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[ORIGINAL ARTICLE]

Influence of Forward Head Posture on Pulmonary Function in Young Adults - A Correlational Study

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ABSTRACT :

Background: Forward head posture is one of the most common musculoskeletal disorders associated with abnormal neck posture. Young adults with daily activities of living involve static work for studying, slouched sitting, prolonged mobile or laptop use in which the body remains motionless for a long time to perform the work, which causes the neck and shoulder muscles to strain, causing most people to take the front head.

Relevance of Study: Since the muscles around the neck and shoulders are directly involved in breathing, their alignment ensures proper breathing. Irregularity in these muscles due to tension or weakness because of altered posture may interfere with breathing.

Methodology: A Cross-sectional study was conducted on 53 young adults. Subjects were selected according to the inclusion and exclusion criteria by Convenient sampling Technique. Craniovertebral angle were assessed using Mb ruler software for forward head posture & PFT for pulmonary function was assessed. Statistical analysis was carried out using paired t test.

Results: The statistical significance of correlation in study group was tested using Pearson's correlation coefficient test which shows moderate positive correlation. The p-values was less than 0.05 which was considered to be statistically significant.

Conclusion: The study concluded that there is moderate positive correlation exist between cranio-vertebral angle and forced vital capacity as the cranio-vertebral angle decreases forced vital capacity also decreases.

Keywords- *Craniovertebral angle, forward head posture, forced vital capacity, pulmonary function test*

Introduction

Forward head posture is one of the most common musculoskeletal disorders associated with the use of imaging equipment. Forward head posture (FHP) is an abnormal neck posture defined by hyperextension of the cervical spine and the front of the cervical spine.[1] Forward head may cause dysfunction such as shoulder pain, pain, and disability in the body or limbs. Other dysfunctions include muscle weakness and shortening, as well as muscle imbalances caused by abnormalities in the stability and connectivity of each muscle.[2] Young adults activities of daily living involve static work for studying, slouched sitting during lecture hours, prolonged mobile or laptop use in which the

body remains motionless for a long time to perform the work, which causes the neck and shoulder muscles to strain, causing most people to take the front head.[3] When FHP is maintained for a long time, the cervical flexor and erector spinae muscles in the upper thoracic will weaken due to the length and the scapula will rise. Tension in the subscapularis occurs due to tension in the levator scapula, sternocleidomastoid, suboccipital, and splenius muscles.[4] Thus, neck muscles being short and long or tense or loose due to muscle imbalance, rounded shoulders, slight curvature of the chest area, sitting on the body and stress cause chronic pain. It is well known that head pressure can affect breathing by weakening the respiratory muscles. The Primary inspiratory muscles are Diaphragm and internal and external intercostal muscles. Most important

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muscles which assist respiration & expiration are Internal muscles, subcostal muscles, abdominal muscles and abdominal muscles. Lung muscles are sternocleidomastoid, oblique, pectoralis major, pectoralis minor anterior, medius and posterior muscles, serratus anterior, latissimus dorsi, iliocostalis, cervical, posterior Lower fibers of serratus. Scalenes and sternocleidomastoid muscles are the flexor muscles of the neck and play a role in maintaining neck posture. They also act as muscles that strengthen the body by lifting the chest wall to make breathing easier. Especially during breathing, the muscles that form the chest wall cause the chest bones, including the ribs, to move forward.[4] Forward head posture means the head is in front of the vertical line of thought. A horizontal plane passes through the body's center of mass. These behaviors are often associated with changes in muscle length and strength, including weakness of the deep cervical flexors, tight suboccipital muscles, and dysfunction of the sternocleidomastoid muscles and scalene. The cervical spine curves relative to the thoracic and lumbar spine. The sternocleidomastoid and scalene cervical flexors play a role in the function of the neck. Sternocleidomastoid and scalene muscles play a role in the neck and also the accessory muscles of respiration. Lung Function Testing (PFT) is an important tool for diagnosing and monitoring patients with respiratory pathology. They provide important information about the size and integrity of the large and small airways, lung parenchyma, and pulmonary capillary bed. They are not diagnostic, but different abnormalities can be seen in various respiratory diseases that can help make a diagnosis. Standard spirometry method is the maximum working time of the lungs after maximum inhalation (maximum possible) after maximum inhalation (maximum possible). Since the muscles around the neck and shoulders are directly involved in breathing, their alignment ensures proper breathing. Irregularity in these muscles due to tension or weakness because of altered posture may interfere with breathing. There is paucity in the research literature on the correlation between forward head posture & lung function. Therefore, the purpose of the study was to evaluate the influence of forward head posture on lung function in young people (healthy men and women aged 18-25).

