



## Risk Factors of Musculoskeletal Problems among Dentists in Khartoum Locality, Khartoum State

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### **Abstract**

**Background:** Dentists are among the workers who are more often susceptible to MSDs; their work includes risk factors that may lead to many diseases. Occupational diseases have not only physical, psychological, and social consequences, but also economic and security impacts when they reach a level of severity that directly affects work capacity, causing absences and early retirement

**Objective:** To study the risk factors of musculoskeletal problems among dentists in Khartoum Locality, Khartoum State, Sudan, 2018

**Methods:** Descriptive cross-sectional hospital-based study conducted in health facilities that provide dental health services in Khartoum locality, Khartoum state, Sudan from December 2017 to October 2018. Data entered, cleaned, and analyzed using Statistical Package for the Social Sciences (SPSS), version 25.0.

**Results:** This study covered 230 study participants (dentists) recruited randomly from Khartoum state, Sudan, 2018. The mean age was  $31.1 \pm 5.9$  and male: female ratio 1:2.2. Regarding professional background, the study found that (26.1%) were specialists, (10.9%) registrars and (63%) were medical officers. Concerning the risk factors related to the presence of musculoskeletal problems, the study found that nearly third of the study participants, (30.9%) of them had inactive physical life style, (18.3%) had average daily working hours more than ten, (7.8%) had more than 10 hours of contact with patients, and (12.6%) had more than 20 patients per day. Moreover, the study found that more than half of them (51.3%) performing surgical operations, and (59.1%) had not enough rest breaks. The study found that the study participants had  $8 \pm 2.7$  hours as daily working time,  $6.3 \pm 3.1$  hours as a contact time with the patients and  $13.4 \pm 11.7$  patients to deal with per day.

**Conclusion and recommendation:** In this study, musculoskeletal problems among dentists were positively associated with the daily working hours ( $p = 0.0003$ ), and with daily number of cases seen by them ( $p = 0.0422$ ).

**Keywords:** risk factors, musculoskeletal problems, work-related musculoskeletal disorders, Dentists.

## Abbreviations

MS Musculoskeletal

MSDs Musculoskeletal Disorders

OR Odds Ratio

PSPs Prolonged Static Postures

WHO World Health Organization

WMSDs Work-Related Musculoskeletal Disorders

## Introduction

The term “work-related musculoskeletal disorders” (WMSDs) refers to MSDs that are made worse or longer lasting by work conditions. MSDs are some of the most important work-related problems currently reported. Musculoskeletal problems called as ergonomics disorders, repetitive motion injury, repetitive stress injury, or overuse injury. Dentists are among the workers who are more often

susceptible to MSDs; their work includes risk factors that may lead to many diseases [1]. Occupational diseases have not only physical, psychological, and social consequences, but also economic [3] and security impacts when they reach a level of severity that directly affects work capacity, causing absences and early retirement [2].

In dentistry, overstrained and awkward postures, repetitiveness of different joint movements, use of high frequency vibration tools, and psychological stress have been identified as risk factors. In the last decade, various studies have been published around the world citing the high prevalence of WRMDs among dental professionals. The most affected regions reported are the back and neck. The need for prevention of these disorders has been identified, including identification and modification of risk factors associated with this profession. In most studies only a few of these risk factors have been taken into account simultaneously. This makes it difficult to appreciate the impact of specific risk factors since most studies did not control appropriately for concurrent risk factors [4]. Very few studies have been undertaken in occupational groups with respect to the simultaneous occurrence of different musculoskeletal complaints and their interrelationships [5]. Throughout this context, this study aimed to measure the prevalence of musculoskeletal problems among dentists in Khartoum Locality, Khartoum State, Sudan, 2018

## **Appropriate Headings**

### **Literature Review**

Individual susceptibility or predisposition and personal risk factors such as past injury and underlying medical conditions contribute to the risk for musculoskeletal disorders. There are steps every dental professional can take to reduce their risk of sustaining musculoskeletal disorders [6]. Health problems range from discomfort, minor aches, and pains, to more serious medical conditions resulting in significant social and economic consequences, such as reduced quality of dental treatment, absence from work, and even leaving the profession [4-7].

