

**RESEARCH
ARTICLE**

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The Distribution and The Related Factors of Forward Head Posture Among Medical Students

ABSTRACT

Objective: Forward head posture (FHP) is becoming common in medical students who study for long durations with wrong postures due to intensive curriculum. This study was conducted to determine the frequency of FHP and related factors in medical students.

Methods: The first and second-year medical students filled out the questionnaire including sociodemographic characteristics, activity status, Smartphone Addiction Questionnaire, Beck Depression, Body Awareness, and Perceived Stress Scales after their verbal consent was obtained. FHP and craniovertebral angle values were measured.

Results: 47% of the students had highly severe (≥ 5 cm), 46.2% had severe FHP (2.5-5 cm), and 6.8% had mild FHP. The mean CVA (Costovertebral Angle) values were determined as 44.31 ± 4.31 . The frequency of students whose CVA values are below 45° is 59.3% (140 people). The frequency of highly severe FHP was also found as high in the taller, in males, and in the students with high BMI. In the regression model examining the situations that increase the risk of severe FHP, it was found that depression increased the risk of FHP 2.5 times.

Conclusions: FHP was found to be very common (90%) in medical students. FHP was found to be more severe in students with high depression scores.

Keywords: Forward Head Posture, Medical Student, Beck Depression Scale, Smartphone Addiction Scale.

Tıp Öğrencileri Arasında İleri Kafa Duruşunun Dağılımı Ve İlişkili Olduğu Faktörler

ÖZET

Amaç: İleri kafa duruşu (Forward Head Posture-FHP), yoğun müfredat nedeniyle uzun süre yanlış duruşlarla çalışan tıp öğrencilerinde yaygınlaşıyor. Bu çalışma tıp öğrencilerinde FHP sıklığını ve ilişkili faktörleri belirlemek amacıyla yapılmıştır.

Gereç ve Yöntem: Birinci ve ikinci sınıf tıp öğrencileri, sosyodemografik özellikler, aktivite durumu, Akıllı Telefon Bağımlılığı Anketi, Beck Depresyon, Beden Farkındalığı ve Algılanan Stres Ölçeklerini içeren anketi sözlü onamları alındıktan sonra doldurdu. FHP ve kraniovertebral açı değerleri ölçüldü.

Bulgular: Öğrencilerin %47'sinde çok şiddetli (≥ 5 cm), %46,2'sinde şiddetli FHP (2,5-5 cm) ve %6,8'inde hafif FHP saptandı. Kraniovertebral açı (Craniovertebral Angle-CVA) değerleri ortalama 44.31 ± 4.31 olarak tespit edildi. CVA değeri 45° 'nin altında olan öğrencilerin oranı %59,3'tür (140 kişi). Uzun boylularda, erkeklerde ve BKİ'si yüksek olan öğrencilerde de oldukça şiddetli FHP sıklığı yüksek bulundu. Şiddetli FHP riskini arttıran durumların incelendiği regresyon modelinde depresyonun FHP riskini 2,5 kat arttırdığı saptanmıştır.

Sonuç: Tıp öğrencilerinde FHP'nin çok yaygın (%90) olduğu saptanmıştır. Depresyon skoru yüksek olan öğrencilerde FHP'nin daha şiddetli olduğu saptanmıştır.

Anahtar Kelimeler: İleri Kafa Duruşu, Tıp Öğrencisi, Beck Depresyon Ölçeği, Akıllı Telefon Bağımlılık Ölçeği.

INTRODUCTION

The rapidly increasing FHP (forward head posture) in modern society is the excessive protrusion of the neck to the anterior of the body (1). The load put on the muscles in the back and neck area increases by 0.45 kg with every 2.5 cm forward positioning of the head that may result in muscle imbalances, posture impairments and FHP which can lead to soft tissue damage, pain in the neck and scapular area, tenderness at associated sites and headaches (2). The prevalence of having FHP in patients with neck pain was found to be 37% in a study (3) suggesting that the correct neck posture is directly related to reducing neck pain. FHP may occur by prolonged use of mobile phones, chairs and beds that do not have good ergonomics, lack of exercise, excessive learning activities and heavy school bags (4). Medical students spend long durations studying at the desk or on the computer due to intensive curriculum which may cause incorrect posture habits without ergonomic conditions.

