Original Article

Work-Related Musculoskeletal Pain among Lebanese Dentists: An Epidemiological Study

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Abstract

Introduction: The aim of this study was to evaluate the prevalence of musculoskeletal disorders and identify their associated factors among a group of Lebanese dentists. **Materials and Methods:** A total of 314 Lebanese, dentists completed an anonymous questionnaire that focused on occupational health problems. This study was approved by the ethics committee of Saint-Joseph University of Beirut, Lebanon. The statistical analyses were performed using SPSS for windows. The alpha error was set to 0.05. **Results:** The mean age of the participants was 39.2 (±11.66) years. The results showed that 61.5% of the surveyed dentists complained of spinal pain: 31.6% of cervical pain, 22.3% of lumbar pain and 13.0% of dorsal pain. Moreover, the pain was continuous in 20.7% and, occasional in 65.8%. Our statistics showed that 7.6% had a problem with the carpal tunnel. A total of 22.3% suffered from tendinitis and 9.2% from arthritis of shoulder, elbow, wrist and hand. The frequency of headaches was 30.6%. Concerning sports activity, 49.7% practiced it occasionally and 3.6% did so frequently. **Conclusions:** The occurrence of musculoskeletal pain in the upper extremities is a serious concern that affects Lebanese dentists. Most of them often complained of tendinitis and headaches because they do not practice sports; thus, encouraging them to practice sports may reduce or solve such health problems. Issuing brochures that include exercises to perform and hiring trained assistants could help reduce the risk of musculoskeletal disorders. Finally, these occupational health problems should be highlighted at all clinical and research symposia to increase awareness.

Keywords: *Epidemiology, Lebanese dentist, musculoskeletal disorders, occupational disease*

Date of Acceptance:
26-Feb-2017

Introduction

According to the World Health Organization, health is a state of physical, mental, and social well-being. Given the continuous social interaction between health care providers and their patients, practitioners' health is particularly important for a successful dental practice and patients' well-being.[1]

Dentistry is a well-known profession that requires focused attention during patients' treatment. Several factors such as repetitive tasks, uncomfortable posture and intense effort have been proven to have direct effects on dentists, affecting their physical health, and thus contributing to serious outcomes or even a worsening of their preexisting disorders.[2-5]

Improper work routines, inconvenient attitudes and monotonous tasks, such as root canal instrumentation, cavity preparation, and filling, scaling, or root planing, may generate musculoskeletal disorders (MSDs) and psychological stress, even weakening dentists' ability to perform work-related tasks.[6,7]

Dentists are considered to be exposed practitioners due to their progressively cumulative trauma, and their static, uncomfortable, and asymmetric work mode. Dental operators sit or stand for lengthy periods and position

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Access this article online

Quick Response Code:

Website: www.njcponline.com

DOI: 10.4103/njcp.njcp_401_16

How to cite this article: Jaoude SB, Naaman N, Nehme E, Gebeily J, Daou M. Work-Related musculoskeletal pain among lebanese dentists: An epidemiological study. Niger J Clin Pract 2017;20:1002-9.

their head, neck, and shoulders in an inappropriate manner.[6,8] There are many factors that influence dental health practitioners, such as neck flexion, arm abduction, and inappropriate posture, thereby increasing the risk of developing MSDs.[9] MSD is identified as damage to the human support system, consisting of the muscles, ligaments, tendons, nerves, blood vessels, bones, and joints, which can result from a a single event or cumulative trauma.[10] In addition, it can cause pain in the neck, shoulder, arm, wrist, hands, upper and lower back, hips, knees, or feet.[11] Musculoskeletal pain is a serious health issue for dental professionals, particularly dentists.[10]

MSDs are a major cause of disability in the Lebanese dentists.[12] Because studies, in Lebanon, on this topic are limited, the aim of this study was to evaluate the prevalence of MSDs and their associated factors among a group of Lebanese dentists.

