

# Prevalence of Work-related Musculoskeletal Disorders among Dental Students of King Saud University, Riyadh, Kingdom of Saudi Arabia

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## ABSTRACT

**Aim:** To evaluate the presence of work-related musculoskeletal disorders (WRMSDs) among undergraduate dental students of the College of Dentistry, King Saud University (KSU), Riyadh, Saudi Arabia.

**Materials and methods:** A questionnaire-based cross-sectional survey was conducted in 2017 and distributed to 150 undergraduate female, and male dental students of KSU who had started to work with patients in the clinic or with manikins. Data were collected related to WRMSDs.

**Results:** Nearly, 142 (95%) students returned the completed questionnaire, 88 (62%) were females and 54 (38%) were males. The results of this study indicate that musculoskeletal symptoms among dental students of KSU are high. Females generally reported more WRMSDs. Seventy-two percent of females and 41% of males reported frequent headaches. Fourteen percent of females and 6% of males had some musculoskeletal pain disorders before joining the dental profession, whereas 68% of females and 43% of males reported pain attributed to their clinical dental work. In the majority of females (67%) and males (61%), the onset of pain was gradual. Commonly reported pain sites in both females and males were the neck, shoulder, upper and lower back. The most common pain sites, among females were shoulder and neck, and upper- and lower-back among males.

**Conclusion:** The WRMSDs can affect the dental professionals from the early stages of their clinical carrier, even as dental students. Concrete steps are required to prevent the occurrence of WRMSDs among dental students by providing them the detailed knowledge about theoretical and practical aspects of dental ergonomics. Higher prevalence of WRMSDs among female dental students indicate that female dental professionals need to be extra vigilant to adhere to the principles of dental ergonomics from the very beginning of their clinical career.

**Clinical significance:** The awareness to implement the principles of dental ergonomics among dental students can help to prevent early development of WRMSDs among them. The inclusion of dental ergonomics as a detailed stand-alone subject in the dental curriculum before the start of clinical training can contribute minimize the risk of WRMSDs throughout the professional life of the dentists.

**Keywords:** Dental students, Ergonomics, Saudi Arabia, Work-related musculoskeletal disorders

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## INTRODUCTION

Numerous previous studies have shown that dental professionals are prone to sustain WRMSDs.<sup>1,2</sup> The WRMSDs describe the pain and dysfunction involving different components of the musculoskeletal system, such as muscles, tendons, ligaments, joints, nerves and related tissues in response to professional work. Usually, such pains and soreness are slow to appear and ignored until they become chronic and permanent in nature.<sup>3,4</sup> The concept of the WRMSDs is not new and was first mentioned in a book from the 18th century.<sup>5</sup> The WRMSDs are known to be caused or aggravated by repeated exposure to high or low-intensity loads with stereotype movements or static postures on the musculoskeletal system over a long period of time, exactly what the dental professionals undergo to dispense dental care and treatment. Dentists need to work with high precision repeated movements of hand and wrist muscles while maintaining uncomfortable trunk, neck and arms postures at the expense of continuous static and dynamic contractions of many muscles,<sup>6,7</sup> which make them more susceptible to acquire WRMSDs.

Back pain has been reported to be the most common WRMSD among dentists, followed by neck pain, high tension in upper limb muscles, carpal tunnel syndrome, tendinitis, arthrosis, etc.<sup>8,9</sup> In spite of rising practice of fourhanded dentistry and use of ergonomically designed equipment, literature reports that at least 73% of the dentists reported to suffer back and neck pain while 81% of dental professionals reported to develop neck, shoulder, and arm pain.<sup>10,11</sup>

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It is reported that there are various factors responsible for the development of WRMSDs, including organizational, psychosocial and sociocultural variables like work-related stress, high muscle tension, and adoption of awkward postural positions while handling patients.<sup>12-15</sup> Age, work experience, female gender and daily working hours with patients have also been related to the incidence and

prevalence of WRMSDs among dental professional.<sup>9,16</sup> A previous study has shown that dentists suffering from long-term WRMSDs are likely to develop other serious complications, such as varicose veins, postural defects, and flat foot type conditions.<sup>17</sup> Some studies have reported that the development of musculoskeletal pain among dental professionals was negatively correlated with their work experience.<sup>18,19</sup> Possible reason for this could be that with experience the dental professionals learn to modify their working posture to avoid pain, or that professionals that develop WRMSDs early leave the profession.<sup>20</sup>

