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Effect of Mechanical Neck pain with forward head posture on scapula position in primary School Teachers

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Abstract: *Objectives*: To study scapular position in primary school teacher with neck pain and without neck pain. To compare scapular position in primary school teachers with and without neck pain *Background:* Teaching is a profession in which majority of women are employed and it is a demanding job. School teachers, in general, during the course of their work may be subjected to conditions that cause physical health problems and the frequently reported health complaints among teachers are shoulder pain (73.4%), neck pain (68.9%), headache (67.1%) and lower back pain (59.2%). Thus we can say teaching leads to physical and mental stress with an impact on functional performance and hence teaching can become a health hazard when it is carried out in an inappropriate way. Abnormal or altered scapular position is defined as an observable alteration in the position and motion of the scapula relative to the thoracic cage. Poor postural habits and neck pain are increasingly common among individuals who work predominately on computer and work with forward head posture for long hours. *Methods and measures*: A case control study with convenience sampling was done with 60 subjects. Each subject Scapular protraction measurements were taken with the participant standing with normal, relaxed posture. The measurements were performed at 3 different positions (at rest, hands on hip, and 90^0 glenohumeral abduction). All measurements were taken bilaterally. Also scapular upward rotation was measured with the help of baseline digital inclinometer at rest, 60 and 90 degree glenohumeral abduction. *Results*: The results showed that there is a significant difference in scapular position and in primary school teachers with neck pain. *Conclusion*: In the present study it was concluded that scapular position is altered which includes altered scapular protraction and upward rotation in primary school teachers who are suffering from neck pain in all three positions that is at rest, hands on hip, and 90 degree glenohumeral abduction and in scapular upward rotation.

Keywords: Neck Pain, School Teacher, Musculoskeletal Disorder, Scapula Dyskinesia.

Introduction

Teaching is a profession in which majority of women are employed and it is a demanding job [1]. School teachers, in general, during the course of their work may be subjected to conditions that cause physical health problems and the frequently reported health complaints among teachers are shoulder pain (73.4%), neck pain (68.9%), headache (67.1%) and lower back pain (59.2%) [2]. Thus we can say teaching leads to physical and mental stress with an impact on functional performance [3] and hence teaching can become a health hazard when it is carried out in an inappropriate way.

Black board teaching requires a stressful overhead activity and regarding the overhead activities the position of scapula is the key contributor to normal and abnormal scapular motion and control. Normally scapula rests at a position on the posterior thorax approximately two inches from the midline, between the second and seventh ribs. The scapula also is internally rotated from vertical, and is upwardly rotated 10 to 20 degrees from vertical [4].

Protraction and retraction of the scapula on the thorax are often described as translatory motions of the scapula away or toward the vertebral column, respectively. Scapular protraction is an abnormal position which has been defined as an increased distance between the inferior angle of scapula and the spinous

process of vertebra [5]. Some authors reported that imbalanced force produce superior translation of the scapula with less efficient downward rotation and increased posterior tipping [6].

Neck pain or neck dysfunction is a musculoskeletal disorder caused by improper posture with physical impairment or functional limitation [7]. Musculoskeletal disorders (MSD) are one of the leading causes for ill health retirement among school teachers. Studies confirm that low back pain is a common problem in both heavy and light manual workers [5].

Musculoskeletal complaints, especially of the lower back, neck and shoulders are also common among teachers. Recently, Hong Kong teachers showed a higher prevalence for neck (68.9%), shoulder (73.4%) and low back pain (59.2%) in the past 30 days [8]. Epidemiological studies have demonstrated that factors such as gender, age, length of employment and awkward posture are associated with higher MSD prevalence rates among teachers [9]

The Neck and shoulder pain NSP and low back pain LBP were positively associated with high school teacher. Secondary school level remained associated with decreased odds of reporting NSP and LBP as compared to primary school teachers. Occupational factors of prolonged standing, sitting and static posture, uncomfortable back support and twisting posture remained associated with NSP and LBP in the final model [7]. The hours of working with computer ≥4 h/day was associated with NSP but not with LBP. Hours of lessons ≥14 h/week, prolonged standing, sitting, static posture and holding the neck in a forward bent posture, were all associated with NSP and LBP. Have enough rest time was also associated with LBP [10].

As teachers using blackboard are regularly doing overhead activities, scapular positioning becomes an important factor to be assessed. The work tasks of school teachers often involves significant use of a 'head down' posture, such as frequent reading, marking of assignments, and writing on a blackboard. Considering the posture adopted when using a blackboard, its use appears to represent a fatigue factor for the musculoskeletal structure, and making them one of the high-risk groups for developing occupational-related neck pain and upper limb pain [11].

Neck disorders are a significant source of pain and activity limitations in workers. Most neck pain results from complex relationships between individual and workplace risk factors. No prevention strategies have been shown to reduce the incidence of neck pain in workers [12]. Individuals with neck pain may display altered postural behavior when performing prolonged sitting tasks such as during computer use, hence need of the study is to find out whether mechanical neck pain is associated with scapular position in teaching professionals.