Dental profession and practice represent a unique occupation with regard to work demands and occupational hazards. Dentists normally work in restricted areas for extended hours in uncomfortable postures that require excessive use of vision, neck, back and hands. This can lead to discomfort, pain, strain and fatigue on muscles especially those of the neck and back thus contributing to increased prevalence of musculoskeletal symptoms (MS). Dentists at work are susceptible to the development of health disorders. Bad working habits, repetitive tasks and uncomfortable posture contribute to musculoskeletal disorders (MSDs), stress and loss of production. Occupational injuries involving musculoskeletal tissues are often related to repetitive movements of upper limbs and prolonged postures such as sitting and standing activities common in dentistry [4].

The physical load among dentists seems to put them at risk for the occurrence of musculoskeletal disorders. Muscular imbalance, neuromuscular inhibition, and pain and dysfunction may frequently be observed among oral health care providers. Repeated unnatural, deviated or inadequate working postures, forceful hand movements, inadequate equipment or workplace designs and inappropriate work patterns are likely to be the particular risk factors [4-5].

However, MSDs are not an avoidable part of the oral health care providers' professional lives. The high frequency of musculoskeletal disorders probably reflects the specific work load in dentistry, with high demands on vision and precision and fine manipulative hand movements and work with unsupported, elevated arms. The symptoms might impair work capacity and the future possibility to stay in the profession. Studies have shown that active leisure and several psychosocial work factors strongly influence good general health and well-being. Physical tasks influence musculoskeletal disorders more than active leisure and psychosocial work factors. The data on the prevalence of work-related musculoskeletal disorders for different professions can provide the basis for formulation of necessary strategies to prevent them in the future [5].

Musculoskeletal diseases, covering a wide range of complains including pain, weakness and paresthesia, are reported to be associated with wide range of occupations [6]. However, it should be indicated that other factors can contribute to the development and the experience of pain and discomfort. Later investigations indicated that causes in the psychic working environment such as work satisfaction, the level of appreciation, self-confidence, anxiety and worry about the future can also influence the experience of pain and discomfort [6]. Studies emphasized that dissatisfaction with work, demand of performance, anxiety, psychosomatic sickness (headache, insomnia, stomach trouble) and concern about the future, can be strong contributing factors in pain and discomfort perception. He concluded that these factors together may give rise unsatisfactory personal harmony, which probably increases the risk of pain and discomfort [5] [6].

Many risk factors have been identified, including static and awkward posture and work practices. Overall, the review suggests that musculoskeletal problems represent a significant burden for the dental profession. [7]. The mechanism of musculoskeletal disorder can be explained by means of flowchart. Dentists must understand the mechanisms that contribute to MSDs so they can make informed choices regarding ergonomic equipment, exercise and lifestyle. Having this knowledge is key in preventing and managing work-related musculoskeletal problems in clinical dentistry [8].

Some useful strategies for reducing the risk of repetitive strain injuries are to use instruments with larger-diameter handles that require less gripping force; select instruments that are textured to allow easier gripping; avoid awkward wrist positions; take small rest breaks when performing repetitive tasks; and use mechanical scaling devices where appropriate to reduce the need to exert force when root

planning and scaling. The use of mechanical scaling devices will also decrease the duration of the stressful activity [9].

Dentists often work using static body positions, such as extended elbows, for prolonged periods of time. This requires the retraction of at least 50% of the body's muscles to allow the body to remain motionless while resisting gravity. This static loading of the muscles causes greater fatigue than moving forces, and may lead to MSDs in addition to chronic back, neck, or shoulder pain. Posture and patient positioning are two important tools in preventing the use of static body positions. Operator and assistant posture and patient positioning go hand in hand as a strategy for improving chair-side ergonomics. Good operator position consists of: Head and neck relatively erect with the focal distance 13 inches to 18 inches from the patient's face, Operator loupes adjusted to focus on the working field at a distance of 13 inches to 18 inches, Shoulders should be parallel to the floor, The back should be supported at approximately a 100-degree to 110-degree angle to the stool seat, Elbows should be at the sides at the level of the patient's mouth, Forearms should generally be parallel to the floor, Knees should be slightly below hip level, in addition to the left leg should be extended under the patient's chair with the foot flat on the floor while the right foot operates the rheostat (reverse for a left-handed operator) [10].

