

Prevalence of Musculoskeletal Disorders Among Orthodontists in Indore: A Questionnaire Survey

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ABSTRACT

Background: Ergonomic problems have been noted among the hazards in the dental workplace. Many surveys have suggested that dental professionals may suffer from musculoskeletal disorders (MSDs) of the low back and neck as well as other MSDs but not much has been researched particularly for Orthodontists. This survey aimed to look deeper into MSDs among Orthodontists in Indore and provide a starting point to direct ergonomic intervention. This Questionnaire based Survey was carried out on 80 Orthodontists who were registered in Madhya Pradesh and met the inclusion criteria. Google form link to Standardized Nordic questionnaire was mailed and sent on WhatsApp to Orthodontists. The questionnaire consisted of questions concerned with demographic details, work duration and acquired specialization, organization and methods of work in the surgery, and also disorders connected with the musculoskeletal system and physical prophylactic activity. There was a 75% response rate from a sample of 80. 64% percent of the respondents were males and 36% were females. The results showed that 46% (n = 23) of the respondents were suffering from work-related musculoskeletal disorders (MSD). Wrist pain and low back pain (40%) are the most prevalent MSD, followed by neck and shoulder trouble. The descriptive data were analyzed and Chi-square test was used for statistical significance ($p < 0.05$). Comorbidity of the musculoskeletal pains is noted. Around 37% of the study is suffering from more than one type of body pain, out of which 4% reported more than four anatomic sites. These results were consistent with other studies surveyed on dental professionals for the number and type of MSDs present. Further attention should be directed towards risk factors and ergonomic intervention.

Conclusion: The findings are alarming and proper formal educational training in ergonomics is necessary to minimize the work-related musculoskeletal conditions.

Keywords: Musculoskeletal disorders; Prevalence; Orthodontists, dental ergonomics, occupational hazard.

INTRODUCTION

Occupational health hazards are very common in dentistry and are increasing trifold day by day. Work-related musculoskeletal disorders (WMSDs), which are problems of musculoskeletal system, are significant that they affect occupational health and the careers of the working population leading to

financial and economical loss. The term 'musculoskeletal disorders (MSD)' refer to conditions that involve the nerves, tendons, muscles and supporting structures of the body¹. Orthodontists at workplace are susceptible to the

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occupational health hazards and the development of cumulative trauma disorders.

In Orthodontic practice, there is a good social interaction between patient and assisting staff because of long stretched appointments. In our profession performance is restricted to an area covering only a few millimeters (the mouth), and requires repeated and precise force applications. A healthy orthodontist is of prime importance in a successful practice. We can, and do experience illnesses and problems that can disrupt or impair a practice. There are growing evidences suggesting increased vulnerability within the profession to certain disorders and afflictions which are only practice related, to avoid these problems there must be increase in-awareness of the proper armamentarium, correct postures during work, designing the workstation to promote neutral positions and correct use of instruments for a healthy work practices to reduce the stress of work on the practitioner's body.

Recently, "Ergonomics in Orthodontics" has become a popular term. It is a science that deals with orthodontists and their relationship to their occupational environment. In Greek, "Ergo," means work and, "Nomos," means natural laws or systems. Therefore, it is an applied science of designing products and procedures for maximum efficiency and safety. Also, a study of the relationship between the personnel, equipment and environment in the workplace. Proper ergonomic design is necessary to prevent repetitive strain injuries, which can develop over time and can lead to long-term disability. Figure 1, counts the factors that can lead to ergonomics in orthodontic practice.



Fig 1: Factors affecting ergonomics for Orthodontic practice

Orthodontists are at a much higher risk and the main reason for this is long stretched appointments and difficult techniques like the newly introduced lingual system. They often assume static positions that are un-comfortable and asymmetric. There are growing evidences suggesting increased vulnerability within the profession to certain disorders and afflictions which are majorly practice related, to avoid these problems there must be increase in-awareness of the proper armamentarium, correct postures during work, designing the workstation to promote neutral positions and correct use of instruments for a healthy work practices to reduce the stress of work on the practitioner's body^{2,3}. Bad working habits, repetitive tasks and uncomfortable posture contribute to musculoskeletal disorders (MSDs), stress and loss of working efficiency.

