



Physics Not Chemistry for Anesthesia

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Abstract

Background *Musculoskeletal problems or musculoskeletal disorders, are described as problems of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs. Musculoskeletal disorders are a common cause of work-related disability in different professions. Few studies have been undertaken in occupational groups with respect to the simultaneous occurrence of different musculoskeletal complaints and their interrelationships.*

Objective *To study the prevalence 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 ± 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. The mean working experience was 6.6 ± 5.7 years. More than half of them (51.7%) were not satisfied from their economic status. 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. Our study revealed that dentists have many musculoskeletal complains such as fatigue (62%), pain (54%), discomfort (44.5%) and strain in (18.5%). The most common sites affected in the body with musculoskeletal problems were; lower back (57.5%), followed by shoulders (46%), neck (42.5%), a mid-back area (23%). Less common sites were wrist (21%), leg (20.5%), feet (20%) and upper back region. 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. The analysis found a significant relationship ($P = 0.003$) between the economic status non-satisfaction with the occurrence of musculoskeletal problem.

Conclusion and recommendation the study concluded that considering the high prevalence of musculoskeletal disorders among Sudanese dentists.

Keywords: musculoskeletal problems, work-related musculoskeletal disorders, ergonomics 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

Musculoskeletal problem or musculoskeletal disorders (MSDs), are described as problems of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs [1]. 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 [2].

Dental surgeons often cannot avoid prolonged static postures. Even in optimal seated postures, more than one-half of the muscles of the body are contracted statically and there is little movement of the vertebral joints [3]. This may result in damaging physiological changes that can lead to back, neck, or shoulder pain or MSDs. If regularly occurring pain or discomfort is ignored, the cumulative physiological damage can lead to an injury (macro change) or a career-ending disability [4].

Basic operating posture is considered an important occupational health issue for dental surgeons. It is generally agreed that the physical posture of the operator should be such that all the muscles are in a relaxed, well-balanced, and neutral position [3]. Postures outside of this neutral position are likely to cause musculoskeletal discomfort. A thorough understanding of the underlying physiological mechanism leading to these problems is necessary to develop and implement a comprehensive approach to minimize the risk of work-related injury [4].

In dentistry, bad working habits and repetitive tasks such as scaling, root planning, and uncomfortable physical postures contribute greatly to MSDs, stress, and loss of productivity. The key objective for clinicians is to find a position that allows them to achieve optimum access, visibility, comfort, and control at all times. Musculoskeletal disorders are a common cause of work-related disability in different professions. The physical aspect of work associated with such professions has been identified as a risk factor for developing work-related musculoskeletal disorders (WRMDs) [4].

Throughout this context, this study aimed to measure the prevalence of musculoskeletal problems among dentists in Khartoum Locality, Khartoum State, Sudan, 2018

7. Appropriate Headings

A- LITERATURE REVIEW

Musculoskeletal disorders, including repetitive motion injuries, result in painful work, lost workdays, and, in extreme cases, disability resulting in forced retirement. Musculoskeletal disorders are not highly predictable in any single person. The issue of musculoskeletal disorders (MSDs) is an important occupational health problem in all sectors, including healthcare industries and modern dentistry. MSDs

can affect the body's muscles, joints, tendons, ligaments, and nerves from the neck to the feet. 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 [5-7].

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 [6]

Musculoskeletal diseases, covering a wide range of complains including pain, weakness and paresthesia, are reported to be associated with wide range of occupations. Nearly 2 million workers suffer from musculoskeletal disorders each year. These problems are caused by repetitive, awkward, or stressful motions. Dental personnel had an increased risk of developing such disorders. Physically unfavorable load is probably an essential factor in the emergence of symptoms in the upper locomotor system [7].

Globally, researchers suggest that the prevalence of general musculoskeletal pain ranges between 64% and 93%. The most prevalent regions for pain in dentists have been shown to be the back (36.3-60.1%) and neck (19.8-85%), while the hand and wrist regions were the most prevalent regions for dental hygienists (60-69.5%) [8].

the prevalence of work-related musculoskeletal disorders among dental professionals is high, affecting their daily activities, sometimes even forcing them to change their work setting. In addition to pain, dentist work related complain extended to aching or stiffness of the entire body, the feeling that the muscle have been pulled or overworked, sleep disturbances, twitching muscles and sensation of burning in addition to discomfort, fatigue and strain [9].