The ideal position in which to place the patient while working on the maxillary arch is with the chair fully supine. With the patient in this position, the operator can use the mirror for indirect vision without bending, leaning or stretching. For the mandibular arch, elevate the back of the patient's chair between 5 degrees and 30 degrees. When working on either arch lower the patient's chair to just above the operator's leg. It is also helpful to use a variety of seated positions around the patient chair to access different teeth and surfaces while working. It is helpful to view the patient chair as if it were a clock, with the top being the 12:00 position. Although most procedures can be performed from the 11:00 position (1:00 position for left-handed operators), there are situations in which anywhere from 9:00 to 12:00 may provide better access and less bending and leaning of the upper body with less flexing of the wrist. Better access and visibility are provided to the assistant when seated with hips and thighs parallel to the patient's shoulder [11-12].

Effective four-handed techniques require the active participation of both the dentist and the assistant. The dentist must communicate adequately to the assistant the sequence of instruments so that the appointment progresses smoothly. Instrument transfers should occur in a designated transfer zone, ensuring that both the assistant and the dentist understand where and how instruments will be passed, reducing the need for unnecessary movement while also increasing efficiency and reducing the risk of accidentally dropping the instrument [13].

The important risk factors for musculoskeletal disorders among dental professionals, especially when occurring at high levels and in combination are: Awkward Postures, Forceful Exertions, Repetitive Motions, Duration, Contact Stresses, Vibration, and Psychosocial Factors [14]. More stress is placed on

the spinal disks when lifting, lowering, or handling objects with the back bent or twisted compared with when the back is straight. Manipulative or other tasks requiring repeated or sustained bending or twisting of the wrists, knees, hips, or shoulders also imposed increased stresses on these joints. Activities requiring frequent or prolonged work over shoulder height can be particularly stressful. Dental personnel assume these awkward positions for those reasons: to coordinate the relative positions between dentist and assistant, to obtain optimal view of teeth within the patient's mouth, to provide a comfortable position for the patient, in addition to maneuver complex equipment and reach for instruments [14].

Tasks that require forceful exertions (like tooth extractions) place higher loads on the muscles, tendons, ligaments and joints. Prolonged experiences of this type can give rise to not only feelings of fatigue but may also lead to musculoskeletal problems when there is inadequate time for rest or recovery. Force requirements may increase with: use of an awkward posture, the speeding up of movements, use of small or narrow tool handles that lessen grip capacity, increased slipperiness of the objects handled, and use of the index finger and thumb to forcefully grip an object (i.e., a pinch grip compared with gripping the object) [14-26].

If motions are repeated frequently and for prolonged periods, fatigue and muscle tendon strain can accumulate. Effects of repetitive motions from performing the same work activities are increased when awkward postures and forceful exertions are involved. Repetitive actions as a risk factor can also depend on the body area and specific act being performed. Job tasks that require use of the same muscles or motions for long durations increase the likelihood of both localized and general fatigue. In general, the longer the period of continuous work the longer the recovery or rest time required [15].

Repeated or continuous contact with hard or sharp objects, such as nonrounded desk edges or unpadded, narrow tool handles may create pressure over one area of the body (e.g., the forearm or sides of the fingers) that can inhibit nerve function and blood flow. Exposure to local vibration occurs when a specific part of the body comes in contact with a vibrating object, such as a power hand tool. Identified stressors include the psychological demands of doing meticulous surgery with little or no rest or diversion and time pressures. Dentists with work-related MSDs show a significant tendency to be more dissatisfied at work and to be more burdened by anxiety, experiencing poorer psychosomatic health and feeling less confident [14].