Although some previous studies<sup>7,19</sup> were conducted to evaluate the prevalence of WRMSDs among dental students, but the main focus of earlier studies was to evaluate the presence of WRMSDs mainly among dentists and dental hygienists.<sup>21</sup> Evaluation of the extent of WRMSDs issue at the very early stage among dental professional's clinical career as dental student can help to devise measures to minimize the development of WRMSDs in dental professionals.<sup>22</sup> Thus, the aim of the present study is to evaluate the prevalence of WRMSDs among undergraduate dental students of both genders of the College of Dentistry, King Saud University (KSU), Riyadh, Saudi Arabia. The obtained information can provide the basis to improve the understanding and knowledge about contributing risk factors and early prevention of WRMSDs among dental students.

## MATERIALS AND METHODS

A questionnaire-based cross-sectional survey was conducted in 2017 among undergraduate dental students of both genders in the College of Dentistry, King Saud University (KSU), Riyadh, Kingdom of Saudi Arabia. A self-designed questionnaire was used for collection of information and was based on a previous study on WRMSDs among dentists in Saudi Arabia.<sup>9</sup> The questionnaire was distributed along with instructions and purpose of the survey to 150 dental students who had started to work with patients or with manikins. Informed consent to participate in this study was obtained from all students. Ethical approval was obtained from the Institutional Review Board No. E-18-3166.

The data include age, gender and academic year of each participant. The questionnaire contained 28 questions to be filled by each participant by hand. The questionnaire was based

on data on basic demographic characteristics, general health information, and history of musculoskeletal disorders before and after starting the dental clinical training. Before the data collection, the validation of the questionnaire was established by means of face validation involving two other experts of questionnaire-based surveys. The reliability was assessed by distributing 10 questionnaires randomly among 10 students. They were asked again to answer the questionnaire after 2 weeks. The similarity percent of answers of the test-retest questionnaire was 95%. Most of the questions were dichotomic (Yes/No). For some questions, the participants were required to give a brief description of his/her own words. Data on personal information, study level, patient contact hours, information on headache, pain disorders before joining dental profession, exercise and physical activity routines, previous pain experiences related to dental clinical work, presence of WRMSDs at the time of completing the questionnaire, visual analog scale (VAS) score and pain sites were collected.

## RESULTS

Out of 150 dental students of both genders, 142 (95%) returned the completed questionnaire. Among them, 88 (62%) were females, and 54 (38%) were males. The mean height for the females was 159.3 cm, and for the males was 171.2 cm. The mean weight for the females was 58.6 kg, while for the males was 75.9. All the respondents were of Saudi origin and were otherwise healthy (Table 1).

### Study Level and Patient Contact Hours

Among the female respondents, 42 out of 88 (48%) were students from the 4th year, while the remaining 46 out of 88 (52%) were studying in the 5th year. All male respondents were students from the 5th year. The mean time of patient contact in hours per week was 15.9 for female students and 14.9 for male students (Table 1).

### Headache

The majority of the female respondents; 63 out of 88 (72%) reported frequent headaches. Among those 63 females' students, 42 (67%) had the headache episodes 3 times or less per week, and 15 (24%) females' students had headache 3 to 5 times per week, while there was 6 (9%) females' students had headaches more than 5 times per week. Out of 63 females who frequently experienced headaches, the duration of each episode was less than 30 minutes in 21 (33%) females' students, and between 30 minutes and one hour in 27 (42%) females' students, while more than one hour in 16 (25%) females' students (Table 2).

