

ORIGINAL ARTICLE

Musculoskeletal complaints among oral and maxillofacial surgeons and dentists: A questionnaire study

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Abstract

Objective. This is a questionnaire study aimed to collect information from Turkish dentists and oral and maxillofacial surgeons concerning common occupation-related health problems, their knowledge about these problems and the precautions they commonly took. **Study design.** This study involved a postal questionnaire survey of oral and maxillofacial surgeons and other dentists working in various regions of Turkey in both public and private dental institutions in 2010. **Results.** A total of 608 dentists (337 female, 271 male) were included in the study group and evaluated for musculoskeletal complaints. The mean age of participant was 27.63 ± 9.5 , ranging from 22–63 years old. Working position is very important for development of pain. This study exhibited that a significant proportion of dentists with pain worked in standing or sitting alternately working positions ($p < 0.001$). This study found that 39% of dentists worked in standing position with loading on the right foot, 14.6% loading on left foot and 46.4% loading on both the right and left foot alternately to balance their body weights. It was found that 57% of respondents had worked with a dental assistant and 43% had not. **Conclusion.** In this study, it was found that musculoskeletal complaints were most frequently seen at dentists and oral and maxillofacial surgeons who have long working hours per day, working in sitting or standing positions alternately and intermittent working designs.

Key Words: work, musculoskeletal complaint, pain, dentist, oral and maxillofacial surgeons

Introduction

Health is described as a state of physical, mental and social well-being by the World Health Organization [1–3]. Regional musculoskeletal pain is common in working populations. It is a common cause of work-related disability among workers with substantial financial consequences due to workers' compensation and medical expenses [4].

Dentists are at high risk of musculoskeletal problems due to the limited working area and limited visibility associated with the oral cavity. These working restrictions frequently cause a clinician to assume stressful body positions to achieve good access and visibility inside the oral cavity. Also, dental procedures usually take a long time and require concentration and attention during work. A wide variety of deleterious work environmental factors are proved to

affect the physical health of dentists or even aggravate their pre-existing disorders [5,6]. Studies have shown that dentists report more frequent and worse health problems than other high-risk medical professionals [6–8].

During the course of their careers, dentists seem to develop more musculoskeletal disorders (MSD) than other health professions. While the occasional back pain or neck pain is not a cause for alarm, regular pain development or discomfort is usually ignored. Consequently the cumulative physiological damage can lead to an injury or a career-ending disability. The musculoskeletal health of dentists has been the subject of numerous studies worldwide and their focus has been on the pain experienced by the practitioner [6,9–15].

In a 2008 study, Puriene et al. [12] found that 91% of Lithuanian dentists complained of back pain.

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When operators sit, musculoskeletal disorders (MSD) do not occur only in their backs, but also their necks, shoulders and arms. On the other hand, dentists who primarily stood experienced low back pain (65.7%), as well as neurocirculatory disease including varicose veins (66.7%), postural defects (77%) and flatfoot (60.1%) [16].

Specialty in dentistry will cause a change in working posture and consequently could result in changes on MSD frequency. Kerosuo et al. [17] revealed that orthodontists did not differ from general practitioners in respect of any of the complaints including dermatoses in hands, musculoskeletal and respiratory symptoms. Because oral and maxillofacial surgery need more muscle power than other dental specialties, MSD could be most frequently seen in oral and maxillofacial surgeons.

The aim of this study was to collect information from Turkish dentists and oral and maxillofacial surgeons concerning common occupation-related health problems, their knowledge about these problems and the precautions they commonly take.

Patients and methods

This study involved a postal questionnaire survey of dentists working in various regions of Turkey in both public and private dental institutions. The questions of this structured questionnaire used in this study were selected from previous MSD studies on dentists [1,3,4,7–13,17–24] and pilot-tested on 20 dentists who were not included in the study sample. During pilot testing, the use of words and clear understanding of the questions were checked. To avoid bias from regional differences, the questionnaires were equally distributed throughout Turkey. In 2010, questionnaires were sent to 885 licensed dentists, of which 608 were returned. The 2-page, A4-sized, self-reporting MSD questionnaire included 15 questions that took on average 10 ± 5.6 min to answer, an information sheet and a reply-paid envelope were subsequently mailed to each dentist. The demographic characteristics of the responding dentists were assessed in terms of age, gender, specialty, working hours per day, institution type, working method and position, the number of treated patients per day, continuous or intermittent working. The information on MSD, including the location of symptoms in the past 12 months, whether it interfered with

daily activities and whether medical treatment had been taken in the previous 12 months, was assessed. Physical complaints that include neck pain, back pain, shoulder pain, hand–wrist pain, elbow–arm pain, foot pain, knee pain and sacral region pain were assessed. In addition, the type of medical clinic to which they were referred, applied treatments for these complaints and health protection methods of dentists were analyzed. We asked yes or no response questions for MSD complaints seen in past 12 months and we did not use the pain scales for the evaluation of the pain degree.

