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Research

To study scapular position in Architecture students with non-specific neck pain – A cross-sectional study

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Abstract

Background: Architecture students attain static slouched posture during their drawing and drafting work. Also, the furniture provided by college / Universities does not fit every student's stature. Imbalanced force production of upper and lower trapezius muscle and serratus anterior give rise to abnormal scapulohumeral rhythm. But there is a lack of evidence to explain the relation between scapular position and non-specific neck pain in architecture students.
Objectives: To study scapular position using Lennie's test in Architecture students with non-specific neck pain. To study scapular position using Kibler's method of Lateral scapular slide test in Architecture students with non-specific neck pain.
Method: A cross-sectional study was conducted among 50 Architecture students with nonspecific neck pain. For examination of scapular position Lennie's test and Kibler's lateral scapular slide tests were performed. Kibler's tests were performed in three different positions (at rest, hands on hip, and shoulder with 90° abduction and internal rotation). With marker scapular surface landmarks and spinal midline were marked. Bilateral measurements were taken using digital Vernier calliper.
Result: Result shows that there is significant alteration of scapular position in architecture students with non-specific neck pain. In Lennie's test, superior angle of scapula was altered in 98%, root of spine of scapula was altered in 94% and inferior angle of scapula was altered in 96% of population with chi square value of 0.56 and p-value 0.7558.
Conclusion: The present study concluded that there is an association between non-specific neck pain and altered scapular position in Architecture students.

Keywords: Scapular position, Architecture students, Neck pain, Lennie's Test, Kibler's lateral scapular slide test.

INTRODUCTION

The scapula is a flat bone present on the posterior thorax in human body. The position of scapula is chief contributor to the normal and abnormal scapular stability and mobility. The scapular position and motion are primarily balanced through active forces or dynamic stabilization. The dynamic stabilization is provided by the support of the upper trapezius, serratus anterior, rhomboids, and middle trapezius (1). This dynamic stability is limited by passive forces such as articular surface configuration, capsule, or ligaments (2). However, The shoulder girdle is highly susceptible for dysfunction and instability is because of intricate structure and stability and mobility function of shoulder complex(2).

Neck pain with no specific underlying disease is called “non-specific” neck pain. This type of pain is very common and results from postural and mechanical cause without any bony injury or objective neurological deficit (3). In many cases, various factors contribute to development of non-specific neck pain. These might include physical strain at work, sitting at desk for long hours, working in awkward postures, frequent bending forward, sustained static positions and repetitive tasks imposing stress on soft tissues.

Architecture students are engaged in drawing and drafting activity in their usual college activities (4)(5). Architecture students work for an approximate of 6 hours out of the 7 or 8 hours of college in a day. They work on their plan for at least 20 hours in a week(5). They work for long hours on drawing boards in a very awkward slouch posture thus, they are likely to develop musculo-skeletal problems. They attain static posture and repetitive upper limb movements which leads to strain on soft tissue structures surrounding cervical and scapular region. Also, the furniture provided by college / Universities does not fit every student’s stature. They have to work on whatever provided by their college(4).

According to the previously done various studies the highest prevalent area for the pain is neck region in architecture students. Moderate to severe involvement of neck and lumbar region and neck pain which is higher with 69% of prevalence(4)(6)(7). Because of faulty posture attained by architecture students with forward head and protracted shoulder it puts strain on ligaments, muscles in cervical and scapular region(4)(5)(8)(9).

In forward static posture the vertebrae's, ligaments & muscles could not hold forward head posture & because of these anterior cervical muscles get stretch & becomes weak and tension increases in posterior muscles, results in decrease blood flow and oxygen supply to soft tissue. The cervical vertebras may be kept in abnormal position which eventually cause pain and muscle weakness. This causes pain in cervical region. This has influence on biomechanics of altered tension cervicoscapular muscles(8)(10).

