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The relationship of forward head posture and rounded shoulders with neck pain in Iranian office workers

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Abstract

Background: Office workers spend a long period of time behind a computer during working hours. The relation between the posture of sitting during work with computer and neck pain is still debatable. Even though some researchers claim a significant difference in head posture between patients with neck pain and pain-free participants, the FHP (forward head posture) has not always been associated with neck pain in literature. So, the purpose of this study was to discover the relationship between neck pain and improper posture in the head, cervicothoracic spine and shoulders.

Methods: This was a cross-sectional study to explore the relationships between neck pains, sagittal postures of cervical and thoracic spine and shoulders among office workers in two positions, straight looking forward and working position. 46 subjects without neck pain and 55 subjects with neck pain were evaluated using a photographic method. Thoracic and cervical postures were measured by the HT (High Thoracic), CV (Craniovertebral) angles respectively. Shoulder's posture was evaluated in the sagittal plane by the acromion protrusion.

Results: HT and CV angles were positively correlated with the presence of neck pain only in working position ($p< 0.05$). In straight looking forward position there was no significant difference between the two groups statistically ($p>0.05$). The difference of shoulder protrusion between symptomatic and asymptomatic groups was not significant.

Conclusion: FHP and thoracic kyphosis were accompanied with neck pain. But shoulder posture was not correlated with neck pain.

Keywords: Neck Pain, Posture, Shoulder.

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Introduction

Neck pain is a common disorder characterized by pain, ache or soreness experienced in a region between the inferior margin of the occiput and T1 (1). The prevalence of neck pain is not the same all over the world. In western countries (1-3) and Hong Kong (4) it was reported between 34 - 54% and 64 % respectively. One of the highest prevalence rates of neck pain in Asia and Pacific Area was reported in Iran with a considerable difference in urban (13.4%) and rural (17.9%) regions (5-7). It was a more common complaint among Iranian dentists (28-61%) and in a survey in 2012 it was reported as high as 24.5% among office workers (8-10).

The use of computers has increased dramatically over the past decade in various offices so that staffs spend a lot of time sitting behind the computer. These rapid changes may be accompanied by increased

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prevalence of poor posture and resultant neck pain. FHP (forward head posture) and rounded shoulders are defined as protrusion of the head and shoulders in the sagittal plane (11-12). The relation between FHP, rounded shoulders and neck pain is still debatable. Even though some researches claim a significant difference in head, shoulders and thoracic posture between patients and pain-free participants (13-17), the forward head posture has not always been associated with neck pain in literature (18).

Several studies have produced estimates of head, neck and thoracic spine relative position in neutral position in the standing and sitting positions (19-20) but there is still insufficient data for the angles in other positions including during computer work.

Although data on the specific costs regarding job-related diseases leave, medical consumption and neck pain in Iran is not available, it is clear that the prevention of musculoskeletal problems like neck pain would be of great benefit.

As neck pain could become a chronic and disabling symptom; discovering and improving the risk factors seems a reasonable prevention strategy. If it is clear that improper posture is a risk factor for neck pain among Iranian employees, we will design a preventive program to decrease the prevalence of neck pain and increase the quality of life in office workers. So the purpose of this study was to quantify postural changes of head, cervical and thoracic spine and shoulders in office workers when sitting straight and while working with computer in order to determine whether the individuals who have neck pain actually have improper posture in comparison to individuals without neck pain or not.

Methods

A cross sectional study was designed to compare the head, shoulder, cervical and upper thoracic posture in office workers with and without neck pain during 2011-2012. This study was granted by Tehran University of Medical Science

The Research Ethics Committee of Tehran University of Medical Sciences approved the study.

A list of office workers' name who were working with computer in Tehran University Of Medical Sciences (Pardis e Hemmat) was provided. A total of 203 were randomly selected. Throughout telephone calls, presence or absence of neck and shoulder pain was asked.159 volunteers accepted to attend the study.

All office workers with neck pain, ache or soreness experienced in a region between the inferior margin of the occiput and T1 for a period of over 3 months were included in the symptomatic group, and all other volunteers who had no ache or soreness in this region were included in the asymptomatic group. 58 participants were excluded from the study because of lack of consent, presence of acute neck pain or any radiation of the pain to the upper extremity (neurologic origin of the pain), and any history of cervical trauma, fracture or surgery. Finally, the study was conducted by 101 subjects.

The researchers went to the room of each office worker and explained them the procedure of posture measurement by taking photographs. A written informed consent was obtained and demographic data was taken including gender, age, height, weight, BMI, location and duration of pain (if any), hours of working in a day, hours of driving per a day and any treatment received.

