

## Prevalence of Musculoskeletal Disorders Among Lebanese Dentists

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### Abstract

**Background:** Musculoskeletal disorders (MSDs) are significant workplace problems affecting dental professionals and increasing among their workers. Despite improvements in knowledge and ergonomic strategies in dental workplace, many dentists are confused whether work environments affect their physical health or not and don't follow ergonomic guidelines in their practices.

**Aim:** To assess the prevalence and the relationships between demographic variables and some dental practices with musculoskeletal disorders among Lebanese dentists.

**Materials and Methods:** Self-administered questionnaires were given to a sample of 218 dentists to answer, and the information including demographic variables as gender, age, experience, practice, specialization and location of pain in different parts of the body was collected and recorded. The data was then analysed with SPSS 20, and P-value < 0.05 considered to be statistically significant.

**Results:** 92.7% of the participants suffered from musculoskeletal disorders out of which 40% had at least one MSD symptom over the past twelve months. The most common areas affected by MSD in order of magnitude were low back pain (61.8%), neck pain (51.5%), shoulder pain (39.5%), finger pain (14.1%), wrist pain (11.8%), and elbow pain (8.6%). Pain differences were statistically significant among specialists. Back pain was the highest among pediatric dentists, neck pain, that was related to daily working hours, was the highest among endodontic dentists; while shoulder pain was the highest among dental surgeons. Pain location, however, was statistically significant between genders. In particular, females suffered more than males, especially at the neck and the wrist levels. This implies that permanent pain by location is inversely proportional to physical activity.

**Conclusions:** The findings confirm that the Lebanese dentists do not respect the ergonomic recommendations, and they have low awareness about their health issues; so further studies are needed to identify the specific risk factors of the Lebanese dentists' MSD and introduce effective remedial measures.

**Keywords:** Dentistry; Health; Musculoskeletal Disease; Ergonomics

### Introduction

Dentists are often exposed to a variety of occupational hazards that may include chemical, biological, legal, and ergonomic hazards. These hazards can lead to diseases, disorders, and stresses [1]. In the United Kingdom, a study showed that the most frequent causes of premature retirement among dentists were musculoskeletal disorders 29.5%, cardiovascular diseases 21.1%, and neurotic symptoms 16.5% [2]. Musculoskeletal disorders and stress related illnesses were the two most important factors that influenced premature retirement [2].

Literature reviews across the world have confirmed that there is a high prevalence of musculoskeletal disorders (MSDs) among dentists [3-5]. About 63% to 93% of dentists have experienced musculoskeletal disorders worldwide [5]. World Health Organization (WHO) and The United Nations (UN) [3] have realized that MSDs are the causes of long-term pains and disabilities that affect hundreds of millions of people [6]. Due to this fact, WHO defines an MSD as 'a disorder of the muscles, tendons, peripheral nerves or vascular system not directly resulting from an acute or instantaneous event (e.g. slips or falls)' [7].

The causes of MSD symptoms are numerous. Risk factors are habits, genetic predisposition, physical conditioning, and age [1-8]. Dentists spend their workdays in static and awkward positions with repetitive movements, frequent vibrations affecting their hands and wrists, and suboptimal lightings [1-6]. They perform precise procedures in a small workspace referred to as 'the patient's mouth'. Their common postures are static and require contractions of muscles to hold the body motionless while resisting gravity [9-10]. The awkward positions are due to improper seating, improper patient positioning, poor techniques, and poorly designed equipment. Repetitive motions that involve scaling, root planning, and polishing [9] are extremely prevalent in clinical practices. While extracting the teeth or grasping small instruments for long periods, the dentist needs an excessive force and a much greater one than the power grip (object in the palm of the hand) [3].

It is thus reasonable to believe that MSD represents a significant barrier for the dental profession. A systemic review in Dentistry shows an increasing awareness about MSDs high prevalence in developed countries than in less developed ones [3-11]. What about Lebanon? In light of the above, the aim of this study is to assess the prevalence of MSDs among the Lebanese dentists.

