

ERGONOMIC HAZARDS TO DENTAL SURGEONS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Ergonomics is the working condition which facilitates the performance of labor and promotes worker's welfare. Dentists all around the world have been challenged with issues related to the musculoskeletal system. Mostly musculo – skeletal problems start during the learning period of the dentist and then continue throughout his/her life, affecting spine, neck, shoulders, hands and other body parts. The aim of this study was to assess the awareness of graduate and postgraduate dental students about the role of ergonomics in dentistry and to evaluate the presence of any pain / discomfort during the last twelve months.

A cross-sectional study was carried out on 120 dental graduate and postgraduate students working in Armed Forces Institute of Dentistry, Rawalpindi using the Standardized Nordic Musculoskeletal Questionnaire. All of the respondents endorsed the significance of maintaining an ideal posture during their clinical activities. However, 65% reported that they seldom assumed an ideal posture during work. About 70% of the participating dentists reported one or more episodes of musculoskeletal disorders over the last 12 months. The highest frequency was observed for lower back ache (65%) followed by neck pain (53.3%) and pain in wrist/hand (37.5%). A positive correlation was found between the musculoskeletal disorders and the average working hours per week ($P < 0.05$).

Key Words: Musculoskeletal disorder, musculoskeletal pain, dentists.

INTRODUCTION

According to WHO, occupational health is defined as a multidisciplinary activity which promotes and protects a worker's health.¹ Dentists all around the world have been challenged with issues related to the musculoskeletal system. This mainly occurs due to uncomfortable posture in the work area.² This uncomfortable posture frequently results in muscular disorders.

A number of risk factors make the dentists prone to occupational hazards. These can be classified as biomechanical, ergonomic and work factors i.e. the fixed elements surrounding the work area such as the furniture, the equipment used and the presence of a

dental assistant.³ All of these factors reflect the extent to which a dentist can be limited at his work station resulting in physical or mental stress. Ergonomics is basically the working condition which facilitates the performance of labor and promotes worker's welfare.⁴ It is "designing the job to fit the worker, not forcing the worker to fit the job."

Mostly musculoskeletal disorders (MSD) start during the learning period of the dentist and then continue throughout their life, affecting their spine, neck, shoulders, hands and other body parts.⁵ During training, students should, therefore, be very careful about their working posture which can otherwise result in life-long MSD. A comfortable or ideal posture will provide optimal working conditions as well as physical and psychological comfort during their clinical work. A balanced or ideal posture includes a straight back and avoiding rounding the neck into C shape, maximum 20 degrees forward inclination of trunk, 20-25 degrees of forward inclination of head from the trunk, arms placed along the body oriented forward within 10 degrees; forearm up to 25 degrees from the horizontal, 105-110 degree angle between the thigh and trunk, thighs apart up to 45 degrees and feet on the floor, forward in same plane as the trunk.⁶

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Despite the huge risk to their health, dentists as well as dental students usually demonstrate improper working habits and a deficiency of the basic knowledge of ergonomics. Almost 81% of dentists in USA suffer from neck, shoulder and lower back pain.⁷ Similar results have also been reported for orthodontists in the Canadian population.⁸ Rising et al⁹ studied the prevalence of body pains in a population of dental students and reported that up to 70% of the students report musculoskeletal pains by the third year of their education. Rehman et al¹⁰ evaluated musculoskeletal disorders among dentists in the local population and reported a prevalence of 46.7%. In a recent study by Rehan et al¹¹, the prevalence of musculoskeletal disorders among dentists in Karachi, Pakistan was found to be 90%, with a higher frequency in females.

A review of the literature suggests that the risk of work-related health problems can be minimized by increasing the awareness of these hazards among the students in their formative years.¹² The aim of this study was to assess the awareness of graduate and postgraduate dental students about the role of ergonomics in dentistry and to evaluate the presence of any pain/discomfort during the last twelve months.

METHODOLOGY

A cross-sectional study was carried out on 120 dental graduate and postgraduate students working in Armed Forces Institute of Dentistry, Rawalpindi. Data was collected using a two – part questionnaire. The first part aimed at collecting the respondent's demographic data including age, gender, years in dental profession, field of specialization, average working hours per day, significance of posture and how often did the dentist maintain an ideal posture during work. The second part consisted of the Standardized Nordic Musculoskeletal Questionnaire¹³ to screen the prevalence of any MSD in the study population. The questions pertained to nine anatomical areas of the human body, inquiring about pain or discomfort during the last 12 months and its limiting effect on the respondent's work, if any. Frequency and percentages were calculated for categorical variables like lower back ache, neck ache etc. Mean and standard deviation was calculated for age. Post-gender stratification was done using Pearson's Chi-square test to control confounding factors. $P < 0.05$ was considered significant.

