Original Research Article

Correlation of Craniovertebral Angle with Neck Pain in Undergraduate Students- Cross-Sectional Study

Surabhi S Shinde[1], Drashti Niket Shah[2]

[1]Intern, College of Physiotherapy, Wanless Hospital, MMC, Miraj, India, [2]Professor, Department of Community Physiotherapy, College of Physiotherapy, Wanless Hospital, MMC, Miraj, India.

Corresponding Author: Drashti Niket Shah

ABSTRACT

Background: Neck pain is a common disorder characterized by pain, discomfort or soreness experienced in the region between the inferior margin of the occipital bone and T1. It is one of the commonest problems in young adults due to their repetitive use of computers, laptops, cell phones, TV, improper sitting posture leading the body to exhibit a bad posture. Bad posture is a serious health problem which causes more musculoskeletal disorders with age. One of the common results of poor posture is Forward head posture (FHP), the prevalence of which is very also significant in young adults.

Method: In this Cross-sectional study 133 male and female students between the age group of 17-25 years were included by using Convenience sampling technique. Their Craniovertebral Angle was assessed using Surgimap software and Neck pain was assessed using NPRS. Individuals with spinal deformities, recent fracture of the spine, cervical tumor or any other medical conditions were excluded from the study.

Result: Out of 133 students assessed 91 had FHP. Neck pain was not very significant among the students with about 74% of population showing mild, 27% moderate and 8% having severe neck pain. Spearman's correlation test was used to find the correlation of CVA with neck pain, in which the r value was found to be [r= -0.157] indicating a clinically negative correlation.

Conclusion: It is concluded that there is a weak correlation of Craniovertebral Angle with Neck Pain in Undergraduate students.

Keywords: Craniovertebral angle, Forward head posture, Students, Neck Pain, Surgimap Software

INTRODUCTION

Neck pain is a common disorder characterized by pain, discomfort or soreness experienced in the region between the inferior margin of the occipital bone and T1 [3]. It is said to be the second most widespread disorder associated with spine dysfunction after back pain experienced by every age group, including children and adolescents. Neck pain is one of the commonest problems in young adults due to repetitive use of computers, laptops, cell phones, TV, improper sitting posture leading the body to exhibit a bad posture [6]. Static positions with constantly repeated movements, especially cervical flexion or strong-arm movements, as well as prolonged sitting position also leads to neck pain. The prolonged and repetitive adaptation of bad posture can lead to muscular imbalance causing shortening and associated elongation of the muscles of the cervical spine. The muscular imbalance can eventually lead to anterior positioning of the cervical spine causing Forward Head Posture (FHP) [4].

FHP is also called as "text neck", "scholars' neck", "reading neck", "wearies neck". FHP can be caused due to various reasons including sleeping with the head elevated too high; extended use of cell phones, laptops or computers; Improper house and school furniture; heavy back packs; lack of developed back muscles or lack of nutrients like Calcium [7]. FHP is characterized by increased flexion of the lower cervical spine and upper thoracic region and increased extension of the upper cervical spine. It is associated with shortening of the upper trapezius, the posterior cervical extensor muscles, the sternocleidomastoid muscle, and levator scapulae muscle [1]. Each 1-inch anterior positioning of the head puts about 10 lbs i.e., 4.5 kg extra weight on the cervical spine. A study on Prevalence of forward head posture and its impact on the activity of daily living among students concluded that the prevalence of forward head posture in students is about 73% and forward head posture affects the activity of daily living of the students to some extent with most of the students experiencing some quantity of neck pain throughout the day [6].

FHP is identified by measuring the Craniovertebral (CV) Angle [7]. The Craniovertebral Angle is measured by calculating the angle made at the intersection of a line joining the midpoint of the tragus of the ear to the skin overlying the C7 spinous process and the horizontal line passing through the C7 spinous process. The normal Craniovertebral angle ranges between 48-50 degrees. Anything less the 48 degrees is defined as Forward head posture [1]. It is thought that adolescents or patients with neck pain have a more forward head posture, thus a smaller Craniovertebral angle than age-matched pain-free participants [3].