### Materials and Methods

This survey was conducted in 2013 during two main dental conventions: The Biannual Meeting of the International Convention of the Lebanese University in September and Beirut International Dental Meeting of the Lebanese Dental Association in October. The registered dentists in both conventions were of all specializations covering all the country.

Based on a review of literature, a self-administered questionnaire was developed and adopted to testify 10 dentists and collect data about 11 questions including

- Demographic variables: age, gender, years of experience and specialty,
- Working techniques: posture (standing and sitting, or an alternate in between them), duration of work (working hours per day or week), and vision (direct or indirect),
- Practice of Dentistry: General Dentistry or specialty,
- Pain location in the neck, shoulder, lower back, fingers, wrists, and elbows during the last twelve months,
- Frequency of pain (rare, permanent, occasional, or none), and
- Physical or non-physical activity.

More than 300 anonymous questionnaires were distributed to maintain credibility. The approached dentists were given a choice to fill either an English or a French survey.

230 questionnaires were filled and returned on the same day. Twelve of them were excluded because they were not completed, and so only 218 questionnaires were included in the study.

### Statistical Analysis

Data entry was performed using the software Access (Microsoft Office). Statistical package for social sciences (SPSS) version 20 was used to determine frequency distributions, means and proportions. The proportions were then compared by using Fischer's exact test with P-value < 0.05 considered as statistically significant.

### Results

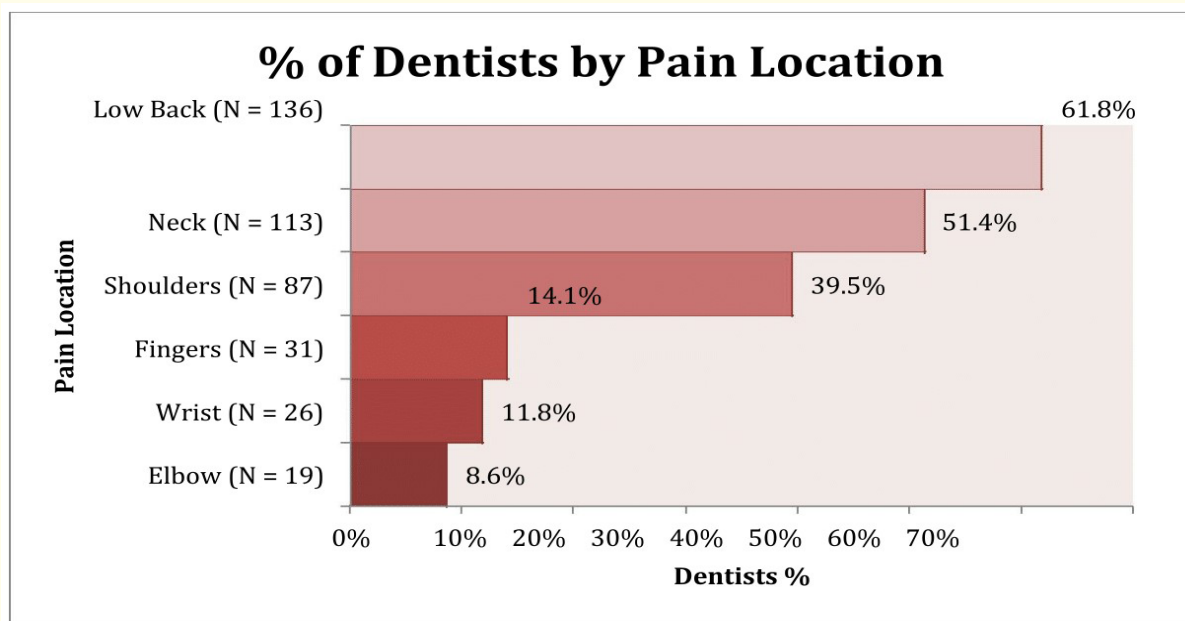
#### Demographic characteristics of the study sample (Table 1)