There are three segments in shoulder complex which are joined by three independent linkages; the sternoclavicular joint, the acromioclavicular joint, the glenohumeral joint. And the articulation of scapula and thorax described as the scapulothoracic joint. Scapulothoracic motion in interdependent on sternoclavicular and acromioclavicular joint. Any movement of the scapula on thorax must result in movement at these two joints. It is difficult to observe and measure individual sternoclavicular and acromioclavicular joint than scapular motion on thorax. Thus, scapulothoracic motion is frequently observed and measured in studies to see alteration in scapulohumeral rhythm(2).

Scapular motions on thorax occur in combination, such as simultaneous upward rotation, and posterior tilting with upper extremity movements. Studies have been done on activation of scapular muscles and scapular translator motion on thorax. Imbalanced force production of upper and lower trapezius muscle and serratus anterior give rise to abnormal scapulohumeral rhythm. Chiefly serratus anterior muscle provides primary muscular force to produce posterior tipping of scapula during arm movement (11). But because of imbalanced muscle activation due to musculoskeletal disorders compassion seen in muscles to produce upward rotation of scapula. The evidences are available explaining casual relationships between highly repetitive work and neck and neck/shoulder musculoskeletal disorders. With continuous arm and hand movements affects neck/shoulder musculature and provoke altered scapular position. But there is a lack of evidence to explain relation between scapular position and non-specific neck pain in architecture students.

Students with neck pain and posture acquired during their drawing and drafting activity use abnormal scapular posture and associated changes in muscle activity leads to mechanical stresses on pain sensitive cervicobrachial structure, hence the purpose of study is to find out whether neck pain is associated with scapular position in architecture students using Lennie’s test and Kibler’s lateral scapular slide test.

MATERIALS AND METHOD

POPULATION: Architecture students of 2nd to 5th year
STUDY SETTING: Colleges in Talegaon, Pune
SAMPLE SIZE: 50
SAMPLING TECHNIQUE: Purposive Sampling
STUDY DESIGN: Cross-sectional Study
STUDY TYPE: Observational study

STATISTICAL TEST: Demographic data represented through graphical Pie and Bar charts Chi Square Test to know the association between non specific neck pain and altered scapula position in architecture students.

MATERIALS

1. Pen
2. Paper
3. Skin Marker
4. VAS scale
5. Digital Vernier caliper

METHODS

- 50 students were included based on inclusion criteria and exclusion criteria.
- Informed written consent was taken from all students.
- For assessing scapular position Lennie's test and Kibler's lateral scapular slide test were used with digital Vernier caliper in relaxed standing position.
- Skin marker was used to mark surface landmark.
- Scapular surface landmarks were marked with palpatory method(14).
- Lennie's Test:
  1. The Spinal midline was marked as a straight line from the C7 spinous process to midpoint between the posterior superior iliac spine (PSIS) i.e., S2.
  2. With marker superior angle of scapula, root of the spine and inferior angle of scapula was marked of both side of scapula.
  3. All these three markings over each scapula, corresponding marks were made over the spinal midline.
  4. Then, using digital Vernier caliper the distances between spinal midline and scapular surface landmarks were measured and transposing the distance to metric ruler.
  5. The distance from spinal midline to marked scapular landmarks should be between 5 to 6 cm(2)(15)(16)(17).

