Occupational problems and injuries caused by adopted postures among dental personnel in AIMST University

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Abstract

Introduction Dentistry is an interesting and motivating occupation but is arduous physically. Failure to accustom with the settings can predispose to ailment or injury. Musculoskeletal disorders usually contribute to early retirement among dental professionals. The purpose of the study was to find the common musculoskeletal disorders experienced by the dental employees and dental undergraduates in AIMST University, Malaysia.

Methods

A cross sectional study was conducted among 100 dental personnel including dentists, dental technicians and dental students in AIMST University, Malaysia. A self-applicable questionnaire and direct observation of operator's position by the research team was used for assess the possibility of musculoskeletal problems in dental personnel's. Questionnaires were filled up, collected and tabulated using Microsoft Excel. Then, based on the data, a descriptive analysis was done using SPSS Statistics Software.

Results

81% were not having musculoskeletal problems due to adopted posture while 19% are having the problem. 61% felt that back pain is the most common musculoskeletal problem in dental practice and 1% felt that wrist/leg pain or head pain affects them more. Based on the study, it was evident that majority of dentists follow the correct chair positions while delivering treatment to the patients.

Conclusions The majority of the dental students had good general health whereas the frequency of musculosketal problems increased in the professionals as the year of experience increased. Practicing optimal working methods, precise postures and regular strengthening excercises could reduce musculoskeletal problems and injuries thereby improving the health of the dentists.

Introduction

Dentistry working market is becoming increasingly competitive and this is influencing the daily life of dentists, bringing changes to their professional activities and requiring more working hours. These daily difficulties are exposing dentists to increasingly stressing situations[1]. Strained posture at work disturbs the musculoskeletal alignment and leads to stooped spine. The stooped posture also involved certain groups of muscles and joints. This may lead to diseases of the musculoskeletal system.

It is possible that this whole labour transformation process favours adverse physical and psycho-social conditions, thus bringing changes to the quality of life (QL) of such professionals[2,3]. It may also generate high stress levels, contributing to make many workers with 40 to 50 years of age unable to respond to the requirements of tasks proposed to them[4]. Since stress has several causes, it is not possible to establish a single way to prevent it or fight it. Associated to this, a certain working posture, maintained for a long time, may lead to continuous stress of most required muscles and may generate circulatory and metabolic disorders, in addition to causing pain or muscle discomfort[5]. The origin of musculoskeletal injuries is in general related to labour activities requiring excessive strength with hands, inadequate upper limbs postures, repetitiveness of a same movement, mechanical compression of UULL structures and neighbour regions (shoulders, arms and hands) and not enough time to carry out a certain job[6]. In this sense, dentists are exposed to stress, anxiety and excessive physical effort[2,7].

The prevalence of musculoskeletal disorders is higher than any other occupational disease among dentists and this is due to the fact that such professionals work for long periods in inflexible and prolonged static postures, carrying out delicate and accurate procedures[8-10]. To meet the specifications of the profession, dentists adopt a kyphotic posture, bending and twisting the head to adjust their field of vision, with lumbar rotations and upper limb flexion[11]. In spite of

ergonomic recommendations, these professionals end up adopting vicious or wrong positions which, in the future, may impair their health, triggering cervical and lumbar disks degeneration and inflammatory processes in shoulders, elbows, wrists and hands[8-11].

Musculoskeletal disorders are prevented by means of ergonomically organized environments, adequate working postures and intervals between consultations. Dental ergonomics looks at organizing environments to provide professionals with higher productivity allied to QL[12,13]. Continuous educating and appropriate intervention studies are needed to reduce the complication of these hazards. So, it is important for dentists to remain constantly up-to-date about measures on how to deal with newer strategies and dental materials, and implicates the need for special medical care for this professional group.

The posture of professionals and their working environment are in general organized according to standards proposed by the partnership between the International Standards Organization (ISO) and the Fédération Dentaire Internationale (FDI) which aims at optimizing dentists' work, promoting a restructuring to standardize dental office working routine by establishing ergonomic standards and guidelines[3].