	N	%
<b>Gender</b>		
Male	147	67.4%
Female	71	32.6%
Total	218	100.0%
<b>Specialty</b>		
General Dentistry	144	67.3%
Oral Surgery	19	8.9%
Endodontics	5	2.3%
Orthodontics	28	13.1%
Pediatric Dentistry	6	2.8%
Periodontology	12	5.6%
Total	214	100.0%
<b>Vision</b>		
Direct	86	39.4%
Indirect	18	8.3%
Both	114	52.3%
Total	218	100.0%
<b>Posture</b>		
Sitting	138	64.5%
Standing	11	5.1%
Both	65	30.4%
Total	214	100.0%

**Table 1:** Distribution of Dentists by demographic characteristics in relation to the prevalence of MSD.

The sample included 218 dentists of males (67.4%) and females (32.6%) whose mean age was 43 and average duration of practice 18.6 years. However, 67% of the participants were general dentists and the rest were pediatric dentists, oral surgeons, endodontists, periodontists and orthodontists. Most of these practitioners worked 7 hours per day and 5 days per week. 64% of them worked in a sitting position, and 52% used both direct and indirect vision.

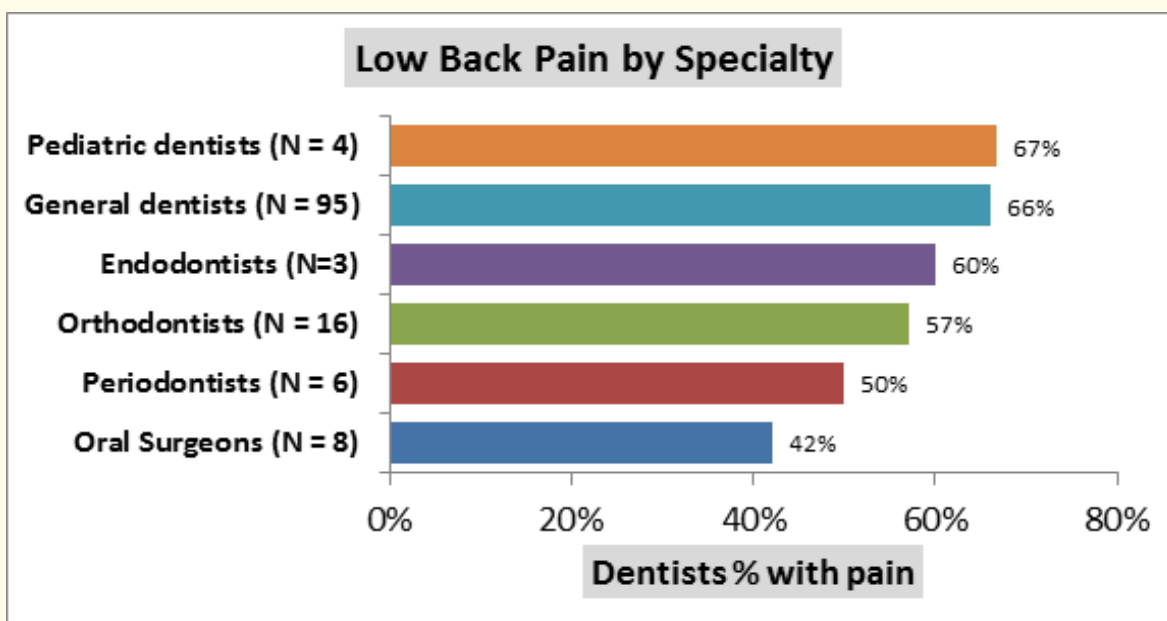
**Prevalence of MSD:** 92.7% of the participants suffered from musculoskeletal disorders. 60% of them had pain in more than one side, and 40% had a prevalence of at least one MSD symptom during the last 12 months. It was shown that the most common areas affected with MSD in order of magnitude were low back (61.8%), neck (51.4%), shoulder (39.5%), finger (14.1%), wrist (11.8%), and elbow (8.6%) (Chart 1).



