

Prevalence of Work-Related Musculoskeletal Disorders of Upper Extremities among Dentists in Punjab: A Questionnaire Study

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Abstract

Background: The prevalence of musculoskeletal disorders (MSDs) in the upper locomotive organs was investigated, along with the risk factors in association with MSDs were evaluated among dentists in Punjab.

Methods: This cross-sectional study was carried out among dentists using self-administered and nordic musculoskeletal questionnaire. Descriptive statistics and Chi-square test were used for the data analysis. Statistical analysis was done using Statistical Package for the Social Sciences version 20.

Results: A total of 160 dentists were included in the study. Majority of dentists had experienced symptoms in the shoulder (55%) as compared to wrist/hand (36.25%) and elbow (16.875%). The prevalence of MSDs increased when there were a lesser number of dental assistants in the clinics. Risk factors ($P < 0.05$) were observed to be different as per the site of MSD in question across the sample as associated stresses and contributing factors varied.

Conclusion: The prevalence of MSDs among Indian dentists is high. Specifically, long working hours and high job demand are the most significant risk factors. There is a dire need to address and to change the way dentistry that is practiced to the lower the risks of MSDs to dental practitioners. Dental professionals should be cautious and well trained to stop certain behaviors that can put their health at risk.

Key words: Dentist, Musculoskeletal disorder, Ergonomics, Nordic questionnaire, Pain, Dentistry

INTRODUCTION

Dentistry is a rapidly growing occupation in India, with numbers increasing from 40,000 dentists in 2000^[1] to more than 2.7 Lakh in 2018.^[2] However, little attention has been paid to occupational health hazards in the dental profession in India. While work-related musculoskeletal disorders (WRMSDs) have been frequently reported in the dental profession across different countries,^[3-7] knowledge of the phenomenon among Indian dentists is lacking.

The World Health Organization recognizes conditions that result in pain and functional impairment that affect the neck, shoulders, elbows, forearms, wrists, and hands as work related when the work activities and work conditions significantly contribute to the development of work-related disorders [Figure 1]. WRMSDs are described as wide range of degenerative and inflammatory conditions that affect the supporting blood vessels, peripheral nerves, joints, ligaments, tendons, and muscles. Such conditions could result in functional impairment and pain which are widely experienced at the upper extremities and the neck.^[8]

At the workplace, the causes of MSDs are diverse but poorly understood. Aptel *et al.*^[9] stated that biomechanical factors such as repetitive motion, strenuous efforts, extreme joint postures, and/or psychosocial factors establish the key role in WRMSDs. In Mekhora *et al.*,^[10] it is provided that certain psychological factors are associated with

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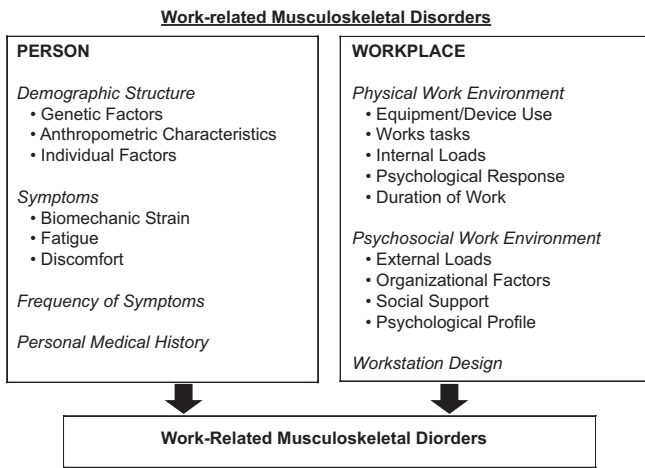


Figure 1: Factors scheme

musculoskeletal discomfort and may eventually provide one way to intervene to reduce MSDs.

In Western countries, attention to and awareness of WRMSDs in the dental profession has increased substantially due to the elevated number of musculoskeletal symptoms significantly affecting the health of dentists.^[7,11,12] However, in India, even though the population amounts to 1.38 billion people, there is still a lack of research about the prevalence of WRMSDs in this rapidly growing occupational sector or the possible work-related risk factors for Indian dentists. Therefore, investigating the prevalence of work-related symptoms among dentists in India is of crucial importance.