The questionnaire consisted of structured questions and no open question was added. Four end-points for each body site were defined: (a) musculoskeletal back, neck, shoulder, knee, foot, head or hand/wrist pain in the past 12 months, which had continued for at least a few hours, (b) MSD which led to a period of sickness absence in the past 12 months, (c) chronic pain in the last 12 months, referred to a complaint that was present almost every day with a minimal presence for at least 1 month and (d) MSD which led to medical care seeking in the past 12 months.

Statistical analysis of the data was performed using MS Office Excel and SPSS version 15.0 software package, with data analyzed using descriptive and analytical methods. A chi-square test was used to evaluate the mutual distribution of categorical properties. A *T*-test was used to compare the quantitative characteristics of the two sub-groups. Percentage, mean and standard deviation properties were used as descriptive statistics. Tests of significance were reported at the 0.05 level. The authors report no conflicts of interest.

Results

In a total of 608 dentists, 337 (55.4%) were male and 271 (44.6%) were female. The mean age of participants was 27.6 ± 9.5 , ranging from 22–63 years old. Participants in the current study were 44.7% specialists and 55.3% general dental practitioners. The rates of specialty of respondents were oral and maxillofacial surgery (27.5%), restorative dentistry and endodontics (26.5%), orthodontics (16.2%), prosthodontics (5.3%), periodontology (7.3%), pediatric dentistry (6.5%) and oral diagnosis (4.5%). Employment status of the study group was as follows; 68.7% in private institutions and 31.3% in public institutions. The

Table I. Pain percentage distributions of 531 dentists who reported MSDs complaints.

Pain region (%)	Shoulder	Wrist	Elbow–arm	Knee	Foot	Head	Neck	Back	Sacral
Total	36.5	29.8	21.9	26.6	34.5	33.9	53.1	63.7	19.1
Right side	12.4	15.5	11	12.2	10.5	—	—	—	—
Left side	6.7	3.9	3.6	4.8	2.6	—	—	—	—
Left+right side	17.4	9.4	6.3	9.7	21.4	—	—	—	—

Table II. Neck and back pain distribution according to specialty of dentists.

		Neck pain		Back pain	
		Yes	No	Yes	No
General dentistry		190	146	222	114
		56.5%	43.5%	66.1%	33.9%
Specialty	Oral and maxillofacial surgery	36	39	45	30
		48%	52%	60%	40%
	Other specialty in dentistry	100	97	126	71
		50.7%	49.3%	64%	36%

mean work experience was 10.3 ± 8.5 years and the mean working time was 6.6 ± 4.3 h per day. They deal with 14.6 ± 9.2 patients per day.

In the study group, 531 (87.3%) dentists were suffering from pain in at least one shoulder, wrist, elbow–arm, knee, foot, head, neck, back and sacral region. The reported complaints were summarized in Table I. More than half of the respondents reported back pain (63.7%) and neck pain (53.1%). Additionally, we investigated neck and back pain frequency in oral and maxillofacial surgeons and general dentists and it was found that MSDs were not seen more frequently in oral and maxillofacial surgeons than general dentists and other dental specialties ($p > 0.05$) (Table II). A total of 66.5% of these dentists complaining of pain applied to physical treatment (25.3%), orthopedics (18.1%), brain surgery (6.9%), neurology (6.4%), cardiovascular surgery (4.3%), internal medicine (3.9%) and psychiatry (1.6%) clinics for these complaints; 33.5% of dentists did not apply to any medical treatment for their complaints.

Applied treatments for these MSD complaints were pharmacological treatment (42.3%), resting (30.1%), exercise (27.4%), massage (21.4%), acupuncture (8%) and surgery (1.8%). In order to avoid the MSD, dentists have done abdominal exercise (35.2%), fitness (30.6%), back exercise (14.3%), stretching and relaxation exercises (8.1%) and regular sports (1.3%). Dentists did these exercises daily

(7.1%), 2–3 times per week (27.1%), once a week (22.2%) or once a month (10.4%); 33.2% of dentists were not taking any action to prevent these disorders. We investigated age, gender, experience, number of treated patients per day and working period of time per day and no association was found in terms of age, gender, experience and numbers of treated patients per day. However, working time per day appeared as a significant factor for the development of pain ($p = 0.003$) (Tables III and IV).