**Chart 1:** Prevalence of MSD in relation to the area involved.  
Area wise predilection of MSD in relation to specialty of the dental practitioners.

**Variables' Analysis**

Pain was statistically significant by specialty. Back pain was the highest among pediatric dentists (67%) and general dentists (66%), but it was the lowest for oral surgeons (42%) (Chart 2).



**Chart 2:** Low back pain by specialty.  
MSD in the low back area was the highest among pediatric dentists and general dentists and the lowest among oral surgeons.

Neck pain was the highest among endodontic dentists (60%) and the lowest among pediatric dentists (33%) (Chart 3).

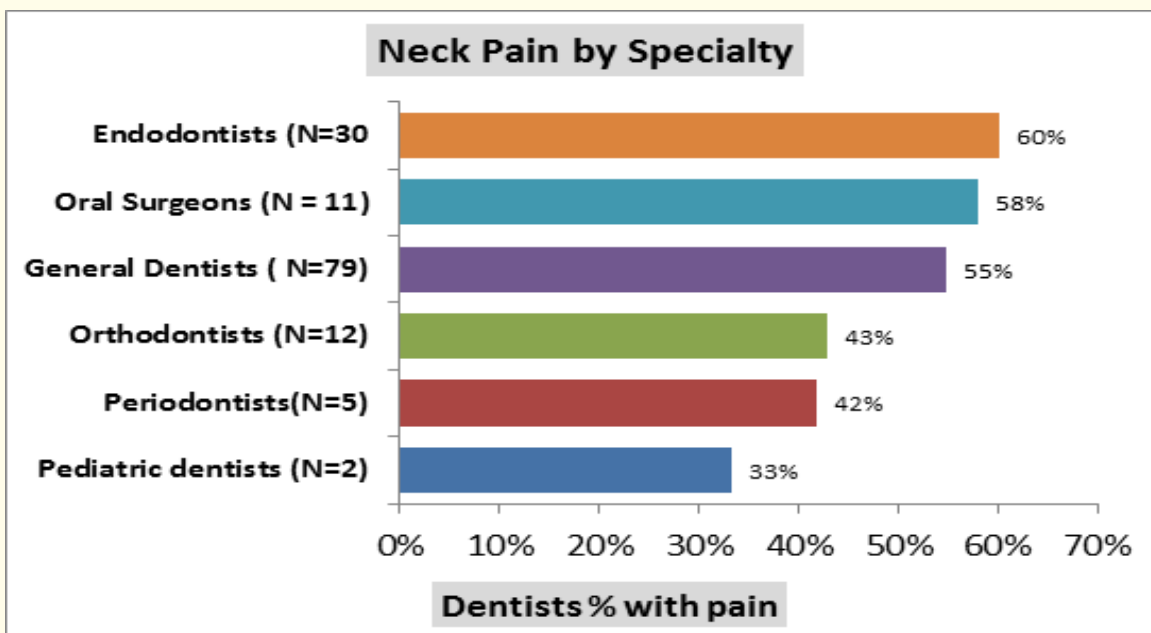


Chart 3: Neck pain by specialty.

MSD in the neck area was the highest among endodontists and oral surgeons and the lowest among pediatric dentists.

Shoulder pain was the highest among oral surgeons (52.6%); while endodontic dentists didn't complain about it at all (Chart 4).