Significance of study In India can be explained as future of students depends more or less on teachers. If teachers suffer, it directly affects the future of students as well. So, we need to make teachers physically, mentally and functionally better so that they can focus on the betterment of students. Aim of the study is to find out the impact of mechanical neck pain with forward head posture on scapular protraction upward rotation in Primary school teachers.

Material and Methods

30 primary School teachers were taken as sample for the study of age group: 25-35 years. Both male and females primary school teachers were included in the study. School Teachers with moderate to severe neck pain (4-10) as per numeric pain rating scale (NPRS) and who work for 6 and more hours per day were included in the study. Primary school teachers who has any recent surgery of the back and neck and any neurological dysfunction were excluded from the study also those who has any pathology preventing scapular position testing were also excluded from the study.

Study Protocol and Allocation: If the subject fulfilled the inclusion and exclusion criteria, a patient information sheet providing details about the study was given to them. For subjects willing to take part in this study, an informed consent was obtained. A brief assessment of the subjects were taken prior to the commencement of the study. Subjects

were allocated using convenience sampling. Subjects will be divided in to two groups Group 1 (with Neck pain) and Group 2 (without Neck Pain).

Outcome Measures: The primary outcomes for the study were baseline digital inclinometer for assessment of scapular upward rotation at rest, 60 and 90 degree glenohumeral abduction and keibler's method of assessment of scapular protraction at three different positions of glenohumeral abduction. Initially before measuring the scapular position, a brief physical assessment was taken which included demographic data and assessment of neck pain by using NPRS. The number of hours each individual works in a day were also taken in to consideration. The purpose of the study will be explained to the subjects. The subjects will be encouraged to participate in the study. The subjects will be taken into the study only if they meet the inclusion criteria. An informed consent will be obtained from the subjects prior to the examination.

Measurement of scapular protraction: lateral scapular slide test (LSST) Kibler designed the lateral scapular slide test (LSST) to assess scapular asymmetry under varying loads. It is used to determine scapular position with the upper extremity abducted to 0°, 45°, and 90° in the coronal plane [13]. Scapular protraction measurements will be assessed, where subject will be standing with normal, relaxed posture. The measurements will be performed at 3 different positions [13].

1. First position- At rest.
2. Second position- Hands on hip.
3. Third position - 90^0 glenohumeral abduction with internal rotation.

For test position 1 of the LSST, participants will be instructed to keep their upper extremities relaxed at their sides.The assessor will obtain and confirm the test position and then identify through palpation and mark the inferior aspect of the inferior angle of the scapula and the closest spinous process in the same horizontal plane. The distance between the 2 reference points will be measured bilaterally with a tape measure. This procedure will be repeated for test positions 2 and 3 [13].

For test position 2, the patient will be instructed to actively place both hands on the ipsilateral hips and, consequently, the humerus will be positioned in medial rotation at 45° of abduction in the coronal plane [13].

In test position 3, participants will be instructed to actively extend both elbows and to elevate and maximally internally rotate ("thumbs down") both upper extremities to 90° in the coronal plane [13].

We bilaterally measure scapular distance to find the value of the difference in side-to-side measurements. All scapular distance measurements will be taken 2 times. The mean will be calculated and used for data analysis. The value of the difference between sides will be calculated by subtracting the value for the dominant side from the value for the nondominant side, and the absolute value of this difference will be used for data analysis. A difference of 1.5 cm or more in any of the 3 positions will be considered a positive result of the LSST [13].

Measurement of Scapular Upward Rotation: Scapular upward rotation measurements will be measured with the participant standing in normal, relaxed posture. Baseline digital inclinometer will be used to measure upward rotation. The lateral arm of inclinometer will be placed over the posterior-lateral acromion, and the medial arm will be placed over the root of scapular spine. The hold button will be pressed to record the measurement. This procedure will be repeated twice, and the average of the two measurements will be used. All measurements will be taken bilaterally at rest, 60^0,90^0 and 120^0 [14].

Statistical Analysis: The statistical software namely SPSS 15.0 was used for analysis of the data and Microsoft excel has been used to generate graphs and tables. Descriptive statistical analysis has been carried out in the present study Measurement of scapular position which includes measurement of scapular protraction according to keibler at three different positions that is at rest, hands on hip, and 90 degree glenohumeral abduction with maximum internal rotation were taken along with measurement of scapular upward

rotation at 60 and 90 degree glenuhmeral abduction Mean of right and left side was obtained. After using descriptive statistics mean value, standard deviation, confidence interval, t value and p value was obtained.

Statistical test: Independent t test was used to compare the mean in terms of distance of right and left side, also test was used to compare the mean difference of scapular position at three different position and for scapular upward rotation at rest, at 60 and 90 degree abduction among the group.

Results

The total no of subjects who were included in the study were 60 of which 30 subjects in study group and 30 in control group.