Orthodontists along with supporting dentists and dental hygienists are at a greater risk of work-related musculoskeletal disorders (MSDs) than the general population. These disorders can result in pain and dysfunction of the neck, back, hands and fingers. Estimated work related musculoskeletal injuries occur in 54% to 93% of professionals, with most frequent injuries occurring in the spine (neck and back), shoulders, hands and elbows which if ignored, that this physiological damage will lead to an injury or a career-ending disability⁴. Many work related MSDs are building up over years or decades and a poor ergonomic choice may not have an impact today but over a time, it could result in pain or injuries, affecting the productivity and earning potential. Good habits adopted early, are the best strategy when it comes to posturedontics (Ergonomics)².

Many anecdotal researches^{1,4-7} surveying MSD prevalence among general dental practitioners GDS and Orthodontists are summarized in Table 1. These studies, with the exception of Shugars et al. (1984), showed that MSDs were not related to gender, years of practice, operating style, or frequency of exercise, however these authors did not conclude or suggest what may have been related. Shugars et al. (1984) concluded in their study that MSD prevalence was related to congenital factors, sports injuries, and trauma injuries. Shugars et al. (1984), Kerosuo et al. (2000) and Lalumandier et al. (2001), proposed results and recommendations that generalized the whole group of dental professionals. However, the

authors did not comment on the different physical demands of the different professions or their likeness to support a generalization. Since most of the previous research surveyed GDs, this study conducted a survey specifically on orthodontists and compared the results to the previous research mentioned above. Several differences are noted between the job demands of orthodontists and GDs. For example, GDs work deep inside the patient's mouth, and will tend to have more awkward head, neck, and torso postures to enable them to see and work with precision inside the mouth. GDs also position themselves at the side of the patient's head to get a better view of their work area. Whereas, orthodontists work on the teeth surface, which allows them to work at the head of the patient, and

have more neutral work postures in relative terms to GDs, as they do not require to see the other side of the patient's teeth (Newell, 2003)¹. Further, they suggested that dental professionals may suffer from musculoskeletal disorders (MSDs) of the low back and neck as well as other MSDs but none has specified the specific problems related to Orthodontics. In the above context, this survey was aimed to look deeper into WMSDs (Work Related Musculoskeletal disorders) among the orthodontists in Indore and meant to instigate a starting point for an in depth review of risk factors in the work environment of orthodontists and provide a starting point to direct ergonomic intervention.

Table 1: Previous study reports of musculoskeletal disorder prevalence among dental professionals

Study	Population group	Sample n	Back pain			Neck pain	Shoulder pain
			General%	lower%	upper%		
Basset (1983)	General Dentists	465	62	-	-	-	-
Shugars et al. (1984)	Ortho-dontists	32	41	38	22	-	-
	General Dentists	347	57	31	54	-	-
Kuroinka et al. (1987)	General Dentists	359	-	50 females 43 males	-	72	-
Kerosuo et al. (2000)	Ortho-dontists	81	70%				
	General Dentists	147	28	-	-	53	56
Lalumandier et al.(2001)	Ortho-dontists	59	43	-	-	19	15
	General Dentists	647	35	-	-	28	21

MATERIALS AND METHODS

Subjects

All practicing orthodontists registered and practicing in Indore, Madhya Pradesh around 80 in total, were potential subjects for the study. The Modified Nordic questionnaire was distributed to around 80 Orthodontists (Male and Female) both in Hard and Soft copy format. Google form link was mailed and/or sent via WhatsApp to around 80

registered Orthodontists practicing in Indore (MP). Out of this 60 answered the questionnaire form and the response rate was 75% (Figure 2). This rate is considered to be adequate according to Diem (2002)¹ for such surveys. The non-respondents were assumed to be similar to the respondents based on the notion that the group under study was a somewhat homogeneous group. This population maintains some homogeneous characteristics such as the same graduate and post-graduate level

education, as well as social and economic status. In support of this notion, the respondents had a similar mean age and male to female ratio as the entire population, making them substantially representative of the population under study. The responding subjects' demographic details obtained from the self-administered questionnaire are presented in Table 2.

The Questionnaire consisted of two parts, namely, demographic data and MS pain-related data. The demographic data included age, gender, educational level, working status, weekly normal working hours, weekly overtime working hours, duration of dental work, income and frequency of exercise. For statistical analysis, the work experience was divided into three groups— below 5 years, 5 to 10 years and the third group above 10 years of work experience. Musculoskeletal complaints were measured using the standardized Nordic questionnaire with visual analog. The visual analog was given to mark the area of musculoskeletal pain. A total of 80 orthodontists were given this self-administered questionnaire containing around 60 questions that focused on the personal life, work practices, presence of symptoms related to WMSDs, etc.