If the participants desired, his or her colleagues were requested to leave the room to observe the privacy of the participants, especially if their sex was not matched. All the measurements were performed in the office and at their own desk between the fourth and fifth hour of work. A surgical cap and mask was provided for each participant to cover their hair and face in order not to be identifiable in the photos.

The participants were asked to expose their neck and upper thoracic spine. Spinous processes of C7 and T7 were palpated and two adhesive markers were attached over the midpoint of most prominent part

of C7 and T7. Another marker was attached on tragus and prominent point of the acromion was marked with pen.

Three markers were used to help us finding the points in photos during analysis. Two photos were taken at the distance of 80 cm to record sagittal sitting postures at the right or left side of the participant depending on the location of the staff's desk. The lens of the camera was adjusted at the level of external auditory meatus by adjusting the height of camera tripod. All the photos were taken using the Nikon coolpix P4 camera (8.1 megapixels). Photography was done in two positions of neutral (looking ahead at a fixed point on the wall, 120 cm above ground) and working position. Before taking the photograph in neutral position the participant was asked to completely flex and extend his or her neck three times and rest in the most comfortably balanced position (13). All photographs were taken by the one researcher.

Data of photography was transferred to a computer running customized software "Body Posture Analyzer", designed by Danesh Salar Iranian Company. In the software the tragus, C7, and T7 points were determined by researcher's clicking by mouse and angles were calculated as defined: HT angle was measured as the angle between horizontal line through the spinous process of T7 and a line connecting the spinous process of T7 to C7. CV angle was measured as the angle between horizontal line through the spinous process of C7 and a line connecting C7 to tragus by the software. Shoulder posture in sagittal plane was measured as acromion protrusion from the imaginary line passing ear tragus perpendicular to horizontal plane. One of the main non-invasive methods is photography techniques. The reliability of the assessment was reported as satisfactory in sagittal view (21-23).

According to Lau, intra-rater and inter-rater reliabilities (ICCs) in measuring the high thoracic angle ranged from 0.80 to 0.86, for the Craniovertebral angle the ICCs ranged from 0.81 to 0.87 (17).

Statistical methods

The data were analyzed using SPSS version 16. Descriptive statistics (mean, SD, range) were calculated for each study variable. Uni-variate and multi-variate analyses were performed. The differences between groups were calculated through cross-tabulations and an independent sample's t-test.

Results

Among a total of 101 office workers (46 subjects in asymptomatic group and 55 subjects in symptomatic group) took part in the survey 73% were female. The mean age of participants was 39±8 years without any significant difference in two groups (p=0.847). They have been working for about 14±8 years with no difference between neck pain and asymptomatic group (p=0.415). Weight, height and BMI (body mass index) of our two groups were comparable and their mean ±SD were 69.2±11.9 kilograms, 165.0±8.4 centimeters, and 25.3±3.7 kilograms per square meters, respectively.

As it can be seen from the table 1, there is a statistically significant difference in CVA or HTA between symptomatic and asymptomatic subjects only during computer work. In other words, participants with neck pain revealed a poorer posture of cervical and thoracic spine during working time. According to correlation coefficient between sagittal posture of cervical and thoracic spine and presence of neck pain, HTA and CVA were positively correlated with cervical pain but shoulder protrusion is not related to neck pain

In asymptomatic group (Table 2), 30.6% of the people (26) worked fewer than 4 hours, 17.6% (15) worked 4-8 hours and 3.6% (3) worked over 8 hours during daytime with computer. In people with neck pain, it was 21.2% (18), 22.4% (19) and 4.7% (4), respectively.

Table 1. Comparison of CVA and HTA in symptomatic and asymptomatic office workers

		Symptomatic	Asymptomatic	p
Looking forward (neuter position)	CVA*(degrees)	37.1±7.8	37.7±8.2	0.70
	HTA**(degrees)	118.3±7.9	117.0±8.6	0.43
Working with computer	CVA (degrees)	23.0±10.7	28.4±12.4	0.04
	HTA (degrees)	129.8±10.3	124.39±10.2	0.02

* craniovertebral angle (smaller angle indicate FHP)
**high thoracic angle (greater angle indicate FHP)

Table 2. Comparison of shoulder protrusion in symptomatic and asymptomatic office workers

	symptomatic	asymptomatic	p
Looking forward (neutral position)	16mm	15.4mm	0.85
Working with computer	22.1mm	22mm	0.71