Materials and Methods

A questionnaire focusing on the MSDs of dentists was prepared. This research and its consent procedure were approved by the ethics committee of the Saint-Joseph University Beirut-Lebanon (USJ) in accordance with the World Medical Association Declaration of Helsinki. The questionnaire was pretested and auto-administrated on a sample of 30 dentists arbitrarily chosen from the dental school of USJ. Improvements of this questionnaire were done according to this pilot study. Thereafter, the improved questionnaire was distributed to the dentists who attended the 3-day francophone symposium organized by USJ in 2014. This questionnaire was auto-administrated by each participant. The inclusion criteria were Lebanese dentists registered in the order of dentists who accepted to fulfill the questionnaire. The non-Lebanese dentists who were attending the dental symposium were excluded from the study. A total of 1100 Lebanese and non-Lebanese dentists were present during the 3-day francophone symposium (including the instructors). A sample of 350 Lebanese dentists was randomly selected using the random number table. The response rate was 90% since 314 dentists accepted to participate in the study.

The outcome variable of the study was the presence of MSDs in dentists such as spinal pain (Yes/No) and the type of spinal pain (Cervical, dorsal and lumbar), wrist pain (Yes/No), carpal tunnel problem (Yes/No), arthritis (Yes/No), tendinitis (Yes/No), headache (Yes/No), and circulatory problem in lower limb (Yes/No). The predictor variables of the study were age, gender, year's number of dental practice, dental specialty, mean number of working days per week, presence of a dental assistant (Yes/No), working position (sitting, standing), spinal trauma (Yes/No), and sport practice (Yes/No).

The statistical analyses were performed using the Statistical Package Software for Social Sciences (SPSS) for Windows (version 18.0, Chicago, IL, USA). The alpha error was set at 0.05. The normality distributions of the continuous variables were assessed with Kolmogorov–Smirnov tests. Univariate analyses were performed to assess the association of each predictor factor with each MSD component. Chi-square tests and Fisher exact tests were used for categorical variables, and Student/Mann–Whitney tests or analysis of variance/Kruskal–Wallis tests were used for continuous variables. Logistic regression analysis was used with each component of MSD as the dependent variable. Sociodemographic variables, year's number of dental practice, dental specialty, mean number of working days per week, presence of dental assistant, working position, spinal trauma, and sport practice that showed associations with $P < 0.200$ in univariate analyses were candidates for the multivariate model according to the Enter method. Collinearity among independent variables was also tested. Independent variables highly correlated were excluded (age and year's number of dental practice).

Results

A total of 314 dentists (184 male and 130 female), aged 39.2 ± 11.66 years, completed the questionnaire; 45.9%

Table 1: Sociodemographic characteristics of the participants; the percentage is more than 100% due to duplicate answers

	N (percentage %)
Marital status (n = 314)	
Married	179(57.0%)
Single	126(40.1%)
Divorced	3(1.0%)
Widowed	3(1.0%)
No answer	3(1.0%)
General practitioner (n = 314)	
Yes	144(45.9%)
No	164(52.2%)
No answer	6(1.9%)
Specialty (n = 314)	
Restorative and Prosthetic Dentistry	79(25.2%)
Orthodontics	34(10.8%)
Surgery	33(10.5%)
Endodontics	32(10.2%)
Periodontology	31(9.9%)
Pediatric Dentistry	24(7.6%)
Oral Pathology	5(1.6%)
Oral Radiology	1(0.3%)
No answer	86(27.4%)
Dental assistant (n = 314)	
Yes	231(73.6%)
No	76(24.2%)
No answer	7(2.2%)