RESULTS

Questionnaires were distributed to 120 dental practitioners and all were returned with a response rate of 100%. About 50 of the respondents were house surgeons while the remaining 70 were postgraduate trainees. Among the house surgeons, 26 were females and 14 were males whereas among the PG trainees, 27 were males and 43 were females (Fig 1). The mean age was 25.95 ± 3.14 years while average working hours per week were 39.13 ± 3.17 hours (Table 1). All of the respondents agreed to the significance of maintaining an ideal posture during their clinical activities. How-

TABLE 1: DESCRIPTIVE STATISTICS FOR AGE AND WORKING HOURS

	N	Mini- mum	Maxi- mum	Mean	Std. Devia- tion
Age	120	21.00	34.00	25.9500	3.14055
Average working hours per week	120	35.00	43.00	39.1333	3.17271

TABLE 2: FREQUENCY OF MAINTENANCE OF IDEAL WORKING POSTURE

	Frequency	Percent
Always	10	8.3
Most of the time	32	26.4
Seldom	78	64.5
Total	120	99.2

TABLE 3: PREVALENCE OF MSD IN RELATION TO THE GENDER OF DENTAL PRACTITIONERS

Musculo-Skeletal Disorder	Male (%)	Female (%)	P value
1. Lower Back Ache	95.2	57.7	0.000
2. Neck Ache	35.7	62.8	0.005
3. Pain in Wrist/Hand	23.8	44.9	0.023

TABLE 4: PREVALENCE OF MSD IN RELATION TO THE STATUS OF DENTAL PRACTITIONERS

Musculo-Skeletal Disorder	House Surgeon (%)	PG Trainee (%)	P value (<0.05)
Lower Back Ache	44	90	0.000
Neck Ache	66	44.3	0.019
Pain in Shoulders	26	31.4	0.519
Pain in Elbow	0	36	0.000
Pain in Wrist/ Hand	28.6	50	0.017
Pain in Upper Back	22	18.6	0.643
Pain in Hip/Thigh	14.3	40	0.001
Pain in Knee	8.6	24	0.020
Pain in Ankle/ Foot	10	26	0.20

ever, 65% reported that they seldom assumed an ideal posture during work (Table 2).

About 70% of the participating dentists reported one or more episodes of MSD over the last 12 months.

TABLE 5: PREVALENCE OF MSD IN RELATION TO AVERAGE WORKING HOURS PER WEEK

Musculo-Skeletal Disorder	35 working hours	40 working hours	43 working hours	P value (<0.05)
Lower Back Ache	4.2%	20.8%	40%	0.000
Neck Ache	25%	57.5%	68.8%	0.001
Pain in Shoulders	30%	35.4%	18.2%	0.272
Pain in Elbow	0%	0%	15%	0.000
Pain in Wrist/Hand	9.4%	37.5%	56.2%	0.000
Pain in Upper Back	27.5%	14.6%	18.8%	0.314
Pain in Hip/Thigh	0%	25%	41.7%	0.000
Pain in Knee	0%	15%	25%	0.009
Pain in Ankle/Foot	0%	17.5%	27.1%	0.006

In response to the Standardized Nordic Questionnaire, the highest frequency was observed for lower back ache (65%) followed by neck pain (53.3%), pain in wrist/hand (37.5%), pain in shoulders (29.2%), pain in hip/thigh (25%) and pain in upper back, elbow, knee and ankle/foot ($\leq 20\%$) (Fig 2).

A significant difference was found between frequency of lower back ache in both genders, with the condition being more prevalent in males ($P=0.000$). Similarly, a significant difference was found between females and males for wrist/hand ache ($P=0.02$) (Table 3). Table 4 correlates the prevalence of MSD to the status of the dental practitioner while Table 5 gives a prevalence of MSD and average working hours per week. None of the respondents was seeking any active treatment for their pain/discomfort.

DISCUSSION

This cross-sectional study evaluated the prevalence of self-reported MSD in graduate and postgraduate dentists at AFID in terms of pain or discomfort occurring over the last 12 months. Lower back ache was found to have the highest prevalence of 65%. Similar results were reported by Dayakar et al¹⁴ in India with a prevalence of 67.34%. These findings are in contrast with those reported by Newell et al⁸ in the Canadian population (59%) and by Kierklo et al⁷ who reported a 32% prevalence of lower back pain in north eastern Polish dentists. Rehman et al¹¹ evaluated the prevalence of MSD among dentists in Khyber Pakhtunkhwa and reported back ache as the most common complaint with a prevalence of 57.8% which is slightly lower than the findings in the present study.

