



Evaluation of the Forward Head Posture, its association with Neck Pain & Quality of life of Female DPT Students

Abrish Habib Abbasi¹, Mamoon Aslam², Tehseen Ashraf², Arshad Nawaz Malik²

ABSTRACT

Background: Craniovertebral angle is the landmark for assessment of head and neck postures. The angle is significantly smaller in subjects with neck pain. The decrease in the values of Craniovertebral angle is associated with the greater incidence of forward head posture, and a greater level of disability among the subjects with neck pain.

Objectives of Study: The purpose of the study was to measure and correlate Craniovertebral angle with the forward head posture in female university students and its association with level of disability.

Methodology: It was a Descriptive cross sectional study. Forward head posture was assessed in female DPT students of Riphah International University who complaint of mild to moderate neck pain, they were asked to fill in Neck Disability Index Questionnaire and SF-36 Questionnaire. Goniometer was used to measure appropriate Craniovertebral angle, after seeking consent from students their side-view pictures were taken. The study took 6 months duration for its completion.

Results: The results showed that 50% (n=32) students with complaint of neck pain had slight postural deformity having mild forward head posture (FHP) and fewer students, 3.1% (n=2) had severe postural deformity. Neck Disability Index, showed that majority of students 48.8% (n=31) were lying in moderate level of disability. SF-36 (Energy & Fatigue) depicted that majority of students were having loss of energy and some fatigue, which is (31-70%). There was a positive association between Craniovertebral angle (photogrammetric values) and quality of life, Energy & Fatigue level of the subjects with a p value of 0.052, while no association was found between photogrammetric values and Neck Disability Index, with p value 0.487 in students.

Conclusions: There is an association between the forward head posture and the prevalence of neck pain among students; also there quality of life is affected making them prone to develop severe postural problems in future.

Key words: Craniovertebral angle (CVA), Forward Head Posture (FHP), Neck pain

1. Foundation University, Rawalpindi
2. Riphah International University,
Islamabad

INTRODUCTION

Neck pain, is a multifactorial condition, commonly prevailing among young adults and a major problem in modern society.^[1] Presence of body asymmetries and postural deviations are considered as significant factors for a person's complaints of musculoskeletal pain and dysfunction.^[2] Posture is the attitude which, is assumed by body parts to maintain stability and balance with minimum effort and least strain on musculoskeletal structures.^[3]

Forward head posture is the deviation from ideal head posture in which the head is positioned anteriorly and the anterior cervical convexity that is cervical lordosis is increased, i.e. adaptive flexion of lower cervical spine with extension of upper cervical spine.^[3] Risk of neck pain may be higher if job requires neck to be held in one position for prolonged periods of time. After spending several hours in different sustain sitting posture, students usually develop forward

head posture in relation to their neck which increases work load on cervical muscles leading to pain and even worse neck posture. One objective method of assessing head posture is through measuring the Craniovertebral angle (CV angle).^[4] The CV angle is an angle formed from a horizontal line that passes through the C7 spinous process and a line passing through the tragus of the ear. In this study if the angle was less than 50°, the participant was considered to have forward head posture.

The selection of 50° as a reference angle was guided by the studies of Diab and Mustafa and Yip et al, with the later reporting 55.02 ± 2.86 as a normal range.^[5] A small angle indicates more forward head posture. The CV angle is a reliable indicator of changes in head and neck posture.^[2] These days, laptop and computer use while sitting a great deal is becoming increasingly popular among students.^[6] The effects of using a computer, keeping a posture of staring at a



monitor, for a long time makes the head moves forward, which causes an exaggerated anterior curve in the lower cervical vertebrae and exaggerated posterior curve in the upper thoracic, which results in the development of forward head posture. Forward head posture has a potential to impair proprioceptive input from neck muscles and contribute to postural control deficits in patients with neck pain.^[3] Szeto et al.^[7] and Moore^[8] stated that maintaining the head forward for long periods of time may cause musculoskeletal disorders such as 'upper crossed syndrome'. Burgess- Limerick et al.^[9] suggested that such posture causes shortening of muscular fibers around Atlanta-occipital articulation and over stretching of muscles around the joints and thus possibly resulting in chronic neck pain.

Silva et al.^[10] reported, in a comparative study with people with and without traumatic neck pain, that patients complaining of non- traumatic neck pain tend to keep the forward head posture, when compared to people without pain. Yoo et al., 2005 tested the CV angle inter and intra rater reliability and they found that using CV angle measure was in excellent category of reliability. The reliability of photographic method of posture assessment was also tested in children by McEvoy and Grimmer, 2005^[11] they found differences between repeated measures of photographed posture in primary school children. In a study conducted by Salahzadeh et al.,^[12] photogrammetric method was found to have a greater reliability to assess Craniovertebral angle values as compared to observational methods. Since there is limited literature available evaluating the relation of head posture and neck pain in physical therapy sciences students this study was conducted with objective to measure and correlate neck pain with forward head posture.