There is no standard approach to measure Craniovertebral Angle. Craniovertebral Angle can be quantitatively measured using a number of ways including- Plumb line, Photographic method, Electronic Head Posture Instrument (EHPI), or Radiographic method [12,8]. One of the ways of measuring Craniovertebral Angle is with the use of a Software. Surgimap software is one of the recent and reliable software for measuring the angles [12] A previous study has found that Surgimap software is a reliable method for measuring spinal postural angles in adolescents from different views in standing position from digital photographs with reliability of 0.99 [8,13]

The aim of the study was to find the correlation of Craniovertebral Angle with neck pain in undergraduate students. The three main objectives of the study were: 1) To asses Craniovertebral Angle. 2)To asses neck pain. 3)To study the correlation between Craniovertebral Angle and neck pain.

MATERIALS & METHODS

Ethical committee clearance was obtained from the concerned committee, College of Physiotherapy, Wanless Hospital, Miraj. Prior to the study the aim and the procedure were explained to the participants. A written consent form was taken from the participants. Participants were selected according to the inclusion ad exclusion criteria. First the participants were assessed for their neck pain using NPRS scale. Later the assessment of Craniovertebral Angle was done using Surgimap Software.

ASSESSMENT OF CRANIOVERTEBRAL ANGLE

- The Craniovertebral Angle was measured using a digital imagining technique i.e., Surgimap software. The craniovertebral angle is measured to by calculating the angle found at the intersection of a line drawn from the tragus of the ear through the spinous process of C7 Vertebra and a horizontal line through C7 Vertebra.

- A mobile phone (64 megapixel) was placed at a distance of 150 cm on a tripod stand and height was adjusted

according to the level of the subject shoulder.

- Adhesive tapes were used to locate the C7 spinous process and tragus of the ear.
- The subjects were then asked to stand laterally so that their left shoulder was facing the camera.
- The subjects were then instructed to stand comfortably with their weight evenly distributed on both feet and the eyes looking straight forward.
- Then the subjects were instructed to flex and extend the head three times and then rest it in a comfortable position.
- An image was taken with the mobile camera and then the angle was measured using the Surgimap software.
- The reliability of Surgimap Software is 0.99
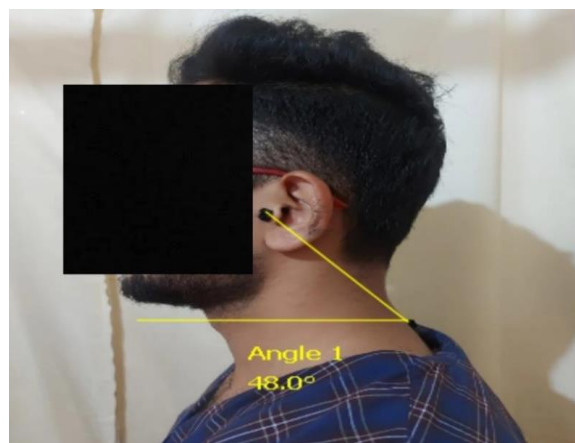
ASSESSMENT OF NECK PAIN

- The NPRS was used to measure neck pain.
- A 10 cm linear line was drawn on a paper with numbers ranging from 0-10 marked on it.
- The subjects were then instructed to mark the number that corresponds to the degree of their neck pain.
- As the number on the scale increases the intensity of pain also increases.
- The reliability of NPRS scale is 0.96
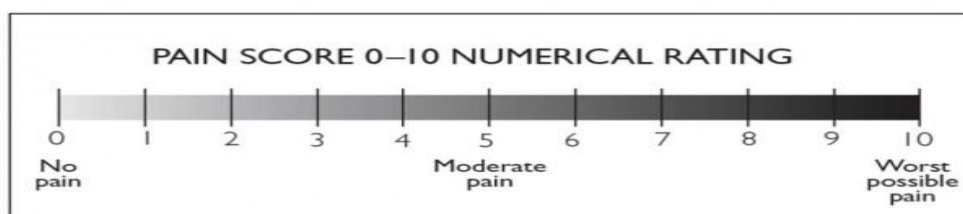
Statistical Analysis

Statistical analysis was done using SPSS Software version 20. Non-parametric Spearman's test was used for the correlation of Craniovertebral Angle with Neck Pain.

RESULT

Statistical analysis was done using Statistical Package for the Social Sciences [SPSS] version 20. The level of correlation was calculated using non-parametric spearman's test for correlation.

For this study 133 students were assessed. Out of which 40 were male and 93 were female. Their neck pain was assessed using NPRS and Craniovertebral angle was measured using Surgimap Software.