Basic operating posture is considered an important occupational health issue for oral health care clinicians. It is generally agreed that the physical posture of the operator, while providing care, should be such that all muscles are in a relaxed, well-balanced, and neutral position. Postures outside of this neutral position are likely to cause musculoskeletal discomfort. Ergonomics is the application of a body of knowledge addressing the interactions between man and the total working environment, such as atmosphere, heat, light and sound, as well as all tools and equipment of the workplace [16].

Work related musculoskeletal injuries, caused by poor posture, have been discussed in human dentistry for several years. Neglect of ergonomic principles brings inefficiency and pain to the workplace. An ergonomically deficient workplace may not cause immediate pain, because the human body has a great capacity for adapting to a poorly designed workplace or structured job. However, in time, the compounding effect of job and/or workplace deficiencies will surpass the body's coping mechanisms, causing the inevitable: physical symptoms, emotional stress, low productivity, and poor quality of work [17].

**The Postural Awareness Techniques includes:** maintain the low back curve: Maintaining the low back curve when sitting can reduce or prevent low back pain. The following practices can help maintain the low back curve, tilt the seat angle slightly forward five to 15 degrees to increase the low back curve, sit close to the patient and position knees under the patient's chair if possible, this can be facilitated by tilting the seat and using patient chairs that have thin upper backs and headrests, consider using a saddle-style operator stool that promotes the natural low back curve by increasing the hip angle to approximately 130 degrees, adjust the chair so hips are slightly higher than knees and distribute weight evenly by placing feet firmly on the floor, use the lumbar support of the chair as much as possible by adjusting the lumbar support forward to contact back, stabilize the low back curve by contracting the transverse abdominal muscles, and pivot forward from hips, not waist [18].

**Also use magnification:** Proper selection, adjustment and use of magnification systems have been associated with decreased neck and low back pain, as they allow operators to maintain healthier postures. Adjust operator chair properly: Operators need to know how to adjust the features of their chairs to obtain maximal ergonomic benefits which includes [19]. In addition to adjust chair first then adjusting patient chairs to accommodate the patients, allowances can be made when working with patients who are elderly or disabled, position the buttocks snugly against the back of the chair, place feet flat on the floor and adjust the seat height up until thighs gently slope downward while the feet remain flat on floor, move backrest up or down until the lumbar support nestles in the natural lumbar curve of the low back. Then angle the lumbar support forward to facilitate contact with the low back, tilt the seat forward about five to 15 degrees, also adjust armrests, which are designed to decrease neck and shoulder fatigue and strain, to support elbows in the neutral shoulder position [19].

**The various positioning strategies includes:** avoid static postures: workers should vary their work positions as often as possible to shift the workload from one group of muscles to another [20]. Alternate between standing and sitting: Standing uses different muscle groups than does sitting; therefore, alternating between the two positions let one group of muscles rest, while the workload is shifted to another group of muscles. Alternating between standing and sitting also can be an effective tool in preventing injuries [19-20].

**Reposition the feet:** Subtle changes in foot position can shift the workload from one group of low back muscles to another, allowing the overworked tissues to be replenished with nutrients. Position patients at the proper height: Operators should take the time to position their patients properly for mandibular and maxillary procedures. Generally, patients should be placed in a semi supine position for mandibular procedures and a supine position for maxillary procedures. Avoid twisting: When possible, dentists should position instruments within easy reach. Operators should try to retrieve items with the closest hand, especially with rear delivery systems, to avoid twisting or reaching across the body. Repeated unilateral twisting in one direction may result in muscle imbalances or structural tissue damage, leading to low back pain [20].

