

## ORIGINAL ARTICLE

# Occupational Health-Related Illness and Awareness Level among Dental Surgeons in International Islamic University Malaysia, Kuantan

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## ABSTRACT

**Introduction:** Dental surgeon exposes to numerous occupational hazards include the bloodborne pathogens, pharmaceuticals, ergonomic hazards, noise, vibration and workplace violence. It causes prolonged health effects on short or long term exposure include musculoskeletal disorder, back pain and other health issues. This study aimed to identify the awareness level of occupational hazards and experiences among dental surgeons and to determine whether preventive measures are employed. **Methods:** A cross-sectional study design and convenience sampling method had been used in this study. The Occupational Hazards in Dentistry questionnaire was self-administered by 39 dental surgeons in International Islamic University Malaysia, Kuantan. The data were analysed using descriptive, chi-square and thematic analysis. **Results:** The overall response rate was good (78%). Among the participants, 59% were female, and 41% were male. Half of the participants (59%) had worked for 11-20 years. The majority of the participants (82%) practised a correct posture while providing dental treatment. The most-reported pain areas were at the shoulder and neck and followed by the lower back. Approximately, 10% of the participants had been diagnosed with cervical spondylitis/ degenerative cervical discs. Most participants have taken preventive measures to reduce exposure to these occupational hazards. **Conclusion:** Work-related pain is common among dental surgeons. The most affected pain area is the shoulder and neck, followed by back and wrist pain. Occupational hazards can be alleviated effectively using a comprehensive approach. It is essential for dentistry to incorporate comprehensive strategies into practice to improve productivity and enhance occupational safety.

**Keywords:** Occupational health-related illness, occupational hazards, awareness, dentistry, prevention

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## INTRODUCTION

Occupational health hazard can be described as a risk or danger resulting from the working conditions of a specific job (1). It is common in dental setting which challenging to the dental profession in minimising the exposure risk. Dental surgeons are exposed to several occupational hazards in their professional work, including bloodborne pathogens, pharmaceuticals, ergonomic hazards, noise, vibration, and violence at work (2).

Working under low lighting can cause the dentists to have eye strain while working under excessive

illumination resulted in eye discomfort. Exposure to dental curing light can cause conjunctivitis and keratitis for dentists (3). According to the Open Occupational Health and Safety Journal, non-ionising radiation such as the blue and ultraviolet light used to cure materials can also result in damage to the retina and cornea (4).

Dentists are also exposed to hearing problems whereby handpieces, ultrasonic scalers, compressors and suction are hazardous sources of noise (5). Modern dental equipment's noise and sound level are below 85db, and the risk of having hearing loss is negligible. Loss of hearing, acoustic stress, and impaired concentration power affected the individual exposed to frequencies above 3000 Hz regularly (6).

Blood, body fluids, and body secretions are biomedical wastes that harbour most bacteria, viruses, and parasites responsible for infections such as human

immunodeficiency virus (HIV), hepatitis, tuberculosis, pneumonia, diarrhoeal diseases, tetanus, and whooping cough (5). The main entries of these infectious agents are the epidermis of hands, oral epithelium, nasal epithelium, upper respiratory epithelium, bronchial, alveoli, and conjunctival epithelium (3,7).

In 1991, the World Health Organization concluded that mercury absorption from dental amalgam was four times higher than from fish consumption and caused damage in human blood cells (3). Although the mercury used in dental amalgam is pre-tested, they are aerosolised with the use of a handpiece and may be inhaled by the dentist (4).

The posture of the dentist at work, mostly with the bent and twisted neck, abducted arm, and repetitive movement of the fingers, is also the main reason for musculoskeletal disorder experienced by the dental surgeons (1). A study carried out by Reddy et al. (8) revealed that dentists in the 25-35 age group had the most prevalent neck pain (76.6%), followed by hand and wrist problems. Dentists have had symptoms in the shoulder (85.18%), mostly in 36-45 years, followed by neck and wrist or hand pain. Among 46-56 years of age, it was most common for dentists to have more significant symptoms in the neck, followed by the knee (55.5%) and low back (44.4%) (8).

A stressful event like having high patient loads or uncooperative patients, especially those of extremes of age, were major causes of increased stress at work in the present study (1). According to Reddy et al. (8), a study has reported that dentists suffer a high level of job-related stress. In concordance with the findings by Myers (9) study among general dentists in 2004, reported that 60% of them feel nervous, tense, or depressed, 58% have a headache, 60% have trouble night sleeping at night, and 48% feel tired without reason (9).

Assessment of professional hazards among dental surgeons is, therefore, an important aspect of the dental profession. Hence this study was conducted with the aim to identify the level of awareness level of occupational hazards and experiences among dental surgeons' and to determine whether preventive measures are employed.