FHP was found to be higher in people with depression, and a change in posture was observed when depression improved (5). There are studies in the literature that found a relationship between perceived stress, body awareness, depression, head and neck posture, and FHP (6-8). But there is no study examining all these together. Therefore, the aims of this study are; to reveal the prevalence of FHP among medical faculty students, to explore the distribution of FHP; to investigate the relationship between perceived stress, depression, body awareness, head and neck posture.

MATERIAL AND METHODS

This descriptive cross-sectional study which was approved by Sakarya University Faculty of Medicine Ethics Committee (Approval number: 71522473/050.01.04/28) was conducted in 1st and 2nd grades of medical faculty. According to Yeom et al. two methods can be used to detect FHP (1).

There is FHP if the imaginary line between the tragus of the ear and the middle of the shoulder is not on the same line when viewed from the side. And the horizontal length between that two vertical lines indicates the severity of FHP. The level of FHP is classified as slight/severe/highly FHP according to that horizontal length. The slight FHP is accepted as between 1cm-2.5cm, severe FHP between 2.5cm-5cm, and highly severe FHP 5 cm and above (1).

As a second objective method that provides information about FHP is the craniovertebral angle (CVA) which is the angle between the horizontal line passing from the tip of the spinous process of the seventh cervical vertebra and the imaginary line directed from that tip to the tragus of the ear on the same side (9). CVA can be measured by a goniometer or through photographs taken from a side of a person (9,10). There is no cutoff value for CVA but the smaller the CVA, the more severe the

FHP grade (3). The average CVA measured in FHP patients is less than 45° (11).

The students also filled a questionnaire asking sociodemographic characteristics, height, body mass index (BMI), weekly average sitting time, standing time, activity status, Beck Depression Scale, Body Awareness Scale, Perceived Stress Scale, and Smartphone Addiction.

Measurements with a goniometer were made by one person and the questionnaires were conducted under observation.

Statistical Analyses: The variables were investigated using analytical methods (Kolmogorov Smirnov test) to determine distribution. Descriptive analysis was defined using means and standard deviations if the variables were normally distributed. Categorical variables were specified as numbers and percentages. Continuous variables were shown as median (25th – 75th) percentiles. Mann Whitney U test was used for comparisons of the not normally distributed data, Student's t test was used in normally distributed data. Logistic regression analysis were used to determine independent predictors of FHP. Hosmer Lemeshow goodness of fit statistics were used to assess model fit. Statistical analyses performed using the SPSS 21.0 software version.

The Evaluation Scales: The Beck depression scale is a self-rating scale consisting of 21 items that evaluate the behaviors in the last week and the risk of depression (12). Categorically, 0-9 points are indicators of minimal depression, 10-16 mild depression, 17-29 moderate depression, 30-63 severe depression. Turkish validity and reliability study has been done (13).

The body awareness scale, developed by Shields et al. in 1989 (14) was asked via the questionnaire having 18 items that scored between 1 and 7 points for each. The higher the score, the better the body sensitivity (14). Turkish validity and reliability have been made for the questionnaires (15).

The perceived stress scale, developed by Cohen et al. aims to measure perceived stress in the last month (16). Cronbach Alpha value was found 0.86 in the reliability study (16). Its Turkish validity and reliability study was conducted (17). In the questionnaire, the total score is between 0-32.

Smartphone Addiction Scale: Smartphone Addiction Scale is a Likert-type scale developed by Kwon et al. in 2013 to measure the risk of smartphone addiction in adolescents (18). Total score is between 10 and 60. As the severity of smartphone addiction increases, the score obtained from the scale increases. In the Korean sample, the cut-off score was reported as 31 for men and 33 for women (18). The Turkish validity and reliability study was conducted (19).

RESULTS

In our study, the average age was 20.06 ± 1.33, and 45% of them were male. The incidence of

highly severe FHP in males is higher than in females ($p < 0.001$). The severity of FHP was significantly

higher in those with higher BMI and those who were taller ($p < 0.001$; $p < 0.001$, respectively) (Table 1).