Neck ache was the second most common condition with a prevalence of 53.3%. These results compare favorably with those of Muralidharan et al¹⁵ who reported a 52% prevalence of neck ache among the dental practitioners in India. Kierklo et al⁷ reported comparable results with a prevalence of neck ache as 47%. However, previous studies have reported frequency of neck ache in dentists as low as 37-38%.^{10,16}

In this study, a significant difference was found between males and females for neck ache ($P=0.005$), lower back ache ($P=0.000$) and pain in wrist/hand ($P=0.023$) (Table 3). While neck ache and pain in wrist/hand was more prevalent in females, lower back ache was significantly more prevalent in males. These findings are in accordance with those of previous studies.^{7,8,17} Rehan et al¹¹, however, reported contradictory results with MSD being more prevalent among males (55.5%) than females (45.5%).

The present study also correlated MSD to the average working hours per week (Table 5). The frequency of MSD increased as the number of work hours increased. These results are endorsed by those of Martinez et al² who reported that MSD increased as the number of work hours increased and that students who worked for more than 2 hours per day had a 1.2 times greater

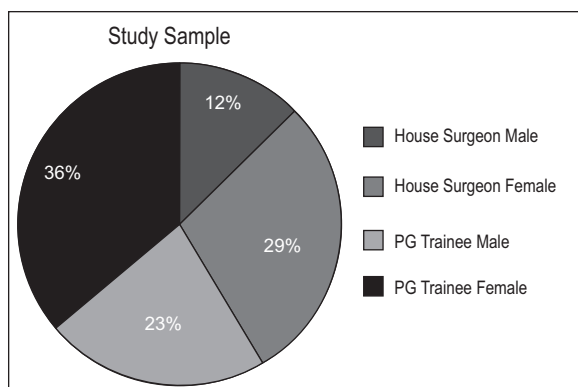


Fig 1: Distribution of male and female subjects

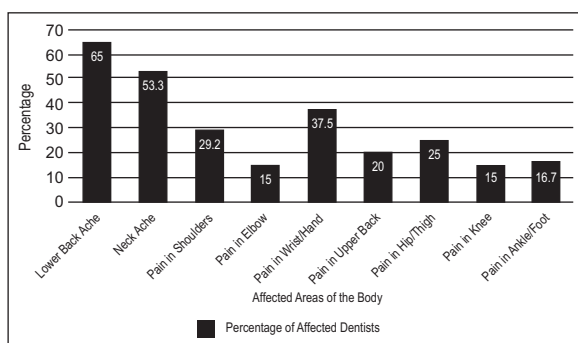


Fig 2: Prevalence of Musculoskeletal Disorders

chance of developing MSD. Similar findings were reported by Rehman et al¹⁰ and Afridi et al¹⁸ who found that MSD were more prevalent in dentists working for longer durations every day. Also, in the present study, MSD were significantly more prevalent in postgraduate trainees ($P < 0.05$) than among the house surgeons (Table 4). This can be explained on the basis of their increased work load and increased working hours.

The limitation of this study is that since it was a cross-sectional study, only the prevalence of MSD in the study population was reported and the subjects were questioned only about their work posture. The exact cause of the problem was not assessed. MSD have a multifactorial etiology and may be caused by improper posture, long working hours, physical loads, mental stress etc.^{15,19} Another limitation of the study is that the prevalence of MSD is self-reported by the subjects which can induce some degree of bias. Recent and serious MSD episodes are more likely to be remembered and reported by the dentists than older and minor ones.

Musculoskeletal disorders represent one of the major occupational hazards associated with dentistry. There is a need to thoroughly investigate this condition in the local population to increase the awareness of dental practitioners, specify the involved risk factors and to identify and implement effective curative measures.

CONCLUSION

Within the limitations of this study, following conclusions can be drawn:

- i. About 70% of dental graduate and postgraduate dentists working in AFID suffer or have suffered from one or more episodes of musculoskeletal disorders.
- ii. The highest prevalence was observed for lower back ache and the condition was found to be more common in men.
- iii. The prevalence of MSD increases as the number of working hours of the dentist increases.

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3 Bushra Rehman, Ayesha Aslam:	Analysis and interpretation of data
4 Bushra Rehman, Ayesha Aslam, Afsheen Ali:	Drafting of manuscript
5 Anum Tariq:	Critical revision