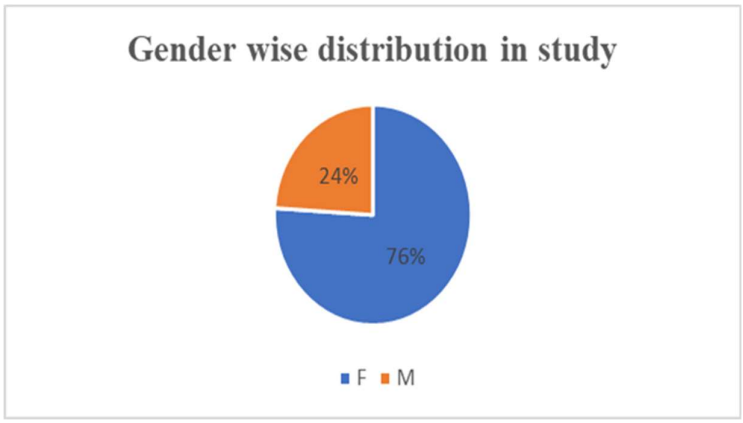
- Kibler's Method of Lateral Scapular Slide Test(13)(18):
  1. In relaxed standing position
  2. Inferior angle of scapula was marked with skin marker.
  3. Then, using digital Vernier calliper inferior angle and spinal midline distance were measured in three different test position of upper extremity.
     a. Arm by the side
     b. Hands on hips
     c. Shoulder 90^0 abduction and internal rotation
  4. The distance measured between inferior angle and spinal midline of both side of scapula in these three different test positions.
  5. All measurements were determined consecutively from position 1 to position 3 and bilaterally.
  6. The bilateral difference should be less than 1.5cm in all three positions(13).
  7. The measurements were taken thrice and average reading was considered as final reading.
  8. The same procedure was performed for other side of scapula.

RESULTS

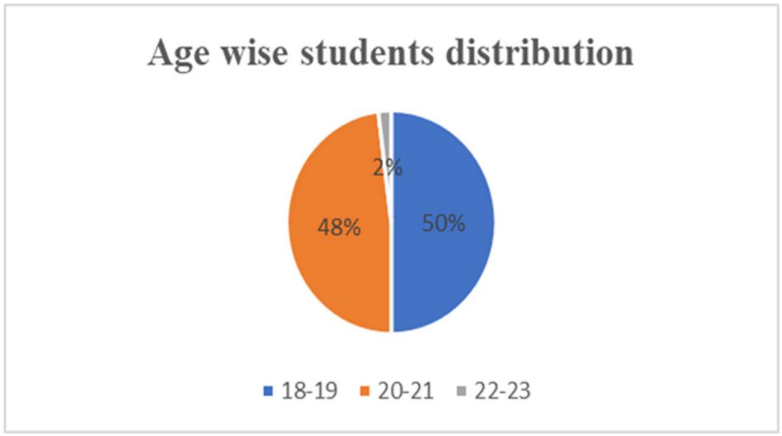
Total of 50 Architecture students were included for the study who were having non-specific neck pain. There were 38 females and 12 males of the age group 18-23 years were participated in the study. In the age group of 18-19 years, 25 students were having altered scapular position among them 18 were females and 7 males. In the age group of 20-21 years, 19 students were having altered scapular position among them 19 were females and 5 males. In the age group of 22-23 years only 1 female student had altered scapular position.

With Lennie's test, altered scapular position was found among all students. Among them 38 females and 12 males had altered scapular position with percentage distribution of 76% and 24% respectively. Using Kibler's lateral scapular slide test it is estimated that scapula's alignment was altered as compares to right and left side of scapula in all three-test position. Whereas in Kibler's test altered scapular position was found among 29 students where 21 were females and 8 males. With percentage distribution, 55% of total female population had altered scapula position. And with 67% of total male population had altered scapular position. In Lennie's test, superior angle of scapula was altered in 98%, root of spine of scapula was altered in 94% and inferior angle of scapula was altered in 96% of population. In Lennie's test, chi square value is 0.56 with p-value of 0.7558. In Kibler's lateral scapula slide test, altered scapula was found in three different test position. Altered scapula position was found

