Original Article

The Effect of Number of Patients Treated, Dental Loupes Usage, Stress, and Exercise on Musculoskeletal Pain among Dentists in Jeddah

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ABSTRACT

Objectives: The aim of this study was to investigate the prevalence of musculoskeletal pain (MSP) and to explore its potential risk factors among dentists in Jeddah, Saudi Arabia. **Materials and Methods:** A cross-sectional survey of private and government dentists in Jeddah, Saudi Arabia was undertaken between January and December 2018. A self-administered questionnaire was distributed randomly to consenting participants. Descriptive data analysis involved measures of central tendency and percentages, *t* test, chi-square, and logistic regression analysis were used to evaluate relationships among the variable "having MSP experience after dental work" and other potential predictors among dentists. **Results:** A total of 300 dentists completed the questionnaires. The overall prevalence of MSP was 68%, with back pain as the most frequently reported symptom (54%). The results revealed significant association of MSP with number of patients treated per day, nonuse of dental loupes during dental work, stress, and lack of regular exercise ($P < 0.05$). **Conclusion:** The prevalence of MSP among dentists in Jeddah is high attributable to poor ergonomics and stress, which further impact the quality of life of practitioners.

Keywords: *Back pain, ergonomics, health occupations, muscle disorders, stress*

Introduction

Working in a dental practice predisposes dentists to biological, chemical, psychological, and ergonomic hazards. These occupational risks are associated with the incidents of musculoskeletal disorders (MSDs). MSDs are a group of serious occupational diseases characterized by pain and dysfunction affecting the musculoskeletal system that includes nerves, tendons, muscles, and intervertebral discs.[1] The prevalence of MSDs is relatively high,[1-3] contributing to increased disability among healthcare providers.[4,5] An American study found that MSDs accounted for 65% of all new workplace disease cases.[5] MSDs can have a devastating impact on the quality of life. Sufferers have afflictions to the back, neck, shoulders, and knees, resulting in pain, movement difficulties, and functional impairments, which affects their productivity, workdays, and socializations.[1,5,6]

Studies conducted on dentists attribute the high prevalence of MSD to the nature of dental work, poor posture during work, mental fatigue, and stress.[2,3,5] Other risk factors of MSD include heredity, stress, obesity, smoking, poor nutrition, and lack of regular exercise.[7] The failure to prevent MSD costs dentists $41 million annually in treatment fees only.[7]

MSDs most commonly affect the back, neck, shoulders, and knees among healthcare workers.[4] Multiple studies indicated back pain as the most frequent complaint, followed by neck pain, that were reported among dentists.[8,9] Therefore, identifying musculoskeletal pain (MSP) risk factors is particularly important and can

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have a positive impact on healthcare practitioners—especially dentists—by adopting preventive measures. This study aimed to investigate the prevalence of MSP among dentists in Jeddah, Saudi Arabia, and to explore the potential risk factors that either increase or decrease the prevalence of MSP.

Materials and Methods

The Research Ethics Committee of the Faculty of Dentistry at King Abdulaziz University in Jeddah, Saudi Arabia approved this research (approval number 178-11-19). A descriptive cross-sectional study was conducted through a self-administered, structured questionnaire distributed to dentists. Government-sector dentists were recruited from all four major dental hospitals in Jeddah city, whereas others were randomly selected primary healthcare centers distributed in Jeddah's five major districts (North, South, Middle, East, and West). Similarly, private-sector dentists were randomly selected from private hospitals and polyclinics in the same five major districts. Dentists were eligible to participate in this study if they were competent, licensed, and had been practicing for at least 3 years. History of orthopedic disease, orthopedic trauma, or sport-related trauma to the musculoskeletal system was an exclusion factor. Data were gathered between January and December of 2018.

An existing, validated questionnaire was adopted from previous studies and modified to accommodate the objectives of this study.[10] The modified questionnaire comprised three main domains with a total of 26 closed-ended questions. The first domain gathered demographic information, including age, gender, qualification, duration of dental practice in years, number of patients seen per day, and the use of dental loupes during dental work. The second domain was the Standardized Nordic Musculoskeletal Questionnaire (SNMQ), which is a screening tool for MSP epidemiological studies. This study used SNMQ to examine the prevalence of MSP during the past year (12 months) among participants. The SNMQ consists of general questions regarding existing MSD problems. Then, the second set of questions showed eight anatomical sites (neck, shoulders, back, elbows, wrist/hand, hip/thigh, knee, and ankle/foot) that may have been subject to pain in the preceding 12 months. The third domain of the questionnaire focused on the afflictive stress experienced by the participant. This domain's questions were binary (yes/no) and assessed three main stress axes: financially related stress, work-related stress, and emotion-related stress. A cutoff point should indicate the exposure level of stress (negative/positive). The afflictive stress cutoff point for questions answered as "yes" is ≥6. When respondents answered in the affirmative to ≥6 stress-related questions, they are considered to have been subjected to afflictive stress (positive). If <6, they are considered to have not been subjected to afflictive stress (negative).