Table 2: Association between musculoskeletal problems and gender

	Gender		P
	Male	Female	
Spinal pain (n = 193)	97(53.6%)	96(73.8%)	<0.0001
Total	181(100%)	130(100%)	
Lumbar Pain (n = 43)	32(34.8%)	11(11.7%)	
Dorsal Pain (n = 25)	11(12.0%)	14(14.9%)	
Cervical Pain (n = 61)	23(25.0%)	38(40.4%)	0.016
Lumbar, Dorsal Pain (n = 4)	2(2.2%)	2(2.1%)	Fisher exact test
Lumbar, Cervical Pain (n = 20)	9(9.8%)	11(11.7%)	
Dorsal, Cervical Pain (n = 11)	5(5.4%)	6(6.4%)	
The three types of pain (n = 22)	10(10.9%)	12(12.8%)	
Total	92(100.0%)	94(100.0%)	
Permanent (n = 40)	16(17.0%)	24(25.0%)	0.073
Rare (n = 23)	16(17.0%)	7(7.3%)	Chi-square test
Occasional (n = 127)	62(66.0%)	65(67.7%)	
Total	94(100.0%)	96(100.0%)	
Wrist Pain (n = 52)	27(15.8%)	25(19.7%)	0.381
Total	171(100.0%)	127(100.0%)	Chi-square test
Carpal tunnel problem (n = 24)	8(4.8%)	16(13.8%)	0.008
Total	167(100.0%)	116(100.0%)	Chi-square test
Arthritis (n = 29)	18(11.0%)	11(9.2%)	0.607
Total	163(100.0%)	120(100.0%)	Chi-square test
Tendinitis (n = 70)	36(22.1%)	34(28.3%)	0.229
Total	163(100.0%)	120(100.0%)	Chi-square test
Headache (n = 96)	38(21.8%)	58(45.3%)	<0.0001
Total	174(100.0%)	128(100.0%)	Chi-square test
Circulatory problems in lower limbs (n = 61)	19(11.1%)	42(33.1%)	<0.0001
Total	261(100.0%)	24(100.0%)	Chi-square test

Table 3: Association between musculoskeletal problems and sport practice

	Sport Practice			P
	Never	Occasional	Frequently	
Spine Pain (n = 188)	24(75.0%)	97(62.2%)	66(58.4%)	0.232
Total	32(100.0%)	156(100.0%)	113(100.0%)	Chi-square test
Permanent (n = 40)	5(21.7%)	26(26.8%)	9(14.1%)	0.251
Rare (n = 22)	1(4.3%)	13(13.4%)	8(12.5%)	Fisher exact test
Occasional (n = 122)	17(73.9%)	58(59.8%)	47(73.4%)	
Total	23(100.0%)	97(100.0%)	64(100.0%)	
Wrist Pain (n = 50)	7(21.9%)	25(17.0%)	18(16.4%)	0.762
Total	32(100.0%)	147(100.0%)	110(100.0%)	Chi-square test
Carpal tunnel problem (n = 22)	3(9.7%)	14(10.1%)	5(4.7%)	0.276
Total	31(100.0%)	138(100.0%)	107(100.0%)	Fisher exact test
Arthritis (n = 28)	4(12.9%)	14(10.3%)	10(9.2%)	0.779
Total	31(100.0%)	136(100.0%)	109(100.0%)	Fisher exact test
Tendinitis (n = 70)	11(35.5%)	41(29.9%)	18(16.5%)	0.021
Total	31(100.0%)	137(100.0%)	109(100.0%)	Chi-square test
Headache (n = 94)	17(54.8%)	46(30.7%)	31(27.4%)	0.013
Total	31(100.0%)	150(100.0%)	113(100.0%)	Chi-square test

Table 4: Association between musculoskeletal problems and presence of assistant

	Presence of assistant		P
	Yes	No	
Spine Pain (n = 188)	142(62.0%)	46(61.3%)	0.917
Total	229(100.0%)	75(100.0%)	Chi square Test
Wrist Pain (n = 49)	34(15.4%)	15(21.1%)	0.260
Total	221(100.0%)	71(100.0%)	Chi square Test
Carpal tunnel problem (n = 24)	21(10.1%)	3(4.3%)	0.134
Total	208(100.0%)	70(100.0%)	Chi square Test
Circulatory problems in lower limbs (n = 61)	43(19.7%)	18(24.7%)	0.370
Total	218(100.0%)	73(100.0%)	Chi square Test

Table 5: Association between musculoskeletal problems and working position

	Working position			P
	Sitting	Standing	Alternate	
Spine Pain (n = 193)	163(63.9%)	5(50.0%)	25(54.3%)	0.340
Total	255(100.0%)	10(100.0%)	46(100.0%)	Chi-square test
Circulatory problems in lower limbs (n = 61)	49(20.1%)	2(22.2%)	10(22.2%)	0.858
Total	244(100.0%)	9(100.0%)	45(100.0%)	Chi-square test