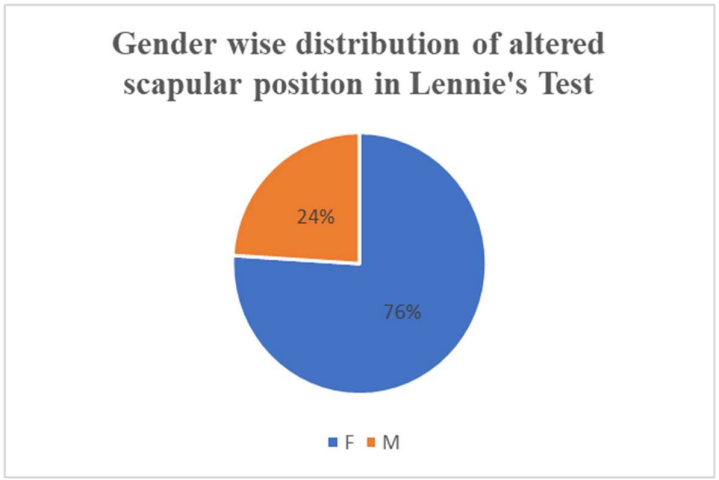
using Kibler's test at rest, hand on hip (i.e., shoulder 45o abduction) and shoulder 90° abduction and internal rotation in 26% of population, in 30% of population and in 42% on population respectively. In Kibler's lateral scapula position, chi square value is 35.584 with p-value of 0.00000002.



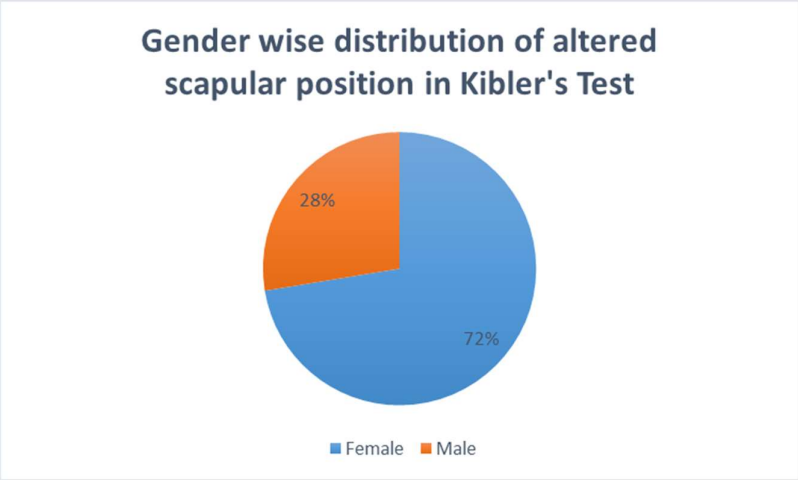
Graph 1: Gender wise distribution in the present study out of the total study population 24% were males and 76% were females.



Graph 2: Age wise distribution in the present study



Graph 3: Gender wise distribution of altered scapular position in lennie's test



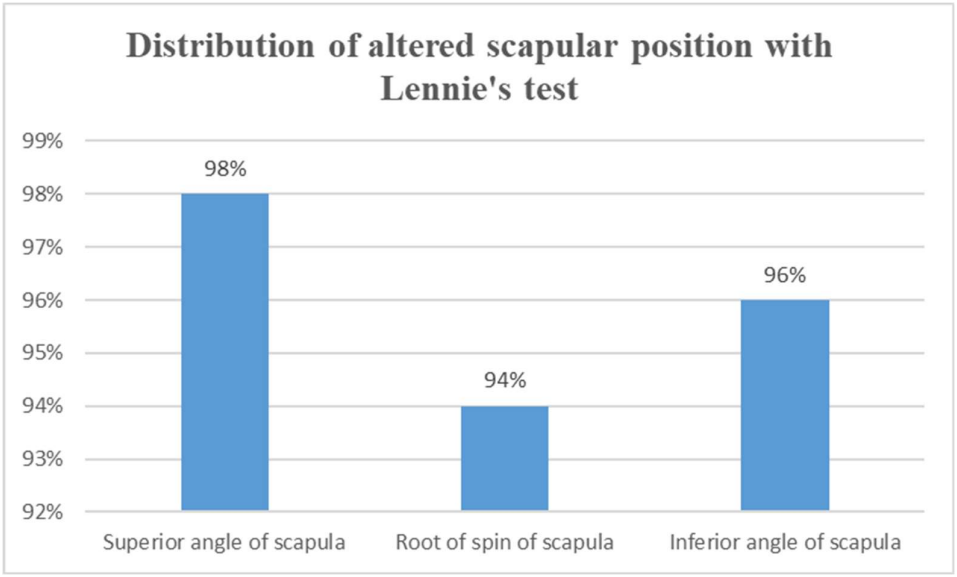
Graph 4: Gender wise distribution of altered scapular position by Kibler's test