**Periodic breaks and stretching include:** Chair side directional stretching: Stretches performed in the reverse direction of awkward PSPs may prevent muscle imbalances that can lead to pain and MSDs. Directional stretches can be performed in or out of the operatory and can be incorporated into a daily routine that facilitates balanced musculoskeletal health. Directional stretching involves a rotation, side bending or extension component that generally is in the opposite direction of that in which the operator frequently works. Frequent stretching breaks address the detrimental physiological changes that can develop while working in optimal or awkward PSPs: ischemia, trigger points, muscle imbalances, joint hypomobility, nerve compression and disk degeneration. Furthermore, stretching increases blood flow to muscles; increases production of joint synovial fluid; reduces formation of trigger points; maintains normal joint range of motion; increases nutrient supply to vertebral disks; creates a relaxation response in the central nervous system; warms up the muscle before beginning to work; identifies tight structures that may be predisposed to injury [21].

Treating Trigger points: Sometimes, operators may experience pain that is not relieved with stretching but instead worsened by it. This pain may be caused by a sustained contraction inside a tight band of muscle known as a trigger point, which feels like a small hard knot. When firm pressure is applied, trigger points are painful and may refer pain to another area. They do not allow the muscle fibers to contract or relax; therefore, they effectively decrease flexibility and reduce blood flow to the muscle. It is important that operators release trigger points as soon as possible. Various people can help treat trigger points: physical therapist trained in trigger point therapy, contract and relax technique or muscle energy technique; neuromuscular therapist; massage therapist trained in trigger point therapy; physician trained in spray and stretch technique or trigger point injection; the dentist self-administering trigger point therapy using a tennis ball or other small ball between the back and a wall or using a trigger point self-massage tool [22].

MSDs in dentistry often begin with fatigue of the postural stabilizing muscles of the trunk and shoulders [23]. As these muscles fatigue, operators tend to slump into poor posture, setting the stage for injuries. Dentists should perform specific strengthening exercises for the trunk and shoulder girdle to enhance

the health and integrity of the spinal column, maintain good overworking posture, optimize the function of the arms and hands and prevent injuries [24].

Aerobic exercise should be performed three to four times a week for at least 20 minutes. One major contributing factor to MSDs is decreased flow of nutrients and oxygen to muscles. Aerobic exercise increases blood flow to all of the tissues in the body and improves their ability to use oxygen. In addition, aerobic exercise improves cardiovascular and cardiorespiratory function lowers heart rate and blood pressure, increases high-density lipoprotein (good) cholesterol, decreases blood triglycerides, reduces body fat, improves stress tolerance, increases mental acuity improves sleep quality and may increase longevity. Operators should choose aerobic exercises that they enjoy. Stress management Stress can elicit muscular contraction and pain, especially in the trapezius muscle. Operators may use various stress-reduction techniques to decrease stress-related muscular tension. They include breathing techniques, progressive relaxation, visualization, massage, aerobic exercise, meditation or yoga [25].

To protect their own health, dentists should seek out and receive education about musculoskeletal health, injury prevention and dental ergonomics. Ideally, this education should begin during dental school and continue through the dentist's professional life [26]. Dental operators can be taught to manage and prevent injuries effectively. They can educate themselves and their staff members using a multifactorial approach that includes preventive education, postural and positioning strategies, proper selection and use of ergonomic equipment, and frequent breaks with stretching and strengthening techniques before painful episodes occur. Prevention strategies should be easy to use to ensure long-term compliance [27].

## **Materials and Methods**

The cross-sectional health facility-based study was conducted in health facilities that provide dental health services in Khartoum locality, Khartoum state, Sudan within the period from December 2017 to October 2018. This study was conducted among dentists working in Khartoum locality who fulfill the following criteria: dentists whom licensed for working in Sudan as dentist at any professional level (medical officer, registrar or specialist), Had working experience more than one year and accept to participate in the study.

Selection of the study sample proportional to the population size. Sampling frame obtained from the targeted hospitals that contained the total list of staff population. Then, randomly, the sample was selected. The data collected comprehensive structured close ended questionnaire. The questionnaire is adapted from a number of relevant questionnaires.

