective role of estrogen, premenopausal women are generally not at risk of developing cardiovascular diseases. Postmenopausal women are at risk of developing cardiovascular disease due to ovarian failure and redistribution of fat leading to abdominal obesity and estrogen deficiency. Studies have shown that in postmenopausal women there has been alterations in lipid levels within last one year of last menstrual cycle. Previous studies have shown that in Menopause Transition (MT) there was reduction in loss of protective effects of high-density lipoproteins (HDL) cholesterol.<sup>4</sup>

The climacteric changes that arise during the postmenopausal phase have an impact on elderly women's health. Studies have shown that metabolic syndrome and CVD are more common in women above 55 years of age with a significant increase in individual risk factors in the postmenopausal phase. Due to estrogen deficiency one of the outcomes seen is a change in the lipid-lipoprotein profile further leading to cardiovascular diseases in postmenopausal women. Obesity is positively

linked with cardiovascular disease risk factors such as lipoproteins hyperinsulinemia and plasma lipids, and insulin resistance.<sup>5</sup>

Women develop Coronary heart diseases (CHD) many years later than men. During midlife there is marked increase in CHD risk which coincides with Menopause transition. This has led to the hypothesis that Menopause transition leads to Coronary heart diseases. Longitudinal studies that were carried out in women transitioning through menopause has contributed to a deeper understanding of the relationship between Menopause transition and CVD risk. The findings from these studies highlight the importance of MT as a time of increasing CVD risk and underline the importance of potential monitoring and intervention during midlife.<sup>6</sup>

## Methodology

### Inclusion Criteria:

- 1) Postmenopausal women in the age limit of 45-65 years
- 2) Subjects who are willing to participate voluntarily and sign the written informed consent,
- 3) Subjects who do not have any limitation that might preclude walking.

### Exclusion Criteria:

- 1) Subjects who had Premature menopause or Surgical menopause,
- 2) Subjects with other diseases affecting quality of life (e.g., cancer, moderate to severe chronic renal insufficiency, chronic respiratory diseases, cardiovascular diseases including uncontrolled hypertension, diabetes, and the presence of severe cognitive, visual, or hearing impairments.
- 3) Subjects who are terminally ill,
- 4) Subjects whose disability can affect their physical activity
- 5) Subjects who have taken part in similar kind of study.

## Procedure

Permission from the associations of selected apartment complexes was taken. A written informed consent from the selected subjects was taken after

explaining the purpose of the study. Recruitment of the subjects was done between the age limit of 45-65 years who have attained menopause and were requested for participation in the study. The recruitment of the subjects was done based on the Inclusion and Exclusion Criteria of the study. Demographic data of the subjects were recorded.

The following Screening Tools was conducted on the subjects for the Study:

- 1) **BODY MASS INDEX (BMI):** BMI was measured with measuring tape and weighing machine and was calculated based on the Quetelet's index,  $BMI = \text{Weight (in kg)} / \text{height}^2 \text{ (in m)}$  and the BMI was classified based on Asia- Pacific Classification.
- 2) **WAIST-HIP RATIO (WHR):** Using a tape measure, waist circumference was measured at the midpoint between the last palpable rib and the top of the iliac crest. The hip circumference was measured around the widest portion of the buttocks with the tape parallel to the floor. Calculation of WHR was done with the formula  $WHR = \text{waist circumference (cm)} / \text{hip circumference (cm)}$ .

The following Outcome Tools was conducted on the subjects for the Study:

- 1) **ANKLE- BRACHIAL INDEX (ABI):** The subject was advised to rest for 10 minutes in the supine position. ABI was performed by measuring systolic blood pressure from both brachial arteries and from the dorsalis pedis and posterior tibial arteries of both lower limbs using a stethoscope and a sphygmomanometer. The ABI was calculated by dividing the ankle systolic pressures between the arteries by the highest brachial pressures between the two sides.
- 2) **SIX- MINUTE WALK TEST (6MWT):** The 6 MWT was performed indoors or outdoors according to the apartment settings. The walking course was measured 100 ft hallway (30 m in length). Prior to the test the subject was asked to rest for 10 minutes and the heart rate, blood pressure,  $SPO_2$ , baseline dyspnea levels was recorded. As soon as the subject started walking the timer was started. After

completion of the test the subject was asked to sit on the chair and the post walk heart rate,  $SPO_2$  and dyspnea levels was recorded. The number of laps, additional distance covered was recorded and the total distance walked, rounding to the nearest meter was recorded.