Table 1. The distribution of sociodemographic and some personal characteristics (n=242)

Features	FHP (< 5 cm) n (%)	FHP (\geq 5 cm) n (%)	p
Sociodemographic and some personal characteristics			
Gender (n(%))			
Male	41 (32.8)	64 (57.7)	<0.001*
Female	84 (67.2)	47 (42.3)	
Age Median (1.- 3.pc.)	20.0 (19.0-20.5)	20.0 (19.0-21.0)	0.289**
BMI (m2/kg) (1.- 3.pc.)	21.2 (19.7-23.1)	23.4 (20.9-24.8)	<0.001**
Height (m) (1.- 3.pc.)	167.0(161.5-175.0)	175.0 (165.0-181.0)	<0.001**
Chronic disease(n(%))			
Yes	9 (7.3)	12 (11.1)	0.308*
No	115 (92.7)	96 (88.9)	
Activities and physical activity habits			
Average studying duration except school time (Median (1.-3. pc.))	2.00 (1.00-3.00)	2.00 (1.00-3.25)	0.211**
Average sitting time on weekdays (Median (1.-3. pc.))	8.00(6.00-10.00)	7.50(6.00-10.00)	0.459**
Average sitting time over the weekend (Median (1.-3. pc.))	8.00(5.00-10.00)	7.00(5.00-10.00)	0.419**
Average time using a computer, mobile phone (Median (1.-3. pc.))	4.00 (3.00-5.00)	3.00 (3.00-5.00)	0.094**
Exercising regularly in the last five years			
No exercise	69 (58.5)	57 (52.8)	0.389*
Exercise done	44 (37.3)	44 (40.7)	
Still ongoing	5 (4.2)	7 (6.5)	
Average standing time per day (hours) (Median (1.-3. pc.))	3.00 (2.00-5.00)	3.00 (2.00-4.00)	0.179**
Average continuous head flexion per day (hour) (Median (1.-3. pc.))	3.00 (2.00-5.00)	3.00 (1.13-5.00)	0.798**

*Chi square test **Mann Whitney U Test pc.=percentile

The average standing time of the participants per day is 3.74 ± 2.15 hours. The duration of the students to keep their head in flexion was 3.86 ± 3.38 hours per day. The average sitting time of students on weekdays and weekends is 8.06 ± 2.99 , and 7.58 ± 3.50 , respectively. The severity of the FHP level of the students does not change according to the time spent sitting, studying, or at the computer. 56% of the students (n=130) have not done any sports in the last five years. No difference was found in terms of head positioning anteriorly according to the weekly sitting time, the time of sitting in front of the computer, the duration of the head flexed continuously, and the average sitting time on weekdays and weekends (Table 1).

Highly severe FHP was detected in 47.0% of the students (n=111), and severe FHP in 46.2% (n=109). The frequency of students whose CVA values are below 45° is 59.3% (n=140).

Exercising status, smoking or not smoking, presence of chronic disease, use of medication, use of the computer in different positions (such as prone or on back, with desk or chair) don't cause a significant difference in gonio distance and CVA ($p > 0.005$).

49.2% (n=116) of the students had severe depression. It was found that 33.6% (n=75) of the students had smartphone addiction. In most of the students, the smartphone addiction scale score was below the addiction level (Table 2).

Table 2. Distribution of Smartphone Addiction, Beck Depression, Body Awareness, Perceived Stress Scale Scores by FHP

Scales	Total Median (1.-3.pc.)	Slight or severe FHP Median (1.-3.pc.)	Highly severe FHP Median (1.-3.pc.)	p*
Smartphone Addiction	27.0 (21.0-36.0)	28.0 (23.0-37.0)	27.0 (21.0-34.0)	0.504
Beck Depression score	30.0 (26.0-37.0)	29.0 (25.0-36.0)	31.0 (27.0-37.2)	0.172
Body Awareness score	88.0 (76.0-95.0)	87.0 (75.0-94.0)	90.0 (78.0-96.5)	0.063
Perceived Stress Score	14.0 (11.0-18.0)	15.0 (12.0-18.0)	13.0 (10.2-17.0)	0.157

*Mann Whitney U Test FHP=Forward Head Posture pc.=percentile

In the regression model, the dependent variable was categorized as those with a FHP level of 5 cm and above and those with FHP below 5 cm. Beck's depression is categorically classified as (minimal, mild, moderate, severe). Participants were only included in the moderate and severe depression categories. The table shows that the severe

depression category increases the risk of having FHP by 2.50 times compared to the moderate depression category. It was detected that the risk of FHP increased 1.17 times with the increase of BMI, 1.04 times with the increase in height, and 1.04 times as the score obtained from the body awareness scale increased (Table 3).