Data entered, cleaned, and analyzed using SPSS version 25.0. Descriptive statistics in term of frequency tables with percentages and graphs. Means and standard deviations presented with relevant graphical

representation for quantitative data. Bi-variable analysis to determine the associations between the main outcome variable (prevalence of work-related musculoskeletal problems) with Chi square test (for categorical variables) and t- test (quantitative variables) statistical tests. P value of 0.05 or less is considered statistically significant. Data represented after analysis in form of univariable tables, cross tabulation (bi variable tables), figures and narrative illustration...

## RESULTS

This study covered 230 study participants recruited randomly from Khartoum state, Sudan, 2018. Most of them (92.6%) were less than 40 years of age. The mean age was  $31.1 \pm 5.9$ . More than two thirds of them were females (68.3%) with male: female ratio 1:2.2, nearly two thirds of them were singles (63%). Regarding the presence of musculoskeletal problems, the study found that (87%) of the study participants had this problem.

Concerning the risk factors related to the presence of musculoskeletal problems, the study found that nearly third (30.9%) of them had inactive physical life style, (18.3%) had average daily working hours more than ten, (7.8%) had more than 10 hours of contact with patients, (12.6%) had more than 20 patients per day. Moreover, the study found that more than half of them (51.3%) performing surgical operations, and (59.1%) had not enough rest breaks.

The study found that the study participants had  $8 \pm 2.7$  hours as daily working time,  $6.3 \pm 3.1$  hours as a contact time with the patients and  $13.4 \pm 11.7$  patients to deal with per day as detailed in tables (1) and (2). Regarding the presence of musculoskeletal problems, the study found that (87%) of the study participants had this problem. (7%) of them with severe degree and (27%) of them for several years as detailed in table 5.

The analysis found a significant relationship ( $P = 0.003$ ) between the economic status non-satisfaction with the occurrence of musculoskeletal problem. Moreover, the study found a significant relation with not taking enough rest breaks ( $p < 0.001$ ) as detailed in table 8. Similarly, in this study, musculoskeletal problems among dentists were positively associated with the Daily working hours ( $p = 0.0003$ ), and with daily number of cases seen by them ( $p = 0.0422$ ) as showed in table (3) and (4).

Risk factors		Frequency	Percent
Past medical history of musculoskeletal problems	Yes	75	32.6
	No	155	67.4
Active physical life style	Yes	159	69.1
	No	71	30.9
Daily working hours	≤ 5	31	13.5
	5.1 - 10	157	68.3
	> 10	42	18.3
Contact hours with patients	< 5	94	40.9
	5.1 - 10	118	51.3
	> 10	18	7.8
Number of patients attended per day	≤ 10	143	62.2
	11 - 20	58	25.2
	> 20	29	12.6
Performing of surgical operations	Yes	118	51.3
	No	112	48.7
Enough rest breaks	Yes	94	40.9
	No	136	59.1

**Table (1) the distribution of the study participants according to the risk factors of musculoskeletal problems (n = 230)**

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Daily working time (hours)	230	8.0	2.7	4.0	19.0
Contact time with patients (hours)	230	6.3	3.1	2.5	17.5
Patients attended /day (cases)	230	13.4	11.7	2.0	50.0

**Table (2) summary statistics for some demographical characteristics of the study participants (n = 230)**

Factors		Musculoskeletal problems				Total		P value
		Yes (n = 200)		No (n = 30)				
		Freq.	Percent	Freq.	Percent	Freq.	Percent	
PH of MS problems	Yes	71	35.5	4	13.3	75	32.6	0.016*
	No	129	64.5	26	86.7	155	67.4	
Active life style	Yes	137	68.5	22	73.3	159	69.1	0.593
	No	63	31.5	8	26.7	71	30.9	
Performing surgical operation	Yes	103	51.5	15	50.0	118	51.3	0.878
	No	97	48.5	15	50.0	112	48.7	
Enough rest breaks	Yes	72	36.0	22	73.3	94	40.9	< 0.001*
	No	128	64.0	8	26.7	136	59.1	
Actual working position	Standing	58	29.0	10	33.3	68	29.6	0.254
	Sitting	130	65.0	16	53.3	146	63.5	
	Both	12	6.0	4	13.3	16	7.0	