Regardless that the real burden of MSDs among dentists in Sudan was not clearly described or measured, more research in the form of larger assessment studies is urgently required, to help more clearly elucidate the development of this important issue for dental service professionals. Dentists frequently assume static postures, which require more than 50 percent of the body's muscles to contract to hold the body motionless while resisting gravity. When the human body is subjected repeatedly too prolonged static postures, it can initiate a series of events that may result in pain, injury or a career-ending MSD [10].

Muscle imbalances, ischemia, trigger points, joint hypomobility and spinal disk degeneration are some of the physiological consequences of Prolonged Static Postures (PSPs). Most dental workers provide care in a relatively small space such as a dental operator. During the course of a dental appointment, it may be necessary to access information on a computer or reach for equipment, paperwork, and dental

materials. If these items are not easily accessible, the members of the dental team must reach, stretch, twist, and often contort their bodies to get to the items they need. Counters that are wide and close to the side of the assistant allow for placement of materials and devices within easy reach. Adjustable work surfaces, including flat platforms on swinging arms are also good tools to bring things close to the assistant and dentist, but allow for movement around the dental chair if needed by simply swiveling the platform out of the way [11].

Items attached to the dental cart or delivery system may provide resistance because of weight, balance, or the pull of cords. Some potential solutions to these issues include: Selecting high-speed suction handles that are not awkward to hold and activate, purchasing lightweight handpieces that have a balanced feel, installing cords that are long enough to allow the operator to manipulate into a comfortable position yet not so long as to add unnecessary weight, installing handpiece swivels, and any other available features that make the equipment more comfortable to operate [12].

Purchasing decisions should not be based on the marketing of ergonomic design alone. There are no industry standards for the ergonomic design of dental equipment, and improperly designed equipment may exacerbate MSDs rather than relieve them. Instruments that generate vibration, require force to hold or manipulate, have small diameter handles, or are difficult to grip can potentially contribute to MSDs. One well-known MSD that results from repetitive motion is carpal tunnel syndrome, which results when there is compression of the median nerve as it passes through a small opening bordered by bones and ligament. When subjected to repeated forceful motion of the wrist, the tendons that pass through the carpal tunnel with the nerve swell and compress the median nerve and limit its blood supply. The compression and/or obstruction of the vascular supply causes the symptoms associated with this painful syndrome [13].

Working with a dental assistant not only increases the efficiency of the procedure, but also allows the dentist to maintain posture and avoid awkward positions. The dentist must communicate adequately to the assistant the sequence of instruments so that the appointment progresses smoothly [14].

Types of MSDs are: Neck and Shoulder disorders, Back Disorders, and Hand and Wrist Disorders. Neck and Shoulder disorders include: Myofascial Pain Disorder, Cervical Spondylolysis, thoracic Outlet Syndrome, and rotator Cuff Tendinitis/Tears. Myofascial Pain Disorder contain: pain and tenderness in the neck, shoulder, arm muscles, Painful trigger points—may twitch upon touch or massage, restricted range of motion. Possible causes of Myofascial Pain Disorder are: overloaded neck and shoulder muscles. Cervical Spondylolysis contain: intermittent/chronic neck and shoulder pain or stiffness, headache, hand and arm pain, numbness, tingling, clumsiness may occur. Cervical Spondylolysis possible causes are: age-related spinal disc degeneration leading to nerve compression and spinal cord damage; arthritis [15].

Thoracic Outlet Syndrome contain: pain in the shoulder, arm or hand (can be all three), numbness, tingling of fingers, muscle weakness/fatigue and Cold arm or hand. Possible causes of Thoracic Outlet syndrome: compressed nerves or blood vessels passing into arms, trauma, slouching forward or dropping shoulders [15-16]. Rotator Cuff Tendinitis/Tears contain: pain and stiffness in the shoulder associated with backward and upward arm movements, and weakness of rotator cuff muscles. Possible causes of Rotator Cuff Tendinitis/Tears: swelling or tearing of rotator cuff soft tissue; shoulder joint bone spurs/abnormalities; poor shoulder posture [16].

Back Disorders include: Herniated Spinal Disc, Lower Back Pain and Sciatica. The Herniated Spinal Disc symptoms are: back and leg numbness, tingling, pain, weakness, worsens with coughing, sneezing, sitting, driving, bending forward. Possible causes of Herniated Spinal Disc are: bulging or fragmenting of intervertebral discs into spinal canal compressing and irritating spinal nerves; excessive heavy lifting without adequate rest. Lower Back Pain symptoms are: pain, stiffness in lower spine and surrounding tissues. Possible causes of Lower Back Pain are: heavy lifting and forceful movements; whole body vibration; bending/twisting; awkward static postures [17]. Sciatica indicators are: pain from lower back or hip radiating to the buttocks and legs, leg weakness, numbness, or tingling. Possible causes Sciatica are: prolapsed intervertebral disc pressuring the sciatic nerve; worsened with prolonged sitting or excessive bending/lifting [18].