Inclusion criteria included all the orthodontists above 3 years of work experience after passing out their qualifying examination. Exclusion criteria was work experience below 3 years, previous history of trauma that impaired musculoskeletal system, any previous history of neuromuscular disorders. Nine questionnaire forms were rejected as they did not satisfy the inclusion criteria set above. One of the questionnaire forms were rejected as they provided incomplete data. Only 50 questionnaire forms were included in the final analysis.

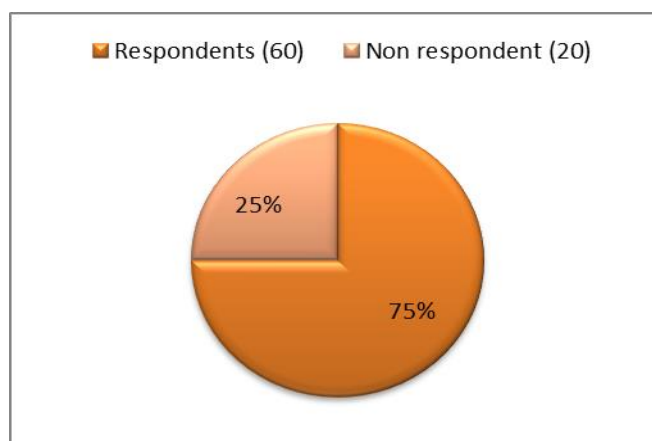


Fig 2: Participation response.

Table 2: Demographic variables of the responding orthodontists in the Nordic questionnaire

Total No. of Respondents	N=50	100%
1. Gender	32	64%
• Male	18	36%
• Female		
2. Age	43.1 (8.21)	
3. Height (in cm)	173.1 (0.032)	
4. Weight (Kg)	73.45 (5.1)	
5. BMI	26.61 (1.83)	
6. Orientation	45	90%
• Right Handed	05	10%
• Left Handed		
7. Work Experience (In years)	9	18%
• < 5 Years	12	24%
• 5-10 Years	29	58%
• >10 Years		
8. Type of Job Work	20	40%
• Only in Private Practice – No Academics	02	4%
• Only in Academics – No Private Practice	28	56%
• Both in Academics & Private Practice		
9.Type of Dental care provided	23	46%
• Restricted to Orthodontics	27	54%

• Both general practice & Orthodontics		
10. Hours of Work per day	05	10%
• 2-4 Hours	32	64%
• 4-8 Hours	13	26%
• > 8 hours		
11. Work on weekends	28	56%
• No Work on Sundays	22	44%
• Work on Sundays also		
12. Life Partner	24	48%
• Dentist	26	52%
• Non Dentist		
13. Life Partner (Orthodontist)	0	0%
• Yes	50	100%
• No		
14. Exercise regularly	28	56%
• Yes	22	44%
• No		
Total No of Orthodontists with WMSDs	N= 23	46%
Medical Consultation for WMSDs	N= 11	22%

Statistical Analysis

All categorical answers for every subject will be subjected to Statistical Analysis performed using, SPSS 20.0 software. Means and standard deviations (SDs) were used to describe the demographic details. Prevalence odds ratio (OR) with 95% confidence intervals (95% CI) and chi-square (χ^2) tests with Yates correction were calculated as a measure of association between variables in relation to the presence of WMSDs in different groups to determine, if any significant correlations existed. Univariate logistic regression analysis was used with significance level of $p < 0.05$ for the selection of risk factors. These analyses were carried out amalgamating for all musculo- skeletal complaints put together.

RESULTS

The response to participate in the study was 75%. The demographic data of base line characteristics of the population under study are given in the Table 2. The subjects consisted predominantly of males (64%) compared with females (36%) with age ranging from 28 to 66 years with mean age 43.1 (8.21). The average BMI is 26.61 (1.83). The mean age of the work experience is 11.36 (6.23) years. Most of the orthodontists in the study have work

experience more than 10 years (58%). The data also indicated that more than half of the orthodontists (54%) also practice general dentistry. Majority of the practicing orthodontists are attached to some teaching hospital and are in academics (56%). Around one quarter of the orthodontists work for more than 8 hours a day (26%) and around half of them (44%) work on Sundays also. Personal life of orthodontists reveals that slightly less than 50% of them are married to dentists and none have orthodontists as their mutual life partner. The data also show that many orthodontists do not exercise regularly (44%).