Table No.1.: Shows Mean and Standard Deviation of Baseline Data [NPRS and CVA].

| Outcome Measures	Mean And Standard Deviation
NPRS	1.61 ± 2.07
CVA	44.30 ± 5.66
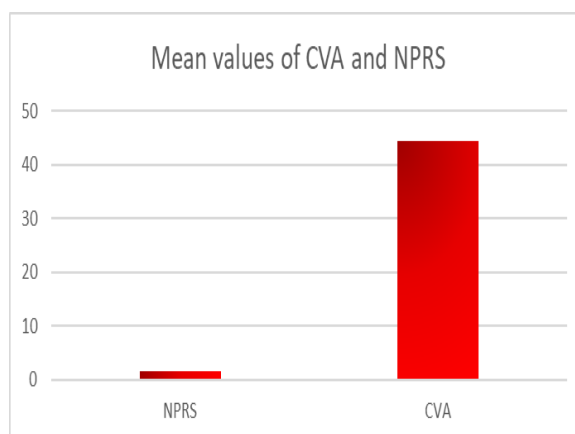
Graph No.1: Shows Mean of Baseline Data [NPRS and CVA].

- Table and Graph No. 1 shows mean and standard deviation value of baseline data [NPRS and CVA] [1.61 ± 2.07] and [44.30 ± 5.66] respectively

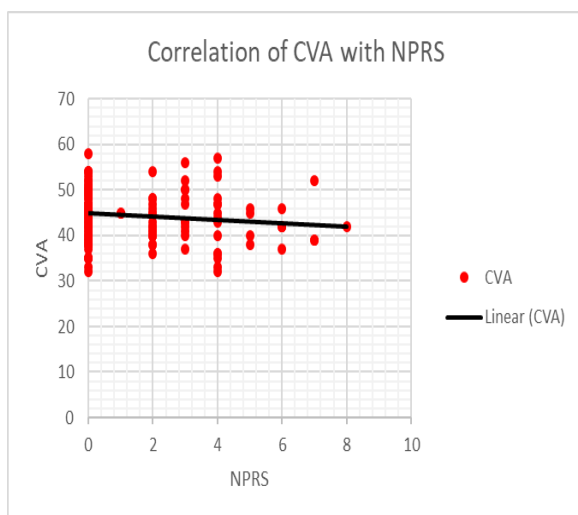**Table No 2.: shows the total no male and female students with and without Forward head posture**

Male		Female	
Normal	FHP	Normal	FHP
40	24	93	67
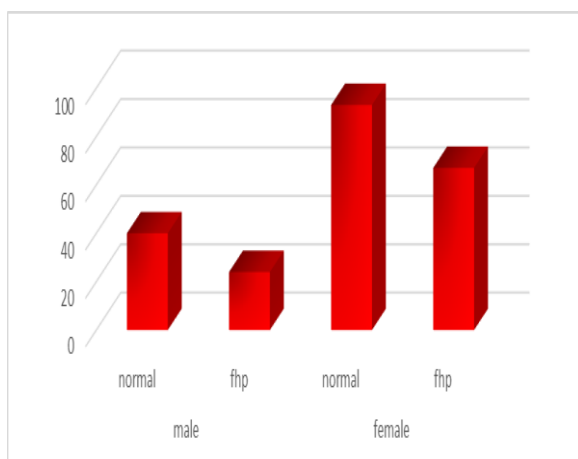
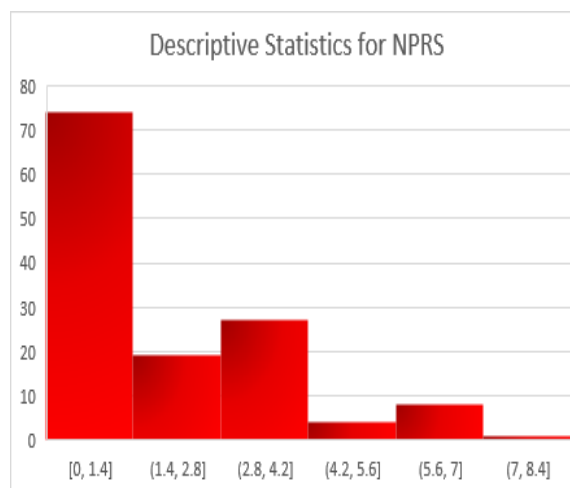**Graph No.:2 shows the male and females students with and without Forward head posture**

Table No 3.: Shows correlation of CVA with neck pain

SPEARMAN'S COEFFICIENT VALUE	P VALUE
-0.157	0.71

Graph no 3.: Shows correlation of CVA with Neck Pain

- Table and graph no. 3 shows the correlation of CVA with Neck pain

Graph No4.: Shows Statistics for NPRS

The Mean and SD of CVA and NPRS was [1.61±2.07] and [44.30 ± 5.66] respectively. The results of the study revealed that, there is weak correlation i.e. [r=-0.157] of CVA with neck pain.

