ORIGINAL ARTICLE

Musculoskeletal Disorders Among Dental Practitioners in Kulliyyah of Dentistry, IIUM Kuantan

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ABSTRACT

Introduction: It is common for dental practitioners to encounter stress, repetitive movements, and prolonged static postures that lead to musculoskeletal disorders (MSD). As a multifactorial disorder, MSD results in discomfort or pain in the affected body area. The MSD can adversely affect one's job performance if the symptoms are left untreated. Hence, this study examined the risk factors, prevalence, and impacts of MSD on dental practitioners from Kulliyyah of Dentistry (KOD), International Islamic University Malaysia (IIUM) Kuantan. **Materials and methods:** By adopting the cross-sectional approach, this study assessed the risk factors, prevalence, and impacts of MSD on the study population by using the modified validated Standardised Nordic Questionnaire (SNQ). The questionnaire was disseminated to the study population via online Google Forms. The study population comprised of dental practitioners from KOD IIUM with more than one-year clinical experience. The survey outcomes were analysed via Chi-Square analysis. **Results:** In total, 45 dental practitioners were involved in this study and the response rate was 83%. The results revealed that 86.7% of the participants suffered from MSD in at least one part of their body. Most of them had MSD in their neck region (62.2%), shoulder area (53.3%), and lower back part (48.9%). The common risk factors related to MSD were short breaks, prolonged static posture, and awkward posture. As MSD affected their work capacity, the participants suffered from stress and required medication prescriptions. **Conclusion:** The outcomes support the escalating evidence of the high prevalence of developing MSD among dental practitioners. Effective interventions and ergonomic awareness education should be implemented to minimise the incidence of MSD among dental practitioners to ensure optimum work performance.
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Keywords: Dental practitioners, Musculoskeletal disorder, Standardised nordic questionnaire, Ergonomics, IIUM Kuantan

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INTRODUCTION

Musculoskeletal disorders (MSD) refer to pain or injuries to the human support system involving blood vessels, muscles, nerves, tendons, joints, cartilage, and ligaments (1). A high prevalence of MSD has often been related to cumulative trauma to the tissues and repetitive strain from occupation or physical activities. The World Health Organisation (WHO) and the United Nations reported that the occurrence of MSD mostly stems from disability and long-term pain suffered by millions of people across the globe (2). Dental practitioners are predisposed to a high risk of MSD due to frequent exposure to poor occupational ergonomics (3). In fact, many dental practitioners had to limit or even abandon their profession due to the adverse impacts of MSD on their work performance and productivity (2, 3).

Literature pertaining to MSD suffered by dental practitioners has accumulated from a worldwide perspective. The common symptoms of MSD displayed by dental practitioners have been outlined in numerous publications. Recent studies (4, 5, 6) revealed that the prevalence of MSD among dental practitioners with one-year clinical experience ranged between 24% and 100%. Most of them reported that their wrists, neck, and lower back were heavily affected by pain and MSD (4, 5, 6). A recent study conducted among dental practitioners in Iran demonstrated a high prevalence of MSD (73%)

from a study population of 92 participants (3). This result was comparable with studies from other countries that also reported the high occurrence of MSD among the same sample population, such as 88% in China (6), 92% in Europe (5), and 100% in India (4).

Studies concerning MSD prevalence among Malaysian dental practitioners are in scarcity. Based on a pilot study conducted in Betong and Sri Aman (Sarawak) in 2019 (7), 96% of dental clinicians experienced at least one MSD symptom and the neck area was the most affected body part. In addition, a cross-sectional study conducted in Perak, Terengganu, and Kuala Lumpur in 2017 demonstrated high MSD occurrence (87.5%) amidst dental therapists with their back region as the most affected body part (8).

The exposure to developing MSD is higher among dental practitioners than those in other professions. The MSD suffered by dental practitioners is further escalated by some risk factors, including individual, biomechanical, and psychosocial work factors (1, 9, 10). Biomechanical factors related to dental practitioners' work tasks include prolonged static awkward postures (1, 6), excessive tool vibrations (7, 11), repetitive movements (5), and forceful exertions (12). Individual factors, including high body mass index (BMI), older age, sedentary lifestyle, female, and history of trauma can increase the risk of MSD (6, 9), whereas psychosocial work factors comprise of long working hours, short breaks, and work stress (7).