The number and type of self-reported symptoms related to musculoskeletal disorders are given in Table 3. It is found that 23 persons (46%) in the study were suffering from WMSDs affecting one or more of the body parts. It is found that the wrist pain ($n = 20$) and lower back region pain ($n = 20$) are the most common WMSD. Musculoskeletal comorbidity was high. Around 37% of the subjects is suffering from more than one type of body pain, out of which 4% reported more than four anatomic sites. Wrist pain is strongly associated with the low back pain since more than 50% of the subjects with wrist pain are also associated with chronic low back pain in the last 12 months. Besides low back pain

and wrist pain, pain in the shoulders is the common cause for abstinence from duties (8%). Eleven orthodontists took proper medical consultation for relief of pain (22%). The work-related musculoskeletal problems are relatively less in the lower part of the body with foot and ankle being the least.

Significant correlations ($p < 0.05$) were found between MSD prevalence and some variables related to type of job work, work on weekends. No significant correlations ($p > 0.05$) were found between WMSD and type of dental practice, number of hours/day, regular exercise, etc (Table 4). It is noted that the WMSD in general increased with work experience. Musculoskeletal disorders are 10 times more prevalent in males compared with females (OR = 5.099) which is statistically significant. WMSD is significantly higher in groups with 5 to 10 years of work experience (OR = 1.849) and in those above 10 years of experience (OR = 1.634). At the same time, no statistically significant difference is noted in the orthodontists who

practice only orthodontics (OR = 1.518) compared with those who practice both general dentistry and orthodontics. Surprisingly, higher prevalence is noted in the orthodontists who are restricted to orthodontic practice. The prevalence of WMSD is comparatively higher (OR = 1.7082) in those orthodontists who work for more than 8 hours a day, though it is not statistically significant. Probably Indian orthodontists are accustomed to work for more number of hours per day. The presence of WMSD was noted on a minimal scale in those who are restricted to academics without any private practice and this was found to be statistically significant. The MSDs are comparatively less in the orthodontists who have their dentists as life partners compared with non-dentists as life partners (OR = 5.17) and is statistically significant. Probably, this may be due to the share of workload which needs to be investigated. The prevalence ratio of WMSD is more than double in orthodontists who practice on Sundays (OR = 1.85) compared with those who do not practice on weekends.

Table 3: Type of MSDs and its consequences in the past 12 months among Orthodontists (N=50).

	Occurrence in the past 12 months		Occurrence in the past 7 days		Abstinence from duty more than one week in the last 12 months		Medical consultation for the pain	
	n	%	n	%	N	%	n	%
Neck	14	28%	3	6%	2	4%	7	14%
Shoulders	18	36%	4	8%	4	8%	9	18%
Wrist	20	40%	3	6%	5	10%	10	20%
Elbow	16	32%	2	4%	2	4%	11	22%
Upper back	15	30%	2	4%	2	4%	09	18%
Lower back	20	40%	3	6%	4	8%	11	22%
Thighs/hips	9	18%	1	2%	1	2%	4	8%
Knee	7	14%	1	2%	1	2%	3	6%
Foot/ ankle	6	12%	2	4%	1	2%	3	6%

*Total number of orthodontist suffering from MSDs is 23 (n = 23). The total number of orthodontist took medical consultation is 11. The above data also indicates that the individuals are suffering from comorbidity involving more than one body part.

Table 4: Correlation between work risk factors and prevalence of musculoskeletal complaints among Orthodontists (n = 50).