Lack of physical activity and sedentary lifestyle also contribute to increase the risk of developing or worsening some medical conditions, such as cardiovascular and metabolic disorders and musculoskeletal pain[3,14]. Some studies show that frequent exercises are associated to lack or less painful, depressive or anxiety symptoms[1,14,15].

This study aims to evaluate the occupational musculoskeletal disorders and related risk factors among dental personnel in AIMST University, Malaysia. The objective of the study was to identify and describe the work-related musculoskeletal disorders among dental personnel in AIMST University, Malaysia and to increase the awareness about occupational problems and injuries caused by adopted postures among the dental personnel.

To promote health and minimize negative physical consequences of the profession, it is necessary to know the profile of professionals, their working environment and current health reality of dentists.

Materials and Methods

A cross sectional study was conducted among 100 dental personnel including dentists, dental technicians and dental students in AIMST University, Malaysia. A self-applicable questionnaire was used for each dental personnel to check the frequency of musculoskeletal pain and occupational injuries and the location of such pains. The questionnaire included the age, gender, occupation, the year of working experiences and history about whether the dental personnel had been suffering from musculoskeletal pain and occupational injuries before or not.

First, 100 questionnaires were distributed among dental students, lecturers and dental technologists. General questions were filled by the respondents and the questions related to chair positions were marked by the researcher by observing the participants during treatment procedures or in simulation laboratories. The observations were marked based on the following criteria:

While treating the buccal surface of right maxillary molars and premolars and palatal surface of left maxillary molars and premolars following 9 o'clock position on the right of patient with their head turned away from operator. On treating the buccal surface of left maxillary molars and premolars and palatal surface of right maxillary molars and premolars, 9 and 11 o' clock position on the right of patient with their head turned towards the operator was used. While treating the palatal surface of maxillary teeth, use of indirect vision wasrecommended. While treating the labial and palatal surfaces of patient's upper anterior teeth, whether the operator chose to stand or sit behind the patients for a better view.

While treating the buccal surface of right mandibular molars and premolars and lingual surface of left mandibular molars and premolars, 9 o'clock position on the right of patients with patients' head turned away from operator was followed. While treating the buccal surface of left mandibular molars and lingual surface of right mandibular molars and premolars, 9 and 11 o'clock position on the right of patient with patients' head turned towards operator was assessed. While treating the labial and lingual surface of lower anterior teeth,operator chose to stand or sit behind the patients. The observations were marked as yes if all the operator's positions were followed accurately.

Questionnaires were filled up, collected and tabulated. Data were tabulated using Microsoft Excel. Then, based on the data, a descriptive analysis was done using SPSS Statistics Software. Bar charts were prepared on the basis of statistics.

Results

This research addressed the occupational problems and injuries faced by adopted postures by the dental personnel in AIMST University, Malaysia. The sample included 100 respondents including dental students, dental technologists and lecturers.

In the questionnaire, the demographic data were obtained. The questionnaire was distributed and the results are analyzed using Microsoft Excel sheet. Most respondents (65%) were between 18 to 28 years and least respondents (2%) were between 49 to 58 years. 70% were students and have less than 5 years of clinical experience, about 14% comprised of lecturers were a work experience of 5-9 years. Of the respondents 51% were male and 49% were females. The questionnaire comprised of 9 key questions and the details were explained to the respondents. Based on the descriptive analysis, the results obtained were as follows:

81% were not having musculoskeletal problems due to adopted posture while 19% are having the problem (Table 1).

Table 1 shows the presence of musculoskeletal problems due to adopted posture

Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
19	19.0	19.0	19.0	1.810 /.3943
81	81.0	81.0	100.0	
100	100.0	100.0		

61% felt that back pain is the most common musculoskeletal problem in dental practice and 1% felt that wrist/leg pain or head pain affects them more (Table 2).