Methodology:-

This Co-relational study is conducted in Dr. Ulhas Patil College of Physiotherapy, Jalgaon.

Institutional ethical committee approval was obtained from 'The Institutional Ethical Committee of Dr. Ulhas Patil College of Physiotherapy, Jalgaon'. This study is also registered under Clinical Trials Registry- India with registration no. CTRI/2023/09/057433

A total 53 samples were selected for the study by the Convenient Sampling Technique. Subject included in this study was the Age group between 18- 25 yr with both genders, BMI 18-24.9, Cranio vertebral angle less than 48 degree. Subjects with Cervical fracture, trauma & instability, Any other musculoskeletal cervical disorders & deformities other than forward head posture, Radiating neck pain & local neck pain, Any cardio respiratory diseases, Any recent trauma of upper limb & upper limb dysfunction, Participants involved in sport specific recreational activities & routine exercise, Tobacco chewer and cigarette smoker were excluded. Force Vital Capacity (FVC) using Pulmonary function test and Cranio-vertebral Angle using Mb-Ruler software are outcome measures for this study.

Procedure:-

To conduct the study Permission from Institutional ethical committee & concerned hospital was taken. Prior to recruiting subjects, the study was registered under clinical trial registry of india (CTRI) & a registration no. CTRI/2023/09/057433 was given. The Subjects were selected according to the inclusion and exclusion criteria by Convenient sampling Technique. Prior to starting the study procedure was thoroughly explained to the subjects selected for the study & consent were taken. Earlier the demographic data of each and every individual were taken in consideration.

Selected subjects were assessed for forward head posture (CVA) using Mb ruler software. Subjects were assessed for any deviation of head posture using valid & reliable computerized photogrammetry with emphasis on craniocervical segment. Normal craniovertibral angle is 48°. The photographic records were obtained from a digital camera, positioned 3.5 m from the subject, allowing the recording of the face and upper trunk in the sagittal plane (left or right view). The subjects were sitting over stool and looking forward in a relaxed posture. Skin over the anatomical landmarks was wiped with cotton soaked in sprit to remove skin secretions for proper fixation of adhesive markers.

Anatomical landmarks were marked with marker pen; there after adhesive markers were fixed over the anatomical landmarks. Anatomical landmarks are: spinous process of C7, tragus of the left or right ears. The photographs were analyzed using MB Ruller software - the craniovertebral angle (CVA), that is the angle between the horizontal line passing through C7 and a line extending from the tragus of the ear to C7 will obtained. The literature reports high reliability of this procedure (ICC = 0.88).Then the photographs were transferred to laptop for measuring the

Fig. 1: Measuring neck angle with software

After evaluation of craniovertebral angle the pulmonary function test was assessed to find out the respiratory parameters like forced vital capacity (FVC). Subjects were asked to loosen tight clothing, Jewelry or other things that can cause a problem with the procedure. Subjects were instructed to empty their bladder before the procedure. Then they were asked to sit in a chair. A soft clip was put on their nose. This is so all of your breathing is done through your mouth, not your nose. Then he/she was given a sterile mouthpiece that is attached to a spirometer. They will form a tight seal over the mouthpiece with their mouth. They were instructed to inhale and exhale.(i.e for FVC patients are instructed to perform forceful inspiration with forceful expiration). The therapist carefully observe the subjects during the procedure for dizziness, trouble breathing, or other problems. This procedure were perform 3 time with the rest period of 1 minute and the best score were calculated and used for statistical analysis.

Fig. 2 : Pulmonary Function Test

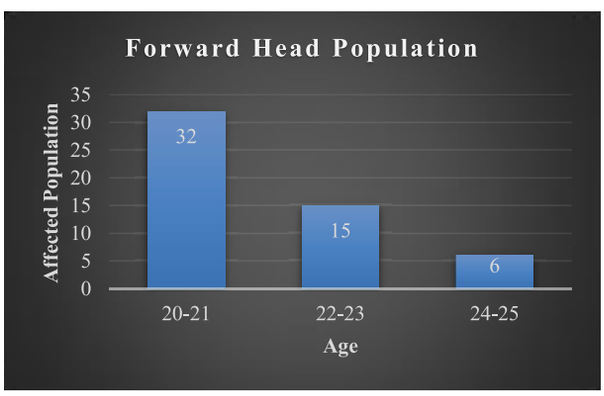
Results

The study included 53 subjects who met the inclusion criteria who were assessed individually. Statistical analysis was done using statistical package of social science (SPSS) version 28.0.0.1. Statistical analysis were conducted to find out correlation between forward head posture & pulmonary function Pearson Co-relation co-efficient test was used.