The computed descriptive statistics included means, standard deviation, and percentages. Bivariate analyses including chi-square and *t* tests were carried out to identify association between variables. The level of significance was set at $P = 0.05$. A binary logistic regression model was constructed to estimate the potential association between "having MSP experience after dental work" with other potential predictors among dentists. The collected data were statistically analyzed with Statistical Package for the Social Sciences (SPSS) software program, version 22.0 (IBM, Armonk, New York).

Results

A total of 300 dentists participated in the study. The majority of dentists were male (59%) and general practitioners (63%). The mean age of participants was 35.3 ± 10.7 years, with average working experience 13.2 ± 6.9 years. The mean number of patients treated per day was seven patients a day (6.7 ± 3.5). The demographic findings of the study population are presented in Tables 1 and 2.

The majority of participants (68%) reported muscle pain after dental work. Back pain was the most frequently reported (53.9%), whereas wrist was the least frequently reported (7.4%). Over 17% of participants had pain in more than one location. The majority of participants (64%) did not use dental loupes while working. Moreover, approximately 38% of those dentists were subjected to afflictive stresses, and 39% of them were exercising regularly.

The results in Table 3 suggest that more "MSP experience after dental work" was observed among specialized dentists, dentists who did not use dental loupes, who were subjected to afflictive stress, and who did not exercise regularly. All of these findings were statistically significant. The findings in Table 4 suggest a statistically significant relationship between "MSP experience after dental work" and number of patients treated per day. Those who reported "MSP experience after dental work" had a higher mean number of patients treated per day ($P < 0.05$).

After controlling for potential confounding factors during binary logistic regression analysis, the results indicated that odds of MSP were significantly lower

Table 1: Demographic characteristics of study participants

Variable		Freq.	%
Gender	Male	177	59
	Female	123	41
Level of dental profession	General dentist	190	63.30
	Specialized dentist	110	36.70
Muscle pain experience after dental work	Yes	204	68
	No	96	32
Location of muscle pain after dental work	Neck	87	28.9
	Shoulder	29	9.8
	Back	162	53.9
	Wrist	22	7.4
Having more than one location of pain	Yes	52	17.2
	No	248	82.8
Use of magnification during dental work	Yes	108	36
	No	192	64
Subjected to stress	Yes	114	38
	No	186	62
Regular muscle exercise (work out)	Yes	118	39.33
	No	182	60.67

Table 2: Descriptive measures of study participant

Variable	Mean	Standard deviation
Age	35.3	10.7
Years of dental practice	13.2	6.9
Number of patients treated per day	6.7	3.5

among the dentists who used magnification (68%) and exercised regularly (52%), compared to their counterparts. On the contrary, the odds of MSP were 3.63 times more in dentists who experienced stress than those without. The odds of MSP also increased significantly for one-unit increase in number of patients treated (19%) [Table 5].

Discussion

MSP ranked among the most common condition affecting dentists worldwide. The prevalence of MSP in our study (68%) is comparable to findings in Ha'il (78%),[1] Riyadh (85%),[9] UAE (65%),[11] and South Wales (64%).[12] This observation confirms the epidemic nature of MSP among dental professional independent of location. Literature indicates that pain is commonly experienced in the back, neck, and least of all the wrist. These findings are comparable with the outcomes of our study.[4,11,13]

Furthermore, we showed that, as the number of patients treated per day increased up to seven, this will contribute to the likelihood of developing MSP by 1.19 times ($P < 0.0002$). These results were consistent with Lietz *et al.*[14] and Pejčić *et al.*[15]

MSP was observed frequently and to a statistically significant degree with specialized dentists, those who did not use dental loupes, and those who exercised regularly. It is well known that magnifying loupes can be used to improve the visualization of fine details and to help in maintaining good posture.[16] The two optical systems that are used in loupes are Galilean and Prismatic.[17] Galilean loupes system is more common. They are considered light in weight and inexpensive. On the contrary, Prismatic loupes have the highest optical quality as they provide wider fields of view and greater depth of field.[17]