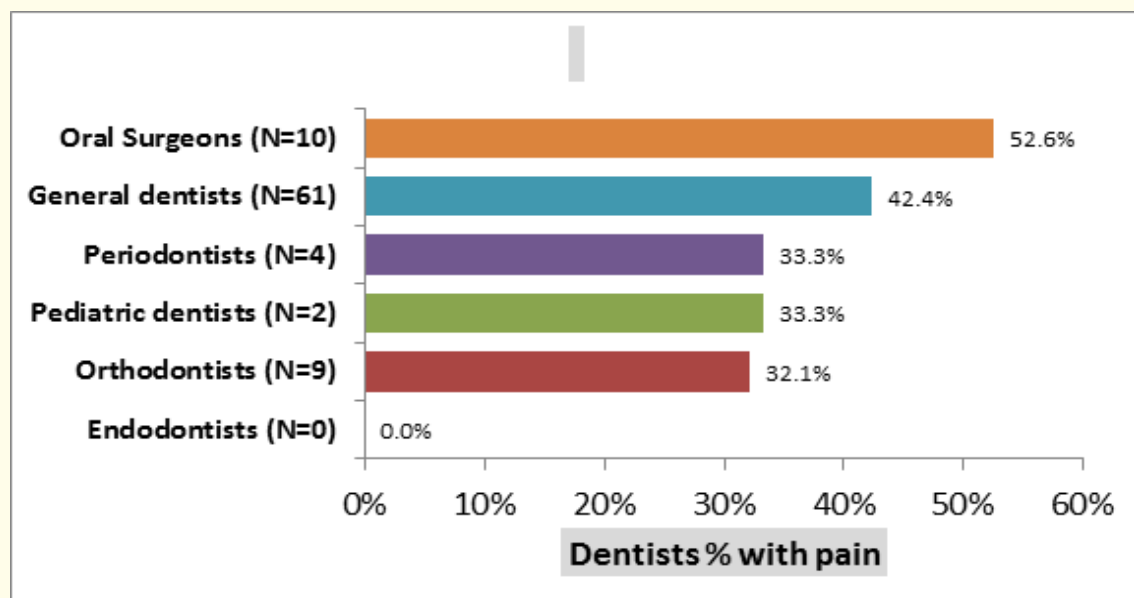
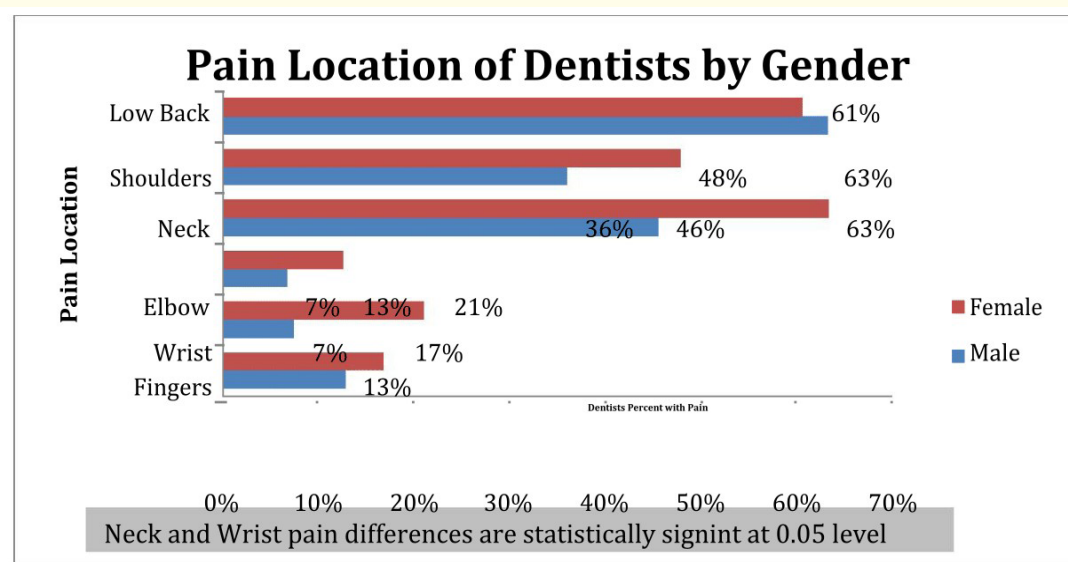


Chart 4: Shoulder pain by specialty.

MSD in the shoulder area was the highest among oral surgeons and absent among endodontists.