Table 2 shows the location of musculoskeletal pain

		Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
Valid	back pain	61	61.0	61.0	61.0	2.400 /1.8368
	wrist/leg pain	1	1.0	1.0	62.0	
	shoulder pain	6	6.0	6.0	68.0	
	head pain	1	1.0	1.0	69.0	
	more than 2 options	31	31.0	31.0	100.0	
	Total	100	100.0	100.0		

19% adopted straight back to dental chair position while treating patients while 1% adopted horizontal shoulder while treating patients(Table 3).

Table 3 describes the commonly adopted operator's position.

		Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
Valid	straight back to dental chair	19	19.0	19.0	19.0	5.360/ 2.5127
	curved back to dental chair	6	6.0	6.0	25.0	
	shoulder -horizontal	1	1.0	1.0	26.0	
	feet on floor	10	10.0	10.0	36.0	
	more than 2 options	60	60.0	60.0	96.0	
	not related	4	4.0	4.0	100.0	
	Total	100	100.0	100.0		

84% adopted correct operator's position while 10% did not follow most of the operator's position accurately while treating maxillary teeth(Table 4).

Table 4 Describes the use of ideal position while treating maxillary teeth surfaces and use of indirect vision.

		Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
Valid	yes	84	84.0	84.0	84.0	1.220 /.5427
	no	10	10.0	10.0	94.0	
	not related	6	6.0	6.0	100.0	
	Total	100	100.0	100.0		

While treating mandibular teeth, 81% were following the correct posture while 13% were not doing so(Table 5).

Table 5 Describes the use of ideal position while treating mandibular teeth surfaces.

		Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
Valid	yes	81	81.0	81.0	81.0	1.250/ .5573
	no	13	13.0	13.0	94.0	
	not related	6	6.0	6.0	100.0	
	Total	100	100.0	100.0		

17% preferred to undergo treatment and follow up when they are facing any musculoskeletal problems while 79% goes for treatment only if the pain radiates(Table 6).

Table 6 Describes the adoption of treatment and follow up for musculoskeletal problems.

		Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
Valid	yes	17	17.0	17.0	17.0	1.870 / .4416
	no	79	79.0	79.0	96.0	
	not related	4	4.0	4.0	100.0	
	Total	100	100.0	100.0		

32% feel that endodontic treatment will cause musculoskeletal problems while 3% feel that restoration and oral prophylaxis will cause musculoskeletal problems easier(Table 7).

Table 7 Describes the most common dental treatment procedures resulting in musculoskeletal problems

		Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
Valid	endodontic treatments	32	32.0	32.0	32.0	5.010 / 3.2768
	restoration	3	3.0	3.0	35.0	
	prosthodontic treatments	8	8.0	8.0	43.0	
	oral surgery treatments	4	4.0	4.0	47.0	
	oral prophylaxis	3	3.0	3.0	50.0	
	>than 2 options	45	45.0	45.0	95.0	
	not related	5	5.0	5.0	100.0	
	Total	100	100.0	100.0		

8% feel that the symptoms of hand arm vibration syndrome are white finger syndrome and 29% feel the symptom is the loss of feeling in 1 or more fingers(Table 8).

Table 8 Describes the effect of musculoskeletal problems associated with arms and fingers in dental personnels.

		Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
Valid	white finger symptom	8	8.0	8.0	8.0	3.050/ 1.1404
	loss of sensation in one or 2 fingers	29	29.0	29.0	37.0	
	aches/pain in hands and lower arms	22	22.0	22.0	59.0	
	none of the above	32	32.0	32.0	91.0	
	more than 2 options	9	9.0	9.0	100.0	
	Total	100	100.0	100.0		

To improve the working posture, 22% feel that 4 handed dentistry or close support dentistry is good while 3% feel that magnifying loupes can improve the posture (Table 9).