Despite the evidence of MSDs in dentistry, research conducted among the dentists in Punjab region specifically aimed at upper extremities and their joints is very scanty. Hence, the present study is aimed to describe the prevalence of MSDs in the upper limbs and joints experienced by dentists during their clinical work in Punjab. The study also aimed to find the association between MSDs and selected sociodemographic, professional, and working characteristics variables.

MATERIALS AND METHODS

In this cross-sectional study, participants included a convenience sample of 160 dentist of Punjab region. Written informed consent was obtained from all participants before the start of the study.

A self-administered standardized nordic musculoskeletal questionnaire^[13] was conducted on dentists in state of Punjab, over a period of 2 months. Before the study, a pilot study was undertaken to test the questionnaire for comprehensibility and relevance among ten dentists. The

purpose of the questionnaire and how they should be answered was explained and whenever required, necessary further information was provided. They were not included in the study.

A 1-year recall of MSDs was used in this study, as this was shown to be an appropriate time scale in Taiwan,^[14] Japan,^[15] Korea,^[16] Saudi Arabia,^[17] Australia,^[18] and Denmark.^[19] In addition, the questionnaire contained general items such as gender, age, body mass index (BMI), education level, experience, and working conditions, including the work place, frequencies and duration of work tasks, number of dental assistants, and durations of being in a bent position and using handpieces. Similar method was used in the study focused on MSDs in neck and back among dentists in Punjab.^[20]

The collected data were thoroughly screened and entered into MS-Excel spread sheets and analysis was carried out using Statistical Package for the Social Sciences version 20. Descriptive statistics and Chi-square test were used to assess statistical significance of differences observed. $P \leq 0.05$ was considered statistically significant.

RESULTS

During the survey, effective responses from 160 dentists were received, among them, 104 (65%) were female [Figure 2]. Majority of respondents (71.9%) belonged to the age group of 21–30 [Figure 3]. Nearly half of the dentists (45%) were 161–170 cm tall [Figure 2]. Values of the BMI of nearly half of the respondents (43.125%) were in over weight range (43.125%), about one-third (29.375%) were within normal range and 19.375% were obese.

Among the study sample, about three-fourths (74.375%) had completed graduation in the year 2011–20 [Figure 2]. Among the 160 dentists, 54 (33.75%) had a master’s degree and the remaining 106 (66.25%) were dental graduates. About one-half (56.875%) worked with no dental assistant, and also nearly another one-half (41.875%) had one to six dental assistants.

Majority of them (85.625%) worked 6 days in a week while Nineteen dentists (11.875%) worked 7 days a week. Majority of dentists (85%) treated no more than 10 patients per day while about one-tenth (11.875%) treated about 11–30 patients per day. About half of dentists (53.125%) spent around half an hour per patient daily while around one-fourth (26.875%) spent more than 50 min per patient daily. During treatment, around 60% (60.625%) of dentists worked in a forward bent position for an average time of 1–10 min/patient.