Table 6: Association between musculoskeletal problems and spinal trauma

	Spinal Trauma		P
	Yes	No	
Spinal Pain (n = 185)	21(95.5%)	164(61.0%)	0.001
Total	22(100.0%)	269(100.0%)	Chi-square test
Permanent (n = 37)	8(38.1%)	29(17.9%)	0.113
Rare (n = 23)	2(9.5%)	21(13.0%)	Fisher exact test
Occasional (n = 123)	11(52.4%)	112(69.1%)	
Total	21(100.0%)	162(100.0%)	
Wrist Pain (n = 49)	10(47.6%)	39(14.8%)	0.001
Total	21(100.0%)	26(100.0%)	Fisher exact test
Carpal tunnel problem (n = 23)	4(18.2%)	19(7.4%)	0.095
Total	22(100.0%)	256(100.0%)	Fisher exact test
Arthritis (n = 27)	8(40.0%)	19(7.3%)	<0.001
Total	20(100.0%)	259(100.0%)	Fisher exact test
Tendinitis (n = 70)	12(60.0%)	55(21.2%)	<0.001
Total	20(100.0%)	259(100.0%)	Fisher exact test
Headache (n = 88)	11(50.0%)	77(28.5%)	0.035
Total	22(100.0%)	270(100.0%)	Chi-square test

were general practitioners and 73.6% worked in the presence of an assistant. Sociodemographic characteristics of the participants are presented in Table 1.

The mean number of years of dental practice was 15.50 ± 11.18 years (Range: 0–45 years), the mean working days per week was 4.68 ± 1.11 (Range: 1–7).

Our study showed that 81.5% (n = 256) of the surveyed dentists worked in a sitting position. A total of 74.8% (n = 235) worked in direct vision.

The results showed that 16.6% (n = 52) of the surveyed dentists had wrist pain and 61.5% (n = 193) complained of spinal pain. The most affected part of the spine was the cervical spine according to 31.6% (n = 61) of the surveyed dentists; the lumbar spine according to 22.3% (n = 43), the dorsal spine according to 13.0% (n = 25); the lumbar and cervical spine according to 10.4% (n = 20); the lumbar, dorsal, and cervical spine according to 11.4% (n = 22); the dorsal and cervical spine according to 5.7% (n = 11); and 2.9% (n = 7) did not specify. Our

Table 7: Logistic regression of the factors associated with MSD in dentists

	B	Standard error	Degree of freedom	Sig.	OR	95.0% C.I. for OR	
						Lower	Upper
Spinal pain							
Gender	.908	.264	1	.001	2.479	1.478	4.158
Spinal trauma	2.708	1.036	1	.009	15.004	1.971	114.194
Wrist pain							
Spinal trauma	1.647	.488	1	.001	5.189	1.994	13.502
Working days/ week	.215	.146	1	.142	1.239	.931	1.650
Arthritis							
Spinal trauma	1.928	.557	1	.001	6.875	2.307	20.486
Age	–.048	.019	1	.012	1.049	1.011	1.088
Tendinitis							
Spinal trauma	1.447	.528	1	.006	4.250	1.509	11.966
Age	.036	.013	1	.006	1.036	1.064	1.010
Sport (Never)			2	.024			
Frequently	–1.023	.455	1	.025	.360	.147	.878
Occasionally	–.770	.318	1	.016	.463	.248	.864
Carpal disorders							
Gender	1.787	.537	1	.001	5.971	2.083	17.118
Years of dental practice	.059	.024	1	.012	1.062	1.013	1.111
Dental assistant	.906	.659	1	.169	2.475	.681	8.999
Spinal trauma	1.163	.672	1	.083	3.201	.858	11.944
Headache							
Gender	.976	.292	1	.001	2.654	1.498	4.702
Spinal trauma	.919	.447	1	.040	2.506	1.043	6.022
Working days/week	.002	.129	1	.987	1.002	.778	1.291
Sport (Never)			2	.017			
Frequently	–1.167	.418	1	.005	.311	.137	.706
Occasionally	–.157	.275	1	.569	.855	.498	1.466

B: Beta coefficient; Sig.: Significance or P-value; OR: Odds ratio; 95% CI for OR: 95% of confidence interval

results showed that 65.8% (n = 127) had occasional pain, 20.7% (n = 40) had continuous pain, 11.9% (n = 23) infrequent pain, and 1.6% (n = 3) did not answer, whereas 121 did not have pain; the average time of appearance of spine pain after 6.02 ± 5.57 years of dental practice.