**Table (3) the relation between factors with the occurrence of the musculoskeletal problems (n= 230)**

**\*Note:** p value is corresponding to chi square statistical test for assessment of the possible associations between two categorical variables. P value < 0.05 is significant

Factors	Musculoskeletal problems		P value
	Yes (n = 200)	No (n = 30)	
Daily working time (hours)	8.2	6.3	0.0003*
Contact time with patients (hours)	6.3	6.4	0.8955
Patients attended /day (cases)	14.0	9.3	0.0422*

**Table (4) the relation between some quantitative factors with the occurrence of the musculoskeletal problems (n = 230)**

**Note:** p value is corresponding to t - statistic test for the difference between two independent means. P value < 0.05 is significant

## Discussion

The risk factors related to the presence of musculoskeletal problems; the study found that (30.9%) of them had inactive physical life style. This result was less than in Thailand where most dentists (52.4%) did not exercise. Our study found that (18.3%) had average daily working hours more than ten, (7.8%) had more than 10 hours of contact with patients, (12.6%) had more than 20 patients per day. This picture is almost similar to the nature of work setting in Thailand where the most dentists worked for >8 hours per day and worked >6 days per week, at 63.7% and 53.2%, respectively. 100% of subjects worked in public institutions, and 68% also worked in both public and private institutions [29].

Moreover, the study found that more than half of them (51.3%) performing surgical operations, and (59.1%) had not enough rest breaks. In other study, Abdul Rahim Shaik et al., found that the majority of the dental surgeons (73.3%) experienced stiffness in the back and 23.3% experienced severe pain in their neck. It was observed that the number of patients attended per day by the dental surgeons had a significant association ( $P = 0.024$ ) with the pain they experienced in their hip/thigh region [29].

Our study found that the study participants had  $8 \pm 2.7$  hours as daily working time,  $6.3 \pm 3.1$  hours as a contact time with the patients and  $13.4 \pm 11.7$  patients to deal with per day. Other study by Kierklo A, et al. found that more than 29% of the dentists experienced trouble with fingers, 23% with hip, whereas 20% demonstrated problems in the midback, and also in the shoulders (20%) [30].

Pain in the wrists was reported by 18.3%, and pain in the knees, feet or elbows by 15-16% of respondents. Other study from Iran found that Iranian dentists which took part in this study, prevalence of skeletal disorders in Iranian dentists has been 17.6% in knees, 33.2% in shoulders, 33.4% in the thorax, 51.9% in necks, 33.7% in wrists/hands, 12.9% in elbows, 37.3% in lower back, 11.9% in thighs, 12.9% in the foot, and 10.5% in legs. [31]. Concerning the working positions, nearly two thirds of the dentists under the study preferred sitting position during working (62.6%), while actually 29.6% of them worked on standing position and (7%) worked on both standing and sitting positions [30].

the study found a significant with not taking enough rest breaks ( $p < 0.001$ ). Other studies stated that MSDs can be reduced through proper positioning of dental worker and patient, regular rest breaks, general good health, and exercises designed to counteract the particular risk factors for the dental occupation. Similarly, in this study, musculoskeletal problems among dentists were positively associated with the number working time ( $p = 0.0003$ ), and with daily number of cases seen by them ( $p = 0.0422$ ). Other studies agreed such as the one by Kierklo A, et al. who found that there were significance relationships between MSDs and both standing work position and non-use of rest breaks [30]. then, they concluded that the symptoms of MSDs increased with the number of years of practice. Evangelos et al agree that the physical load among dentists seems to put them at risk for the occurrence of musculoskeletal disorders [32].

## Conclusion

This study covered 230 dentists. Most of them (92.6%) were less than 40 years of age. The mean age was  $31.1 \pm 5.9$ . More than two thirds of them were females (68.3%). The prevalence of musculoskeletal problems among the dentists was 87%.

Musculoskeletal problems among dentists were positively associated with the daily working time and with daily number of cases seen by them.

Other risk factors included the economic status non-satisfaction among the dentists, not taking enough rest breaks and active physical life style.

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