Neck pain is associated with various postural deformities which need our keen attention. This study may help in cost reduction which is associated with musculoskeletal impairments in health and loss of work in future. The objective of this study was to measure and correlate Craniovertebral angle with the forward head

posture and its association with the level of disability and quality of life of these students.

METHODOLOGY

A descriptive cross-sectional study was conducted after receiving approval from Ethical Committee of Riphah College of Rehabilitation Sciences, Rawalpindi (RCRS). The study was completed over duration of 6 months i.e. August 2015 till January, 2015. A signed statement of informed consent was taken from the agreed participants after they were fully briefed about the purpose of the study. 64 female DPT students were selected through purposive non probability sampling according to the specific inclusion criteria. Students aged between 18-25 years with the complaint of neck pain and no other abnormal finding confirmed through our physical examination and using laptops or computers for most of their study hours were included in the study. Students with a history of any congenital postural deformity and uncooperative students were excluded from the study.

All subjects filled out a questionnaire regarding the level of pain they felt due to abnormal posture while performing ADLs. NDI (Neck Disability Index) and SF-36 questionnaire were used to check the severity of neck pain and how it affected the quality of life of these subjects. NDI has been found to be reliable and valid for patients with neck pain. It consists of ten questions that assess the physical functions from which a result is obtained out of total score of 50. The scores to the questions were summed and converted to a percentage score, as recommended. SF-36 was used to collect information about the health status of students suffering from neck pain. We chose question number 23- 31. Each question has a max value of 100 and min value of 0 and some questions had opposite max and min-values. Questions were related to two main interests: Energy/ fatigue and Emotional wellbeing are the components.

PHOTOGRAMMETRIC MEASUREMENT OF CV ANGLE

While each photograph was captured the

participants were instructed to:

1. Maintain the upright, static, natural posture and their arms by their side.
2. Look straight forward.

By following these instructions the student should place the head in the neutral position and if needed, the student was asked to flex & extend the head three times and then rest the head in a comfortable neutral position. Small adjustments were made if necessary. The lateral standing posture was captured while the camera flash was activated to ensure visibility of the markers during the digitizing process. Student's face was covered with paper to hide their lateral view due to ethical considerations.

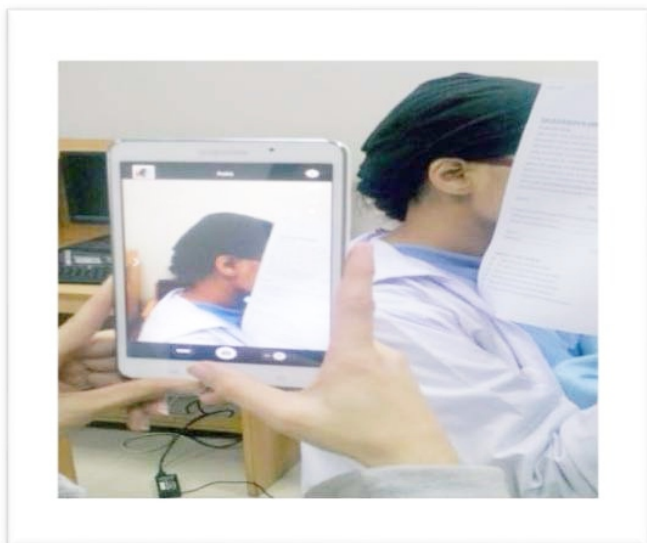


Fig1: Photogrammetric Measurement

GONIOMETRY TO MEASURE CV ANGLE

CV-angle measurement of a student was taken using a universal Goniometer and values recorded on their respective questionnaire to prevent any false readings. The participants were requested to expose their neck and were instructed to do cervical flexion and extension to locate C7 spinous process, it was palpated and identified and an adhesive pin marker was attached over its most prominent part. The participant was asked to maintain the neutral neck position. Another adhesive pin marker was fixed at the tragus of ear (A). The participant was instructed to stand comfortably with her weight distribution evenly on both feet. Goniometer both

axis were placed on C7 and then its one axis was moved towards tragus, and then we adjusted both axis and documented CV angle reading on participant's questionnaire. The CV angle value less than 50° was considered as mild FHP. If values fall below 30° then it was considered as severe form of FHP.



Fig 2: Photograph taken while performing Goniometry

PLUMB LINE

Have the client stand with the plumb line just in front of the lateral malleolus (lower end of the fibula that forms the prominent bulge on the outer side of the ankle). In optimal posture, this line passes through the midline of the knee, the lumbar vertebrae, the shoulder joint, the cervical vertebrae and the earlobe.^[13] Participant was labeled as Forward Head Posture, if tragus of ear lies slightly or moderately anterior to the plumb line.