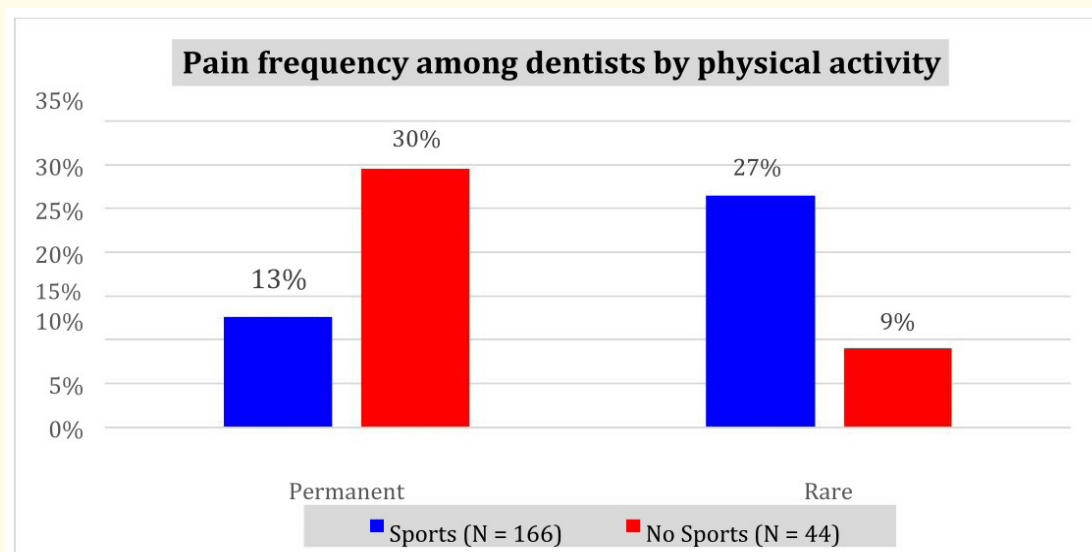
63% of females suffered from neck pain compared to 46% of males. 21% of female dentists suffered from wrist pain compared to 7% of male dentists (Chart 5).



**Chart 5:** Area wise predilection of MSD in relation to gender of the dental practitioners.

Prevalence of MSD in the involved area was higher for female dentists than for male dentists. Female dentists suffered much more than male dentists in both neck and wrists areas.

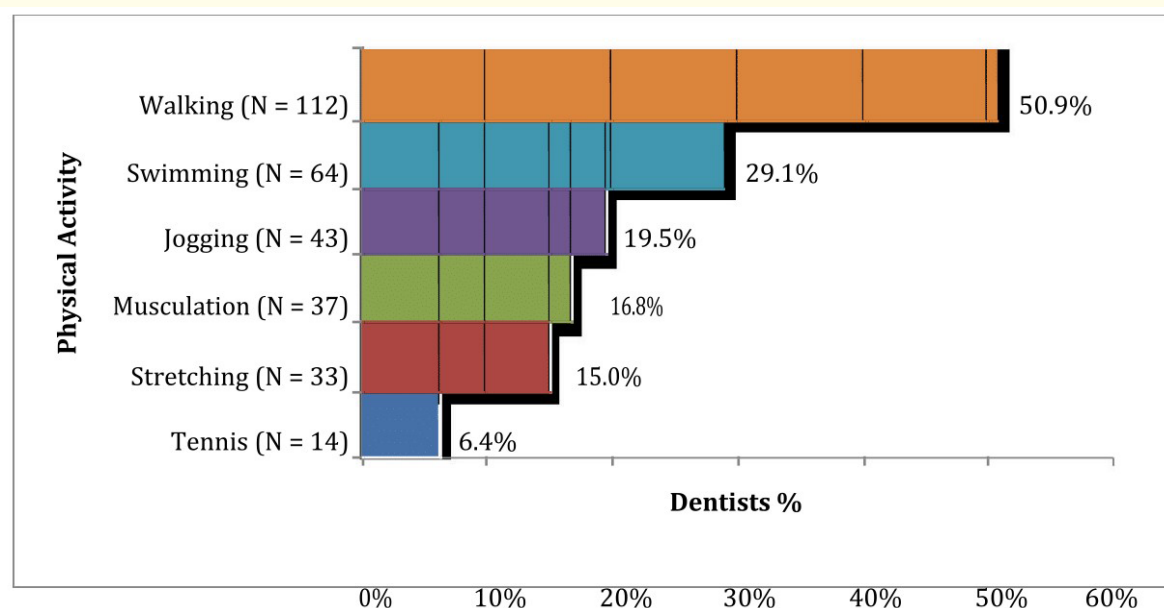
The relationship between pain and physical activity was inversely proportional. The frequency of pain decreased with physical activities, and pain became rather rare (Chart 6).