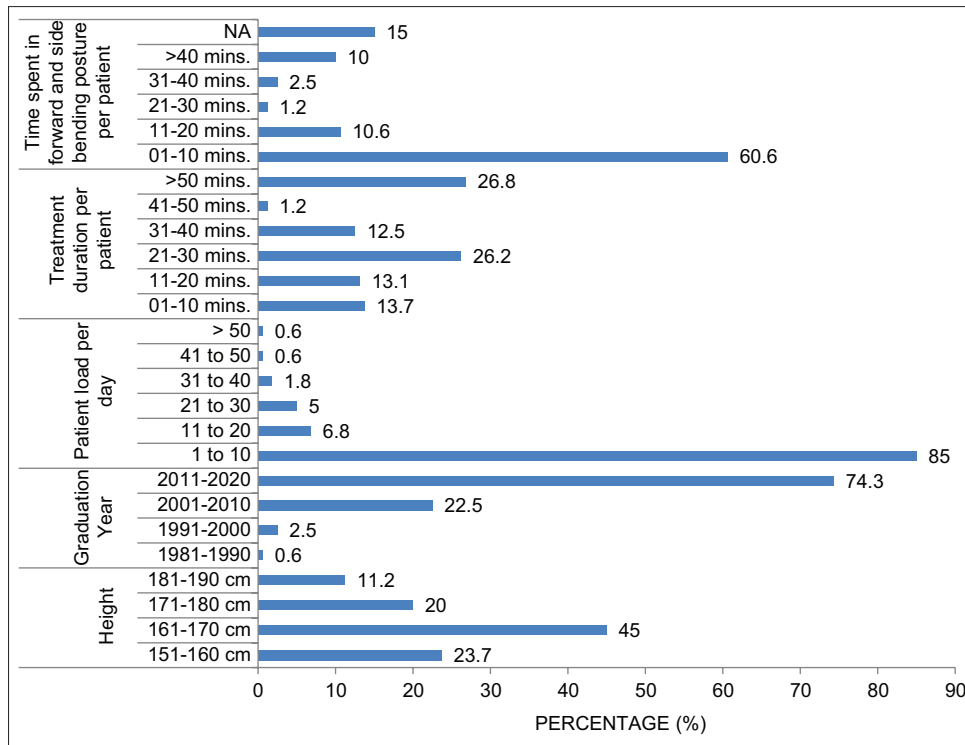


Figure 2: Distribution of study subjects according to different variables

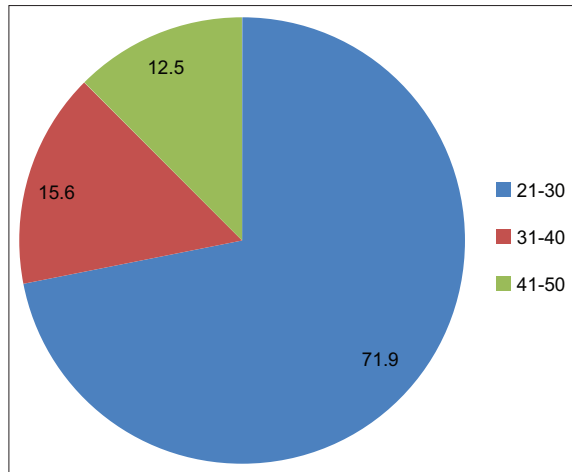


Figure 3: Distribution of study subjects according to age groups

Among the sample, 61.25% (98 dentists) reported pain in one of the regions, 10.625% (17 dentists) had pain in all the three regions whereas 38.75% (62 dentists) reported no pain in these three regions.

Out of 160 dentists, female dentists showed higher prominence of trouble in shoulder accounting to be 59.615% (62 dentists) among female as compared to 46.428% (26 dentists) among male which was clinically significant. Moreover, women with shoulder problems mostly had trouble in both shoulders 90.32% (56 dentists) as compared to an individual shoulder. Thirteen

dentists had BMI <18.5, among these 12 (92.31%) had shoulder trouble which was statistically significant. 17 dentists (65.38%) amongst the 27 dentists having BMI in the range of 27.1–35 had pain in shoulder which was statistically significant. Seventy-six dentists (55.88%) reported problem in shoulder among the dentists who have been practicing for 1–10 years which was statistically significant. One hundred and six dentists had education level as BDS, among them 62 had pain in shoulder which was statistically significant. About 61.11% (55 dentists) among the 90 dentists who had no dental assistants complained of trouble in shoulder which was statistically significant [Table 1].

Forty-three dentists (41.346%) among total of 104 female dentists complained of trouble in wrist/hand which was clinically significant. Fourteen dentists among the 26 dentists having BMI ranging between 27.1 and 35 confirmed about pain in wrist/hand which was clinically significant [Table 2].

Among the 47 dentists with BMI ranging between 18.5 and 24, 13 dentists approved of trouble in elbow which was statistically significant. Thirteen practitioners among the 54 postgraduate dentists confirmed of pain in elbow which was statistically significant. Six dentists who worked 7 days a week complained of problem in elbow which was clinically significant [Table 3].

