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Comparison of scapular alignment in auto rickshaw drivers with and without neck pain: A pilot study

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Abstract

Background: Auto rickshaws form 10-20% of daily motorized urban transport and ensure connectivity and easy access throughout congested Indian cities. Mostly used body parts in driving areas are the neck and shoulders. The musculature attaching the shoulder girdle to the axial skeleton is primarily responsible for scapular orientation. The overuse and improper support of muscles in this region is caused due to poor posture resulting in pain between the shoulder blade and neck; also discomfort between Scapula. Increased muscle activation of the neck- shoulder stabilizers result in higher levels of cervical spine loading; which results in neck pain. This study aimed to examine scapular alignment in auto rickshaw drivers with and without neck pain.

Objective: To determine the difference in scapular alignment in auto rickshaw drivers with and without neck pain.

Methodology: This observational study was conducted in 20 auto rickshaw drivers within the age group of 20-50 years and were divided into two groups. Group A included subjects with neck pain and Group B without neck pain on basis of the Numerical Pain Rating Scale. Scapular distance was measured using Lateral Scapular Slide Test (LSST) in 3 positions viz. at rest, with hands on hip and 90° of shoulder abduction and were compared using the independent t-test.

Results and Conclusion: Statistically significant difference of scapular alignment in auto rickshaw drivers with neck pain was noted ($p < 0.05$). Hence, it was concluded that scapular alignment is altered in auto rickshaw drivers with neck pain as compared to those with no neck pain.

Keywords: Neck pain, scapular alignment, auto rickshaw drivers

Introduction

The musculature attaching the shoulder girdle to the axial skeleton is primarily responsible for scapular orientation, with the sternoclavicular joint being the only ligament attachment of the shoulder girdle to the trunk. The co-ordination of the trapezius and serratus anterior muscles is important in controlling scapular orientation during postural function and may be influenced by the activity and extensibility of the levator scapulae, rhomboids and pectoral muscles, which may compromise the muscle balance. Biomechanical reasoning indicates that altered activity in these muscles, affecting scapular orientation, may introduce detrimental load on the cervical spine. The upper trapezius also has the potential to produce tissue distortion through its superior attachment. Increased tension in the muscles may directly induce compressive, rotational and shear forces on cervical motion segments. Altered activity in the axioscapular muscles may therefore, create or sustain symptomatic mechanical dysfunction in the cervical spine and increase the recurrence of neck pain. During full arm elevation, the clavicle undergoes posterior long axis rotation, retraction and elevation; and the scapula undergoes upward rotation and posterior tilt relative to the thorax, as well as both internal and external rotation. Increased cervical and thoracic curves and a slouched posture are also known to affect scapular orientation^[1]. Scapula normally, called as the shoulder blade, rests at a position on the posterior thorax, approximately 2 inches from the midline, between the 2nd and 7th ribs. The scapula is internally rotated from the vertical, and is upwardly rotated 10 to 20 degrees from vertical. The position of the scapula is very important for muscle balance. There is a significant relationship between the contractile abilities of the muscles in the shoulder region and the position of the scapula and shoulder protraction developed due to poor posture, posing as a disadvantage for muscle function.

The neck and shoulder areas are one of the most used body parts in driving. The overuse and improper support of muscle in this region can have an impact in more ways than one. There are host of different things that can cause pain between shoulder blade and neck. The cause for this pain is more commonly due to poor posture, it is common cause for discomfort between scapula. The pain between the shoulder blades is due to muscles that have become tired, irritated or inflamed [2].

