

Disabilities of Arm, Shoulder and Hand In Adult Population With Forward Head Posture

Discapacidades de brazo, hombro y mano en población adulta con postura de cabeza adelantada

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Received: 14-07-2023

Revised: 05-10-2023

Accepted: 02-01-2024

Published: 03-01-2024

How to Cite: Garg K, Chahal A, M Alshehri M, A AlAjam R, BEG RAB, Saravana Kumar N, Abu Shaphe M, M Ahmed M. Disabilities of Arm, Shoulder and Hand In Adult Population With Forward Head Posture.: Assessment of Disabilities with Forward Head Posture. Interamerican Journal of Health Sciences. 2024;4:83. <https://doi.org/10.59471/ijhsc202483>

ABSTRACT

Introduction: forward Head Posture is an abnormal postural deviation giving appearance of poking chin involving flexion of lower cervical vertebrae followed by extension of upper craniocervical segment of vertebral column in sagittal plane. The aim of this study was to evaluate disabilities of Arm, Shoulder and Hand in an adult population with a forward head posture.

Method: in this study, 76 subjects, both male and female with Forward Head Posture (FHP) were recruited by a convenience sampling method. Demographic characteristics (Name, age, gender) and anthropometric characteristics (height, weight and Body Mass Index) were recorded. Extent of FHP and disability of upper extremity were assessed by measuring Cranio-Vertebral Angle (CVA) through a photogrammetric method and Disabilities of Arm, Shoulder and Hand (DASH) questionnaire respectively.

Results: spearman's correlation coefficient was used to assess the correlation between FHP and CVA. The study results depict a non-significant association between CVA and DASH.

Conclusion: the present study concludes, FHP does not cause disabilities of upper extremity in an adult population.

KEYWORDS

Anthropometry, Body Mass Index, Forward Head Posture, Cranio-Vertebral Angle, Disabilities Of Arm Shoulder And Hand.

RESUMEN

Introducción: la Postura de Cabeza Adelantada es una desviación postural anormal que da la apariencia de un mentón hundido y que implica la flexión de las vértebras cervicales inferiores seguida de la extensión del segmento craneocervical superior de la columna vertebral en el plano sagital. El objetivo de este estudio era evaluar las discapacidades de brazo, hombro y mano en una población adulta con una postura de cabeza adelantada.

Método: en este estudio, 76 sujetos, tanto hombres como mujeres con Postura de Cabeza Adelantada (PCD) fueron reclutados mediante un método de muestreo por conveniencia. Se registraron las características demográficas (nombre, edad, sexo) y antropométricas (altura, peso e índice de masa corporal). La extensión de la PSF y la discapacidad de la extremidad superior se evaluaron midiendo el ángulo cráneo-vertebral (ACV) mediante un método fotogramétrico y el cuestionario de discapacidad de brazo, hombro y mano (DASH), respectivamente.

Resultados: se utilizó el coeficiente de correlación de Spearman para evaluar la correlación entre el FHP y el CVA. Los resultados del estudio muestran una asociación no significativa entre CVA y DASH.

Conclusiones: el presente estudio concluye que la FHP no causa discapacidades de la extremidad superior en una población adulta.

PALABRAS CLAVE

Antropometría, Índice De Masa Corporal, Postura De Cabeza Adelantada, Ángulo Cráneo-Vertebral, Discapacidad De Brazo Hombro Y Mano.

INTRODUCTION

Presence of a Postural dysfunction represent one step forward by increasing level of difficulty to execute tasks required in quotidian routine. Considering a human body as a building with a lot of pillars, disturbance in architecture of a pillar does influence stability of the other. Likewise, different regions of human body depend on each other for their optimal functions.⁽¹⁾ Fascial links lay foundation for connection between different segments of human body. The body is regarded as a single unit which demand global observation. An abnormal state of a segment impacts nearby joints ability to function well at least to some level. Postural fatigability is one of the reasons to reduce efficiency of an individual. Ignorance in positive attitude towards ergonomics among adult population predispose them to develop a compensated posture with increased muscular effort. COVID-19 pandemic has altered the pattern of living. The greater usage of mobile phones, laptops and other devices to stay in communication with the world consequently lead to a deskbound life. In this era, students to industrialists, everyone is spending time in sitting posture following which slouch sitting is common adaptation while working. Cervical postural alteration following reading, studying and other activities in order to maintain appropriate gaze cause an anomalous alignment of cervical vertebrae with respect to each other.⁽²⁾ Flexed position of head is commonly adapted by individuals while using electronic gadgets like mobile phones for extended time period which put more stress on craniocervical musculature. Abnormal muscular imbalance at craniocervical region exist to neutralize torque created by deviated cervical posture. Low level of screen height with respect to head position predispose individual to develop aberrant posture of cervical spine in sagittal plane. Protruded position of neck in neutral position is commonly adapted by individuals. This position if hold for quite a long time makes one more susceptible to have Forward Head Posture (FHP).⁽³⁾