In a similar study, a survey was used to examine MSDs among Australian dental hygienists; they found that dental loupes wearers were significantly less likely to experience MSP,[18] which appeared to be due to improved ergonomics, working distances, and effective muscle use with fewer side effects and less muscle damage.[19] Of our participants, 64% reported that they did not use dental loupes during their dental work. Our results showed that 83% of those who use dental loupes did not experience muscle pain, whereas 70% of those who do not use loupes had MSP ($P < 0.0001$). Several studies have shown that the use of magnification tools during dental work has a positive impact on the dentist's posture and on minimizing MSP. The results of our study aligned with those of Aghilinejad *et al.*,[6] Al-Rawi *et al.*,[20] and Lietz *et al.*[14]

It is well recognized that dentistry is a high-stress occupation that triggers muscular pain and contraction.[21] The trapezius muscle was found to be the most responsive muscle to stress,[22] which explains a possible relationship between increased prevalence of back/neck pain and stress. In this study, 38%

Table 3: Chi-square association of muscle pain experience after dental work and demographics

Variables		Muscle pain experience after dental work		Total	*P* Value
		Yes	No		
Level of dental profession	General dentist	(106) 55.79%	(84) 44.21%	(190) 100%	0.04
	Specialized dentist	(94) 85.45%	(16) 14.55%	(110) 100%	
Use of magnification during dental work	Yes	(18) 16.7%	(90) 83.3%	(108) 100%	<0.0001
	No	(135) 70.3%	(57) 29.7%	(192) 100%	
Subjected to stress	Yes	(72) 63.16%	(42) 36.84%	(114) 100%	<0.0001
	No	(51) 27.42%	(135) 72.58%	(186) 100%	
Regular muscle exercise (work out)	Yes	(46) 38.98%	(72) 61.02%	(118) 100%	<0.0001
	No	(121) 66.48%	(61) 33.52%	(182) 100%	

Table 4: Association of muscle pain experience after dental work with number of patients treated

Variables	Muscle pain experience after dental work		*T*-statistics	Degrees of freedom	*P* Value
	Yes	No			
Number of patients treated per day	7.3 ± 2.2	6.1 ± 3.1	3.8444	298	0.0002

Table 5: Binary logistic regression analysis of musculoskeletal pain

Variable	Odd ratio	95% Confidence interval		*P* Value
		Lower	Upper	
Specialized dentists	1.16	0.59	1.42	0.511
Number of patients treated per day	1.19	1.10	1.42	0.007
Using magnification during dental work	0.32	0.25	0.57	<0.0001
Subjected to stress	3.63	1.97	5.13	<0.0001
Regular muscle exercise	0.48	0.20	0.71	0.023
Constant	1.13			0.0085

Muscle pain experience after dental work coded 0 = absence and 1 = presence

of participants who were subjected to stress were complaining of pain ($P < 0.0001$). Dentists who were subjected to afflictive stress were found to be 2.63 times more likely to develop MSP.

Nonetheless, our findings revealed that MSP was less prominent among dentists who performed regular muscle exercise ($P < 0.0001$). These disorders can be avoided by maintaining a regular exercise regime, which appeared to lower the chance of developing MSP by 52%. Aerobic and stretching exercises are believed to be a key factor in preventing musculoskeletal system damage in dental professionals.[21] However, some studies concluded that the effect of exercise on the incidence of MSP was not significant.[23,24]

Our study's limitation was completely depended on self-reported questionnaires, which may carry the possibility of over- or underestimation of participants' conditions; various other biases may have affected the final results.

Further studies should be undertaken to assess the association between stress and MSP by having the participant undergo a clinical examination by a psychologist and physiotherapist. However, the high impact of stress on dentists indicates a need for stress reduction protocols, regular exercise, and weekly activities. To minimize MSDs, identifying the controllable variables with appropriate management, early preventive measures and strategies are highly recommended for reducing MSP in dental students and dental professionals in the beginning of stages of their career; these can consequently help them practice safe ergonomics.

Conclusion

Our study revealed that the prevalence of MSP was high among dentists in Jeddah attributable to poor ergonomics and stress, which impact negatively on the quality of life. Dentists should pay attention to their musculoskeletal health to prevent conditions that can harm their professional career.

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Conflicts of interest

There are no conflicts of interest.

Author contributions

All authors listed have significantly contributed to the development and the writing of this article. All authors have read and approved the final manuscript.

Ethical policy and institutional review board statement

Ethical policy and Institutional Review board statement: The Research Ethics Committee of the Faculty of Dentistry at King Abdulaziz University in Jeddah, Saudi Arabia approved this research (approval number 178-11-19) on 18/11/2019.

Patient declaration of consent

Written informed consent was obtained from all participants.

Data availability statement

The data that support the findings of this study are available on request from the author Faten Alaqil (falaqil@kau.edu.sa).

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