The equation used to calculate the percent predicted 6MWD for individual adult women who performed the test for the first time:

$6MWD = (2.11 \times \text{height cm}) - (2.29 \times \text{weight kg}) - (5.78 \times \text{age}) + 667 \text{ m}$ . For the lower limit normal (LLN), 139 was subtracted from the equation.

Formula used for the calculation  $VO_{2max}$ :  $VO_{2 \text{ peak}} = 0.02 \times \text{distance(m)} - 0.191 \times \text{age(year)} - 0.07 \times \text{weight(kg)} + 0.09 \times \text{height(cm)} + 0.26 \times RPP \times (10-3) + 2.45$

$(RPP = \text{Heart rate} \times \text{systolic blood pressure} \times 0.001)$ .

- 3) **Health-Related Quality of Life SF12 Questionnaire** for the quality of life in post-menopausal women: The SF-12 covers eight domains of health (physical function, role physical general health, bodily pain, vitality, role emotional, social functioning, and mental health) and is summarized into two scores PCS and MCS. The SF-12 was used to assess the health-related quality of life among post-menopausal apartment-dwelling women to collect the data regarding their experience of physical and mental symptoms using direct oral interview technique.

## Results

The data obtained from the study are analyzed statistically and results are as follows:

**Table No. 1: Age distribution of Post-Menopausal Apartment Dwelling Women**

Age (years)	Frequency	Percentage
≤ 50	12	10.91
51 - 60	62	56.36
> 60	36	32.73
Total	110	100.00



In the present study, it was observed that, out of 110 subjects studied, 12(10.91%) were in the age group of  $\leq 50$  years, 62(56.36%) were in the age group of 51-60 years, 36(32.73%) were in the group of  $>60$  years of age.

**Table No. 2: Distribution of BMI among Post-Menopausal Apartment Dwelling Women**

BMI (kg/m <sup>2</sup> )	Frequency	Percentage
Normal	7	6.4
At risk	8	7.3
Obesity class I	59	53.6
Obesity class II	36	32.7
Total	110	100.0

In the present study, it was observed that, out of 110 subjects, 7 (6.4%) were in the Normal weight class, 8 (7.3%) were in At-Risk class, 59 (53.6%) which constitutes majority were in the Obesity class I and 36 (32.7%) were in the Obesity class II.

**Table No. 3: Distribution of Waist-Hip Ratio among Post-Menopausal Apartment Dwelling Women**

Waist-Hip Ratio (WHR) (cm)	Frequency	Percentage
$<0.85$	54	49
$\geq 0.85$ Increased	56	51
Total	110	100.0

In the present study, it was observed that, out of 110 subjects, 54 (49%) had  $<0.85$  cm of Waist Hip Ratio, 56 (51%) had Substantially increased Waist- Hip Ratio

**Table No. 4: Distribution of Left ABI among Post-Menopausal Apartment Dwelling Women**

Left ABI	Frequency	Percent
Normal	19	17.3
Borderline (equivocal)	30	27.3
Mild-to moderate peripheral arterial disease	61	55.5
Total	110	100.0

**Table No. 8: Descriptive Statistics for Six- Minute Walk Test**

6 MWT	Range	Mean	Std. Deviation	Std. Error of Mean	95% CI for mean	
					LB	UB
Total distance in 6 minutes (m)	490-900	657.09	79.94	7.622	642.152	672.030
VO <sub>2</sub> Peak (ml/kg/ min)	11.27-20.74	16.35	1.96	0.187	15.985	16.719

In the present study, it was observed that, out of 110 subjects, 19(17.3%) had Normal Left ABI, 30 (27.3%) had Borderline (equivocal), 61 (55.5%) had Mild-to moderate peripheral arterial disease.