Auto rickshaws are relatively cheaper and easily available mode of public transport in middle income countries. They form 10 to 20 percent of daily motorized urban transport and ensure connectivity and easy access throughout congested Indian cities [3]. Among drivers, complains concerning the musculoskeletal systems are most frequently reported from the neck, shoulder and lower back. The driving sitting position is featured by non-neutral spinal postures, generally a reduction in neutral lumbar lordosis and increased or decreased neck flexion [2]. The habitual posture of the person in sitting and standing leads to impact on the spinal vertebrae during prolonged sitting and driving. Drivers who work for longer hours a day are used to adapt poor posture which causes related musculoskeletal disorders such as forward head posture (FHP). This abnormal posture causes rounded shoulder and neck pain due to an imbalance between the curvature of spine and muscles that are attached to the neck bone is correlated with the problems in the neck bone. While several interventional studies are underway to improve forward head posture, research on correlation between scapula position and neck pain remains incomplete [4]. Hence, present study aims to specifically examine the correlation between scapula position and neck pain in auto rickshaw drivers.

Materials and Methods

This descriptive observational study recruited a total of 20 auto rickshaw drivers from Dakshina Kannada. The study was conducted between March 2020 to March 2021. A written informed consent was obtained from each participant.

Procedure

Subjects with 3 or more years of driving experience and working for 8 hours or more per day were included in the study. Those having a history of whiplash injury, cervical spine injury, history of cervical fracture, fracture/dislocation/subluxation or spine deformity were excluded. The included participants were divided into two groups based on NPRS scores (Group A - NPRS \geq 5). Group A and Group B consisted of auto rickshaw drivers with and without neck pain respectively.

Outcome measures

Lateral Scapular Slide Test

This test involved measurement of the distance from the inferior angle of the scapula to the nearest vertebral spinous process in centimeter using an inch tape in three positions; hands at rest, hands on hip and 90° of shoulder abduction. The test was performed in standing position. The participants were instructed to fix their eyes on an object in the examination area so as to maintain consistent posture during all the test positions.

Test position 1 - At Rest - participants were instructed to keep their upper limbs in a relaxed position at their sides.



Fig 1: Test position 2 - Hands on Hip - participants were instructed to actively place both hands on the ipsilateral hips so that the humerus was positioned in medial rotation at 45° of abduction in the coronal plane.



Fig 2: Test position 3 - 90° Shoulder Abduction - participants were instructed to actively extend both elbows and to elevate and maximally internally rotate ("thumbs down") both upper extremities to 90° in the coronal plane as shown in figure.

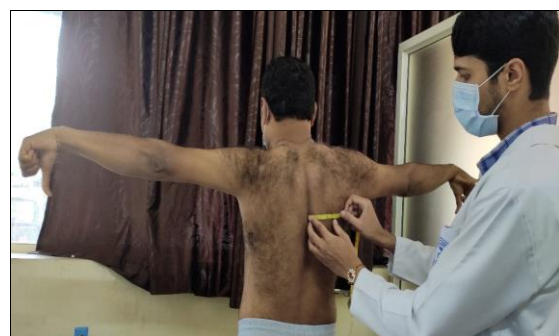


Fig 3: The distance between the inferior aspect of the inferior angle of the scapula to the closest spinous process was measured bilaterally with a tape measure in centimeters. These measurements were taken bilaterally, both dominant and non-dominant side. The value of difference between side to-side measurements were noted. This procedure was repeated for all three test positions.

Results

The mean age of the study participants was 39.90 ± 7.54 years. The difference in the distance between the inferior

angle of scapula and spinous process from both sides in Group A and Group B is displayed in Table 1.

Table 1: Difference in the measurements from inferior angle of scapula to spinous process from both sides in each test position

Test Position	Group A (in cms)			Group B (in cms)		
	Right	Left	Difference	Right	Left	Difference
At rest	10.6500	8.7700	1.88000	10.5200	10.3300	0.19000
Hands on Hip	10.7400	9.0900	1.65000	9.7600	10.0300	0.27000
90° Shoulder Abduction	10.6400	8.7400	1.90000	9.8300	9.4400	0.39000

Table 2 shows the comparison between the two groups in each test position. The difference in Group A was significantly greater than the difference in Group B indicating increased asymmetry in individuals with neck pain.

