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Frequency of Thoracic Spine Disability with Forward Head Posture among Dentists of Tertiary Care Hospitals of Peshawar

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All authors equally contributed to the study and approved the final manuscript

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ABSTRACT

Background: When the position of head is sustained in forward direction for longer period of time, chronic upper back pain syndrome occurs. Dentists are prone to develop MSK disorders compared to other professionals. There is very little evidence available that could discover the effect of thoracic spine mobility on neck dysfunction and thoracic kyphosis. **Methods:** This Cross sectional descriptive study is presented in which 201 dentists of 2 public and private tertiary care hospitals were recruited through purposive sampling technique after inclusion and exclusion criteria. The dentists were given Revised Oswestry Thoracic Pain Disability questionnaire and forward head posture was observed by measuring CVA. Data was then analyzed through SPSS. **Results:** Out of 201 participants, there were 48.8% male and 51.2% female. The mean age ±SD of the sample was 34 ±6.37 years. Headache was present in 168 participants and neck pain was present in 83.6% of the sample. Mild thoracic disability was seen in 69 dentists, among which 5 had severe forward head posture and 64 had mild forward head posture. Moderate disability was seen in 65 dentists among which 63 had severe forward head posture and 2 had mild forward head posture. Severe disability was seen in 64 dentists, 62 had severe forward head posture while 2 reported mild forward head posture. Only 3 participants were presented complete disability and all of them had severe forward head posture. The level of significance was 0.000 showing significant association between forward head posture and thoracic disability. The likelihood ratio was 185.7. **Conclusion:** It is concluded that dentists are more prone to develop thoracic spine disability and forward head posture, both of these are related to one another and are interconnected. The results also showed that this disability has negative impact on the professional practice of dentists and other musculoskeletal disorders like neck pain and headache are associated with forward head posture and thoracic disability.

INTRODUCTION

To reduce stress on cervical muscles and vertebrae, it is important to balance muscular activity by adopting good posture of neck and head.(1). Major cause of neck pain is forward head posture (FHP), which is the abnormal dynamics of neck and shoulder muscles(2, 3). If the placement of head over spine is disturbed, then there is increased stress on muscles of cervical spine and the length-tension parameters of the posterior structure of neck are affected, as a result movement of neck is restricted, muscles become hyperactive and proprioception of cervical area is impaired.(4).

Palesa et al in February 2012 stated that the most common complaint in adults reported in clinics is neck pain, having 30-505 of the total annual prevalence. These patients report other associated disability in the upper spine region with varying symptoms of pain, among which the chronic symptoms are appeared in one third of the total patients(5). A study by Sim and Adams that was completed in UK, investigated that thoracic spine and neck pain are interconnected in patients who report complain of pain in the cervical region(6). Brazilian researcher, Atenio stated that dentists develop musculoskeletal disorders with high prevalence rate specially in shoulder,

neck and upper back region(7). While talking about the prevalence of thoracic disability and associated neck pain, it is not same all over the world. In countries of west world, the prevalence reported was 34 - 54% and in Hong Kong it was 64 %(8). In Asian region, the highest prevalence was seen by Davatchi et al in Iran with percentage of 13.4% in urban area and 17.9% in rural areas(9). When dentists were evaluated by Chamani et al, the prevalence rate of disability related to thoracic and neck pain was 28-61% in Iranian dentists, while in 2012, according to a survey it was reported that 24.5% office workers reported forward head posture and disability related to thoracic spine(10). Wendy et al stated that exaggerated anterior curvature of the thoracic spine is called postural hyper kyphosis, which is also called gibbous deformity and Dowager's hump. This condition promotes disability and imbalance of muscular structure is one of the contributing factors among other factors that result in hyper kyphosis(11) While Rauch et al revealed that a shape of vertebral discs and vertebral bodies also contribute to the normal C shape/anterior curvature of thoracic spine, but an angle greater than 40° is termed as hyper kyphosis in normal adults(12). Author named Bharucha said that the more angle of kyphosis increases in an individual, the more that person is prone to develop thoracic disability and quality of life is affected in general(13). Takahashi et al studied 236 community dwelling individuals and found that the incidence of hyper kyphosis vary between 20% and 40% for both men and women(14).