**Chart 6:** Pain frequency among dentists by physical activity.

The frequency of pain decreases with physical activities, and the relation between pain and physical activities is inversely proportional.

The study showed that the most physical activity practiced by the Lebanese dentists was walking 50.9% (Chart 7), and there was no relationship between MSDs symptoms, age, or years of practice.



**Chart 7:** Percentage of dentists by type of physical activity. 50.9% of dentists chose walking as physical activity; while 29% of them chose swimming.

The frequency of pain decreases with physical activities, and the relation between pain and physical activities is inversely proportional.

### Background on Musculoskeletal Disorders among Lebanese Dentists

A retrospective study was performed in September 2001 by the authors Sayegh M, Ghossoub K, *et al* [14]. 300 questionnaires were distributed to the participants during a national dental congress, but only 170 were included in the study.

The descriptive analysis, however, showed that the mean age of the participants was  $37 \pm 9$ . The sample was represented by 83% of males, 56.5% of general dentists, with an experience of  $12 \pm 8$  years and a duration of work of  $5 \pm 1$  per week and  $7 \pm 2$  hours/day. Practitioners took breaks for 85 min /day although 94% of them worked under stress.

In 2001 66% of the participants suffered from musculoskeletal disorders. The most common areas affected with MSD in order of magnitude were low back (85.5%), shoulders (62%), neck (59%), pins and needles (32%), lower limbs (25%) and hands (10%).

By using SPSS version 10, statistical analysis showed that there was a strong correlation between MSD symptoms and sports ( $p = 0.007$ ) and break duration for ( $p = 0.005$ ), as well as a decrease in MSD symptoms related to extra physical activities and breaks in between cases. The analysis also showed that MSD symptoms were the highest for General dentists ( $p = 0.016$ ) during which female dentists suffered more than male dentists.

## Discussion

The importance of maintaining a healthy life is irrefutable. As the prevalence of MSD is high worldwide [12,13], dentists need to study the factors that contribute to this disease in order to make better choices regarding ergonomic equipment, physical exercises, and healthy lifestyle. The comparison between the two retrospective studies 2001 and 2013 showed that the percentage of dentists with MSDs is increasing. In fact, 66% of the Lebanese dentists suffered from MSDs in 2001 [14] and 92.7% in 2013. Only 7.3% of the dentists did not complain about MSDs. 40% had at least one MSD symptom during the last twelve months, and 60% suffered from pain in more than one side. The results suggested that dentists' awareness of preventing and managing work-related musculoskeletal problems in their practice was insufficient. The high percentage of MSDs among dentists was probably correlated to the frequency and duration of awkward body positioning, the movements made by dentists in their daily work, and the lack of recovery time and physical activity. The results of both surveys in Lebanon confirmed that MSDs symptoms decreased with physical activity ( $p = 0.07$ ), frequency, and period of breaks during the workday ( $p = 0.05$ ) [14]. In fact, taking breaks between cases were extremely recommended [15], and using micro pauses and stretching during dental procedures were very efficient [4-17]. Many studies, however, realized the efficacy of these preventive remedies. In particular, stretching increased the blood flow to the muscle, the production of joint synovial fluid, and the nutrient supply to vertebral disks; it also reduced the formation of trigger points [18].

In general, many studies about MSDs within dentists were performed; they showed a high prevalence of musculoskeletal disorders, as well as a common study of the upper and lower body, neck, shoulders, and wrists. Studies in Lebanon, New Zealand [18] and Saudi Arabia [19] showed that the most common areas affected by MSD in order of magnitude were low back pain followed by neck and shoulder pain.