Table 1: Demographic data

Participants (n=142)	Females 88 (62%)	Males 54 (38%)			
Height (cm)	159.3 (SD 13.7)	171.2 (SD 13.6)			
Weight (kg)	58.6 (SD 9.9)	75.9 (SD 21.7)			
Patient contact (h/week)	15.9 (SD 4.6)	14.9 (SD 5.1)			
<i>Study level</i>					
8th semester	42 (48%)	0 (0%)			
10th semester	46 (52%)	54 (100%)			
<i>Patient contact (hrs./week ± SD)</i>					
<i>Participants</i> (n=142)	<i>Height</i> (cm ± SD)	<i>Weight</i> (kg ± SD)	<i>Patient contact (hrs./week ± SD)</i>	<i>Study level</i>	
				<i>4th year</i>	<i>5th year</i>
Females	159.3 ± 13.7	58.6 ± 9.9	15.9 ± 4.6	42 (48%)	46 (52%)
Males	171.2 ± 13.6	75.9 ± 21.7	14.9 ± 5.1	0 (0%)	54 (100%)

Table 2: Headaches, frequency and duration among respondents  
n = 142 (F= 88, M = 54).

Headaches	Females	Males
Frequent	63 (72%)	22 (41%)
3 times or less/week	42 (67%)	17 (77%)
3 to 5 times/week	15 (24%)	5 (23%)
More than 5 times / week	6 (9%)	0 (0%)
<i>Episode duration of headaches</i>		
Less than 30 minutes	21 (33%)	9 (41%)
Between 30 minutes and 1 hour	27 (42%)	5 (23%)
More than one hour	16 (25%)	8 (36%)
Sought medical help	11 (18%)	3 (14%)

For male respondents, 22 out of 54 (41%) reported frequent headaches. Among them, 17 out of 22 (77%) had headache episodes 3 times or less per week, 5 out of 22 (23%) had headache 3 to 5 times per week, and none of the male respondents had headaches more than 5 times per week. Out of 22 males who frequently experienced headaches, the duration of each episode was less than 30 minutes in 9 (41%), between 30 minutes and one hour in 5 (23%) and more than one hour in 8 (36%) respondents (Table 2). Eleven female students and three male students sought medical advice for their headache problems.

### Pain Disorder Before Joining the Dental Profession

Twelve out of 88 (14%) females and 3 out of 54 (6%) male respondents reported the presence of pain disorders before joining the dental profession. Out of 12 females, 7 had low back pain and 5 did not specify their pain disorder. All 3 males reported having low back pain before joining the dental profession (Table 3).

### Functional Limitations due to Pain Disorders Before Joining the Dental Profession

None of the female or male respondents had any functional limitations due to pain disorders before joining the dental profession.

### Exercise and Physical Activity

Out of the 88 female respondents, 69 (78%) were doing regular exercise. 18 (20%) were regularly attending gym and 51 (58%) were walking or jogging regularly, ranging from 30 minutes to 1 hour, 1–3 times per week. The rest 19 (22%) were not doing regular exercise. Out of the 54 male respondents, 50 (93%) were doing regular exercise. 16 (30%) were regularly attending the gym, 24 (44%) were walking or jogging regularly, and 10 (19%) were playing football, ranging from 1–2 hours, 2–4 times per week. Only 4 (7%) male respondents were not engaged in regular exercise.

### Pain Since Starting the Dental Clinical Work

The majority of the female respondents, 60 out of 88 (68%) reported pain they attributed to their clinical dental work. Among them, 30 out of 60 (50%) reported neck and shoulder pain, 15 (25%) reported back pain, 6 (10%) had neck pain, 6 (10%) had neck and back pain, 2 (3%) pin & needle pain in arms, and 1 (1.7%) reported generalized body pain. For the male respondents, 23 out of 54 (43%) reported pain due to their clinical dental work. Among them, 8 out of 23 (35%) reported back pain, 6 (26%) reported neck and shoulder pain, 4 (17%) had neck pain, 4 (17%) had neck and back pain, and 1 (4%) reported generalized body pain (Table 4).

### Sought any Treatment for Dental Professional Work Related Pain

For the females, 10 out of 60 (17%) sought treatment for their pain problems, 5 out of 10 (50%) used pain-killers and remaining 5

(50%) received physiotherapy help. Whereas, for the males, 3 out of 23 (13%) sought treatment for their pain problems, 2 out of 3 (67%) received physiotherapy help and remaining 1 (33%) used pain-killers.

### Onset of Pain

For the females, in 20 out of 60 (33%) respondents pain problems started suddenly and in the rest 40 (67%) the pain started gradually. For the males, in 9 out of 23 (39%) respondents pain problems started suddenly and in the rest 14 (61%) the pain started gradually.