RESULTS

GENERAL CHARACTERISTICS OF STUDY POPULATION:

Table 1 shows the demographics of the study population with their Mean and standard deviation.

Table 1: Demographics of the study population

Variables	Mean \pm SD
Age (Years)	21.02 \pm 1.46
CV Angle	43.66 \pm 6.89
Photogrammetric CV Angle	40.19 \pm 6.47
NDI	28.92 \pm 14.08
SF-36 (Energy & Fatigue)	45.78 \pm 17.67
SF-36 (Emotional Wellbeing)	66.06 \pm 15.29

Craniovertebral angle measurements

CV-angle measurements as assessed through Goniometry showed maximum students with neck pain had slight postural deformity having mild FHP and fewer students had severe postural deformity as shown in Table 2.

Table 2: Frequencies & Percentages for Craniovertebral Measurements (Goniometric Values)

CV Angle	Frequency (%)
Severe FHP	2 (3.1)
Moderate FHP	18 (28.1)
Mild FHP	32 (50)
Normal	12 (18.8)

Photogrammetric values of CV Angle were measured by taking photographs in sagittal plane. 2 (3.1%) students out of 64 presented with severe FHP. 26 (40.6%) students had moderate FHP, 32 (50%) with mild FHP and 4 (6.3%)

students were having normal values for CVA. The disability level assessed through NDI showed 21 (32.8%) students have minimal disability. 31 (48.8%) had moderate level of disability. 10 (15.6) had severe disability level and 2 (3.1) students had crippling disability. Students were presenting with acute neck pain that is why majority were having moderate symptoms of forward head posture hindering ADLs.

SF-36(Energy & Fatigue), results showed 18 students with 28.1% had least energy and maximum level of fatigue, while 40 (62.5%) experienced some fatigue with some loss of energy and 6 (9.4%) had maximum functioning level.

SF-36 Emotional Wellbeing showed that majority students lie in moderate functioning level, which is (31-70%). Results signifies that only 2 (3.1%) students had least functioning level, 33 (51.6%) had moderate and 29 (45.3%) lie in the category of maximum level of functioning.

Table 3: Non- Parametric Kruskal Wallis Test to find association between CVAngle, Disability Index & Quality of life

	Energy & Fatigue	Emotional Wellbeing	Neck Disability Index
P values	.052	.282	.487

No association was found between Photogrammetric values and Emotional Wellbeing of students with a p value of 0.282. However, Energy & Fatigue and Emotional Wellbeing in students, which signifies an increase in disability level is associated with least functioning capacity.

DISCUSSION

FHP is one in which the head is positioned anteriorly and the normal anterior cervical convexity that is cervical lordosis is increased in comparison with optimal posture. In our study Craniovertebral angle was measured through goniometry and photogrammetric measurements. This method has been



frequently utilized in previous studies and had an excellent inter and intra rater reliability.^[14]

Literature revealed there was a significant difference in the CV angle between subjects with and without neck pain. CV angle was negatively correlated with Neck pain questionnaire, NPQ. The results of our study signify there is moderate negative correlation between CV angle and neck disability. Patients with small CV angle have a greater forward head posture, and the greater the forward head posture, the greater the disability.^[15]

Our study results revealed that students with decreased CVA values having a more incidence of FHP and are subjected to increased incidence of the pain. This is supported by study conducted by Lopez et al.^[16] to compare standing head posture measurements between patients with non-traumatic neck pain (NP) and pain-free individuals. NP patients were found to have a significantly smaller angle resulting in a more forward head posture than pain free-participants.

Patients from a multi-disciplinary university pain clinic experience strikingly low quality of life. Pain catastrophizing showed the strongest association with quality of life, and stronger than pain intensity^[10]. In our study quality of life of these students was not significantly affected, yet energy and fatigue levels of students showed positive changes as associated with neck pain and decreased values of Craniovertebral angle having a p-value (0.052) analyzed using Kruskal Wallis Test. In our study, when the results of NDI were analyzed, it showed that most of the students 31 out of total 64 candidates lie in the category of moderate pain that showed they experience more pain and difficulty with sitting, lifting and standing. Pain level is not restricting their daily activities, and as the condition is in acute stages, they still have maximum functioning capacities.

A study was conducted to investigate the relationship of forward head posture and cervical backward bending to neck pain. The results of this study support the belief that a relationship of forward head posture and cervical backward bending to neck pain exists^[15].