FHP is an abnormal postural deviation giving appearance of poking chin involving flexion of lower cervical vertebrae followed by extension of upper craniocervical segment of vertebral column in sagittal plane.^(4,5) It is accompanied by upper cross syndrome.⁽⁶⁾ Forward head posture is also regarded as “turtle neck”, “text neck”, and “reading neck”.⁽⁷⁾ Bones, joints, intervertebral discs, spinal nerve roots, muscles, and ligaments are undesirably affected due to disturbance in vertebral column. This pattern involves shortening of levator scapulae, upper trapezius muscle, pectoralis major, pectoralis minor, sternocleidomastoid muscle, cervical erector spinae and suboccipital muscles.⁽⁶⁾ As these muscles develop hypertonicity, antagonistic muscles get weakened relatively. It involves deep neck flexors, middle trapezius, lower trapezius and serratus anterior muscle. FHP renders the dynamics of cervical spine and also impact upper extremity.⁽⁸⁾ FHP exhales increased load on cervical region. Mechanical stress on the musculature further cause developmental active Trigger point (TrP).⁽⁹⁾

Factors like poor respiration, allergies, hormonal imbalance, improper intake of nutrition, infection drift the process to induce TrP activity. Travel and simons describes that beside these factors along with, mechanical stress is a common cause to enhance the activity of TrP. TrP present in tight muscles involved in FHP produce pain sensation at different region of upper extremity. The stress imposed on cervical spine vary with relative position of head with respect to body in space. Scapular movement also suffered higher stress imposed by components of cervical region.⁽¹⁰⁾

FHP not only stress as musculoskeletal structures, but also influence neural structures and viscera as well.^(11,12) It also impacts respiratory efficiency of an individual negatively by decreasing the vital capacity up to 30 %.⁽⁷⁾ FHP increases vocal fatigability,⁽³⁾ Headache is a common complaint from patients with a forward head posture.^(13,14) In addition, Cervicogenic headache occur due to compression of greater occipital nerve by over activity of spinalis capitis muscle commonly involved in FHP. Recent studies show correlation between temporomandibular joint dysfunction and FHP.⁽¹⁵⁾ Some studies also depict prevalence of postural imbalance in patients with depression and other psychosocial conditions.⁽¹⁶⁾

Cranio-Vertebral Angle (CVA) get decrease from 49,9° which leads to increase compressive loads on tissues at cervical vertebral region.⁽⁷⁾ Excessive loads on the cervical spine render the morphology of it and drift up age

related process i.e. degeneration.⁽⁴⁾ It also lead to enhance osteophyte formation. Eventually, greater amount of stress cause deterioration of height of intervertebral discs. All these events influence neurological structure also. Outcome of these changes not only produce impairments locally but also render activity of distal parts. Irritation of neural structure at the site of origin i.e. intervertebral foramen at cervical region is responsible for symptoms of pain and altered sensation down the upper extremity.

Some studies states that presence of FHP enhances susceptibility for entrapment of nerves of upper extremity at periphery.⁽¹⁷⁾ Centre of gravity get shifts from normal and large amount of stress exists not only at axial skeleton but also on appendicular skeleton. The myofascial cables form a network from region of cervical spine to tip of fingers in hand. Complex Aberrant framework of axial skeleton compromise functioning of appendicular skeleton. Various studies concluded no association between upper limb physical parameters and CVA. In contrast to it, hand grip strength affected due to different neck positions. FHP results in malalignment like RSP which alters the pattern of muscle activation. It results in pain and range of motion limitation. Hence the association between FHP and Upper limb function is not yet clear. Very little evidences are available to correlate the performance of upper extremity with FHP.⁽⁸⁾ Therefore this study was planned to evaluate disabilities of arm, shoulder and hand in an adult population with a forward head posture.

METHODOLOGY

Participants

In this study 76 subjects, both male and female with FHP were recruited by convenience sampling. The participants with history of trauma involving cervical region or upper extremity, any illness to upper extremity, any illness involving cervical region, neck pain and any Respiratory illness were excluded from the study. Neck pain and upper limb function pain are the common symptoms of large number of different pathological conditions. Individuals with neck pain, upper limb pain require detailed assessment. Hence, the asymptomatic individuals were selected for the study. Adult individuals were involved in this study after obtaining a satisfactory consent. All the benefits, harms and procedure involved in study were explained in detail.