Table-1 gives details of scapular position in individuals without neck pain at three different positions that is at rest, hands on hip and 90 degree abduction including scapular upward rotation at rest, 60 degree abduction and 90 degree abduction. Results show there is no significant difference between right and left side in all three scapula positions and in upward rotation.

Table-1: Scapula position in primary school teacher without Neck pain

Position	Right (Mean SD)	Left (Mean SD)	t- value	p-value
At rest	11.23 (0.23)	11.38 (0.30)	1.98	0.995
Hands on Hip (in cm)	12.8 (1.65)	12.68 (1.49)	1.98	0.995
90^0abduction (cm)	13.32 (1.33)	13.35 (0.23)	1.99	0.98
Upward Rotation at Rest	32.5 (1.87)	32.7 (1.81)	1.99	0.99
Upwardrotation60^0abduction	29.96 (1.690)	29.93 (1.73)	1.99	0.98
Upward Rotation 90^0 Abduction	10.5 (1.2)	10.7 (1.17)	1.99	0.98

Table-2: Scapula Position in Primary school teacher with Neck Pain

Position	Right (Mean SD)	Left (Mean SD)	t- value	p-value
At rest	12.04 (1.57)	11.08 (1.22)	1.98	0.004
Hands on Hip(in cm)	12.68 (1.65)	11.68 (1.49)	1.98	0.005
90^0abduction(cm)	13.42 (1.33)	12.15(0.23)	1.99	0.00
Upward Rotation at Rest	32.8 (1.87)	34.7 (1.81)	1.99	0.00
Upward rotation 60^0 abduction	28.96 (1.590)	33.93 (1.63)	1.99	0.002
Upward Rotation 90^0 Abduction	10.5 (1.3)	13.7 (1.27)	1.99	0.004

Table 2 gives details of scapular position in individuals with neck pain at three different positions that is at rest, hands on hip and 90 degree abduction including the scapular upward rotation at rest, 60 degree abduction and 90 degree abduction. Results shows there is significant difference between right and left side in all three scapula positions and in upward rotation

The result shows there is a significant difference between the right and left side in all three positions and in upward rotation of scapula.

Discussion

The present study assessed the scapular position in primary school teachers with and without neck pain in three different positions and scapular upward rotation. The result of the study showed that there is significant difference of scapular position in primary school teachers in all three positions that is at rest, hands on hip and 90^0 glenohumeral abduction with internal rotation and in scapular upward rotation in primary school teachers with neck pain. Which infers that the scapular kinematics is altered in all three

positions in primary school teachers who works in abnormal posture for long hours which cause neck pain.

The possible reason for this change can be explained by the fact that Neck pain from poor posture can be explained as in an upright position the head is supported by the spinal vertebrae. Once the head is flexed forward, for instance while working on computer, and working with children the vertebrae do not support the weight of the head as much. Muscles, tendons, and ligaments work harder to hold up the head. Overtime the muscles and other soft tissues tighten up due to the excessive workload required to hold the head in position. The anterior neck muscles become weak from being in shortened position and neural structures are kept in less than optimal positions. This chronic overload and tightening of soft tissues may eventually result in decreased blood flow and oxygen to the soft tissues, ultimately causing pain.

The altered scapular position could have probably occurred due to working posture of primary school teachers, as they used to work for long hours in poor postures which include, forward head posture, and protracted shoulder. Poor working posture will further lead to imbalance of scapular muscle activity especially excessive loading of scapular muscles. This will then causes neck pain in primary school teachers who works in poor posture. This can be supported by a systematic review done by Green B.N et al, who observed that neck pain is associated with prolonged computer use in poor working posture.

Impaired alignment of scapula may be classified as scapular downward rotation, depressed, elevated, adducted, abducted, tilted, or winged scapula. Scapular down ward rotation is defined as a downwardly rotated scapula with the inferior border being more medial than superior border; the shoulder is lower and slopes downward at the acromion end. Scapular downward rotation can contribute to prolonged compressive loading of neck as a result of the transfer of the weight of the upper extremities to the cervical region through the attachments of the cervicoscapular muscles (upper trapezius and levator scapulae).

Increased upper trapezius muscle length in scapular downward rotation does not effectively transfer the weight of an upper extremity load to the sternoclavicular joint, and increased levator scapulae muscle stiffness may contribute increased compressive load and shear force on the cervical spine during active neck movement. Repetitive and excessive stress in the neck structures has the potential to cause cumulative micro trauma to tissue in the cervical region which will lead to neck pain, and limited neck rotation range of motion. Also it has been found that prolonged exposure to stress can impair proprioception related muscle function, which can further damage muscle spindles. In this way, cervical compressive stress might inhibit the proprioceptive muscular feedback system. This increased joint position error has been in patients with neck pain [15-17].

Conclusion

In the present study it was concluded that scapular position is altered which includes altered scapular protraction and upward rotation in primary school teachers who are suffering from neck pain in all three positions that is at rest, hands on hip, and 90 degree glenohumeral abduction and in scapular upward rotation.

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