Table 3. Examination of highly severe FHP status through logistic regression in terms of some features

variables	B	S.E	p	Exp (B)	%95 GA	
					Lower	Upper
Height	0.038	0.018	0.034	1.039	1.003	1.077
BMI	0.162	0.058	0.006	1.175	1.049	1.317
Perceived Stress Score	-0.038	0.034	0.264	0.962	0.900	1.029
Smartphone score	0.005	0.016	0.785	1.005	0.973	1.038
Body awareness score	0.026	0.011	0.017	1.027	1.005	1.049
Severe depression*	0.917	0.377	0.015	2.501	1.195	5.235
Having done sports in the last five years	0.138	0.340	0.686	1.147	0.589	2.235
Constant	-12.688	3.490	<0.001	<0.001		

*Severe depression is scored between 30-63 in Beck Depression Scale

DISCUSSION

Kyphosis is seen about twice as often in men than in women, and the risk of the disease is more common, especially in tall men (20). We found in our study that the frequency of highly severe FHP was higher in those who were taller. The median CVA in this study is 45.00, 1.-3. percentile (40.00-47.75). In various studies, the average CVA was found between 45-53 (21). In a study conducted with physiotherapy students, the frequency of FHP was found to be 70%. In the study, the frequency of severe FHP is higher in those with high BMI. In the literature, there are studies in which a negative correlation was found between increased BMI and CVA (10,22).

In this study, the incidence of severe FHP in females was 42.3%, while it was 57.7% in males. FHP was found in 18.18% of the participants in the study of Talati et al. 3 Of the subjects participating in our study, 6.8% were found to be slightly FHP, 4.2% as severe FHP, and 47.0% as highly severe FHP. Lee et al.'s study found that those with FHP had narrower CVA and increased flexion in their lower cervical vertebrae (23).

Although there is a difference between the genders in terms of FHP, it is thought that this difference is mostly related to the tallness of the men. Because standing and sitting computer usage times are similar. In the model generated in this study, we detected that those in the severe depression category of the Beck depression scale have an increased risk of having highly severe FHP by 2.50 times. In literature, it has been found that people with usual sadness have more protrusion in the shoulders (24). It also found increased head flexion, thoracic kyphosis, a trend toward left pelvic retroversion in people with major depressive disorder in literature (5).

In the literature, it has been observed that an improvement in head and neck posture is observed with postural awareness and exercise (25). However,

in our study, a relationship between regular sports behavior and head and neck posture was not found. This situation is mostly related to the type and frequency of the sport, and instead of asking a specific head and neck exercise, we generally asked about regular exercise behavior.

There is no study examining all these psychological factors and the measurements together. However, there were limitations in our study that prevented the generalization of the study, such as the fact that the study group was medical school students; therefore they had intensive education programs, and most students with moderate and severe depression scores. It has also been found that the stress of medical students creates mental distress which negatively affects their physical health.

CONCLUSION

Approximately 90% of our study group had severe or highly severe FHP which is related to head and neck posture. In the study, FHP was found to be associated with height and depressive mood. Highly severe FHP is quite common in those with severe depression. It has been found that FHP is common in males. In the light of all our results and literature, we can say that FHP awareness should be created among medical students for them to prevent the likely problems they will face associated with head and neck posture disorder in some period of their future life.

This study strongly emphasizes that medical students are at risk for posture disorders. The widespread use of ergonomics awareness, education, and correct application knowledge of ergonomics among the public is necessary for preventing some chronic ergonomic damages such as neck pain and forward head posture.