Measurement

Demographic characteristics (Name, age, gender) and anthropometric characteristics (height, weight and Body Mass Index) were recorded. Participants were assessed for CVA and DASH. Normal CVA is 49.9° . CVA less than it is considered as FHP.⁽⁷⁾

Procedure

Participants were assessed for CVA measurement via Photogrammetry method which involves application of marker on C7 vertebra after palpation and photo clicked for lateral view of cervical spine by a camera. CVA is measured by using a suitable software named "Kinovea". Based on CVA, subject with FHP was included in current study. Participants were asked to fill Disabilities of Arm, Shoulder and Hand (DASH) questionnaire. The DASH score was recorded and later data analyzed to evaluate the disability of upper extremity due to the presence of FHP.

Statistical analysis

The main researcher examined and entered the collected data. The statistical analysis of data was done using SPSS version 16.0. Kolmogorov – Smirnov test was used to check the normality of data which was found to be not normally distributed. Hence non-parametric test, Spearman's correlation coefficient was used to assess the correlation between FHP and CVA.

RESULTS

Total seventy-six subjects participated in this study. All the participants were assessed for Cranio-vertebral angle. Participants with forward head posture were analyzed for DASH Score. Kolmogorov-Smirnov test was used to check the normality of data which was found to be violated. Hence non-parametric test, Spearman's correlation coefficient was used to assess the correlation between FHP and CVA.

Spearman's correlation coefficient shows that there is no statistically significant relationship between CVA and DASH in adult population.



Figure 1. Measuring CVA by Kinovea software

| Table 1. Overall demographic characteristics of participants | | |
|--|------------------------|---------|
| Variables | Values | p-value |
| Age (years) | 21 (18,00 – 28,00)* | 0,001** |
| Weight (kg) | 58,00 (42,00 – 82,00)* | 0,04** |
| Height (m) | 1,61 (1,37 – 1,76)* | 0,001** |
| BMI (kg/m ²) | 21,99 (16,39 – 34,13)* | 0,001** |

*= Values in Median (Inter-Quartile Range)
 **= p-value<0,05 shows that data in not normally distributed

| Table 2. Descriptive statistics for variables | | |
|---|------------------------|---------|
| Variables | Values | p-value |
| CVA | 46,00 (33,00 – 49,00)* | 0,001** |
| DASH | 7,45 (00 – 43.96)* | 0,003** |

*= Values in Median(Inter-Quartile Range)
 **= p-value<0,05 shows that data in not normally distributed

| Table 3. Correlation between CVA and DASH score | | |
|---|-------|---------|
| Variables | P | p-value |
| DASH | -0,27 | 0,817 |

ρ = Spearsman’s correlation coefficient, p-value set as <0,05 as level of significance