Right ABI	Frequency	Percentage
Normal	24	21.8
Borderline (equivocal)	19	17.3
Mild-to moderate peripheral arterial disease	67	60.9
Total	110	100.0

**Table No. 5: Distribution of Right ABI among Post-Menopausal Apartment Dwelling Women**

In the present study, it was observed that, out of 110 subjects, 24(21.8%) had Normal Right ABI, 19 (17.3%) had Borderline (equivocal), 67 (60.9%) had Mild-to moderate peripheral arterial disease.

PCS-12	Frequency	Percentage
50 or less	78	70.9
More than 50	32	29.1
Total	110	100.0

**Table No. 6: Distribution of PCS-12 Score among Post-Menopausal Apartment Dwelling Women**

In the present study, it was observed that, out of 110 subjects, 78(70.9%) had 50 or less PCS-12 score, 32(29.1%) had more than 50 score on PCS-12.

**Table No. 7: Distribution of MCS-12 Score among Post-Menopausal Apartment Dwelling Women**

MCS - 12	Frequency	Percent
42 or less	37	33.6
More than 42	73	66.4
Total	110	100.0

In the present study, it was observed that, out of 110 subjects, 37 (33.6%) had 42 or less MCS-12 score, 73 (66.4%) had more than 42 score on MCS-12.

The Total distance in 6 minutes (m) was in the Range between 490-900, the (Mean: 657.09, SD: 79.94), the Standard Error of Mean: 7.622 and 95% CI for mean (LB: 642.152, UB: 672.030). The VO<sub>2</sub> Peak (ml/kg/min) was in the Range between 11.27-20.74, the (Mean: 16.35, SD: 1.96), the Standard Error of Mean: 0.187, and 95% CI for mean (LB: 15.985, UB: 16.719).

**Table No. 9: Correlation between MCS-12 and PCS-12 among Post-Menopausal Apartment Dwelling Women**

Correlation between MCS12 and PCS 12	0.357
R-square	0.127

The correlation between MCS-12 and PCS-12 has an intermediate negative correlation.

Interpretation:

1. For every unit change in the PCS 12 there is -0.357 unit decrease in MCS 12. This relationship is statistically significant  $P < 0.001$ , stating that increased physical component of quality of life decreased the mental health component of quality of life.
2. R- square

Of the total changes taken place in MCS 12, only 12.7% change is attributed to PCS 12.

**Table No. 10: Regression model Of MCS-12 and PCS-12 among Post-Menopausal Apartment Dwelling Women**

<b>Regression model of MCS 12 on PCS 12</b>	MCS 12 = 60.509 - 0.327PCS 12
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Regression: The intercept is 60.509 with negative regression coefficient of 0.327. So, for every MCS12 value predicted will be decreased by 0.327. So, for increased mental health component quality of life decreased the physical component of quality of life.

## Discussion

The present study was conducted to assess the risk of cardiovascular disease among post-menopausal apartment dwelling women in the age group of 45-65 years of age. The results of this study showed that Post-Menopausal Apartment dwelling women are at a risk of Cardiovascular Disease.

A study done in Indian population to find abnormalities of cardiovascular profile in postmenopausal women and was compared with the cardiovascular profile of premenopausal women. They have found that coronary artery disease (CAD), Hypertension, Body Mass Index and Waist- Hip ratio were significantly higher in postmenopausal group as compared to premenopausal group.<sup>7</sup> In the present study, out of 110 subjects, 59 (53.6%) subjects had a BMI of 25-29.9 kg/m<sup>2</sup> and 36 (32.7%) subjects had a BMI of  $\geq 30$  kg/m<sup>2</sup>.

A cross-sectional prospective study was carried out to find the prevalence of cardiovascular risk factors in postmenopausal women and found that in postmenopausal women from rural areas high prevalence of most of the conventional CVRFs.<sup>8</sup> In the present study out of 110 subjects, 56 (51%) subjects had substantially higher waist- hip ratio ( $\geq 0.85$  cm).

A recent study done to find whether ABI is a predictor of CVD among postmenopausal women had found that the Systolic and Diastolic blood pressures were higher in postmenopausal women.<sup>4</sup> In the present study, out of 110 subjects, 61 (55.5%) subjects had mild-moderate peripheral arterial disease on left side and 30 (27.3%) subjects had Borderline ABI on the left side. 67 (60.9%) subjects had mild-moderate peripheral arterial disease on right side and 19 (17.3%) subjects had Borderline ABI on right side.