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REFERENCES

1. Yeom H, Lim J, Yoo SH, Lee W. A new posture-correcting system using a vector angle model for preventing forward head posture. *Biotechnology & Biotechnological Equipment*. 2014;28(sup1):S6-S13.
2. Haughe LJ, Fiebert IM, Roach KE. Relationship of forward head posture and cervical backward bending to neck pain. *Journal of Manual & Manipulative Therapy*. 1995;3(3):91-97.
3. Talati D, Varadrajulu G, Malwade M. The Effect of Forward Head Posture On Spinal Curvatures in Healthy Subjects. *Asian Pacific Journal Of Health Sciences*. 2018;5.
4. Kang JI, Jeong DK, Choi H. The effect of feedback respiratory exercise on muscle activity, craniocervical angle, and neck disability index of the neck flexors of patients with forward head posture. *Journal of physical therapy science*. 2016;28(9):2477-2481.
5. Canales JZ, Cordás TA, Fiquier JT, Cavalcante AF, Moreno RA. Posture and body image in individuals with major depressive disorder: a controlled study. *Brazilian Journal of Psychiatry*. 2010;32 (4):375-380.
6. Østerås B, Sigmundsson H, Haga M. Perceived stress and musculoskeletal pain are prevalent and significantly associated in adolescents: an epidemiological cross-sectional study. *BMC public health*. 2015;15(1):1081.
7. Cramer H, Mehling WE, Saha FJ, Dobos G, Lauche R. Postural awareness and its relation to pain: validation of an innovative instrument measuring awareness of body posture in patients with chronic pain. *BMC musculoskeletal disorders*. 2018;19(1):1-10.
8. Prins Y, Crous L, Louw Q. A systematic review of posture and psychosocial factors as contributors to upper quadrant musculoskeletal pain in children and adolescents. *Physiotherapy theory and practice*. 2008; 24(4):221-242.
9. Watson DH, Trott PH. Cervical headache: an investigation of natural head posture and upper cervical flexor muscle performance. *Cephalalgia*. 1993;13(4):272-284.
10. Johnson GM. The correlation between surface measurement of head and neck posture and the anatomic position of the upper cervical vertebrae. *Spine*. 1998;23(8):921-927.
11. Park JJ, Choi GS. Modeling of a continuous-time system with time-delay. *International Journal of Internet, Broadcasting and Communication*. 2012;4(2):1-6.
12. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Archives of general psychiatry*. 1961;4(6):561-571.
13. Hisli N. Beck depresyon envanterinin üniversite öğrencileri için geçerliliği, güvenilirliği.(A reliability and validity study of Beck Depression Inventory in a university student sample). *J.Psychol*. 1989;7:3-13.
14. Shields SA, Mallory ME, Simon A. The body awareness questionnaire: reliability and validity. *Journal of personality Assessment*. 1989;53(4):802-815.
15. Karaca S. Vücut farkındalığı anketinin Türkçe uyarlaması: geçerlik ve güvenilirlik çalışması [thesis]. Muğla Sıtkı Koçman Üniversitesi: Muğla.2017
16. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of health and social behavior*. 1983;385-396.
17. Bilge A, Ögce F, Genç RE, Oran NT. Algılanan stres ölçeği (ASÖ)'nin Türkçe versiyonunun psikometrik uygunluğu. *Ege Üniversitesi Hemşirelik Yüksekokulu Dergisi*. 2009;25(2):61-72.
18. Kwon M, Kim DJ, Cho H, Yang S. The smartphone addiction scale: development and validation of a short version for adolescents. *PloS one*. 2013;8(12):e83558.
19. Noyan CO, Darçin AE, Nurmedov S, Yilmaz O, Dilbaz N. Akıllı Telefon Bağımlılığı Ölçeği'nin kısa formunun üniversite öğrencilerinde Türkçe geçerlilik ve güvenilirlik çalışması. *Anatolian Journal of Psychiatry/Anadolu Psikiyatri Dergisi*. 2015;16.
20. Ross JS, Bendok BR, McClendon J. Imagining in spine surgery, Kyphosis, 2018, <https://www.sciencedirect.com/topics/nursing-and-health-professions/kyphosis>
21. Raine S, Twomey LT. Head and shoulder posture variations in 160 asymptomatic women and men. *Archives of physical medicine and rehabilitation*. 1997;78(11):1215-1223.
22. Kocur P, Tomczak M, Wiernicka M, Goliwaş M, Lewandowski J, Łochyński D. Relationship between age, BMI, head posture and superficial neck muscle stiffness and elasticity in adult women. *Scientific reports*. 2019;9(1):1-10.
23. Lee J, Lee Y, Kim H, Lee J. The effects of cervical mobilization combined with thoracic mobilization on forward head posture of neck pain patients. *Journal of Physical Therapy Science*. 2013;25(1):7-9.
24. Do Rosário JLP, Diógenes MSB, Mattei R, Leite JR. Can sadness alter posture? *Journal of bodywork and movement therapies*. 2013;17(3):328-331.
25. Harman K, Hubley-Kozey CL, Butler H. Effectiveness of an exercise program to improve forward head posture in normal adults: a randomized, controlled 10-week trial. *Journal of Manual & Manipulative Therapy*. 2005;13(3):163-176.