Concerning spinal pain, 32.5% (n = 102) consulted a physician and 35.4% (n = 111) were treated by a physiotherapist; 31.5% (n = 35) received preventive treatment, 63.1% (n = 70) received curative treatment, 3.6% (n = 4) received preventive and curative treatment, and 1.8% (n = 2) did not answer.

The results also revealed that 7.6% (n = 24) have a problem with carpal tunnel, 9.2% (n = 29) suffered from arthritis, 22.3% (n = 70) suffered from tendinitis, 7% (n = 22) had been victims of spinal trauma, and 30.6% (n = 96) complained frequently of headaches.

In addition, 98% of dentists who had back pain consulted a doctor and 59.2% did so specially for lower back pain. A total of 34.3% (n = 34) of dentists who consulted a doctor had permanent pain, 31% (n = 31) had pain in their wrist, and 17.9% (n = 17) had a problem with carpal tunnel, 22.3% (n = 21) had arthritis, and 42.1% (n = 40) had tendinitis.

Univariate analyses

Univariate analysis showed that female dentist complain more than male from spinal pain and cervical pain, however, lumber pain was more frequent in men, as shown in Table 2. Age was significantly related to tendinitis (P = 0.002) and arthritis (P = 0.004). However, the number of working days per week was not significantly associated with MSDs ($P > 0.05$).

Moreover, 49.7% (n = 156) practiced sports occasionally and 36% (n = 114) frequently. The statistics revealed that 35.5% of dentists who had never participated in sports had tendinitis and 29.9% of those who occasionally participated in sports had tendinitis, whereas the percentage decreased to 16.5% if the dentist frequently participated in sports. Furthermore, the frequency of headaches among dentists decreased with increasing frequency of sports practice, 54.8% of dentists who never practiced reported headaches, declining to 30.7% among those who occasionally practiced and to 27.4% among those who frequently practiced, as shown in Table 3.

No significant association was found between the musculoskeletal problems and the presence of an assistant ($P > 0.05$), working position ($P > 0.05$), and sports activities ($P > 0.05$) as shown in Table 3, Table 4 and Table 5.

Moreover, 95.5% ($n = 21$) of the dentists who have spinal pain have been subjected to spinal trauma, as well as 47.6% ($n = 10$) of the dentists who have wrist pain, as shown in Table 6.

Multivariate analyses [Table 7]

Spinal pain: Females were 2.5 times more likely to develop a spinal pain than male (*P*-value = 0.001). Dentists who experienced a spinal trauma were 15 times more likely to develop a spinal pain (*P*-value = 0.009).

Wrist pain: Dentists who experienced a spinal trauma were 5.2 times more likely to develop a wrist pain (*P*-value = 0.009).

Arthritis: Age was significantly associated with arthritis (*P*-value = 0.012). Dentists who experienced a spinal trauma were 6.9 times more likely to develop an arthritis (*P*-value = 0.001).

Tendinitis: Age was significantly associated with tendinitis (*P*-value = 0.006). Dentists who experience a spinal trauma were 4.25 times more likely to develop a tendinitis (*P*-value = 0.001). Dentists who practiced sport were less likely to develop a tendinitis compared to dentists who never practiced sports during the last years (*P*-value = 0.024).

Carpal disorders: Females were 5.97 times more likely to develop Carpal disorders than males (*P*-value = 0.001). Years of dental practice were significantly associated with Carpal disorders (*P*-value = 0.012).

Headache: Females were 2.65 times more likely to develop headache than male (*P*-value = 0.001). Dentists who experienced a spinal trauma were 2.51 times more likely to develop a headache (*P*-value = 0.040). Dentists who practiced sport were less likely to develop headache compared to dentists who never exercised sports during the last years (*P*-value = 0.017).