Table 9 Describes the most efficient way for safe dentistry

		Frequency	Percent	Valid Percent	Cumulative Percent	Mean / Std. Deviation
Valid	4 handed dentistry	22	22.0	22.0	22.0	4.980/ 2.7154
	regular exercise	10	10.0	10.0	32.0	
	special design operating tool	4	4.0	4.0	36.0	
	magnifying loupes	3	3.0	3.0	39.0	
	more than 2 options	56	56.0	56.0	95.0	
	not related	5	5.0	5.0	100.0	
	Total	100	100.0	100.0		

Discussion

Musculoskeletal injuries are increasingly becoming object of concern, research and discussion worldwide. It is critical for professional and personal assistants of dentists to know their causes, manifestations, psychological aspects, prevention and treatment of such injuries [16]. Carrying out labor activities in static postures, or with few and low amplitude movements lead to the development of musculoskeletal disorders in several professions, and dental practice is a risk factor for the development of such disorders [17].

A total of 100 dental personnel participated in the study giving a response rate of 100%. The majority of the respondents were dental students (65.0%) within the age group of 18 to 28 years old. Most of the dental personnel involved in the study were lecturers with approximately 3 or more years of experience and dental technicians.

The reasons for musculoskeletal problems among the dental personnel could be due to the fact that they are normally included within the group of professionals at risk of suffering from MSDs due to prolonged awkward or forced postures at work and failure to adopt preventive measures. [18] The present study found that most of the dental surgeons had some kind of musculoskeletal pain and stiffness while performing their professional work.

Besides that, the mechanism of musculoskeletal pain production has been studied extensively. The onset of modern dentistry, as evidenced by four-handed dentistry, has made the major part of the dentist tasks purely sedentary in nature. This has resulted in dramatic rise in musculoskeletal symptoms. [19]

In the present study, it was noted that 81% of person follow the recommended posture during dental treatment. Even though majority follows the posture, the symptoms may be due to prolonged static postures, repetitive movements, and poor positioning. [20, 21] On the other hand, linked musculoskeletal pain occur in dentists due to static postures, which usually requires more than 50% of the body's muscles to contract to hold the body motion less, while resisting gravity. The static forces resulting from these postures have been shown to be much more tasking than dynamic forces. Repeated prolonged static postures are thought to initiate a series of events that could account for pain, injuries, or career-ending problems seen in MSDs.

In our study, we observed that majority of the dental surgeons had good postures while performing their professional work. Eventhough majority of personnel follow the postures, the causes of MSD might be due to repetitive movements and prolonged body postures which can cause muscle damage as well as ligament and joint injuries. [22,23]

According to the present study, most dental specialties showed high occurrence of MSD with variation location in which knee / hip region (45%) is the highest according to the questionnaire. This is in agreement with study conducted by Lalumandir et al. [24, 25] in which they state that all dental specialties show a high occurrence of MSDs, but with variations in frequency and locations. The frequency of pain in the region of hip / thigh and knee varies with the number of patients and height of dentists.

On the other hand, dental surgeons assume a strained posture while working (both while standing and sitting close to a patient who remains in a sitting or lying position), which causes stress on the spine and limbs. The stress negatively affects the musculoskeletal system and the peripheral nervous system especially the peripheral nerves of the upper limb and neck nerve roots. Back pain syndromes diagnosed in dentists originate from spine degeneration in different phases. The posture of the dentist at work, with the bent and twisted neck, abducted arm, and repetitive movements of the hand cause the neck syndrome and pain within the shoulder and upper extremities. The dentist makes constant monotonous movements, which stress the wrist and elbow. [26]

Musculoskeletal injuries are appearing increasingly earlier during dentists professional life, indicating that they leave graduation courses with noxious postural habits. [27] Primary dentists' difficulty is the accurate visualization of the surgical field, forgetting the right posture, excessively bending the neck, very often followed by its rotation. There are many incorrect postures, both of spine and neck projecting them a lot to the front, laterally or performing rotations; and legs being unable to maintain the angle between thigh and leg in an interval of 90 and 120 degrees; and association with musculoskeletal pain during and after procedures. Garbin et al. [9] have observed that the reason for a poor posture may be associated to lack of knowledge about the right posture. Other studies associate working hours and excessive number of patients per period as influencing occupational pain. [4]