Table 1: Result of Lennie's Test

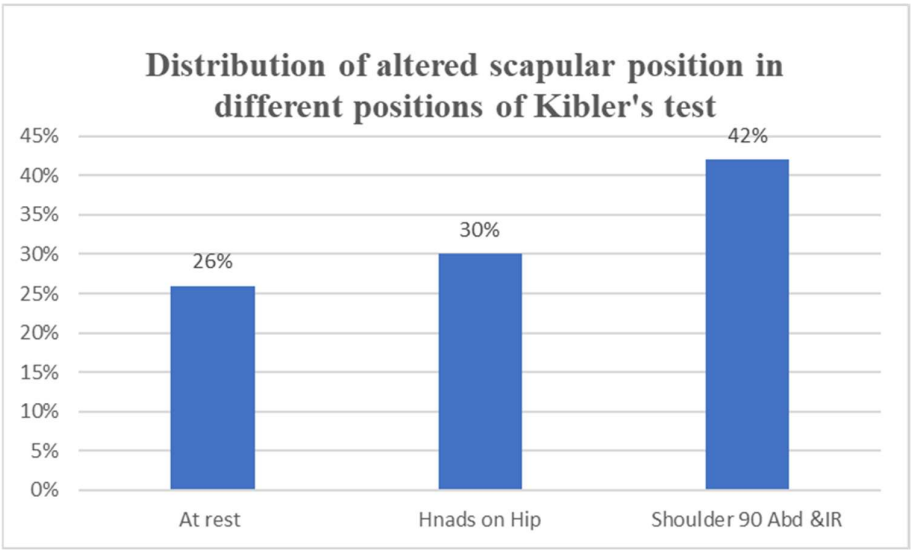
Sr. no.	Surface Landmarks	Right side mean(SD)	Left side mean(SD)
1	Superior angle of scapula	9.13356 (1.27)	8.80716 (1.15)
2	Root of spine of scapula	7.92468 (1.31)	7.36344 (0.99)
3	Inferior angle of scapula	8.78386 (1.33)	8.25244 (1.14)

Table 2: Result of Kibler's test

Sr. no.	Test position	Right side mean(SD)	Left side mean(SD)
1	At rest	8.77152 (1.32)	8.23586 (1.13)
2	Hands on hip	9.4346 (1.27)	8.56214 (1.13)
3	Shoulder 90 Abd & IR	9.36624 (2.01)	8.31458 (1.39)



Graph 5: Distribution of altered scapular position with Lennie's test



Graph 6: Distribution of altered scapular position in different positions of kibler's test

Table 3: Distribution of altered scapular position with Lennie's test among Architecture students

Sr. no.	Scapular surface landmarks	No. of students	Chi square value
1	Superior angle of scapula	49	0.04
2	Root of spine of scapula	47	0.36
3	Inferior angle of scapula	48	0.16
	Total	50	0.56

Table 4: Distribution of altered scapular position in different positions with Kibler's test among Architecture students.

Sr. no.	Test position	No. of students	Chi square value
1	At rest	19	17.66
2	Hands of hip	15	13.51
3	Shoulder 90 Abd & IR	20	4.414
	Total	29	35.584

DISCUSSIONS

The purpose of the study was to find association between non-specific neck pain and scapula position in Architecture students. This study assessed the scapular position with Lennie's test and Kibler's lateral scapular slide test in three different test positions and for neck pain visual analogue scale (VAS) was used. The digital Vernier calliper was used to measure distance between surface landmarks on medial border of scapula and vertebral spinous process.