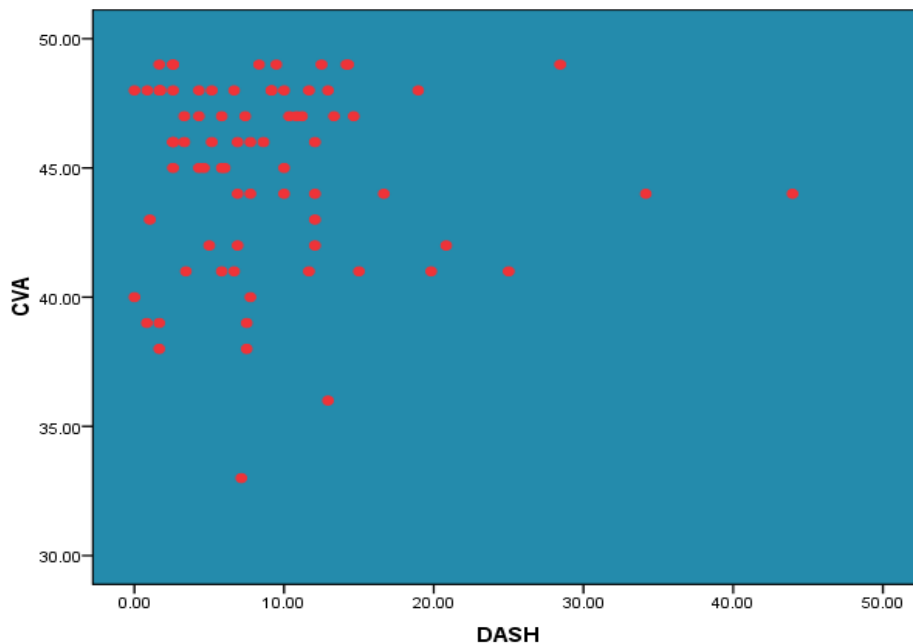


Figure 2. Scatter diagram displaying the correlation between CVA and DASH score

DISCUSSION

The purpose of present study was to evaluate the disability of arm, shoulder and hand in adult population with forward head posture. The adults are more prone to develop FHP because of increase screen time which gets drifted in COVID era. In older population, the prevalence of disability is high due to ageing effects. Hence, adult population is selected for the current study. A total 76 participants were involved for analysis. Kolmogorov - Smirnov test was used to check the normality of collected data. As the data was not normally distributed, spearman's correlation coefficient was used to analyze the relationship between CVA and DASH. Negligible research report effect of FHP on ability of upper extremity to function well in adult Indian population. Data analysis of the current study shows no significant disability of upper extremity caused due to FHP. The dysfunction is not tend to be severe enough to cause distal disability signifies lack of correlation between upper extremity function and reduced CVA. There is no correlation between DASH score which represent disability of upper extremity and CVA as a measure of extent of FHP as shown by Spearman's correlation coefficient. This reveals no marked disabled effect seen in adult population due to FHP.

This study provides evidence supporting the conclusion drawn by many studies; reduced CVA is not severe enough to affect functions of hand, elbow and shoulder joint. In addition, no significant correlation was noticed between CVA and neck disability index in female participants concluded FHP is not a severe dysfunction to produce any disability of neck. FHP does not produce local disability and hence cannot produce disability of distal region.⁽¹⁸⁾ However, this study and current study separately evaluate the effect of FHP on neck and upper arm functionality respectively. Combined evaluation of neck and upper limb function affected due to FHP can be studied with newly developed scales as Gartner et al. describe the significance of Cervical Radiculopathy Impact Scale to assess the upper arm and neck region combinely for cervical radiculopathy patients.⁽¹⁹⁾

The results of the present study go parallel in hand with results of study by Mosa (2017) favoring no significant correlation to found between upper limb, upper arm, hand, forearm length with mid-arm circumference and CVA. No marked association was found between Upper arm parameters and CVA.⁽²⁰⁾ Smith et al. found significant reduction in isometric elevation strength of the shoulder during protraction or retraction. On either protraction or retraction, isometric elevation strength of shoulder joint reduced. Hence, shoulder joint strength not being affected due to scapular position and hence no disability of shoulder joint occurred with change in scapular position.

Thus, findings of this study define the lack of correlation between CVA and DASH.⁽²¹⁾ Amina et al. stated hand grip strength in males and females to be affected with different neck positions and with neutral position of neck, grip strength was maximum.⁽²²⁾ Their result come in opposition of the present study. A recent study titled "Effect of forward head and rounded shoulder posture on hand grip strength in asymptomatic young adults: a cross sectional study" shows no correlation between CVA and handgrip strength which indicates hand muscles were not affected due to FHP and hence no disability related to hand functions is noticed in present study.⁽²³⁾ The controversy is

answerable by following reasons. Firstly, subjects involved in present study were asymptomatic and belonged to adult age group. Secondly, CVA was not severe enough to induce distal alterations.

CONCLUSION

The Current study reveals no significant correlation between CVA and DASH of adult population. This concludes, FHP does not cause disability of upper extremity in adult population.

Limitations: The current study has small sample size. The Study was restricted to only one geographical distribution. Upper extremity muscle strength was not measured.

Future research direction: Current study involved the subjects aged between 18-35 years, hence results are not applicable for old age subjects. Effect of CVA on upper extremity functionality in old age group can be answered by further research. Small Sample size did not find any association between CVA and DASH. It is suggested to conduct similar study with large sample size. Future studies are suggested to include subjects based on BMI and divide them accordingly to analyze the variant effect of FHP due to BMI on upper extremity function, however the result of present study can be used as a first rung of ladder to reach top results in future.

Clinical Implications: FHP is not a risk factor for upper limb dysfunction. Upper extremity disability is not induced by axial skeleton postural abnormality in absence of any underlying pathology. When dealing with Upper limb disability, regional factors other than posture of cervical spine should be given preference as a cause.

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CONFLICTS OF INTEREST

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. We confirm that none of the authors have any conflicts of interest or other relevant disclosures pertaining to this manuscript.

FINANCING

None.

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