Poor ergonomic practice in the dentistry segment is often associated with poorly designed dental equipment and a non-conducive working environment, all of which can exacerbate the symptoms of MSD (13). These conditions may contribute significantly to psychological stress, reduce workers' productivity and quality, increase the number of sick leaves, and early retirement among dental practitioners (5, 12). Most studies recommended the application of ergonomic-friendly dental equipment and workplace settings to improve postures during clinical work, thus minimising stress and the risk of MSD among dental practitioners (11). As such, this present study examined the risk factors, prevalence, and impacts of MSD on dental practitioners from KOD, IIUM (Kuantan, Malaysia).

MATERIALS AND METHODS

Subjects and data collection

This cross-sectional study was approved by the IIUM Research Ethics Committee (ID: IREC 2021-021). The single proportion formula with 0.05 precision and 97% expected proportion was deployed to determine the sample size for this study. An online questionnaire was developed via Google Form and revised after conducting a pilot study. This study was conducted from early September 2021 until October 2021. The online questionnaire was disseminated to 54 dental practitioners who had more than one-year clinical experience in KOD, IIUM Kuantan. Those with below one-year clinical experience were excluded from this study. Complete responses obtained from participants who met the inclusion criteria were accepted for the subsequent data analysis.

Questionnaire

The survey questions were prepared based on the SNQ validated by the Nordic Council of Ministers. Modifications were made based on the study requirement. The survey consists of three sections. In the initial section, the demographic profile of the participants was captured (i.e., BMI, gender, dental practitioner category, age, and years of clinical experience) and several items from the SNQ were incorporated to assess the possible risk factors of MSD. Section two retrieved information about MSD symptoms and prevalence from the participants, including pain, numbness, and discomfort in the body, within the past week and past 12 months. A human body diagram was included in the questionnaire to facilitate the participants to identify the body parts corresponding to the questions. The diagram illustrates the posterior view of the human body in nine areas: neck, shoulder, upper back, elbow, wrist or hand, lower back, hip or thigh, knee, and ankle. If the symptom existed in any of the nine body parts, the participants were considered to suffer from MSD. The third section assessed the possible effects of MSD on the dental practitioners.

Data analysis

Data management and analysis were performed by using Microsoft Excel and IBM SPSS® Statistics Version 25 to determine the mean values, the frequency dissemination, and the fractions of all the variables examined in this study. Fraction comparison was carried out by deploying the Chi-Square analysis. A p-value of less than 0.05 indicated statistical significance.

Ethical clearance

Approval to conduct this study was granted by the Research Ethics Committee of IIUM (reference: No. 1IUM/504/14/11/2/ IREC 2021-021).

RESULTS

Respondents

An online questionnaire was distributed to 54 dental practitioners. As 45 of them completed the questionnaire, the response rate was 83%. Since all participants met the inclusion criteria and missing data was absent, all responses were accepted for the subsequent analysis.

Table I tabulates the demographic profile retrieved from the participants. Most of the respondents were female (57.8%). Most of them had a high BMI with 53.3% overweight and 4.4% obese. Among the 41 clinical lecturers and four dental officers, all 45 participants were involved in performing dental clinical procedures. More

than half of them (62.2%) had more than 10 years of service as dental practitioners. Less than half (44.4%) of them performed physical exercise at least once a week. About half of them had a previous injury or accident related to MSD.

Table I: Demographic information of the participants

Demographic Information	Total Respondents (N=45)
Gender	
Male	19 (42.2%)
Female	26 (57.8%)
Age	
< 40 years old	27 (60.0%)
40 – 49 years old	15 (33.3%)
50 years old and above	3 (6.7%)
BMI	
Normal	19 (42.3%)
Overweight	24 (53.3%)
Obese	2 (4.4%)
Category of DP	
Clinical lecturer	41 (91.1%)
Dental officer	4 (8.9%)
Years of service	
5 to 10 years	17 (37.8%)
More than 10 years	28 (62.2%)
Physical exercise	
No	25 (55.6%)
Yes	20 (44.4%)
Previous MSD injury	
No	22 (48.9%)
Yes	23 (51.1%)

Notes: N = number of subjects; BMI = body mass index; DP = dental practitioners; MSD = musculoskeletal disorders

The prevalence and distribution of MSD

Fig.1 illustrates the distribution of symptoms related to MSD reported by the participants. Apparently, 86.7% of the dental practitioners in KOD IIUM experienced MSD symptoms in at least one body area. The most prevalent musculoskeletal complaint was in the neck area (62.2%), the shoulder region (53.3%), and the lower back part (48.9%). Meanwhile, the least affected body area was the elbow (4.4%). The outcomes revealed that most of the dental practitioners experienced MSD symptoms in multiple body regions.

