International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

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Methods to Analyse Forward Head Posture – A Narrative Review

Noel Samuel Macwan[1*] and Tanvi Ashvinbhai Radadiya[2]

1: MPT (PhD), Asst. Professor, College of Physiotherapy, Sumandeep Vidyapeeth, Piparia, Waghodia, Vadodara, Gujarat, India 391760

2: 2nd year MPT Student (2022-2023), College of Physiotherapy, Sumandeep Vidyapeeth, Piparia, Waghodia, Vadodara, Gujarat, India 391760

[*]**Corresponding Author: Dr. Noel Samuel Macwan: EMail: noel.cop@sumandeepvidyapeethdu.edu.in**

ABSTRACT

Background: With the rising demands of computers with the fast growing Information technology Industry, the numbers of hours spent working after computers have also been drastically increased. This in turn have lead to increase in the number of work related musculoskeletal problems related to neck and upper limbs as sitting with the forward head posture in front of computers lead to changes in cervical spine curvature, which if continued for longer duration can lead to Cervical spine degeneration which can thereby lead to forward head posture, during which the head remains forward to the body's line of gravity . Forward headed posture is common in all age groups more prominently found in 25-50 years of age and can be measured by assessing Craniovertebral angle. The purpose of this article is to focus on different methods used to measure the Craniovertebral angle thereby measuring the forward head posture as to best of our knowledge no article have been reported so far which have covered all the methods to measures the Craniovertebral angle in Forward head posture.

Mehtodology: The PUBMED and the other search engine/databases (Cochrane database / EMBASE / PEDro / CINAHL) were searched. Studies including craniovertebral angle & forward head posture assessment were included. Studies done before 2003 were excluded.

Results: Total 22 relevant studies were found. After removing the duplicates, articles with abstract only and articles published in language other than English, 12 relevant studies meeting the Inclusion criteria were reviewed in detail as they measured CVA for assessment of Forward head posture & neck posture.

Conclusion: With this review it is found that the FHP assessment for CVA is valid and reliable outcome measure. There are different methodologies that are used to assess the CVA which are reliable and valid.

Keywords: Cranio-vertebral angle, Forward head posture, cervical spine curvature, musculoskeletal problems, Computer

INTRODUCTION

Software industry is developing very rapidly nowadays. Approximate numbers of computers per 1000 population are 6 with an installation of 18 million Personal Computers and it is increasing with the time. In every field there is requirement of computer work. India has been forefront in providing major services into the cyber world with information technology industry [1].

Individuals spend more time on the computer in a day in recent times, which results in poor posture, causing neck pain [2]. Musculoskeletal disorders related to the neck and upper limbs are very common among people working on computers, and also with the working hours on the computer [3].

Constant pressure on the cervical spine by working in front of the computer for longer duration, changes the normal spinal curves. It may lead to degenerative changes in joints of cervical spine, and may cause forward head posture (FHP) [4]. Out of 3 in 2 subjects Forward head posture is observed as a common unstructured postural disorder as when the head is held forward to the body's line of gravity [5].

Characteristic feature of FHP is hyperextension of the upper cervical spine (C1 to C3) and flexion of the lower cervical spine (C4 to C7). Also associated with increased cranial rotation angle, and decreased craniovertebral angle (CVA) [6]. CVA is formed at the intersection of horizontal line passing through the C7 spine and tragus of ear [7].

FHP is common in all age groups with mean age in males is 22-44 years with normal CVA about 48.8 degrees, mean age in females is 23-66 years with normal CVA about 47.6 degrees. Normal CVA is 49.9 degrees [8].