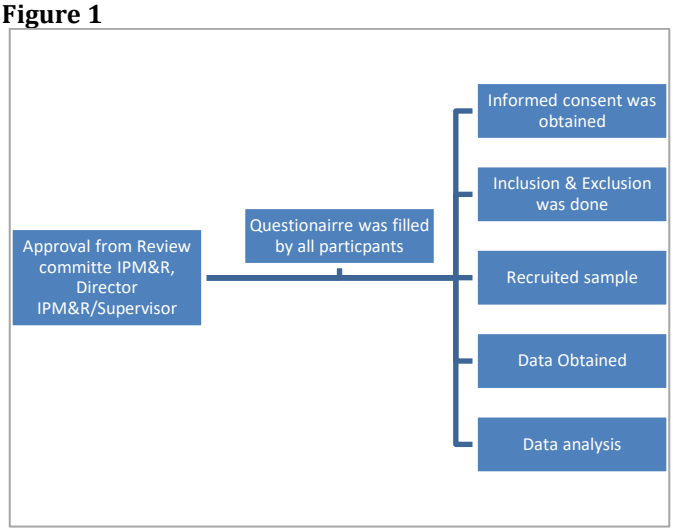
This cross sectional survey is presented as till now not even single research study has been done on thoracic disability in patients with forward head position and the consequences of this on quality of life. No study was found which assess thoracic dysfunction in patients with forward head posture. The aim of this research is to investigate the arbitrating effects of forward head posture (FHP) on the connection between thoracic disability. There is a scarcity of research in this area; for that reason, the intention of the current study is to determine the frequency of thoracic disability in dentists with forward head position. Also previous studies were conducted on forward head posture in dentists had used different measuring tools like goniometer and pendulum method, which is a manual technique having high error chances. Digital method of measuring forward head posture is photogrammetry having reliability of > 0.972 and good inter reliability which we used in our study, having less error chances and more accurate results.

METHODOLOGY

The study employed a cross-sectional descriptive design, with a sample size of 201 determined using the raosoft calculator. The calculation considered a proportion of work-related musculoskeletal disorders among dentists (84.6%), absolute precision (5%), and a confidence level of 95%. Purposive sampling technique was utilized to select participants who met the inclusion criteria. Public dental hospitals and two private dental hospitals in Peshawar were randomly chosen as the population setting. The study had a duration of six months, encompassing data collection to the write-up process. Inclusion criteria for participants comprised dentists with forward head posture (50°-30° classified as mild, <30° as severe), of both genders, aged 25 years and above, and possessing at least one year of work experience. Exclusion criteria excluded dentists with a history of whiplash injury, road traffic accidents (RTA), discogenic pain, or any diagnosed systemic referred pain.

Data collection, approved by the Advanced Studies & Research Board and Ethical Review Board of Khyber Medical University Peshawar, took place at public and private hospitals. Permission from hospital administration was secured, and written informed consent, along with an information sheet, was provided to participants. Screening for forward head posture utilized the photogrammetric method, ensuring participant confidentiality. The cranio vertebral angle was measured using photogrammetric digital imaging. Thoracic disability was assessed using the Revised Oswestry Thoracic Pain Disability Questionnaire.

Figure 1



Data analysis was conducted using SPSS version 25, employing descriptive analysis for independent variables such as age, gender, BMI, and marital status. Tables were utilized to assess significance among various variables. The association between thoracic dysfunction and forward head posture, along with different demographic variables, was examined using the chi-square test, considering a p-value of less than 0.05 as statistically significant.

RESULT

Out of total population 201 participants were recruited. There were 98(48.8%) male and 103(51.2%) female. BMI normal range is 18.5-24.9. Those who lie between the ranges of 25-29.9 are considered overweight, and those lie beyond range of 30 are considered obese. After the descriptive analysis of sample characteristics it was found that 110(54.7%) were with normal body mass index, individuals who were overweight were 40(19.9%), the obese were 39(19.4%) and underweight were 12(6%). The mean ± SD age of the sample was 34±6.37 years. Married individuals were 140(69.7%) and unmarried were 61(30.3%). Headache was present in 168 participants and 33 participants did not report any headache. Neck pain was present in 83.6% of the sample and 33 participants did not have any neck pain. 133 participants when observed had severe forward head posture and 68 patients had mild forward head posture.

Table 1
Baseline Characteristics

Variables		Values
Age		34.0 ± 6.37
Gender	Male	98 (48.8%)
	Female	103 (51.2%)
Marital Status	Married	140 (69.7%)
	Unmarried	61 (30.3%)
BMI	Underweight	12 (6%)
	Normal	110 (54.7%)
	Overweight	40 (19.9%)
	Obese	39 (19.4%)
Headache	Present	168 (83.6%)
	Not Present	33 (16.4%)
Neck pain	Present	168 (83.6%)
	Not Present	33 (16.4%)
Forward Head Posture	Severe	133 (66.2%)
	Mild	68 (33.8%)

Status of Thoracic Spine Disability

When data was analyzed to find out the disability status of upper thoracic spine by using Revised Oswestry Thoracic Pain Disability Questionnaire on total sample. This tool covers four sections of disability; Mild Disability is when the score is 10%-28% (5-14 points), Moderate Disability is when the score is 30%-48% (15-24 points), Severe Disability is when the score is 50%-68% (25-34 points) and when the score is greater than 72%, the disability is complete with points 36 and above. After the analysis it was resulted that, 34.3% of the sample had mild disability, moderate disability was reported by 32.3% of the sample, severe disability was present in 31.8% of the sample and 1.5% reported complete disability.