Hand and Wrist Disorders include: DeQuervain's Disease, Trigger Finger (Tenosynovitis enosynovit), Carpal Tunnel Syndrome, Guyon's Syndrome, Cubital Tunnel Syndrome, Hand-Arm Vibration Syndrome and Raynaud's phenomenon.

The dentists in the Public Dental Service were found to have a high prevalence of pain and discomfort in the locomotor system. Female dentists had a higher prevalence of pain and discomfort [19]. Younger dentists had pain and discomfort in the neck, shoulders and headaches than older dentists. Male dentists, who positioned their patient carefully to gain a direct view, suffered less from headache. Furthermore, dentists who used the mirror reported less headache and pain and discomfort in the shoulders. The ergonomic examination showed that dentists without symptoms applied a wedge cushion under the upper part of the patient's back to obtain an optimum view. Specialists, both with and without cervico-brachial symptoms, were more satisfied with their personal control over their work and the stimulation from their work than were general practitioners. Symptoms of MSDs are: pain, numbness, tingling, burning, cramping and stiffness. Signs of MSDs include: decreased range of motion, deformity, decreased grip strength and loss of muscle function [19].

Physiotherapy with a psychosomatic approach and individual ergonomic instruction gave better relief from pain and discomfort and an increased feeling of mental wellbeing than did ergonomic instruction only. Personal harmony and age had the highest value for explaining the number of painful sites in the

musculoskeletal system. The frequency of lower extremity complaints was low, and only a few of these complaints were considered work-related [20].

Musculoskeletal problems can be managed or alleviated effectively using a multifaceted approach that includes: postural Awareness Techniques, positioning Strategies, periodic breaks and stretching strengthening, exercises and education [21].

B- 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 uni-variable tables, cross tabulation (bi variable tables), figures and narrative illustration.

C- RESULTS

This study covered 230 study participants (dentists) 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 ± 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 professional background, the study found that (26.1%) were specialists, (10.9%) registrars and (63%) were medical officers. More than half of them (53.5%) had working experience less than 5 years. The mean working experience was 6.6 ± 5.7 years. More than half of them (51.7%) were not satisfied from their economic status 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 3. Our study revealed that dentists have many musculoskeletal complains such as fatigue (62%), pain (54%), discomfort (44.5%) and strain in (18.5%). The most common sites affected in the body with musculoskeletal problems were; lower back (57.5%), followed by shoulders (46%), neck (42.5%), a mid-back area (23%). Less common sites were wrist (21%), leg (20.5%), feet (20%) and upper back region. Small proportion of participants reported about twenty areas in the body that detailed in table 4.

In this study, cross tabulation was done to assess the possible associations between some Demographical and professional characteristics with the occurrence of the musculoskeletal problems. The analysis found a significant relationship ($P = 0.003$) between the economic status non-satisfaction with the occurrence of musculoskeletal problem.

Demographical/professional characteristics	Frequency	Percent	
Age - years	≤ 30	134	58.3
	31 - 40	79	34.3
	41 - 50	14	6.1
	> 50	3	1.3
Gender	Male	73	31.7
	Female	157	68.3
Marital status	Single	145	63.0
	Married	80	34.8
	Divorced	4	1.7
	Widowed	1	0.4
Working experience	≤ 5	123	53.5
	6 - 10	68	29.6
	11 - 15	22	9.6
	16 - 20	11	4.8
	> 20	6	2.6
Professional level	Medical officer	145	63.0
	Registrar	25	10.9
	Specialist	60	26.1
Working sector	Public	142	61.7
	Private	33	14.3
	Both	55	23.9
Economic status	Satisfying	111	48.3
	Not satisfying	119	51.7

Table (1) the distribution of the study participants according to their general demographical/professional characteristics (n = 230)

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Age (years)	230	31.1	5.9	20.0	64.0
Experience (years)	230	6.6	5.7	1.5	39.0