The aim of this review was to study the different methodology to measure CVA to assess the FHP.
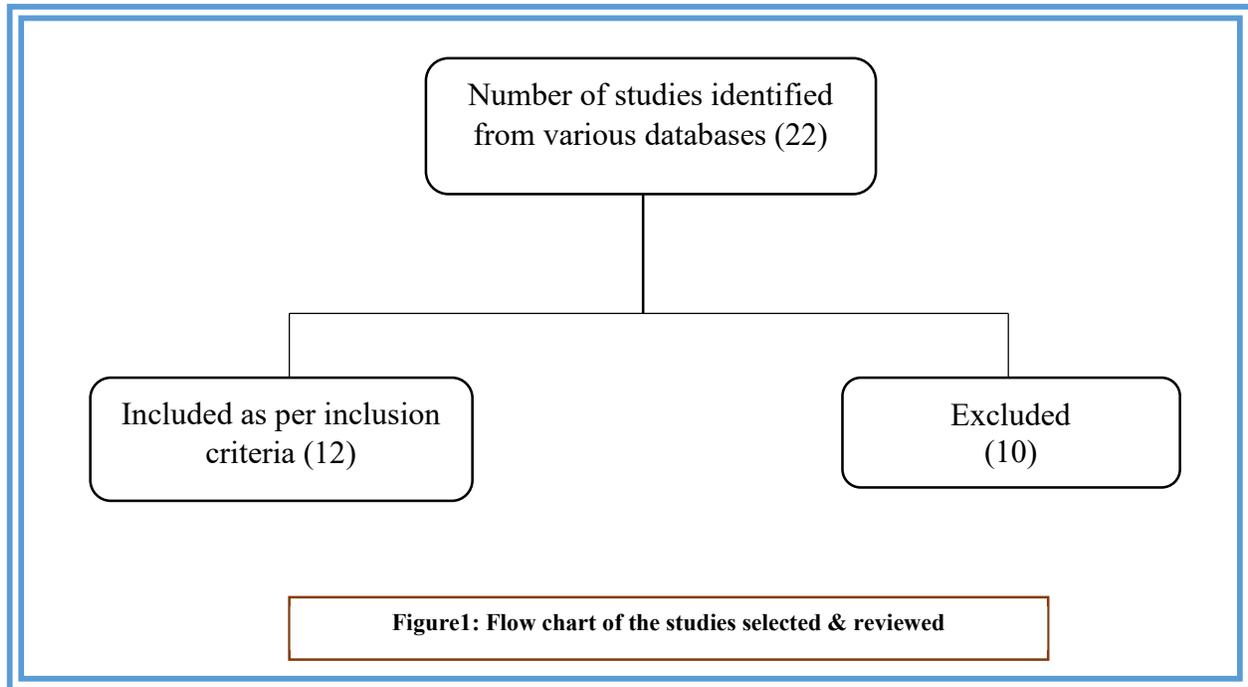
METHODOLOGY

The PUBMED and the other search engine/databases (Cochrane database / EMBASE / PEDro / CINAHL) were searched. The key words used were – Craniovertebral angle, forward head posture, Computer workers, Neck pain, Neck posture.

Inclusion criteria

- Studies including craniovertebral angle & forward head posture assessment

Exclusion criteria

Studies done before 2003.

Number of studies identified from various databases (22)

Included as per inclusion criteria (12)

Excluded (10)

Figure1: Flow chart of the studies selected & reviewed

RESULTS

12 studies were considered suitable & reviewed in detail. They measured CVA for assessment of FHP& neck posture **(Table 1)**.

Table 1: Authors, year of publications, sample size, method

Sr. no.	Title	Author	Sample size	Method used to measure CVA
1	**Modified Universal Goniometer for Objective Assessment of Forward Head Posture in Clinical Setting [7]**	**Rajashree V Naik, *et al* (2018)**	**23**	**Modified Universal goniometer**
2	**Measurement of craniovertebral angle by the Modified Head Posture Spinal Curvature Instrument: A reliability and validity [9]**	**Arun Vijay Subbarayalu, *et al* (2016)**	**85**	**Modified Head Posture Spinal Curvature Instrument**
3	**Reliability of photographic posture analysis of adolescents [10]**	**ZeynepHazar, *et al* (2015)**	**30**	**MB ruler software version: MB ruler pro**
4	**Assessment of forward head posture in females: Observational and photogrammetry methods [11]**	**Zahra Salahzadeh, et al (2014)**	**78**	**Digital imaging technique**
5	**Reliability of the Craniocervical Posture Assessment: Visual and Angular Measurements using Photographs and Radiographs [12]**	**Inae C. Gadotti, *et al* (2013)**	**39**	**Alcimage software**

6	Detecting and Preventing Forward Head Posture with Wireless Inertial Body Sensor Networks [13]	Taeyoung Kim, *et al* (2011)	4	Wireless Inertial Body Sensor Networks
7	Relationships between sagittal postures of thoracic and cervical spine, presence of neck pain, neck pain severity and disability [14]	Kwok Tung Lau, *et al* (2010)	92	Body Posture Analyzer software
8	Postural Assessment Software (PAS/SAPO): Validation And Reliabiliy [15]	Elizabeth Alves G. Ferreira, *et al* (2010)	22	Postural Assessment Software (PAS/SAPO)
9	Reliability of a Photographic Method for Assessing Standing Posture of Elementary School Students [16]	Jelena Paušić, *et al* (2010)	Convenient	UTHSCSA image tool 0.3 software
10	Clinical measurement of craniovertebral angle by electronic head posture instrument: A test of reliability and validity [17]	Herman Mun Cheung Lau, *et al* (2008)	52	Electronic Head Posture Instrument (EHPI)
11	Photographic measurement of upper-body sitting posture of high school students: A reliability and validity study [18]	Sjan-Mari van Niekerk, *et al* (2007)	39	X-ray
12	Reliability Of Measuring Natural Head Posture using the Craniovertebral Angle [19]	Joe Brunton, *et al* (2003)	29	Coutts overlay sheet technique

DISCUSSION

Joe Brunton, *et al* (2003) in a study concluded that CVA provides a convenient and reliable method of measuring head protraction and could be used more extensively in conjunction with other head / neck posture measures like flexion, extension, or ear-eye line angles to better evaluate working postures, especially those involving computer work and visual inspection tasks. The ICC 0.98 of high examiner reliability value is showed [19].