Discussion

The results of the present study show that among 203 office workers who was working with computers, the prevalence of neck and shoulder pain was 36.7 % and 9.3 % respectively. In a case-control study comparing the prevalence of neck pain between dentists and office workers in Iran, neck pain was as prevalent as 24.5% among office workers (10). The results of our study demonstrate that the prevalence of neck pain among Iranian office workers versus office workers in other countries almost is comparable so that it was reported 64% and 36.1% in Sudan and Sri Lanka respectively (24-25). comparing comparison between the prevalence of shoulder pain among Iranian employees and employees of other countries shows that it is less common among Iranian office workers (9.3% versus 41 % and 34.3 % in Sudan and Sri Lanka respectively).In a survey on Chinese adolescents in 2008, the prevalence of Forward Head Posture was reported as high as 25% (26). According to our results, among 101 office worker who worked with computer 61.3 % had FHP and the prevalence of thoracic kyphosis and rounded shoulders were 48.7 % , 78.3 % respectively that demonstrates high prevalence of improper posture among university employees. In reviewing the literature, no data was found on the relationship between head and spinal posture during work and chronic neck pain. According to our study, office workers using computer had more forward head, kyphosis and rounded shoulder posture .The improper posture of head, cervical and thoracic spine was more common in the symptomatic group comparing the asymptomatic group during computer working that is equivalent to the results of mentioned cross-sectional studies that showed a significant relationship between individual's posture and neck pain (27). The negative correlation between shoulder protrusion and neck pain is a prominent point of our study that is opposite to the results of Lau and Szeto Studies (16-17). Duration of computer use may have an impact on the incidence of neck pain. According to results of other cross-sectional studies, it was found that there is positive correlation between duration of sitting and neck pain prevalence (28-31). Another study showed that sitting behind desk for over 5 hours per day, is considered a risk factor for neck pain (32). Despite of these studies, in a systematic review, it was found that there is no significant correlation between duration of sitting and neck pain (27).

According to our study, there was no relationship between the duration of working with computer and neck pain ($p = 0.322$).

In a prospective study with a 3-year follow-up by Ariens et al on over 1,334 employees, it was observed that there is a strong relationship between duration of sitting in working hours and neck pain in such a way that if one is in sitting position for over 95% of his working hours, the probability of suffering from neck pain is increased (RR= 2.01%) (33). According to our results , it was observed that 51.8% of employees spent less than 50% of their working hours on working with computer, lower hours of working with computer in subjects may be the reason for lack of sig-

nificant difference compared to Ariens's work.

In present study, 8.3% of office workers worked with computers over 8 hours daily; they were the employees who worked in units with higher workload and higher concentration which imposes more psychological stress on them. Since psychological stress was not investigated in our study, the relationship between psychological stress and posture can be investigated in the future studies. Thus, this hypothesis can be introduced that if duration of sitting behind computer is high, sitting in proper posture would reduce the probability of neck pain. It is recommended that further researches be conducted in this regard.

According to results of some studies (26, 34), it was observed that FHP is more prevalent in women compared to men, while in present study it was seen that there is no difference in FHP prevalence in men and women. Another systematic review indicated that there is no correlation between participation in various sport and recreational exercises and neck pain (33). In a research by Dimberg et al, it was found that taking part in rocket sport is a negative risk factor for neck pains (27). Of course, in our research on university office workers it was seen that they have no regular sport activity and a few of them may exercise a particular kind of sport at the weekends occasionally which was negligible and no positive or negative correlation was found in this regard. It needs further studies in the future.regard. Another factor investigated in most previous studies is the relationship between driving and prevalence of neck and shoulder pain. In a systematic review, it was found that in two studies, one with high quality and other with low quality, driving had been studied as a risk factor for neck pain and their results showed that there is no relationship between driving and neck pain (27). In the present study, no significant difference was observed in asymptomatic and symptomatic groups in terms of duration of driving time, perhaps because the subjects in this study drove 0.5 hour daily in average (mean: 0.524, SD: 0.8605).

Considering the fact that there is no accurate statistics about disability or need to rest in university office workers, which should be investigated in further research. Informing office workers of proper posture during working with computer can be as a preventive factor for most musculoskeletal dysfunction.

According to a study by Lau et al. it was found that there is positive relationship between sagittal postures of thoracic and cervical spine and neck pain, and people with neck pain had higher HT angle (7.34 degree) compared to people without neck pain (17). In present study, it was observed that thoracic angle in people with neck pain is higher than those without neck pain during computer working. Thus it can be concluded that in people with neck pain, posture of thoracic vertebra should be studied in addition to posture of cervical vertebra.

One limitation of this study is the lack of accurate tools for the assessment of cervical and thoracic posture. Additionally, the psychological stress of subjects was not evaluated in this study. Another limitation of this study was that the ergonomic assessment of office equipments and tools was not conducted.

Conclusion

According this study, head, cervical and thoracic spinal posture were correlated with neck pain in computer working position. But there was no relation between shoulder posture and neck pain.

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