## **MATERIALS AND METHODS**

A cross-sectional study design and convenience sampling method has been used in this study. The study was conducted at Kulliyah of Dentistry, International Islamic University Malaysia (IIUM), Kuantan. Written consent was obtained from participants. Research ethical approval had been received from IIUM Research Ethical Committee (IREC 2019-128) prior to the commencement of the study.

A convenience sample of 39 dental surgeons who met

the inclusion criteria were taken and those who agreed to participate. The inclusion criteria for this study: i) Participants must have a Bachelor of Dental Surgery or Doctor of Dental Surgery degree and currently work in Kulliyah of Dentistry, IIUM, ii) General dental practitioners, as well as specialised practitioners, were included in the study. Whereby dental surgeons on study leave were excluded from this study.

Data collection was done by using the occupational hazards in dentistry questionnaire (OHD questionnaire). The questionnaire was developed in the English language by referring to previous studies, and it was adapted according to the local society and clinical environment. It consisted of 4 sections: Section A (Personal Details), Section B (Awareness level on the occupational hazards), Section C (Experience of occupational hazards), and Section D (Preventive measures taken by the dental surgeons). This questionnaire uses a 3-point scale: Yes, No, and Don't know/Not sure. Participants need to choose one option for each questionnaire items. The example of questionnaire items, "hearing loss could be due to the use of high-speed handpieces/ultrasonic scalers/compressor/suction"; "do you bend your neck or back during the treatment procedure?".

A pre-test study was carried out to assess the validity of the questionnaire. Seven subject-matter experts (SMEs) who are qualified dental surgeons (n=7) participated in the validation process. Three SMEs were involved in face validation, while the other four (4) were involved in content validation. They were not included in the real study. Five (5) items in the questionnaire were rejected as it was categorised as unessential or unnecessary by the experts. Necessary modifications were made according to the feedback received by the experts. The final items in the OHD questionnaire are 43.

Questions were explained whenever necessary, and they were given assurance regarding the confidentiality of their responses. Collected data were analysed using the Statistical Package for Social Sciences (SPSS) 22.0 version. Descriptive data were reported as frequencies and percentages. The chi-square test was used to analyse the association between working positions and socio-demographic factors. Thematic analysis was carried out to identify the pattern across a dataset in Section D (open-ended question). The analysis was done by familiarisation with the data, coding and generating initial themes.

## **RESULTS**

The overall response rate was good (78%). Out of 50 dental surgeons working at International Islamic University Malaysia (IIUM), only 39 of them were available and agreed to participate in this study after minus those who involved in the questionnaire validation.

Table I summarise dental surgeons' background information and professional characteristics. Among the participants, 23 (59%) were female, and 16 (41%) were male. Half of the dental surgeons (59%) had worked for 11-20 years, 33% had worked for 1-10 years, and 3% had worked for more than 20 years.

**Table I: Demographic profile of the participants**

Demographic	n	Percentage (%)
<b>Gender</b>		
Male	16	41
Female	23	59
<b>Working experiences (in years)</b>		
1-10 years	13	33
11-20 years	23	59
> 20 years	3	8
<b>Specialties</b>		
Conservatives/Endodontics	4	10
Dental Public Health	2	5
Oral Maxillofacial Surgery	5	13
Oral Medicine and Oral Pathology	3	8
Orthodontics	4	10
Paediatrics Dentistry	5	13
Periodontics	4	10
Prosthodontics	7	18
None	5	13

Of the twelve questions used to assess the participating dental surgeons' knowledge of common occupational hazards in dental practices, two questions showed that less than half of the participating dental surgeons answered the questions correctly. Both questions No. 3 and 9, in which questions were asked about the dental apparatus that could cause eye inflammation, and also the safe dose of amalgam to patient.

Table II showed the awareness level of participants towards occupational hazards. It showed that 95% of the participants were aware that low illumination during dental procedures could cause eye fatigue, discomfort and headache. 74% of the participants were also aware that using the high-speed handpiece, ultrasonic scalers, compression, or suction could cause hearing loss. In this study, all participants were aware that cut or scratch from a sharp needle and blades are the potential cause for infection. 77% of the participants knew that dental amalgam could not cause cancer, while only 18% did not seem aware of this matter. However, 59% of the participants did not know that the maximum level of mercury exposure considered safe is 3 milligram/cc of air.

As displayed in Table III, the majority of the participants (82%) practised correct posture while providing dental treatment and about 87.2% of the participants take the break in between procedure. More than three quarter of the participants had practised an indirect vision while treating maxillary teeth 84.6%, while 12.8% denied the practice. However, 67% of the participants bent their neck and back in performing dental procedures.