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

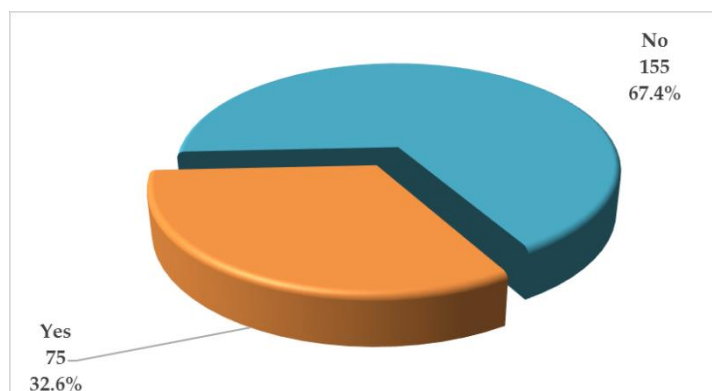


Figure (1) the distribution of the study participants according to the Past medical history of musculoskeletal problems (n = 230)

Musculoskeletal problems		Frequency	Percent
Musculoskeletal problem/complain	Yes	200	87.0
	No	30	13.0
Problem intensity (n = 200)	Mild	79	39.5
	Moderate	107	53.5
	Severe	14	7.0
Problem duration (n = 200)	< 1 day	67	33.5
	1 - 6 days	68	34.0
	1 - 3 weeks	3	1.5
	1 - 11 Months	8	4.0
	≥ 1 year	54	27.0

Table (3) the distribution of the study participants according to the presence of musculoskeletal problems (n = 230)

Musculoskeletal problems		Frequency	Percent	
The problem/complaint (n = 200)	Discomfort	89	44.5	
	Pain	108	54.0	
	Strain	37	18.5	
	Fatigue	124	62.0	
		Blurred vision	1	0.5
		Carpal tunnel syndrome	1	0.5
		Complication of stroke	1	0.5
		Fibromyalgia	1	0.5
Ligament tear		1	0.5	
	Numbness in lower limb	1	0.5	
Region of problem/complain (n = 200)	Fingers	35	17.5	
	Neck	85	42.5	
	Eye	31	15.5	
	Wrist	42	21.0	
	Hand	34	17.0	
	Upper back	39	19.5	
	Feet	40	20.0	
	Shoulders	92	46.0	
	Mid back	46	23.0	
	Lower back	115	57.5	
	Buttock	9	4.5	
	Thigh	29	14.5	
	Leg	41	20.5	
	Others	Ear	1	0.5
		Elbow	1	0.5
Headache		2	1.0	
Knees		3	1.5	
Leg joint		1	0.5	
Leg weakness		1	0.5	
TMJ		1	0.5	

Table (4) the distribution of the study participants according to the presence of musculoskeletal problems (n = 230)

8. Discussion

This study covered 230 dentists who were 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 ± 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 unmarried (63%). Regarding professional background, the study found that (26.1%) were specialists, (10.9%) registrars and (63 %) were medical officers. More than half of them (53.5%) had working experience less than 5 years. The mean working experience was 6.6 ± 5.7 years. More than half of them (51.7%) were

not satisfied from their economic status. Other studies among dental practitioners of Saudi Arabia showed MSD increases with age and duration of practice [22].

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. These results were in agreement with other similar study from Saudi Arabia that revealed that among the dentists 85% reported that they had developed some pain due to work after joining the dental profession, and 42% reported that they were suffering pain [22]. Other study by Kierklo A, et al. was found that over 92% of the surveyed dentists experienced MSDs [23]. In other study by Evangelos et al similarly, they found that 62% of dentists reported at least one musculoskeletal complaint, 30% chronic complaints, 16% had spells of absence and, 32% sought medical care [25].

Our study revealed that dentists have many musculoskeletal complains such as fatigue (62%), pain (54%), discomfort (44.5%) and strain in (18.5%). The most common sites affected in the body with musculoskeletal problems were; lower back (57.5%), followed by shoulders (46%), neck (42.5%), a mid-back area (23%). Less common sites were wrist (21%), leg (20.5%), feet (20%) and upper back region. Slimier picture presented in Ahmad Alghadir et al from Saudi Arabia, they found that besides lower back, shoulder, and neck regions, the hands, upper back, and other regions like the elbows, buttocks, thighs, leg, and feet were areas in which they pain [22]

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%) [23]. 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. [24].

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. In this study, the analysis found a significant relationship ($P = 0.003$) between the economic status non-satisfaction with the occurrence of musculoskeletal problem.

9. Conclusion

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

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