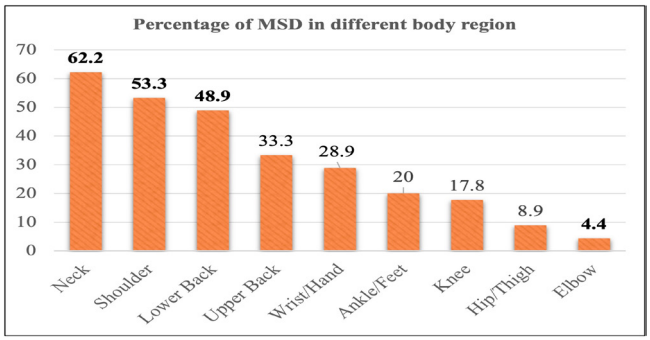

Fig. 1: The percentage of MSD complaints in nine body regions, reported by dental practitioners in Kulliyyah of Dentistry, IIUM Kuantan.

Association between sociodemographic factors and MSD prevalence in specific body regions

This study revealed that MSD mainly affected the neck region (62.2%) among the participants. Table II portrays that the male participants, when compared to their female counterparts, displayed a significantly higher MSD prevalence in the neck area (p-value < 0.05). Those who exercised at least once a week exhibited significantly higher MSD prevalence in their neck area than those who did not. Other demographic factors, such as BMI, category of the dental practitioner, years of service, and previous accident or injury related to MSD, were insignificantly related to MSD prevalence.

Table II: Sociodemographic factors concerning the prevalence of MSD in the neck region

GROUP		MSD on Neck, n (%)		X^2 (df)	*P*-value
		NO	**YES**		
Gender*	Male	4 (21.1%)	15 (78.9%)	3.913 (1)	**0.048**
	Female	13 (50.0%)	13 (50.0%)		
BMI	Normal	9 (47.4%)	10 (52.6%)	2.159 (2)	0.340
	Over-weight	8 (33.3%)	16 (66.7%)		
	Obese	0 (0.0%)	2 (100%)		
Category	Clinical lecturer	16 (39.0%)	25 (61.0%)	0.305 (1)	1.000
	Dental officer	1 (25.0%)	3 (75.0%)		
Years of service	5 to 10 years	7 (41.2%)	10 (58.8%)	0.134 (1)	0.714
	More than 10 years	10 (35.7%)	18 (64.3%)		
Physical exercise*	No	13 (52.0%)	12 (48.0%)	4.840 (1)	**0.028**
	Yes	4 (20.0%)	16 (80.0%)		
Previous MSD injury	No	8 (36.4%)	14 (63.6%)	0.037 (1)	0.848
	Yes	9 (39.1%)	14 (60.9%)		

**Significant difference (p< 0.05); Statistical analysis using the Chi-Square Test*

The second most prevalent MSD symptom reported by the participants was in the shoulder region (53.3%). Table III shows that all demographic factors, including gender, BMI, category of the dental practitioner, years of service, physical exercise, and previous accident or injury related to MSD, were not significantly related to MSD in the shoulder region. Meanwhile, the lower back area emerged as the third-highest MSD prevalence among the participants at 48.9%. Insignificant linkage was observed between the demographic factors and MSD in the lower back region (see Table IV).

Table III: Sociodemographic factors concerning the prevalence of MSD in the shoulder region

GROUP		MSD on Shoulder, n (%)		X^2 (df)	*P*-value
		NO	**YES**		
Gender	Male	7 (36.8%)	12 (63.2%)	1.275 (1)	0.259
	Female	14 (53.8%)	12 (46.2%)		
BMI	Normal	11 (57.9%)	8 (42.1%)	2.953 (2)	0.228
	Over-weight	10 (41.7%)	14 (58.3%)		
	Obese	0 (0.0%)	2 (100.0%)		

CONTINUE

Table III: Sociodemographic factors concerning the prevalence of MSD in the shoulder region. (CONT.)