A previous study done to find the comparison of aerobic capacity using 6 MWD between premenopausal and postmenopausal women. The results of this study showed that there a decrease in aerobic capacity in postmenopausal women.<sup>9</sup> The Normal 6MWD is 400-700 m.<sup>10</sup> In the present study even though the Body Mass Index, Waist Circumference, Waist- hip Ratio have been higher in post-menopausal apartment dwelling women, this did not affect the Aerobic Capacity in postmenopausal women. In the present study the range of 6MWD is between 490-900 m.

The Study of Women's Health across the Nation (SWAN) respondents had better mental health scores than physical health scores. Factors such as physical activity, improved sleep hygiene and body mass index has shown to improve the health-related

quality of life (HRQoL) for older women.<sup>11</sup>The present study showed that post-menopausal women had better MCS12 scores as compared to the PCS12 scores. The correlation between MCS 12 and PCS 12 is poor. For every unit change in PCS 12 there is - 0.357 unit decrease in MCS 12. This relationship is statistically significant  $P < 0.001$  stating that increased physical component of quality of life decreased the mental health component of quality of life.

### Limitations

- Larger geographical area could have been considered.
- Unavailability of scales in regional languages

### Conclusion

Thus, this study concluded that Post-Menopausal Apartment Dwelling Women are at risk of cardiovascular disease. The Body Mass Index, Waist-Hip Ratio is more in post-menopausal apartment dwelling women. The Ankle- Brachial Index is lower on the right side as compared to left side. Although the Body Mass Index, Waist- hip Ratio have been higher in post-menopausal apartment dwelling women, this did not affect the Aerobic Capacity in post-menopausal apartment dwelling women. The regression showed that the intercept is 60.509 with negative regression coefficient of 0.327. So, for every MCS12 value predicted will be decreased by 0.327. So, for increased mental health component quality of life decreased the physical component of quality of life.

**Ethical Clearance:** Approval was obtained from the Institutional Ethics Committee (IEC) of RV College of Physiotherapy®.

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**Conflict of Interest:** Nil

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**Purpose & Scope:** IJPOT is a multidisciplinary refereed journal devoted to disseminating rigorous research on all aspects of the physiotherapy and occupational therapy to enhance learning. The journal seeks to be a catalyst for multidisciplinary dialogue amongst researchers and practitioners worldwide in the fields of learning and cognition, education, and technology, with a view to improving practice and achieving real-world impact in technology enhanced learning.

The journal encourages research from theoretical perspectives, research reports of evidence based practice as well as praxis research work that focuses on the interface between theory and practice and how each can support the other. In addition, the journal strongly encourages reports of research carried out within or involving countries in the Asia— Pacific region.

**Invitation to submit papers:** A general invitation is extended to authors to submit journal papers for publication in IJPOT.

The following guidelines should be noted:

- The article must be sent by E-mail in word only as attachment. Hard copy need not be sent.
- The article should be accompanied by a declaration from all authors that it is an original work and has not been sent to another journal for publication.
- As a policy matter, journal encourages articles regarding new concepts and new information.
- Article should have a Title
- Names of authors
- Your Affiliation (designations with college address)
- Abstract
- Key words
- Introduction or background
- Material and Methods
- Findings • Conclusion
- Acknowledgements • Interest of conflict
- References in Vancouver style.
- Please quote references in text by superscripting
- Word limit 2500-3000 words, MSWORD Format, single file

### ***Our Contact Info:***

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Phone: +91 120 429 4015, E-mail: editor.ijpot@gmail.com,  
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# Indian Journal of Physiotherapy and Occupational Therapy

## CALL FOR SUBSCRIPTIONS

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Print-ISSN: 0973-5666 Electronic - ISSN: 0973-5674, Frequency: Quarterly (4 issues per volume).

An essential journal for all Physiotherapists & Occupational therapists provides professionals with a forum in which to discuss today's challenges-identifying the philosophical and conceptual foundations of the practice; sharing innovative evaluation and treatment techniques; learning about and assimilating new methodologies developing in related professions; and communicating information about new practice settings. The journal serves as a valuable tool for helping therapists deal effectively with the challenges of the field. It emphasizes articles and reports that are directly relevant to practice. The journal is internationally indexed.

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