The study result showed that the scapular position was significantly altered in architecture students. Resting scapular position was altered in architecture students who had neck pain. Also, with Kibler's lateral scapular slide i.e., shoulder at rest, 45° of abduction and 90° abduction and internal rotation scapula position is altered. Chi square value which were obtained are 0.00000002 and 0.7558 in Lennie's test and Kibler's lateral scapular slide test respectively. It showed that there is association of non-specific neck pain and altered scapular position. Students of Architecture work in abnormal slouched posture this gives rise to neck pain and thus alteration of scapular position.

There are many previous evidences that shows high level static contracted posture, prolonged working hours involving neck/shoulder muscles give rise to musculoskeletal disorders. The possible reason of alteration of scapula position may be due to consistently prolonged static posture, awkward neck and upper limb posture maintain during drawing and drafting work, continuously standing and bending forward which link towards the tension-neck syndrome(19). Scapula position is strongly related to muscle system. With increased tension and inefficient recruitment of muscle due to tension-neck syndrome (i.e., static forward head posture) scapula position changes(20). In forward static posture the vertebrae's, ligaments & muscles could not hold forward head posture

& because of these anterior cervical muscles get stretch & becomes weak and tension increases in posterior muscles, results in decrease blood flow and oxygen supply to soft tissue. The cervical vertebras may be kept in abnormal position which eventually cause pain and muscle weakness(8).

The altered scapular position could have probably occurred due to working posture of Architecture students, as they work for prolong hours (approx. 7-8 hours) which include forward head posture and protracted shoulder. Poor posture could lead to imbalanced scapular muscles activity with excessive loading on scapular muscles. This will cause non-specific type of pain i.e., pain without any pathological cause in Architecture students.

Scapular upward rotators are essential for smooth movement of shoulder girdle. The upward rotators of scapula are upper trapezius, lower trapezius and serratus anterior these muscles play an important role in scapulohumeral rhythm. The scapula position or scapulohumeral rhythm could be altered with increase in loading, muscle fatigue and impingement syndrome(21). Ludewig and Cook et al presented a study that patients with shoulder impingement had increased EMG activity in the trapezius, but had decreased EMG activity in the serratus anterior muscle during shoulder elevation in the scapular plane(11). This suggest us that with weakness or because of other reasons abnormal recruitment of upper trapezius muscle activity decreases and load on serratus anterior increases. And it causes poor stability and mobility of scapula. Improper recruitment of scapular muscles and associated changes in scapular posture have been identified as important contributing factor to the prevalence of improper posture and non-specific neck pain.

Architecture is a great field with much more opportunities. An educational period of an Architecture student is of 5 years. Daily they have to work for 7-8 hours on their drawing and drafting work. For 1st,2nd and 3rd years, their syllabus includes drafting, making models, market survey, sight visits and settlement study for which they have to take various measurements and they have to implicate exact drafting on sheets. Also, they repetitively perform welding and wood cutting activity which requires lots of strength. All these activities they perform in forward bending and slouched forward head posture. An Architecture student have to work on drawing desk of which height is common for all students of their institute. They have to adjust between workstation layout and individual working techniques. This cause lots of trouble for many students to adjust accordingly. Giving rise to abnormal slouched posture where tension and loading increases in muscles of spine and scapula and abnormal recruitment of muscle. However, they generate neck pain and alteration in scapula position. In this study it strongly suggests that there is an association of altered scapula position and non-specific neck pain.

From this study we as physiotherapist should have to work on this poor workstation layout and altered scapular position with ergonomic advice and treatment protocol to balance muscle recruitment so as to reduce alteration of scapula position and neck pain. Also neck pain occurs because of static posture so it could be relieved by neck exercises after every short period of work, by leaning backward on chair it will reduce tension on neck muscles. Ergonomic advices such as maintaining drawing desk inclination angle of 10^0(22)., instructing students to work at appropriate heights, avoid awkward positions while working, taking frequent breaks, following small stretches and exercises to avoid strain on neck muscles and also avoid development of work related musculoskeletal disorders.

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CONCLUSION

Hence The present study concludes that, scapula position is significantly altered in Architecture students with non-specific neck pain.

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