GROUP		MSD on Shoulder, n (%)		X^2 (df)	*P*-value
		NO	YES		
Category	Clinical lecturer	21 (51.2%)	20 (48.8%)	3.841 (1)	0.050
	Dental officer	0 (0.0%)	4 (100.0%)		
Years of service	5 to 10 years	9 (52.9%)	8 (47.1%)	0.432 (1)	0.511
	More than 10 years	12 (42.9%)	16 (57.1%)		
Physical exercise	No	11 (44.0%)	14 (56.0%)	0.161 (1)	0.688
	Yes	10 (50.0%)	10 (50.0%)		
Previous MSD injury	No	13 (59.1%)	9 (40.9%)	2.670 (1)	0.102
	Yes	8 (34.8%)	15 (65.2%)		

**Significant difference (p< 0.05); Statistical analysis using the Chi-Square Test*

Table IV: Sociodemographic factors concerning the prevalence of MSD in the lower back region

GROUP		MSD on Lower Back, n (%)		X^2 (df)	*P*-value
		NO	YES		
Gender	Male	7 (36.8%)	12 (63.2%)	2.680 (1)	0.102
	Female	16 (61.5%)	10 (38.5%)		
BMI	Normal	13 (68.4%)	6 (31.6%)	4.059 (2)	0.131
	Over-weight	9 (37.5%)	15 (62.5%)		
	Obese	1 (50.0%)	1 (50.0%)		
Category	Clinical lecturer	21 (51.2%)	20 (48.8%)	0.002 (1)	0.963
	Dental officer	2 (50.0%)	2 (50.0%)		
Years of service	5 to 10 years	9 (52.9%)	8 (47.1%)	0.037 (1)	0.848
	More than 10 years	14 (50.0%)	14 (50.0%)		
Physical exercise	No	15 (60.0%)	10 (40.0%)	1.779 (1)	0.182
	Yes	8 (40.0%)	12 (60.0%)		
Previous MSD injury	No	13 (59.1%)	9 (40.9%)	1.097 (1)	0.295
	Yes	10 (43.5%)	13 (56.5%)		

**Significant difference (p< 0.05); Statistical analysis using the Chi-Square Test*

Risk factors of MSD

Risk factors of MSD may originate from poor ergonomic work settings while treating patients or carrying out clinical procedures. In this study, poor ergonomic postures included prolonged static posture (28.26%), awkward posture (19.57%), and short breaks (17.39%). Fig. 2 illustrates the possible risk factors of MSD among the participants.

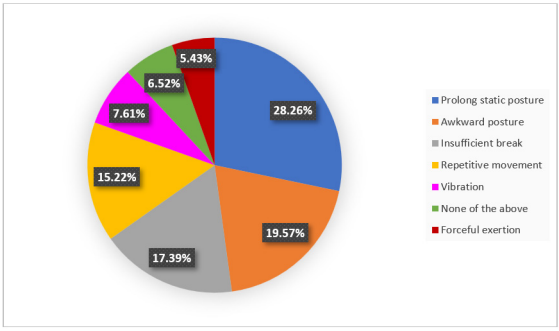

Fig. 2: The distribution of poor ergonomic practices among the study participants. The participants could report either none, at least one, or multiple poor ergonomic practices in their work practice.

Effects of MSD

Table V presents the impacts of MSD on the participants' daily activities. Dental practitioners who suffered from MSD in any body part were most likely to have lower work capacity, stress, and medication prescription. Some might require medical consultation from doctors regarding their MSD-related pain. Only one-fifth (21.5%) of the participants claimed that their daily chores were unaffected by MSD.

Table V: Effect of MSD on daily activities of dental practitioners in KOD IIUM

Effects of MSD	Frequency (n)	Percentage (%)
Change the nature of work	2	2.5
Need for doctors' consultations	10	12.7
Need for sick leaves	3	3.8
Need to take medication	13	16.5
None of the above	17	21.5
Reduction in work capacity	14	17.7
Stress	12	15.2
Thinking of a change of career	2	2.5
Thinking of early retirement	6	7.6

DISCUSSION

Prevalence of MSD among dental practitioners

The study participants recorded a high MSD prevalence (86.7%); higher than a cross-sectional study executed among Indonesian dentists (63.5%) by Phedy et al (14). The highest MSD prevalence recorded among dental practitioners was 100% within the context of India (4). It is not surprising that most of the studies published worldwide disclosed that more than half of dental practitioners experience work-related MSD (26,28). Many dental professionals are predisposed to MSD symptoms even before they start their careers. A similar study conducted among dental students displayed a similar prevalence to this present study, whereby 86.6%

of the students suffered from MSD due to clinical practice during their undergraduate or postgraduate studies (12).

Affected body region

MSD mostly affects the neck (62.2%), shoulder (53.3%) and lower back (48.9%). These findings agree with many studies of the same study populations (25,26,27,28). These body parts are involved directly with unfavourable ergonomics positions such as cramped positions, prolonged static positions, and bending and twisting while managing or treating their dental patients. Prolonged exposure to clinical practice contributed to a higher incidence of MSD, thus leading to high MSD prevalence among dental professionals. Evidently, MSD is a considerable burden in the field of dentistry.