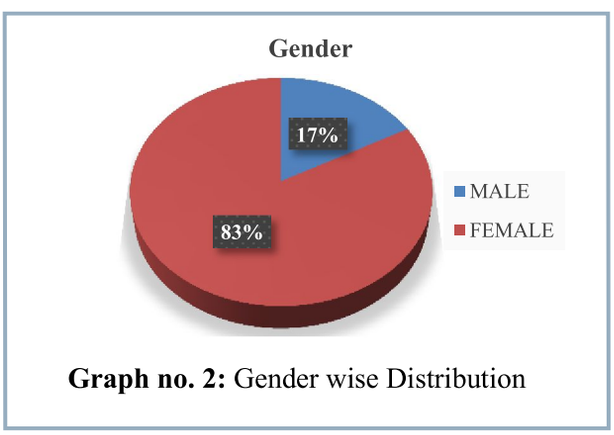
Table 1: Age Distribution

Age in years	Number of subjects (n=53)
20-21	32
22-23	15
24-25	6

In this study there were 32 individual in age group 20-21, 15 individual in age group 22-23, and 6 individuals in age group 24-25.



Graph no. 1: Age Distribution Table

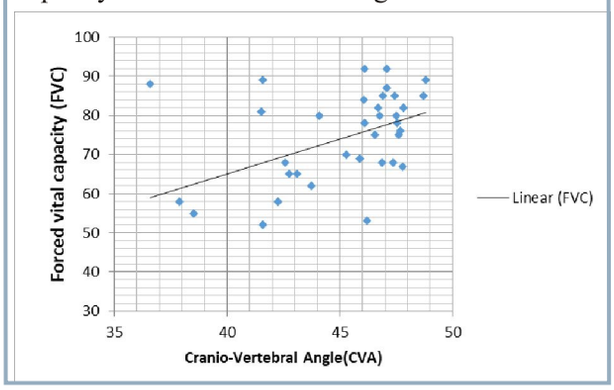


Graph no. 2: Gender wise Distribution

Table no. 3: Corelation between Forced vital capacity and craniovertibral angle.

Cranio-Vertebral Angle (CVA)	Forced Vital Capacity	Pearson correlation coefficient (r)	p value	Significance
45.02 ± 3.16	74 ± 11.54	0.4880	0.0002	Moderate Positive Corrleation

Graph no. 3 : Corelation between Forced vital capacity and craniovertibral angle.



Discussion

Poor head, neck and shoulder posture sustained for a longer duration of time leads to changes in the muscle length further leading to development of musculoskeletal problems such as FHP.[7]

Sustaining poor ergonomic postures while using computers, TV, video games, mobile technologies, etc. for a prolonged period of time can lead to development of FHP. It is often unnoticed at early stages until symptoms appear. Continuous repetitive adaptation of these positions turns into a deformity causing neck and upper back pain, stiffness, shallow breathing, and breathing dysfunction. Individuals with FHP showed reduced diaphragmatic strength as a result of its reduced activity.[7,8]

The chief objective of our study was to evaluate the correlation between forward head posture & pulmonary function in healthy young adults. Correlation between forward head posture & pulmonary function was statistically evaluated using pearson's correlation coefficient in which we found that moderate positive correlation exist between forward head posture & pulmonary function (r=0.4880, 'p'value- 0.0002). This is supported by work of Hodges and colleagues who reported that the diaphragm mobility is altered by posture movements. Increased degree of FHP has a bearing effect on chest expansion and respiratory muscles activities which can lead to reduced alveolar ventilation.