Discussion

The sample of 314 Lebanese dentists, which was randomly selected, completed the questionnaire; the results revealed that prevalence of MSD among Lebanese dentists is 61.5%. Female dentists have a higher prevalence compared to males, i.e., 73.8% among females compared with a prevalence of 53.6% among male dentists. This result agrees with a study from New South Wales that revealed MSD prevalence of 64%[13] among dentists; in Australia, the prevalence ranges between 64% and 93%;[10] in the Emirates it was 68%;[14] in Iran it was 75%;[15] in Sweden, 78% of female dentists had musculoskeletal pain.[16]

Another Iranian study showed that 83.3% of dentists suffered from cervical spine pain, whereas 56.7% complained about back pain and 41% had shoulder problems; they also found that female dentists were more at risk of neck aches and discomfort and pain in their shoulders and hands than male dentists.[17]

These results can be explained by the fact that women have different constitution, higher susceptibility, or lower resistance to constant strain, and smaller muscle strength[18] than those of men. Moreover, they, have a lower tolerance for pain, pay more attention of their health, take care better of their health, and tend to report health problems more often.[1,18,19] In addition to their professional dental work, a female dentist has household chores.[1]

The MSDs were localized to the, cervical spine for women (71.3%).[20] and the lumbar spine for men (57.6%). This in accordance with the results of studies conducted in Australia, although they stated that significantly more females reported neck symptoms (58%).[21] Therefore, men are more vulnerable at the dorsal level and women at the cervical level. The sitting position reduces stress on the back, but can cause increased stress on the shoulder and neck.

According to our study, 7.6% of dentists had a problem with carpal tunnel, whereas studies in the USA showed that 5% of dentists had developed this issue.[22,23] Regarding gender, 13.8% of the female dentists had carpal tunnel syndrome (CTS) compared with 4.8% of male dentists. CTS is caused by repetitive movements, uncomfortable hand positions, strong gripping, mechanical stress on the palm, and vibration. The high percentage of women with CTS is explained by hormonal changes during pregnancy, menopause, and genetic predisposition.[22]

Our results revealed that 30.6% of the surveyed dentists had headaches, of whom 45.3% were female and 21.8% were male. This agrees with the results from a study that were conducted in New South Wales by Marshall *et al*. in 1997, in which they reported that 54% of dentists complained of headaches, 52% of whom were male and 70% of whom were females.[13] The results also agree with a study conducted in Lithuania by Puriene *et al*. in 2008 who found that 88.7% of dentists reported headaches, of which 50% were women.[1] The association between these health problems and pain in the shoulders and neck, agrees with our results, and explains the frequency of headaches which were often associated with neck and shoulder symptoms.[13]

Likewise, 33% of female dentists had circulatory problems in their lower limbs, wereas 11.1% of men reported this problem; this is due to sustaining a static position for a long time, hereditary predisposition, and pregnancy. In general, there is a significantly higher prevalence of these problems in women than in men.

A total of (n = 21) 95.5% of the dentists who suffered from spinal trauma complained of spinal pain, 47.6% also had pain in their wrist, 40% had arthritis, 60% had tendinitis, and 50% had headaches.

The number of dentists who complained of neck pain increased in the absence of a dental assistant (79.1%), while in the presence of an assistant, was 56.1%. This is explained by the fact that rotary movements of the neck are reduced in the presence of an assistant, and that two people work faster, requiring less effort.

Our statistics revealed an association between sports and decreased rate of tendinitis; hence, it is important to encourage dentists to participate in sport activities as this may reduce tendinitis.

Conclusions

Our survey revealed that the prevalence of MSDs in Lebanese dentists is relatively high. The occurrence of musculoskeletal pain in the upper extremities is a serious concern that affects Lebanese dentists' health, especially among female dentists who suffer much more from MSD than male dentists, despite medical visits and physiotherapy treatment. Within the limitation of this study, especially the limited number of participants, our study confirmed that MSDs is a major health problem for oral health providers.

Lebanese dentists often complain of tendinitis and headaches because most of them do not practice sports; thus encouraging them to practice sports on a regular basis, may reduce or solve such issues.[12] Issuing brochures that include important exercises that these dentists should perform can be a solution to reduce the occurrence of MSDs.

In addition, hiring trained assistants could help reduce dentists' risk of MSD. Moreover, it has become crucial to develop and to restructure dentists' cabinets to be more ergonomic to improve the health of dentists. Further studies that focus on appropriate preventive interventions should be conducted. Education of ergonomic principles should begin during the dental curses and continue throughout postgraduate education of working dentists.

Finally, these occupational health problems should be highlighted at all clinical and research symposia to achieve greater awareness.

Financial source of support

None.

Conflicts of interest

There are no conflicts of interest.

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