Working position has importance for development of pain. In this study, we exhibited that a significant proportion of dentists with pain were working in standing and sitting alternately working positions ($p < 0.001$). In our study, we found that 39% of dentists were working in a standing position and loading on the right foot, 14.6% loading on the left foot and 46.4% loading on both the right and left foot alternately to balance their body weight. No effect of loading on left or right foot for pain development was found ($p > 0.05$). We exhibited that 57% of respondents worked with a dental assistant and 43% did not. In the present study, we found that working with an assistant did not affect MSDs development ($p = 0.708$). In this study, we found that 82.1% of the respondents worked intermittently and 17.9% continuously. In addition, 38.5% of the intermittently working dentists were having a break once, 21.9% twice, 17.7% 3-times, 11.6% 4-times and 10.3% 5-times a day. The majority of dentists suffering with pain were intermittent workers ($p < 0.05$) (Table V).

Discussion

The dental offices today are safe, healthy and comfortable places to work and receive dental care.

Table III. Effects of age, experience, working period of time and numbers of treated patients per day on pain development.

	Pain	<i>n</i>	<i>M</i>	<i>SD</i>	<i>p</i>
Age	Yes	529	27.4	9.2	0.295
	No	77	28.6	11.2	
Experience	Yes	263	10.1	8.0	0.386
	No	39	11.4	11.2	
Working period of time per day	Yes	515	6.5	1.7	0.003
	No	74	7.1	1.7	
Number of treated patient per day	Yes	501	18.6	17.8	0.12
	No	66	15.1	11.3	

Table IV. The distribution of pain with gender.

	Pain	
	Yes	No
Male	290	47
Female	239	32
Total	529	79

Table V. Pain distribution of dentists according to working position 1, 2, 3 and 4.

Working positions		Pain		Total
		Yes	No	
Position 1	Only standing	127	22	149
		85.2%	14.8%	100%
	Only sitting	113	38	151
		74.8%	25.2%	100%
Position 2	Standing and sitting alternately	290	18	308
		94.2%	5.8%	77.8%
	Only loading on right foot	219	18	237
		92.4%	7.6%	100%
Position 3	Only loading on left foot	77	12	89
		86.5%	13.5%	100%
	Loading on left and right foot alternately	246	36	282
		87.2%	12.8%	100%
Position 4	With an assistant (4-handed dentistry)	299	48	347
		86.2%	13.8%	100%
	Without an assistant	228	33	261
		87.4%	12.6%	100%
Position 4	Intermittent work (regular breaks one or more)	444	54	498
		89.2%	10.8%	100%
	Continuous work (no break)	85	25	110
		77.2%	22.8%	100%

Despite these significant advantages, there is currently considerable interest in ergonomics and work-related disorders, particularly cumulative trauma disorders or MSDs associated with ergonomics in the dental office. Musculoskeletal pain in dentists usually presents as back pain and carpal tunnel syndrome [2]. In this survey about Turkish dentists, we found that 87.3% of dentists were suffering pain from at least one of the following: shoulder, wrist, elbow–arm, knee, foot, head, neck, back and sacral regions pain in the last 12-month period. Similar rates have been reported by many other countries such as 87.2% in Queensland, Australia [18], 82% in Australia [19] and 78% in Thailand [10]. The 12-month period prevalence of neck and back-related pains were 53.1% and 63.7%, respectively, among dentists in our study. These rates were reported in Saudi Arabia [9] as 54.4% and 73.5%, in Australia [18] as 57.5% and 53.7% and in Israeli as [13] 38.3% and 55%, respectively.

Ratzon et al. [13] conducted a study to determine the effect of work posture on musculoskeletal complaints. They concluded that working only in the sitting position had a more severe low back pain than those who alternated between the sitting and standing positions. A survey in Denmark [20] showed that 60% of dentists preferred the sit-down operating technique, suffered from neck and back pain.

However, in our study we exhibited that a greater proportion of dentists with pain worked in the standing and sitting alternately technique. A possible explanation for this may be, when the operators sit, pain occurs not only in their backs, but also their necks, shoulders and arms. Hence, dentists prefer the standing and sitting alternately operation technique for relaxing musculoskeletal pain.

Hand and wrist disorders are receiving the most attention, although their symptoms are reported less often by dental workers than symptoms of neck and/or back disorders. Because dental instruments are held in a pinched grip, changing the handle design may offer an inexpensive opportunity for reducing the risk of hand pain and wrist stress while providing dental care. In addition, 33.9% of dentists reported hand and 29.8% wrist pain, which is lower than the 75.6% of dental workers reporting one or more symptoms of carpal tunnel syndrome in the aforementioned US military study [21].