According to the present study, majority showed lack of awareness regarding hand-arm

vibration syndrome that affects dental professionals. Hand-arm vibration syndrome is substantially under recognized. [28] A lack of appropriate and timely diagnosis and referral by primary care physicians appears to be an important reason for treatment delay. [29] Workers' lack of awareness and fear of repraisals by employers are additional barriers. [30] This under diagnosis is problematic, as early recognition and management of this condition are crucial for preventing progression and improving prognosis.

In the modern era, the concept of active ergonomics as well as combining health promotion concepts with ergonomics is gaining widespread support. It is based on theoretical models, general physical therapy and ergonomic principles. [31] Both these approaches suggest regular movement as important in reducing the impact, particularly of static postures. This includes regular movement and changing of postures over the work day, as well as integrating exercise, stretching (particularly in the opposite direction of static and repetitive workplace postures), yoga, and/or relaxation exercises. [32] Exercise and stretching also make sense from a biomechanical standpoint, but interventional studies are required to substantiate this view.

Based on the study, SPSS software was used analyse the data collected by questionnaire. The occupational musculoskeletal disorders in AIMST were not severe when compared with other published literatures. The related risk factors identified from the study such as poor positioning and repetitive movement during treatment procedures need to be corrected to avoid occurrence of musculoskeletal disorders. The most common work related musculoskeletal disorders recorded was back pain. Based on the study, it could be concluded that dental students and proffessionals are generally more aware of the problems arising from practising dentistry and work towards changing it.

There are various treatment options given in order to relieve musculoskeletal problems and the following interventions should be considered in the dental practice: [33, 34, 35]

Proper workstations may include the following:

- Dentist's or patient's chair height

- Lumbar, thoracic or arm support in dentist's chair
- Position of instrument table
- Adequate lighting
- Edges of work surfaces should be comfortable
- Proper ventilation
- Pleasant temperature.

Recommended early treatment of MSDs

Early symptoms in the wrist and hand respond to conservative medical management that includes rest, icing, non steroidal anti-inflammatory drugs and splints. Early intervention could be important in order to achieve a better result at less cost and inconvenience.

Posture

- Always try to maintain an erect posture
- Use an adjustable chair with lumbar, thoracic and arm support
- Work close to your body
- Minimize excessive wrist movements
- Avoid excessive finger movements
- Alternate work positions between sitting, standing and side of patient
- Adjust the height of your chair and the patient's chair to a comfortable level
- Consider horizontal patient positioning
- Check the placement of the adjustable light

Summary

Within the limitations of this study, it was found that musculoskeletal disorder is a significant occupational health problem among the dental surgeons. The study revealed that various socio-demographic variables contributed to the MSDs experienced by the dental surgeons. The musculo skeletal pain experienced by the dental surgeons in the back, wrist, and hip/thigh was significant. An interventional study is needed to identify and decrease the prevalence of MSDs among the dental surgeons.

There is a need of continuing interdisciplinary efforts to discover innovative prevention strategies, understand the larger systems issues, and appreciate the very damaging nature of poor ergonomic practices on the lives of dental practitioners. Therefore, there is a call to make our contribution to this vital issue and to promote human factors in order to help the practitioners adopt the so called "ergonomic culture."

Dentists had a high prevalence of musculoskeletal pain which may be related to excessive working hours and to incorrect postures adopted during dental procedures. These factors may be worsened by the low frequency of physical exercises and lack of pauses and micro-pauses between consultations. Further studies on the subject would be interesting to explain the epidemiology of musculoskeletal pain in dentists, including the identification of risk factors and their impact on the quality of life.

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