Risk factors of MSD among dental practitioners

Cases of MSD are rather common in the dentistry segment due to the need to use small hand-held instruments in a confined working space of the oral cavity over a long duration. Many studies identified awkward static postures, repetitive movement, prolonged vibrations, poor lighting, and individual characteristics (e.g., physical condition, weight, general health, gender, and age) as risk factors for MSD among this professional group (15). A study among Arab Saudi dental allied professionals revealed the same findings when it concluded that the work-related factors of MSD are keeping an uncomfortable posture for long periods of time (28).

In this study, MSD was substantially linked to one's sociodemographic profile such as female gender, irregular exercise, high BMI and poor ergonomic practice during dental work (29). Dental practitioners who exercised at least once a week had a considerably greater prevalence of MSD in the neck region. Similarly, a study carried out in the Indonesian context disclosed that most dental practitioners who suffered from MSD exercised at least once a week, most likely due to their intention to alleviate their discomfort from MSD by engaging in physical activity (14). Contrast results were reported among dentists in Shiraz, Iran, as exercising less than three hours per week was found to be significantly associated with the prevalence of MSD (24).

MSD on the shoulder is significantly higher in males. However, this finding is unparallel with a few other studies that reported that MSD affects significantly more female dental practitioners (25, 26).

In addition, poor ergonomics is a common cause of MSD. Previous studies depicted those common poor ergonomic factors that led to MSD among dental practitioners included high exposure to vibrating equipment (76.5%), repetitive hand and shoulder movements (66.0%), and awkward postures (52.3%) (16). An earlier study revealed that hand scaling and ultrasonic scaling procedures were highly predictive of the development of MSD due to exposure to prolonged vibrations and repetitive forces (17). One of the recommendations to reduce MSD in this profession is to broaden the scope of work by encouraging dentists to pursue alternative roles, such as teaching and research tasks.

Effects of MSD on dental practitioners

MSD is a severe issue encountered by dental practitioners as it can adversely affect their job performance and personal lives. In this study, the most affected individuals reported a reduction in their work capacity. Some even succumbed to medication in their attempt to relieve the symptoms, while others experienced stress due to MSD. Other studies have also reported that dentists had to take sick leave and seek medical attention due to this problem (18, 19, 32). A study found that only 38% of those suffering from MSD took the initiative to seek treatment for their pain, whereas the remaining did not take any action. This scenario is ascribable to the varied levels of symptom severity (19). While some may have chronic pain requiring medical care, others may have mild pain that can be relieved by exercise or spontaneously.

Prevention and ergonomic intervention to minimise MSD among dental practitioners

To date, many studies have looked into the effective prevention and intervention methods given the widespread MSD problems in the dental profession. The recommendations include the use of magnification (dental loupes or microscopes) (25, 30, 31), avoidance of static posture by alternating between sitting and standing, feet repositioning, patients positioned at a suitable height, prevention of twisting movement, taking adequate periodic breaks, and performing regular stretching in between (20). Another study found that ergonomically designed dental instruments can reduce the prevalence of MSD (29). Finger rests during instrumentation can minimise muscular activity, thus potentially lowering the incidence of MSD (21). Studies have registered that close-focus sit-standing and conventional sitting as effective ergonomics seating approaches appropriate for dental professionals (22, 23,33). Based on these multi-prong recommendations, a reduction in MSD prevalence is anticipated.

Study limitations

Several drawbacks were noted in this study. First, the convenience sampling performed by involving a small sample size of dental practitioners limits the generalisability of this study. Next, the online platform used for self-reporting data collection could lead to under or overestimation of MSD. It is noteworthy to highlight that this study did not differentiate if the cause of MSD was work-related or other non-occupational factors. Hence, future studies should increase the sample size to improve the statistical power and increase the response rate. On top of that, a combination of online

survey and face-to-face interview sessions may enhance the comprehension of MSD among the participants.

CONCLUSION

This study highlights a high prevalence of MSD among dental practitioners in KOD IIUM (Kuantan). Poor ergonomic postures during dental practice emerged as one of the most common risk factors for a dentist to encounter MSD. Dental practitioners who suffered from MSD experienced reduced work capacity and poor quality of life. Preventive measures and ergonomic awareness programmes should be implemented among dental practitioners to lower MSD prevalence and the associated risk factors.

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