Szymanska [22] tried to find out the relationship between the working time without breaks and the number of episodes experienced, but no difference was found in the frequency of symptoms in dentists working with or without breaks. Marshall et al. [19] also did not find any difference in the symptoms in dentists working with or without frequent breaks. This study suggests that percentages of MSDs are

higher in dentists who take breaks. This could be explained by the fact that the dentists with pain are probably taking more breaks for revealing their pains.

The finding that younger and less experienced dentists were more likely to report MSD of the neck, upper back and shoulders is consistent with some previous studies [7,10]. In this regard, an investigation of Thai dentists revealed that less experienced dentists were more likely to suffer from musculoskeletal pain than their more experienced counterparts [10]. Experienced dentists are probably better at adjusting their break time, working position and techniques in order to avoid musculoskeletal problems compared to their less-experienced counterparts or they simply developed coping strategies to deal with the pain. This hypothesis is partially supported by a 5-year follow-up study of dentists in Sweden [1]. This was not observed in the study of dentists in New South Wales [19]. Similarly, in our study we did not find any correlation between experience, age and pain development.

Human muscles are not adapted for continuous long-lasting contractions and require rest periods to recover from even very low-level exertion [25]. During a sustained, static muscle contraction, the tendon stretches and compresses the vascular supply to the muscle and surrounding tissues, thereby depleting nutrient and oxygen supply. Lactic acid and other metabolites accumulate in the muscle tissues. This process can result in damaged muscle tissue and a painful sensation [26]. Therefore, the prevalence of musculoskeletal pain and discomfort had increased with working time per day [16]. In the present study, a highly significant relationship was found between working time per day and MSD. Pain development was increased by long working hours. However, we did not find a correlation between number of treated patients per day and MSD development.

In this study, it was found that loading foot effects on work posture while working with patients and MSD pain development, but we found no correlation between loading foot and pain development. In order to prevent musculoskeletal and nervous systems complaints, it has been suggested to work four-handed dentistry. This type of work allows the dentists to conserve definite work time, rest the back, the back muscles and the lower extremities. The optimum from the point of view of ergonomics is four-handed dentistry which allows the spreading of physical expenditure of the dentist. Consequently, strains on the lower extremities are harmful in terms of ergonomics and work organization among the dentists. This type of work generally affects the health of the dentists employed and limits their effectiveness. However, it was found in this study that working with an assistant had no influence on MSD development.

There are many reports suggesting that MSDs are more commonly found in women than in men

[12,23]. In the present study correlations between MSD pain and gender were not found. The limited research on dental specialists showed increased risks for developing MSDs pathology compared to general dentists [13,23]. However, differences were not found in other studies [17,24]. In this study, it was found that MSDs were not more common in oral and maxillofacial surgeons than general dentists and other specialists in dentistry. In this survey, it was shown that only 33.5% of dentists sought medical help for neck and back pain. Our result is similar to a study from Saudi Arabia [9] with 37%, less than the 70% reported by Bassett [20]. This indicates that postural problems cause minimal disruption of the working hours of dental professionals in Turkey.

Self-report questionnaires have some disadvantages such as (i) persons who perceive themselves as being exposed to a potential risk factor may more readily report pain; (ii) non-occupational factors may be alternative causes of MSD. In addition, respondents may have differed in their interpretation of adjectives such as 'repeated' and 'prolonged', such that these descriptors cannot be taken to have a single objective meaning. Finally, it must be acknowledged that exposure to risk factors was measured via self-report, rather than on the basis of an objective evaluation.

Here we report that MSDs were most frequently seen in dentists and, particularly, in oral and maxillofacial surgeons who have long working time per day, working in standing and sitting alternately and intermittent working designs.

Conclusion

It is concluded that the experience of occupation-related health problems was common in Turkish dentists and oral and maxillofacial surgeons, as has been reported in some other countries, and their knowledge of occupational health and safety was lacking. There is a substantial need and demand to reduce MSD complaints among dentists in Turkey.

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References

- [1] Akesson I, Johnsson B, Rylander L, Moritz U, Skerfving S. Musculoskeletal disorders among female dental personnel: clinical examination and a 5-year follow-up study of symptoms. *Int Arch Occup Environ Health* 1999;72:395–403.