Result From Analysis

The data of 133 students were analysed using Surgimap Software for measurement of CVA to assess their forward head posture, and it was found that out of 133 students 91 had forward head posture.

Neck pain was not very significant among the students with about 74% of population showing mild, 27% moderate and 8% having severe neck pain.

Correlating the two variables using Spearman's Correlation test, it was found that the value of the non-parametric Spearman's coefficient i.e., r is -0.157 indicating a weak correlation.

DISCUSSION

The cross-sectional study was done with the main objective to find the correlation of Craniovertebral Angle with Neck Pain in Undergraduate Students between the age group of 17-25 years were included. From the results of the students, it was found that there is weak correlation of CVA with Neck Pain. Table and Graph No 2 shows that there is weak correlation of CVA with Neck Pain. Out of 133 students analysed using Surgimap Software, 40 were

male and 93 were female with 24 and 67 of them having forward head posture respectively. The cause of their FHP can be due to adapting faulty posture during sitting, standing or repetitive use of phones, computers, laptops, TV etc.

Previously, a cross-sectional study done by Sutantar Singh et al. to find the prevalence of forward head posture and its impact on the activity of daily living among physiotherapy students concluded that the prevalence of FHP is 73% and it also affects the activity of daily living to some extent in them [6]. Another study by Vinodhkumar Ramalingam et al. on Prevalence and Associated Risk Factors of Forward Head Posture among University Students concluded that the use of computer of more than 6 hours per day have shown high prevalence in number of forward head posture. Similar to computer usage, smart phone usage of more than 6 hours per day also shows high number of forward head posture prevalence [9]. Also, a study by Guan on the head and cervical posture while viewing mobile phone has revealed that while using a mobile phone, the user tends to attain FHP [15].

Along with neck pain, forward head posture also has an effect on breathing, and can induce palpitation, sleep disorders, and numbness in limbs. It can also predispose the individuals towards many pathological conditions including headaches, neck pain, temporomandibular disorders, vertebral bodies disorders, soft-tissue length and strength alteration, or even scapula and shoulder dyskinesis and which may also hamper the activity of daily living [3].

Prolonged adaptation of forward head posture can eventually lead to muscular imbalance causing shortening and associated elongation of the muscles of the cervical spine. Adaptation of the faulty posture during activity of daily living may lead to all the pathological problems associated with it. Studies have also concluded that altered postures may hasten the degenerative changes that take place later in life [1].

Many studies have been done to investigate the correlation of forward head posture and neck pain, which shows that the decreased length of muscle fibres and the decreased capacity of muscles fibres to generate tension in forward head posture causes severe neck pain [6]. A study by Dr. Edrish Saifee et al. on correlation between neck pain and cranio-vertebral angle in individuals between 30-40 years of age concluded that there was a moderate to good negative correlation between Craniovertebral angle and neck pain (measured using NPRS) [3].

Due to these conclusions, proper assessment, diagnosis and treatment of FHP is very important. As well as Awareness about proper posture is also very necessary.

In this study it was found that there is weak negative correlation of CVA with Neck Pain. As the population selected for the study was young physiotherapy students so in the results there was no significant correlation seen. This study alerts physical therapist to address the correction of forward head posture along with conventional treatment in patients with neck pain. Ergonomics can be advised during sitting, standing as well as while using phones, laptops etc before structural changes occur.

CONCLUSION

The results of the study show that there is a weak negative correlation i.e., r value of -0.157. This concludes that there is weak negative correlation of the Craniovertebral Angle with Neck pain in Undergraduate Students. The study also concludes that neck pain was not very significant among the students with about 74% of population showing mild, 27% moderate and 8% having severe neck pain. Although forward head posture does not have a significant effect on neck pain, it is important to address the issue of increasing prevalence of FHP among students. As postural correction is in our conscious control and practicing regular ergonomics and exercise can help prevent postural

conditions, it is important to set a program that includes proper postural assessment and exercises which is explicitly designed to improve posture could help to increase the postural awareness of participants and potentially change their habitual postures.

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