In previous studies, Ming et al,^[17] explored that repetitive use of computers for a an extended period of time and the neck and shoulder pain that can be related to, and caused by computer use. However this was revealed by our study results that heavy computer users are more prone to develop such postural abnormalities in long run and has an impact on their quality of life. CV angles were positively associated with the presence of neck pain. A study suggested that adolescents with neck pain are at high risk of having such symptoms in adulthood.^[18] Life-long chronic neck pain has its origins in childhood. This fact to reduce the prevalence of neck pain in adults, knowledge regarding factors that can predict its onset and persistence in younger population is important. Subjects with slight postural deformities at present can have severe abnormalities in future due to the sustain stress and strain on these postural muscles, and it can result in severe disabilities in future, so the students who attain abnormal sitting postures during most of their study hours are prone to have its future implications.

Our study may provide useful information on which further studies on posture assessment can be based. It may provide a guide in assessing patient's condition to report the absolute angle of change in CV angle as normal CV angle, because of the lack of guidance in the literature. Since the examination of the neck alignment is a routine part of the evaluation of patients presenting with neck pain and abnormalities, knowledge of normal head posture and variability between individuals is fundamental to the interpretation of these observations. This study may provide a helpful way in the cost reduction which is associated with musculoskeletal impairments in health and loss of work in future.

CONCLUSION

There was an association between the forward head posture and the presence of neck pain among students; also there quality of life was affected making them prone to develop severe postural problems in future. There remains a need for further study to understand the effect of



posture on the incidence of musculoskeletal complications especially among student population.

REFERENCES

1. Ariens, G., et al., Are neck flexion, neck rotation, and sitting at work risk factors for neck pain? Results of a prospective cohort study. *Occupational and Environmental Medicine*, 2001. 58(3): p. 200-207.
2. Shaheen, A.A., Supervisor. 2010, King Saud University.
3. Silva, A.G. and M.I. Johnson, Does forward head posture affect postural control in human healthy volunteers? *Gait & posture*, 2013. 38(2): p. 352-353.
4. Silva, A.G., et al., Head posture assessment for patients with neck pain: Is it useful. *International Journal of Therapy and Rehabilitation*, 2009. 16(1): p. 43-53.
5. Ruivo, R.M., P. Pezarat-Correia, and A.I. Carita, Cervical and shoulder postural assessment of adolescents between 15 and 17 years old and association with upper quadrant pain. *Brazilian journal of physical therapy*, 2014. 18(4): p. 364-371.
6. Kang, J.-H., et al., The effect of the forward head posture on postural balance in long time computer based worker. *Annals of rehabilitation medicine*, 2012. 36(1): p. 98-104.
7. Szeto, G.P., L. Straker, and S. Raine, A field comparison of neck and shoulder postures in symptomatic and asymptomatic office workers. *Appl Ergon*, 2002. 33(1): p. 75-84.
8. Moore, M.K., Upper crossed syndrome and its relationship to cervicogenic headache. *J Manipulative Physiol Ther*, 2004. 27(6): p. 414-20.
9. Burgess-Limerick, R., A. Plooy, and D.R. Ankrum, The effect of imposed and self-selected computer monitor height on posture and gaze angle. *Clin Biomech*, 1998. 13(8): p. 584-592.
10. Silva, A.G., et al., Head posture and neck pain of chronic nontraumatic origin: a comparison between patients and pain-free persons. *Archives of physical medicine and rehabilitation*, 2009. 90(4): p. 669-674.
11. McEvoy, M.P. and K. Grimmer, Reliability of upright posture measurements in primary school children. *BMC musculoskeletal disorders*, 2005. 6(1): p. 1.
12. Salahzadeh, Z., et al., Assessment of forward head posture in females: observational and photogrammetry methods. *Journal of back and musculoskeletal rehabilitation*, 2014. 27(2): p. 131-139.
13. Bokaei, F., et al., Comparison of isometric force of the craniocervical flexor and extensor muscles between women with and without forward head posture. *CRANIO®*, 2016: p. 1-5.
14. Ruivo, R.M., P. Pezarat-Correia, and A.I. Carita, Intratester and interrater reliability of photographic measurement of upper-body standing posture of adolescents. *Journal of manipulative and physiological therapeutics*, 2015. 38(1): p. 74-80.
15. Yip, C.H.T., T.T.W. Chiu, and A.T.K. Poon, The relationship between head posture and severity and disability of patients with neck pain. *Manual therapy*, 2008. 13(2): p. 148-154.
16. Lopez-de-Uralde-Villanueva, I., et al., Relationships between craniocervical posture and pain-related disability in patients with cervico-craniofacial pain. *Journal of pain research*, 2015. 8: p. 449.
17. Ming, Z., M. Narhi, and J. Siivola, Neck and shoulder pain related to computer use. *Pathophysiology*, 2004. 11(1): p. 51-56.
18. Puroila, A., et al., Lifestyle Factors in Adolescence as Predictors of Number of Musculoskeletal Pain Sites in Adulthood: A 17-Year Follow-Up Study of a Birth Cohort. *Pain Medicine*, 2015. 16(6): p. 1177-1185.