Table 2
Thoracic Spine Disability Status

Disability Status	%age
Mild Disability	34.3%
Moderate Disability	32.3%
Severe Disability	31.8%
Complete Disability	1.5%

Cross Tabulation of Thoracic Spine Disbility and Forward Head Posture

When Chi Square test was performed on the sample, cross tabulation showed that dentists who had mild thoracic disability were 69 in number, among them the severe forward head posture was present in 5 participants only and 64 participants had mild forward head posture. Moderate disability was seen in 65 dentists among which 63 had severe forward head posture and 2 had mild forward head posture. Severe disability was seen in 64 dentists, 62 had severe forward head posture while 2 reported mild forward head posture. Only 3 participants were presented complete disability and all of them had severe forward head posture. The level of significance was 0.000 showing that thoracic spine disability and forward head posture are significantly associated with one another, both conditions are interconnected and thoracic disability could contribute to the development of forward head posture and vice versa. The likelihood ratio was 185.7.

Table 3
Cross tabulation

Disability	Total	Forward Head Posture		P Value
		Severe	Mild	
Mild Disability	69	5	64	0.000
Moderate Disability	65	63	2	
Severe Disability	64	62	2	
Complete Disability	3	3	0	
Total	201	133	68	

Cross Tabulation of Thoracic Disability and Headache

When Chi Square test was performed on the sample, cross tabulation showed that dentists who had mild thoracic disability were 69 in number, among them the headache was present in 58 participants and 11 participants did not report headache. Moderate disability was seen in 65 dentists among which 54 had headache and 11 participants did not report any. Severe disability was seen in 64 dentists, 53 had headache while 11 reported no headache. Only 3 participants were presented with complete disability and all of them had headache. P value was 0.000 meaning that both conditions (headache and thoracic disability are interconnected and thoracic disability could contribute to the development of headache and vice versa. The likelihood ratio was 1.127.

Table 4
Cross Tabulation

Disability	Total	Headache		P Value
		Present	Not Present	
Mild Disability	69	58	11	
Moderate Disability	65	54	11	
Severe Disability	64	53	11	0.000
Complete Disability	3	3	0	
Total	201	168	33	

Cross Tabulation of Thoracic Disability and Neck Pain

When Chi Square test was performed on the sample, cross tabulation showed that dentists who had mild thoracic disability were 69 in number, among them the neck pain was present in 58 participants and 11 participants did not report neck pain. Moderate disability was seen in 65 dentists among which 54 had neck pain and 11 participants did not report any. Severe disability was seen in 64 dentists, 53 had neck pain while 11 reported no pain in neck. Only 3 participants were presented with complete disability and all of them had neck pain. P value was 0.000 meaning that both conditions (neck pain and thoracic disability are interconnected and thoracic disability could contribute to the development of neck pain and vice versa. The likelihood ratio was 1.127.

Table 5
Cross tabulation

Disability	Total	Neck Pain		P Value
		Present	Not Present	
Mild Disability	69	58	11	
Moderate Disability	65	54	11	
Severe Disability	64	53	11	0.000
Complete Disability	3	3	0	
Total	201	168	33	

Cross Tabulation of Forward Head Posture and Neck Pain

When Chi Square test was performed on the sample, cross tabulation showed that 133 had severe forward head posture among which 111 had neck pain and 22 did not report any neck pain. 68 dentists were having mild forward head posture among which 57 had neck pain and

11 did not report any neck pain. P value was 0.000 meaning that both conditions (neck pain and forward head posture) are interconnected and forward head posture could contribute to the development of neck pain and vice versa the likelihood ratio was 0.004.

Table 6

Cross tabulation

Forward Head Posture	Total	Neck Pain		P value
		Present	Not Present	
Severe Forward Head Posture	133	111	22	0.000
Mild Forward Head Posture	68	57	11	
Total	201	168	33	

DISCUSSION

In present study, out of total population 201 participants were recruited. There were 98(48.8%) male and 103(51.2%) female. It was found that 110(54.7%) were with normal body mass index, individuals who were overweight were 40(19.9%), the obese were 39(19.4%) and underweight were 12(6%). The mean age of the sample was 34 years with SD of 6.37. Headache was present in 168 participants and neck pain was present in 83.6% of the sample. 133 participants when observed had severe forward head posture. Brazilian researcher, Atenio stated that dentists develop musculoskeletal disorders with high prevalence rate specially in shoulder, neck and upper back region(15). While talking about the prevalence of thoracic disability and associated neck pain, it is not same all over the world. In countries of west world, the prevalence reported was 34 - 54% and in Hong Kong it was 64 %(16). In Asian region, the highest prevalence was seen by Davatchi et al in Iran with percentage of 13.4% in urban area and 17.9% in rural areas(17). When dentists were evaluated by Chamani et al, the prevalence rate of disability related to thoracic and neck pain was 28-61% in Iranian dentists, while in 2012, according to a survey it was reported that 24.5% office workers reported forward head posture and disability related to thoracic spine(18).