Table 2: Between Group comparison of all three test positions using independent t-test.

		Mean Difference	t value	p value
At rest	Group A	1.8800	2.741	.013*
	Group B	.1900		
Hands on hip	Group A	1.6500	3.668	.002*
	Group B	.2700		
90° Shoulder Abduction	Group A	1.9000	3.359	.003*
	Group B	.3900		

* $p < 0.05$ indicating significant result

Discussion

The present study was conducted to compare scapular alignment in auto rickshaw drivers with and without neck pain. It was found that there is a significant difference of scapular alignment in auto rickshaw drivers with neck pain as compared to those without neck pain.

Some other studies have also shown scapular position to be altered in different populations with neck pain and postural abnormalities [4, 6, 7, 15].

Auto rickshaw drivers are prone to musculoskeletal problems due to poor posture and prolonged sitting. Neck and shoulder are most commonly affected areas in drivers. Overuse and improper support of muscles in this region can have an impact in different ways. The habitual posture of the person in sitting leads to impact on the spinal vertebrae during prolonged sitting and driving. The discomfort is caused by some identified factors such as the seat shape, the thermal environment, exposure of whole-body vibration and length of time sitting in the same seated position.

In upright position, head is supported by the spinal vertebrae; once the head is flexed forward, the vertebrae do not support the weight of the head, so the muscles, tendons and ligaments work harder to hold up the head. Over time, the muscles and soft tissues tighten up due to excessive workload required to hold the head in position. The anterior neck flexor muscles become weak from being in shortened position and neural structures are kept in less-than-optimal positions. The chronic overload and tightening of soft tissues may eventually result in decreased blood flow and oxygen to the soft tissues. The altered activation of upper trapezius combined with weakness of scapular muscles might contribute to neck pain.

Scapular position can be altered due to the poor posture, as they drive for long hours in poor posture including forward head posture and protracted shoulders which in turn increases the thoracic kyphosis. Normally scapula rests at a position on the posterior thorax approximately two inches from the midline, between the second and seventh ribs. The scapula is

internally rotated from vertical and is upwardly rotated 10 to 20 degrees from vertical. For a muscle balance a scapula position is important as there is a significant relationship between the contraction abilities of the muscles in the position of scapula which can be developed due to poor posture that creates disadvantage in muscle function.

A study done by Eun-Kyung Kim in 2016 showed that a compensatory action for the postural deformity of FHP, severe extension arises between the upper cervical joint and atlanto-occipital joint and the upper cervical vertebrae relatively protrude forward while the face directs upwards [11]. Scapular asymmetry has also seen to indicate imbalance of surrounding muscles of the scapula and is related to neck pain. In another study, Cagnie found that scapula thoracic muscle function was disturbed in patients with neck pain in resting position. The possible reason for the change can be alteration in scapula muscle function which cause mechanical strain to cervical spine structures because of shared muscle attachments between the scapula and the cervical spine. The uppermost attachments of the scapulothoracic muscles such as trapezius and the levator scapulae can transfer loads from the shoulder girdle to cervical structures. Disturbance in this scapular muscle function can induce mechanical loading on cervical segments and create implication for the initiation of neck pain. Scapulothoracic muscle strength values have been shown to be significantly lowered in individuals with neck pain. Another possible reason can be due to poor posture in which the head is supported by spinal vertebrae. When the head is flexed forward, the vertebra does not support weight of the head as much, so the muscles, tendons, and ligaments work harder to hold up the head. To compensate, the muscles and soft tissues tighten up due to excessive workload required to hold up the head in position. The chronic overload and tightening of muscles and soft tissues eventually lead to inappropriate muscle action and decreases the stabilizing musculature while reducing the mobility of neck.

Limitation

Sample size was too small for comparison analyses between scapular alignment with and without neck pain.

Conclusion

Scapular alignment was altered in auto rickshaw drivers with neck pain as compared to those with no neck pain.

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