Based on the final results, low back was the highest for pediatric dentists and general dentists, and the lowest for dental surgeons. It seemed that pediatric dentists in Lebanon bent or twisted their upper bodies to reach the small working spaces (mouths of young patients). During bending and twisting motions of the spine, the pressure on the lumbar discs increased by 200% and caused a compression on the spinal nerve (Fish, 1987). Repeated twisting in one direction might result in muscle imbalances and low back pain [20].

A review of articles showed that the prevalence of back pain among dentists was 61.8% in Lebanon, 64% in Australia, 53% in Queensland, Australia, 50% in Denmark, and 32.3% in Teheran [20]. However, musculoskeletal pain in the lower back was a constant cause of loss of work for dentists [21].

Neck pain prevalence was 51.4% in Lebanon, (57%) [22,23] in Queensland, Australia, (51%) [24] in Dutch, (47%) [20] in Iran, (39.3%) [19] in Saudi Arabia, and (57%) [18] in New Zealand. In comparison with my studies, the daily working in China were significantly associated with the presence of neck pain [4]. Based on the final results, neck pain was the highest for endodontic dentists and oral surgeons, and the lowest for pediatric dentists. Endodontists as well as surgeons spent their workday in awkward head positions to perform precise procedures. Besides, they used to have a high level of stress which increased the potential risk of injuries while performing treatments. Using loopes or surgical telescopes was very helpful during endodontic treatments. In particular, dentists could control their bodies to maintain a neutral working posture with the head over the shoulder, and both the head and the back aligned [4-25].

In this study, shoulder pain was the highest among surgeons with a percentage of 39.5%. Similar results were also found in USA [3]. In New Zealand, the prevalence of shoulder pain was 52% [18]. In China, dentists complained more of shoulder pain 83.3% than of other parts of the body [26]. While extracting a tooth and raising the upper arms, surgeons could have a significant impairment in blood circulation within their shoulders and neck regions.

Gender pain differences were not only found in both studies in Lebanon (2001 - 2013), but also in Lithuania, New Zealand, India [3], and Saudi Arabia [19]. The study showed that female dentists had more pain than males in the neck and wrist areas; whereas the female dentists in Saudi Arabia had a double shoulder pain [19].



As a result, dentists should preserve their health by adopting ergonomic guidelines in their work places. They try to use a wide range of positions around the patients' heads, often referred to as 'o'clock positions'. This suggests that the head and the back must be aligned with the upper arm parallel to the floor, the weight balanced, and the hip angle greater than 90 degrees. Practitioners are supposed to have their seat positions low enough so that they can fix their heels on the floor [25]. Dentists should place instruments within easy reach without twisting or reaching across the body [25]. The use of loopes and surgical telescopes allow dentists to maintain a neutral working posture while increasing their visual acuity, the level of motor control, and the diagnostic ability (UBC, 2008) [4].

In fact, dentists should vary their work positions to shift the workload from one group of muscles to another [13-16]. They have to change between standing and sitting as this lets one group of muscles rest by the time the workload reaches another group of muscles [26]. Repositioning the feet can also shift the workload from one group of low back muscles to another [26], and so placing the patients in a semi-supine position for mandibular and maxillary procedures is recommended [16].

The development of four-handed operatory techniques contributes to working more efficiently and increases productivity [15]. Four-handed seats are suggested, and equipment is developed mainly because of complaints about dentists' musculoskeletal disorders. These results demonstrate the importance of continuing education by either having conferences or training courses.

### Conclusion

This study illustrates clear work-related MSDs. As musculoskeletal disorders represent a significant barrier for dentists, it is necessary to promote prevention programs regarding ergonomic postures of dentists during their clinical practices. Dentists must educate themselves and their staff members by adopting healthy habits that include positioning strategies, selectivity of ergonomic equipment, incorporating frequent work breaks, doing physical activities, and maintaining stress relief.

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