The muscular impairment seen in forward head posture are deep cervical flexors-these muscles, also called the longus-capitus and longus-colli are located along the front of the cervical spine and help stabilize the neck. The deep cervical flexors lengthen as the chin tilts away from the neck. The erector spinae plays a key role in rotating and straightening the spine. When the erector spinae muscles lengthen and loses its strength, they are less capable of keeping the neck and upper back from hunching forward. shoulder blade retractors- the middle trapezius and rhomboid muscles in the upper back help bring the scapula backward to keep the shoulder back and chest open in good posture weak trapezius and rhomboid muscles allow the shoulder blades to tilt forward, further contributing to hunched shoulder.9 Suboccipital muscles –these are the four pair of the small muscles, which connect the lower back of the skull to the top of the cervical spine, help with head rotation and extension. These muscles work extra hard and continually contract to keep the head tilted up and looking straight ahead during FHP. Changes in muscle length and strength, including weakness of the deep cervical flexors, tight suboccipital muscles, and dysfunction of the sternocleidomastoid muscles and scalene.[10,11] chest muscles-as the muscles in the upper back tend to become elongated as the shoulder round forward, chest muscles may become may shortened and tight.[12]

Dimitriadis et al. reported that in individuals with FHP the maximal inspiratory & expiratory pressure showed statistically significant decrease in the normal baseline value which may be because of weakness of SCM, scalene muscles & the trapezius which are accessory respiratory muscles.[12] FHP represents an abnormal posture this posture can increase the trunk's internal pressure during expiration and therefore may increase dynamic mechanism. Our study also showed that there is reduction in FVC value. Our result is in accordance with the study conducted by Jintae Han et al investigated the effects of forward head posture on forced vital capacity and deep breathing in which they concluded that forced vital capacity and forced

expiratory volume in 1 second were significantly lower in the forward head posture groups than in the normal group. [14]

Conclusion

The study concluded that there is moderate positive correlation exist between cranio-vertebral angle and forced vital capacity as the cranio-vertebral angle decreases forced vital capacity also decreases.

Conflict of Interest: All authors declare that they have no conflicts of interest.

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References

1. Chiu TT, Ku WY, Lee MH, et al.: A study on the prevalence of and risk factors for neck pain among university academic staff in Hong Kong. J Occup Rehabil, 2002, 12: 77–91.
2. Cagnie B, Cools A, De Loose V, et al.: Differences in isometric neck muscle strength between healthy controls and women with chronic neck pain: the use of a reliable measurement. Arch Phys Med Rehabil, 2007, 88: 1441–1445.
3. Lee YM, Gong WT, Kim BK: Correlation between cervical lordosis, vital capacity, T-spine ROM and equilibrium. J Phys Ther Sci, 2011, 23: 103– 105.
4. Falla D: Unravelling the complexity of muscle impairment in chronic neck pain. Man Ther, 2004, 9: 125–133.
5. Kapreli E, Vourazanis E, Strimpakos N: Neck pain causes respiratory dysfunction. Med Hypotheses, 2008, 70: 1009– 1013.
6. Kapreli E, Vourazanis E, Billis E, et al.: Respiratory dysfunction in chronic neck pain patients. A pilot study. Cephalalgia, 2009, 29: 701– 710.
7. Lee MH, Chu M: Correlation between craniovertebral angle (CVA) and cardiorespiratory function in young adults. J Korean Soc Phys Med, 2014, 9: 107–113.
8. Legrand A, Schneider E, Gevenois PA, et al.: Respiratory effects of the scalene and sternomastoid muscles in humans. J Appl Physiol 1985, 2003, 94: 1467–1472.
9. Zafar H, Albarrati A, Alghadir AH, Iqbal ZA. Effect of Different Head-Neck Postures on the Respiratory Function in Healthy Males. Biomed Res Int. 2018 Jul 12;2018:4518269. doi: 10.1155/2018/4518269. PMID: 30112389; PMCID: PMC6077663
10. Dimitriadis Z, Kapreli E, Strimpakos N, et al.: Respiratory weakness in patients with chronic neck pain. Man Ther, 2013, 18: 248–253.
11. Koh EK, Jung DU: Effect of head posture and breathing pattern on muscle activities of sternocleidomastoid and scalene during inspiratory respiration. KJSB, 2013, 23: 279–284.
12. Kim SY, Kim NS, Jung JH, et al.: Effect of forward head posture on respiratory function in young adults. J Korean Soc Phys Ther, 2013, 25:311–315.
13. Saraf, Renuka and Shinde, Mukesh and Mahajan, Pradnya and Saini, Vikash, Evaluation of Quality of Life, Fatigue Severity and Functional Status in Post COVID-19 Patients - Cross-Over Longitudinal Study (September 7, 2022). International Journal of Health Sciences and Research (IJHSR).
14. Han JT, Go MJ, Kim YJ: Comparison of forced vital capacity and maximal voluntary ventilation between normal and forward head posture. J Korean Soc Phys Med, 2015, 10: 83–89.