Table 1: Distribution and association of independent variables with shoulder

S. No.	Factors	Trouble with locomotive organs (shoulder)				Significance (<i>P</i> value)
		None	Right shoulder	Left shoulder	Both shoulders	
1.	Gender					0.000
	Male	30	12	7	7	
	Female	42	5	1	56	
2.	BMI					0.007
	<18.5	1	0	1	11	
	18.5–24	25	3	2	17	
	24.1–27	33	12	5	19	
	27.1–35	9	2	0	15	
	>35	4	0	0	1	
3.	Physical activity					0.152
	Yes	52	14	7	38	
	No	20	3	1	25	
4.	Years of practice					0.000
	1–10	60	8	7	61	
	11–20	10	9	1	2	
	21–30	2	0	0	0	
5.	Education level					0.000
	BDS	44	4	3	55	
	MDS	28	13	5	8	
6.	Number of dental assistants					0.000
	1	21	5	3	6	
	2–6	14	11	5	2	
	6–10	1	0	0	0	
	>10	1	0	0	0	
	NA	35	1	0	55	
7.	Work days in a week					0.616
	≤4	2	0	0	0	
	5	2	0	0	0	
	6	60	14	6	57	
	7	8	3	2	6	

**P*<0.05 - Statistically significant

Among the total respondents, 55% (88 dentists) presented with trouble in shoulder; 36.25% (58 dentists) presented with trouble in wrist/hand while 16.875% (27 dentists) presented with pain in elbow.

DISCUSSION

The Nordic standardized questionnaire has been used for analyzing musculoskeletal symptoms since 1987^[21,22] and is an internationally respected instrument for evaluating musculoskeletal complaints.^[22] It is a self-reported survey method and disorders include aches, pains, and discomfort in the musculoskeletal system,^[18] which might not be diagnosed as a disease by physicians.

The numbers of patients with musculoskeletal pain of the upper limb in dentists are growing, so that the prevalence of it from 58% in 2001^[23] has reached to 81% in 2006.^[24] Due to the increasing prevalence of musculoskeletal pain in dentists, the present research studies the prevalence and risk factors of the upper limb MSDs among a cross-section of Punjab dentists' population.

The results of this research showed that 61.25% of the subjects reported symptoms of MSDs over the past year, and this prevalence of such disorders is consistent with many studies (e.g., 64% of the subjects in study of Marshall *et al.*, 64.8%,^[25] in Motamayel *et al.*

In the present study, female dentists showed significantly higher prevalence of pain and discomfort for 59.615% (62 dentists) as compared to male dentists for 46.428% (26 dentists). This shows consistency with the findings of Rundcrantz,^[26] Rickert *et al.*^[27] Moreover, the effect on both shoulders in female dental professionals is observed to be of higher frequency as compared to other regions.

Furthermore, shoulders are the most commonly affected body regions followed by wrists and elbows as observed in the present study population. Similar results were found by Rickert *et al.*^[27] This can be correlated with the higher use of upper body regions while working by the dental professionals which bears strains of vibrating instruments and longer chair time with no intermittent break.

Table 2: Distribution and association of independent variables with wrist/hand

S. No.	Factors	Trouble with locomotive organs (wrist/hand)				Significance (P value)
		None	Right wrist/hand	Left wrist/hand	Both wrists/hands	
1.	Age (years)					0.343
	21–30	70	32	1	12	
	31–40	21	4	0	0	
	41–50	11	6	0	3	
2.	Gender					0.047
	Male	41	8	1	6	
	Female	61	34	0	9	
3.	BMI					0.006
	<18.5	10	3	0	0	
	18.5–24	31	5	1	10	
	24.1–27	45	19	0	5	
	27.1–35	12	14	0	0	
	>35	4	1	0	0	
4.	Physical activity					0.083
	Yes	68	29	0	14	
	No	34	13	1	1	
5.	Years of practice					0.963
	1–10	88	35	1	12	
	11–20	13	6	0	3	
	21–30	1	1	0	0	
6.	Education level					0.857
	BDS	66	29	1	10	
	MDS	36	13	0	5	
7.	Number of dental assistants					0.851
	1	22	9	1	3	
	2–6	20	9	0	3	
	6–10	0	1	0	0	
	>10	1	0	0	0	
	NA	59	23	0	9	
8.	Work days in a week					0.836
	≤4	2	0	0	0	
	5	2	0	0	0	
	6	89	35	1	12	
	7	9	7	0	3	