	Total orthodontists in the study (n=50)	Total number of orthodontists suffering from WMSD	OR	Confidence limit (95%)		Pearson Chi-square with Yates correction	p- value
				Upper limit	Lower limit		
Gender	32	18	5.099	2.21	12.12	15.63	0.0001*
• Males	18	5	0.189	0.0823	0.4484	15.63	0.0001*
• females							
Orientation	45	21	27.162	8.35	87.88	56.95	0.0001*
• Right handed	05	02	0.52	0.132	1.98	0.46	0.4960
• Left handed							
Work experience (in years)	9	3	0.20	0.0902	0.4480	16.34	0.0001*
• <5	12	7	1.849	0.9885	3.4964	3.15	0.0753
• 5-10	29	13	1.634	0.9794	2.7622	3.11	0.0786
• >10							
• Type of job work	20	09	1.592	0.5426	2.477	0.04	0.8502
• Only in private practice –no academics	02	01	0.148	0.706	0.3474	23.42	0.0000*
• Only in academics- no private practice	28	13	2.72	0.15584	4.7387	11.88	0.00006*
• Both in academics and private practice							
2.Type of dental care provided	23	13	1.518	0.9242	2.4973	2.34	0.1266
• Restricted to Orthodontics	27	10	0.657	0.4004	1.0816	2.34	0.1266
• Both general practice and Orthodontics							
3. Hours of work/day	05	02	0.6753	2.918	1.652	0.48	0.5124
• 2-4 hours	32	13	0.7321	0.4366	1.2276	1.10	0.2933
• 4-8 hours	13	8	1.7082	0.9725	2.9800	2.99	0.08338
• >8 hours							
4. Work on weekends	28	9	0.5354	0.3242	0.8846	5.38	0.0202
• No work on Sundays	22	14	1.85	1.1304	3.082	5.38	0.0202
• Work on Sundays also							
5. life partner	24	08	0.1926	0.1121	0.334	36.23	0.0000*
• Dentist	26	15	5.17	3.016	8.916	36.23	0.0000*
• nondentist							
6. life partner – Orthodontist	0	0	0.2967	0.0630	1.4066	1.71	0.1921
• Yes	50	23	3.356	0.7111	15.866	1.71	0.1921
• No							
7. Exercise regularly	28	13	0.6132	0.3728	1.0081	3.26	0.0708
• Yes	22	10	1.632	0.9906	2.672	3.26	0.0708
• No							

*P-values <0.05—statistically significant

DISCUSSION

This Cross-sectional, Descriptive and Observational study was conducted to find prevalence of WMSDs

in Orthodontists practicing in Indore. The prevalence of WMSD is noted in nearly 46% of the orthodontists and this is alarming. The results of the study showed that the prevalence of WMSD in

Orthodontists was less compared to the other studies surveyed on dental professionals in general and orthodontists in particular and for the number and type of WMSDs present in different parts of the world.^{3,5,6,7,8,9} . Though statistically not significant, higher prevalence was noted in certain group of orthodontists. The risk group includes the orthodontists above 5 years of work experience, who work continuously without relaxation on weekends. Significantly, higher amounts of wrist pain and lower back pain were noted in majority of the orthodontists. This is in accordance with the study of Alexopoulos⁸ who noted more prevalence of wrist pain in orthodontists compared to general dentists. Wrist pain may be attributed to the repetitive wrist motion in hyperflexion or hyperextension, while fabricating the orthodontic wires, bonding, debonding procedures, etc. They also reported significant prevalence of shoulder pain in general dentists compared to orthodontists. A study conducted by Theresa M Newell⁷ also revealed that the predominant MSD affecting dental professionals, and orthodontists in particular, occurs in the back. In addition to back pain, they found orthodontists⁷also suffer from neck and shoulder pain, although at a decreased severity. In this study, wrist pain (40%) and low back pain (40%) were the most commonly noted MSDs. Wrist pain may be attributed to the repetitive wrist motion in hyperflexion or hyperextension, while fabricating the orthodontic wires, bonding, debonding procedures, etc. In the present study, it is found that the Orthodontists are affected significantly by low back pain (40%), shoulder (36%) and neck (28%) pain. The studies conducted earlier^{1,2,7-11} have not concentrated on the comorbidity or existence of pain simultaneously in different parts in the same patient. One of the alarming features noted in the study was the comorbidity of the musculoskeletal pain. One of the alarming features noted in the study was the comorbidity of the musculoskeletal pain. The limitation of the present study is that it is limited to study only the prevalence aspect of WMSDs in Indore Orthodontists so it cant be used as an indicator for prevalence aspect of WMSDs of Indian Orthodontists. We need to further do a Survey on Central level for getting better information in regard to same. There are some measures to reduce the WMSDs. Continuous work periods should be avoided and it is advised to relax in between patient

appointments. Regular physical exercise increases muscular strength, improves speed and coordination of movement, flexibility of the tendons, connective tissues and ligaments, and decreases the risk of overburdening and degenerative changes in the locomotive organs.

CONCLUSION

The determination of WMSD prevalence among orthodontists will provide researchers and practitioners with a relevant description of prevalence necessary to have an in depth review of risk factors and ergonomic interventions. Many of the Indian dental schools do not have ergonomics in their academic curriculum. The work-related problems can be minimized by providing the education regarding the detrimental factors of the MSD. Knowledge about the ergonomics as well as health and safety measures at the place of work should be imparted professionally during the dental schooling in general at graduate and particularly at postgraduate level.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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