### Duration of Pain Episode

The majority of the female respondents, 46 out of 60 (77%) had pain episodes lasting for less than a week, 10 (17%) had their pain lasting between 2 to 4 weeks and 4 (7%) had their pain lasting for more than 4 weeks. Similarly, the majority of the male respondents, 19 out of 23 (83%) had pain episodes lasting for less than a week, 3 (13%) had their pain lasting between 2 to 4 weeks and 1 (4%) had their pain lasting for more than 4 weeks.

### Work-related Pain affecting Regular Activities

Out of the 60 female respondents who reported pain attributed to their dental clinical work, 22 (37%) had reported problems in performing everyday activities. For male respondents, 13 out of 23 (57%) reported problems in performing everyday activities.

### Sick Leaves due to Work-related Pain

For female respondents, 5 out of 60 (8%) sought sick leaves due to work-related pain, and the corresponding number for male respondents was 13 out of 23 (57%).

### Presence of WRMSDs at the Time of Completing the Questionnaire, Visual Analog Score, and Pain Sites

The majority of the female respondents, 53 out of 88 (60%) reported the presence of pain at the time of completing the questionnaire, whereas, 17 out of 54 (31%) males reported the presence of pain. The mean VAS scores for female and male respondents were 4.03 (SD 1.4) and 3.91 (SD 1.65), respectively. Most of the respondents had work-related pain in more than one region. In both female and male respondents, commonly reported pain sites were the neck, shoulder, upper- back and lower- back. Among females, the most common pain sites were shoulder (47%), neck (43%) followed by lower (42%) and upper back (33%), and for males, the most common pain sites were lower back (30%), upper back (26%), neck (26%) and shoulder (24%) (Table 5).

**Table 4:** WRMSDs since starting the dental clinical work among respondents, n = 142 (F= 88, M = 54)

	Females	Males	Total
Among all respondents	60 (68%)	23 (43%)	83 (59%)
<i>Location of pain</i>			
Neck and shoulder	30 (50%)	6 (26%)	36 (25%)
Back pain	15 (25%)	8 (35%)	23 (16%)
Neck pain	6 (10%)	4 (17%)	10 (7%)
Neck and back	6 (10%)	4 (17%)	10 (7%)
Pins and needles in arms	2 (3%)	0	2 (< 1%)
Generalized body pain	1 (1.7%)	1 (4%)	2 (< 1%)

**Table 3:** Presence of pain disorders before joining dental studies, n = 142 (F= 88, M = 54)

	Females	Males	Total
Yes	12 (14%)	3 (6%)	15 (11%)
No	76 (86%)	51 (94%)	127 (89%)
<i>Site of pain</i>			
Low back	7	3	10
Other	5	0	5



**Table 5:** WRMSDs sites among respondents at the time of completing the questionnaire, n= 142 (F= 88, M =54)

Location	Females	Males	Total
Neck	38 (43%)	14 (26%)	52 (37%)
Shoulder	41 (47%)	13 (24%)	54 (38%)
Elbow	5 (6%)	0	5 (4%)
Hand	16 (18%)	3 (6%)	19 (14%)
Upper back	29 (33%)	14 (26%)	43 (30%)
Lower back	37 (42%)	16 (30%)	53 (37%)
Low back and buttocks	10 (11%)	6 (11%)	16 (11%)
Thighs and knee	7 (8%)	1 (2%)	8 (6%)
Lower leg	11 (13%)	1 (2%)	12 (8%)
Foot	5 (6%)	2 (4%)	7 (5%)

### Visual Analog Score of Worst Pain Since Starting the Dental Clinical Work

The mean VAS scores for female and male respondents were 6.13 (SD 2.4) and 6.15 (SD 2.23), respectively.