*P<0.05 - Statistically significant

The prevalence of MSD decreases with the increase in number of years of practice. Higher proportion of discomfort in the locomotive organs is found to be present in dentists with 1–10 years of practice which tends to decline as the dental professionals gain experience with age. It can possibly be explained by the development of effective strategies to work for longer hours and adjust patient positioning along with equipment utilization, work efficiency, and maintaining general health. Similar findings were observed by Thornton *et al.*^[7] as the senior batch students (3rd year) reported the highest level of musculoskeletal symptoms who have just started attending clinical practice in the dental school. However, some investigations documented that dentists under the age of 50 years showed lower percentage of MSD than older professionals as observed by Rickert *et al.*^[27]

Number of dental assistants employed in clinic also appears to be associated with the risk of MSD and pain.

No involvement of assistants in dental practice showed higher prevalence of MSD in dental professionals (55 dentists experienced pain in both shoulders, whereas no pain in shoulders/elbows was experienced with a dental setup of 6–10 dental assistants). Similar findings were observed by Samotoi *et al.*^[6] with fewer symptoms reported in the presence of dental assistants. More number of dental assistants reduce the work load on dentists thus reducing the exposure to vibratory instruments as well as to-and-fro movements of joint while mixing of cements and other similar activities.

Educational qualification showed significant correlation on the prevalence of musculoskeletal diseases and pain. BDS graduates showed higher proportion of pain in both shoulders (55 respondents) as compared to postgraduates (MDS). Similar results were observed by Singh, *et al.*^[20] which can be attributed to knowledge of ergonomics and utilizing appropriate illuminating techniques to reduce the strain on body while working.

Table 3: Distribution and association of independent variables with elbow

S. No.	Factors	Trouble with locomotive organs (elbow)				Significance (P value)
		None	Right elbow	Left elbow	Both elbows	
1.	Age (years)					0.381
	21–30	96	8	2	9	
	31–40	22	3	0	0	
2.	41–50	15	4	0	1	0.188
	Gender					
	Male	48	7	0	1	
3.	Female	85	8	2	9	0.000
	BMI					
	<18.5	10	1	2	0	
4.	18.5–24	34	4	0	9	0.069
	24.1–27	60	8	0	1	
	27.1–35	24	2	0	0	
	>35	5	0	0	0	
	Physical activity					
5.	Yes	87	12	2	10	0.425
	No	46	3	0	0	
	Years of practice					
6.	1–10	115	10	2	9	0.031
	11–20	16	5	0	1	
	21–30	2	0	0	0	
7.	Education level					0.135
	BDS	92	5	2	7	
	MDS	41	10	0	3	
8.	Number of dental assistants					0.015
	1	28	5	2	0	
	2–6	24	6	0	2	
	6–10	1	0	0	0	
	>10	1	0	0	0	
9.	NA	79	4	0	8	0.015
	Work days in a week					
	≤4	2	0	0	0	
	5	2	0	0	0	
	6	116	11	0	10	
7	13	4	2	0		

*P<0.05 – Statistically significant

CONCLUSION

This study investigates the prevalence rates for MSDs in upper extremities among dental professionals of Punjab, India. Gender, years of practice, education level, and number of dental assistants have been identified as possible factors affecting musculoskeletal system. Hence, there is a need for well suited interventions for preventing MSD and pain among professional dentists. Using psychosomatic approach and individual ergonomic instructions along with physiotherapy will provide relief from pain and discomfort and enhanced mental well-being. Upper body parts especially shoulders are more prone MSD because of the prolonged uncomfortable positions, the dentist has to stay in during the procedures. To overcome this prevalent disorder, it is highly recommended that the clinicians are regularly updated about the advancements in dental equipments, for example, ergonomic dental loops, dental chairs with lumbar, and arm support. Furthermore, taking brief breaks and stretching in between the scheduled patients greatly help to reduce the strain on shoulders and

arms. To conclude, maintaining a healthy lifestyle is the real key to a successful dental practice.

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