Sjan-Mari van Niekerk, *et al* (2007) in a study showed validation and reliability of photographic measurement of FHP in positions of spine in sitting. It is important to know whether patient is showing true progression to a postural intervention clinically. Based on the results of the study,

the Photographic Posture Analysis Method can be used in practice as a valid measure of sitting posture [18].

Kwok Tung Lau, *et al* (2010) in a study concluded that the photographic method used in the study showed a high intra-rater and inter-rater reliability in measuring the sagittal postures of thoracic and cervical spine (ICCs ranged from 0.80 to 0.87) [14].

Jelena Paušić, *et al* (2010) in a study also concluded that there is high interitem reliability of for the assessment of postural alignment by photographic method [16].

Inae C. Gadotti, *et al* (2013) in a study concluded that the photogrammetry intra-rater and inter-rater reliability. The intra-rater reliability was ICC of 0.98 to 0.99. Inter-rater reliability was ICC of 0.91- 0.99 [12].

Herman Mun Cheung Lau, *et al* (2008) in a study concluded that Electronic Head Posture Instrument (EHPI) was valid in measuring the CVA. There was a high degree of test–retest reliability in measuring the CVA for both the normal subjects and those with neck pain. The intra-rater (ICC 0.86-0.94) and inter-rater (ICC 0.85-0.91) reliability of the EHPI for CV angle measurement for both groups of subjects were high. The CVA of subjects with neck pain was significantly smaller than that of the normal subjects. With demand for evidence-based practice, a valid and reliable outcome measure tool should contribute to better clinical evaluation [17].

Elizabeth Alves G. Ferreira, *et al* (2010) in a study stated that PAS/SAPO is accurate for measuring angles and distances and has good inter-rate and intra-rater reliabilities, and to be considered a useful and reliable tool posture measurement [15].

Taeyoung Kim, *et al* (2011) in a study concluded that the overall precision and accuracy were 88.2% and 94.5%, respectively, which effectively detects FHP by using accelerometer-based wireless inertial body sensors, for continuous monitoring [13].

Zahra Salahzadeh, *et al* (2014) in a study concluded that that there is an association between the observational assessment and CVA methods for assessing FHP. The head tilt angle and head position angle may not detect as efficiently as craniovertebral angle in the subjects with moderate-severe and non FHP. Meanwhile craniovertebral angle, head tilt angle and head position angle have excellent inter rater and intra rater reliability to measure FHP in healthy females. Substantial intra-rater agreement by one rater was there in observational assessment of FHP [11].

Zeynep Hazar, *et al* (2015) in a study concluded that ICC values found for all of the 5 angles (cranio-vertebral, cranio-horizontal, lumbar, and sway angles) were in category like "acceptable" or "excellent" groups, which showing MB-ruler method reliability [10].

Arun Vijay Subbarayalu, *et al* (2016) in a study concluded that the intra-rater reliability (ICC) of the Modified Head Posture Spinal Curvature Instrument (MHPSCI) is 0.87 (CI range from 0.82–0.91) and the inter-rater reliability between the two raters is 0.76 (CI range from 0.65–0.84) which is graded as "good" in the reliability criteria. Moreover, the MHPSCI is found to be clinically valid as it demonstrates a significant difference in the CV angle between normal and postural neck-pain subjects. Thus, the results of this study indicate that the MHPSCI is a reliable and valid tool to measure head posture [9].

Rajashree V Naik, *et al* (2018) in a study concluded that the modified goniometer is a simple modification of the universal

goniometer which is cost-effective, for routine use by physiotherapists. Inter-rater reliability was quantified by interclass correlation coefficients (ICCs) for consistency of measurement using Cronbach's alpha which is 0.893 showing good internal consistency. It is a reliable method for objective assessment of forward head posture in daily clinical physiotherapy practice as a reliable high-end equipment alternative which may not available always [7].

CONCLUSION

The review suggests that for the FHP assessment CVA is valid and reliable measure. Different methodologies are used to assess the CVA which are reliable and valid.

CONFLICT OF INTEREST:

"The authors have no conflict of interest to report".

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