## DISCUSSION

WRMSDs are the most reported health problems among dental practitioners.<sup>21,23</sup> Present study evaluated the prevalence of WRMSDs among dental students in the College of Dentistry, KSU in Riyadh, Kingdom of Saudi Arabia. The results of the present study indicate that musculoskeletal symptoms among dental students are high in the studied group of dental students. Our study points to the fact that urgent appropriate steps are required to minimize the risk factors leading to WRMSDs among dental students, as has been suggested previously by Chohanadisai et al. and de Carvalho et al.<sup>14,24</sup>

Students who had just started their clinical training reported the presence of WRMSDs. This is important because WRMSDs at this stage can lead to more sick-leaves, decrease in work output and even the possibility of early retirement.<sup>20,25,26</sup> This could be due to change in the work nature, practice pattern and working hours from non-clinical years. Morse et al. also reported a higher prevalence of WRMSDs symptoms among dental students ever since they began their practical work in university clinics.<sup>27</sup> Similar complaints were also reported by the students of the Faculty of Dentistry, University of Indonesia.<sup>28</sup>

Results of this study showed that at least 68% of female respondents reported developing pain due to their clinical work as compared to male respondents (43%). Gender has been widely reported as a risk factor for developing WRMSDs.<sup>29,30</sup> This has been attributed to their smaller body structure, lower muscle tone and higher stress levels as compared males.<sup>31-33</sup>

Neck and lower back were reported to be more prone to pain and increased risk of developing musculoskeletal disorders by the respondents. Our findings are in line with the results of previous studies showing that neck, shoulder and lower back pain was commonly reported among dental students.<sup>7,19,23,24</sup> Shoulder and forearm discomfort are usually associated with working posture such that arms are overhead most of the times and with forceful upper limb movements.<sup>34</sup> Similarly, bending and twisting of the neck by the dentists during treatment of patients has also been reported to be related to discomfort and pain in cervical, thoracic

and lumbar regions of the spine.<sup>10,35</sup> Compromising postures, repeated movements and improper forces leading to fatigue of hand and upper limb muscles can result in the development of WRMSDs among dental professionals.<sup>3</sup> A well-organized ergonomic chair-side arrangement by a well-trained dental nurse can facilitate the dentist to provide efficient treatment to the patient in the given time with minimum of musculoskeletal loading on the dental professional.<sup>36</sup>

A similar study has reported that about 58% of the dental students informed that the subject of dental ergonomics was not the part of their curriculum, and 93% of students did not attend any workshop on the prevention of WRMSDs at their dental school.<sup>21</sup> Other studies have also reported that the majority of the dental students did not attend any courses on WRMSDs or dental ergonomics during their education and their knowledge of good posture, ergonomics, and their clinical application was not satisfactory.<sup>37,38</sup> It has been suggested that WRMSDs can be reduced or prevented by applying ergonomic principals while designing dental instruments and other equipment.<sup>39-41</sup> Simple adjustment of the chair while treating patients, placing materials and instruments within reach, and keeping the arms closer to the body and below the shoulder level have been advised to improve posture in clinics to prevent fatigue and risk of developing WRMSDs.<sup>1,14,28,41</sup>

Ergonomics is the science of designing and arranging equipment at the workplace to keep workers healthy during their jobs. Thus, improper working environment and characteristics have been proposed as major factors leading to the development of WRMSDs.<sup>42</sup> Proper ergonomic design of the workplace can help to prevent the development of work-related injuries over time and long-term disability. Continuing education about correct posture, while handling patients as well as practicing ergonomic skills and incorporating them into the undergraduate curriculum, would be beneficial for dental students.

### Limitations

This study involved a relatively small number of respondents that too from only one institution. This study should be repeated on a larger sample representing all institutions in the whole country. Self-reporting by the dental students may affect the results, as there are chances of over or underestimation of the pain and the related injuries.

## CONCLUSION

The WRMSDs can affect the dental professionals from the early stages of their clinical carrier, even as dental students. Concrete steps are required to prevent the occurrence of WRMSDs among dental students by providing them the detailed knowledge about theoretical and practical aspects of dental ergonomics. Higher prevalence of WRMSDs among female dental students indicate that female dental professionals need to be extra vigilant to adhere to the principles of dental ergonomics from the very beginning of their clinical career.

## CLINICAL SIGNIFICANCE

The awareness to implement the principles of dental ergonomics among dental students can help to prevent early development of WRMSDs among them. The inclusion of dental ergonomics as a detailed stand-alone subject in the dental curriculum before the start of clinical training can minimize the risk of WRMSDs throughout the professional life of the dentists.

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