The analysis of our study resulted that, 34.3% of the sample had mild disability, moderate disability was reported by 32.3% of the sample, severe disability was present in 31.8% of the sample and 1.5% reported complete disability. Due to increased strain on the structures around bonny areas, the faulty posture could develop in different parts of the body. This definition was given by The American Academy of Orthopedic Surgeons (AAOS)(19). One descriptive study was conducted in June 2012 to June 2013 by Vakili et al on 96 academic dentists of Tehran. These dentists were assessed for presence of any disability. To asses hyper kyphosis, flexi curve was used by placing the flexible ruler on C7, T1 and T2. The results showed presence of other MSD deformities but hyper kyphosis was not present in any of the individual(20). Computerized video grammetry was used by Geraldo et al on orthodontists in 2014 to analyze hyper kyphosis. When results were obtained, it was found that the endodontists were presented with hyper kyphosis throughout their work cycle. It was shown in the rotary technique that repetitive movement of hands and trunk were contributing to the development of wrong posture(21).

In our study the cross tabulation showed that dentists who had mild thoracic disability were 69 in number, among them the severe forward head posture was present in 5 participants only and 64 participants had mild forward head posture. Moderate disability was seen in 65 dentists among which 63 had severe forward head posture and 2 had mild forward head posture. Severe disability was seen in 64 dentists, 62 had severe forward head posture while 2 reported mild forward head posture. Only 3 participants were presented complete disability and all of them had severe forward head posture. The level of significance was 0.000 showing significant associations. The likelihood ratio was 185.7. 133 had severe forward head posture among which 111 had neck pain and 22 did not report any neck pain. 68 dentists were having mild forward head posture among which 57 had neck pain and 11 did not report any neck pain. The likelihood ratio was 0.004. Quek et al stated that, FHP is also associated with an increased kyphotic thoracic spine or thoracic hyper kyphosis and neck pain, with some studies suggesting an ascending (the hyper kyphosis causes the FHP) or descending component (the FHP causes the hyper kyphosis) to the etiology of FHP or thoracic spine hyper kyphosis. They conducted a research on 51 participants to find out the relation of forward head posture and hyper kyphosis and neck pain. Greater thoracic kyphosis was significantly associated with lesser CVA (Spearman $\rho = -0.48$) and neck pain whereas greater CVA was significantly associated with greater cervical flexion (Spearman $\rho = 0.30$) and general rotation ROM ($\rho = 0.33$), but not with upper cervical rotation ROM ($\rho = 0.15$)(22). Roghani et al said that forward head posture is associated with neck pain and hyper kyphosis which increases mortality level but it is also not pleasing aesthetically(23). Inta Zepa et al investigated 31 participants to find out the relation between hyper kyphosis and forward head posture and neck pain. The results showed significant association between hyper kyphosis, neck pain and atlas inclination towards cervical spine. As CVT angle was wider that was 5.2 degrees in the hyper kyphotic group(24).

CONCLUSION

Keeping in mind the limitations of this study, the conclusion was drawn that dentists are more prone to develop musculoskeletal disorders especially upper back disability that is thoracic spine disability and forward head posture. It was also concluded that thoracic disability and forward head posture are related to one another and both are interconnected. The results also showed that this disability has negative impact on the professional practice of dentists and other musculoskeletal disorders like neck pain and headache are associated with forward head posture and thoracic disability.

Limitations

Due to lack of time and resources, this research was conducted but evaluation of all the related risk factors could not have been done. The findings are based on subjective assessment and objective assessment with no experimental evaluation. Majority of dentists were not cooperative enough to participate in the study due to their duty schedule and some female were not ready to be

photographed for the evaluation of forward head posture. This study was deprived of analytical or experimental study on each and every variable. Lady Ready hospital did not permit us for data collection due to their policy protocol.

Recommendations

The current study was a cross sectional study conducted with a questionnaire, should be followed by a detailed evaluation and experimental approach in future. Due to lack of time and resources, this study could not include a larger population which should be considered in further studies. This study was deprived of analytical or experimental study on each and every variable which is strongly recommended to be considered in the future study, along with other outcome measures that could provide detailed insight about the lifestyle changes in dentists.

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