- [2] Fish DR, Morris-Allen DM. Musculoskeletal disorders in dentists. *N Y State Dent J* 1998;64:44–8.
- [3] Leggat PA, Chowanadisai S, Kedjarune U, Kukiattrakoon B, Yapong B. Health of dentists in southern Thailand. *Int Dent J* 2001;51:348–52.
- [4] Alexopoulos EC, Stathi IC, Charizani F. Prevalence of musculoskeletal disorders in dentists. *BMC Musculoskelet Disord* 2004;9:5–16.
- [5] Myers HL, Myers LB. It's difficult being a dentist: stress and health in the general dental practitioner. *Br Dent J* 2004;197:89–93.
- [6] Puriene A, Janulyte V, Musteikyte M, Bendinskaite R. General health of dentists. Literature review. *Baltic Dental Maxillofacial J* 2007;9:10–20.
- [7] Jacobsen N, Aasenden R, Hensten-Pettersen A. Occupational health complaints and adverse patient reactions as perceived by personnel in public dentistry. *Community Dent Oral Epidemiol* 1991;19:155–9.
- [8] Shrestha BP, Singh GK, Niraula SR. Work related complaints among dentists. *J Nepal Med Assoc* 2008;47:77–81.
- [9] Al Wazzan KA, Almas K, Al Shethri SE, Al-Qahtani MQ. Back and neck problems among dentists and dental auxiliaries. *J Contemp Dent Pract* 2003;2:17–30.
- [10] Chowanadisai S, Kukiattrakoon B, Yapong B, Kedjarune U, Leggat PA. Occupational health problems of dentists in southern Thailand. *Int Dent J* 2000;50:36–40.
- [11] Gijbels F, Jacobs R, Princen K, Nackaerts O, Debruyne F. Potential occupational health problems for dentists in Flanders, Belgium. *Clin Oral Invest* 2006;10:8–16.
- [12] Puriene A, Aleksejuniene J, Petrauskiene J, Balciuniene I, Janulyte V. Self-perceived mental health and job satisfaction among Lithuanian dentists. *Ind Health* 2008;46:247–52.
- [13] Ratzon NZ, Yaros T, Mizlik A, Kanner T. Musculoskeletal symptoms among dentists in relation to work posture. *Work* 2002;15:153–8.
- [14] Rising DW, Bennet BC, Hursh K, Plesh O. Reports of body pain in a dental student population. *JADA* 2005;136:81–6.
- [15] Thornton LJ, Barr AE, Stuart-Buttle C, Gaughan JP, Wilson ER, Jackson AD, et al. Perceived musculoskeletal symptoms among dental students in the clinic work environment. *Ergonomics* 2008;51:573–86.
- [16] Valachi B, Valachi K. Mechanisms leading to musculoskeletal disorders in dentistry. *JADA* 2003;134:1344–50.
- [17] Kerosuo E, Kerosuo H, Kanerva L. Self-reported health complaints among general dental practitioners, orthodontists, and office employees. *Acta Odontol Scand* 2000;58:207–12.
- [18] Leggat PA, Smith DR. Musculoskeletal disorders self-reported by dentists in Queensland, Australia. *Australian Dent J* 2006;51:324–7.
- [19] Marshall ED, Duncombe LM, Robinson RQ, Kilbreath SL. Musculoskeletal symptoms in New South Wales dentists. *Aust Dent J* 1997;42:240–6.
- [20] Bassett S. Back problems among dentists. *J Can Dent Assoc* 1983;49:251–6.
- [21] Lalumandier JA, McPhee SD, Riddle S, Shulman JD, Daigle WW, Newell TM, et al. Carpal tunnel syndrome: effect on army dental personnel. *Mil Med* 2000;165:372–8.
- [22] Szymanska J. Disorders of the musculoskeletal system among dentists from the aspect of ergonomics and prophylaxis. *Ann Agric Environ Med* 2002;9:169–73.
- [23] Harutunian K, Gargallo-Albiol J, Figueiredo R, Gay-Escoda C. Ergonomics and musculoskeletal pain among postgraduate students and faculty members of the School of Dentistry of the University of Barcelona (Spain). A cross-sectional study. *Med Oral Patol Oral Cir Bucal* 2011;16:425–9.
- [24] Brown PN. What's ailing us? Prevalence and type of long-term disabilities among an insured cohort of orthodontists. *Am J Orthod Dentofacial Orthop* 2004;125:3–7.
- [25] Sjogaard G. Intramuscular changes during long-term contraction. The ergonomics of working postures: models, methods and cases. The Proceedings of the First International Occupational Ergonomics Symposium, Zadar, Yugoslavia, 15–17 April, 1985. Philadelphia, PA: Taylor & Francis, 1986. p 136–43.
- [26] Kumar S. Biomechanics in ergonomics. Philadelphia, PA: Taylor & Francis; 1999. p 250–4.