Discomfort around visual and hearing areas is also a

**Table II: Awareness level of the participants towards occupational hazards**

Questionnaire items	Yes (%)	No (%)	Do not Know (%)
1. Low illumination can cause eye strain, eye fatigue and headache.	94.9	5.1	0
2. Excessive brightness can lead to discomfort and eye fatigue.	89.7	7.7	2.6
3. Usage of light cure/computer/lasers can cause conjunctivitis and keratitis.	43.6	38.5	17.9
4. Hearing loss could be due to the use of high-speed handpieces/ultrasonic scalers/compressor/suction.	74.4	17.9	7.7
5. Exposure to radiation can cause genetic change.	92.3	7.7	0
6. Cuts/scratches from sharp needles and blades are the potential cause of infections.	100	0	0
7. Aerosols cannot penetrate the lungs.	12.8	84.6	2.6
8. Ultrasonic scalers produce the lowest amount of airborne contamination	10.3	76.9	12.8
9. The maximum level of mercury exposure considered to be safe is 3 milligram/ cc of air.	23.1	17.9	59
10. A dental amalgam filling can lead to cancer.	5.1	76.9	17.9
11. Acrylics, resins and polymer materials used in restorative dentistry can act as allergens.	97.4	0	2.6
12. The main entry points of infection are the epidermis of hands, oral epithelium, upper airways epithelium, and conjunctiva.	100	0	0

concern for most dental surgeons. In this study, about 33.3% of the participant had experience headaches. Meanwhile, 41% had experienced visual discomfort. The result also showed that most of them (92.3%) denied any hearing problem related to repetitive and prolonged usage of high-speed handpiece/ ultrasonic scalers. In this study, 94.8% of the participants denied having the allergy due to latex. Only 28.2% of them had the experience of needle stick injury. Meanwhile, 38.4% of the participants had experienced an injury or cut from a sharp object other than a needle. The finding also revealed that 33.3% of them are stressed out when their patient is not satisfied with the treatment given. Most of them (76.9%) took some action to manage their stress. Regarding the prevalence of the musculoskeletal disorder among the dental surgeon, it showed that 64.1% of the participant had the experience of pain related to dentistry. The most-reported pain areas were at the shoulder and neck (41%), followed by lower back (36%). Surprisingly, 96% of them experienced pain once in a month, whereby 48% had moderate pain, and only 4% had severe pain. About 24% of them took the medication to ease the pain, while another 76% of the participant denied it. Approximately 10% of the participants had been diagnosed with prolapsed disc L5, cervical spondylitis/ degenerative cervical discs and gouty arthritis.

Table IV showed the findings of dental surgeon's

**Table III: Percentage of participants experienced with occupational hazards in dentistry.**

Questionnaire Items		Yes (%)	No (%)	Not Sure (%)
1.	Do you think you are practising the correct posture?	82	18	0
2.	Do you take any break in between the procedure?	87.2	7.7	5.1
3.	Do you use indirect vision while treating maxillary teeth?	84.6	12.8	2.6
4.	Do you bend your neck or back during the treatment procedure?	66.7	18	15.3
5.	Do you often experience a headache?	33.3	64.1	2.6
6.	Do you often experience visual discomfort?	41	59	0
7.	Have you experienced:			
	a) hearing problem due to repeated and prolonged usage of high-speed handpieces / ultrasonic scalers?	5.1	92.3	5.6
	b) needle stick injury?	28.2	71.8	0
	c) cuts from any sharp objects other than needle while in practice?	38.4	61.6	0
	d) progressive tremulous illegible handwriting due to mercury poisoning?	0	89.7	10.3
	e) asthmatic allergic reactions/anaphylaxis due to latex gloves?	2.6	94.8	2.6
	f) a situation where the patient is not satisfied with the treatment provided and you are stressed over it?	33.3	56.4	10.3
8.	Do you take any action to manage your stress?	76.9	23.1	0
9.	Have you experienced any pain related to your occupation?	64.1	35.9	0
10.	The affected area of pain			
	a) shoulder.	64	36	0
	b) neck.	64	36	0
	c) back.	56	44	0
	d) wrist.	44	56	0
	e) others- fingers	4	96	0
		<b>Never (%)</b>	<b>Sometimes (%)</b>	<b>Often (%)</b>
11.	How often have you experienced pain due to work in a month?	0	96	4
		<b>Mild (%)</b>	<b>Moderate (%)</b>	<b>Severe (%)</b>
12.	What is the severity of your pain experience? Please tick the appropriate box.	44%	48%	4%
			<b>Yes (%)</b>	<b>No (%)</b>
13.	Do you take any medication to ease the pain?		24	76
14.	Have you been diagnosed with a serious disease?		24	76

\*NA-not available

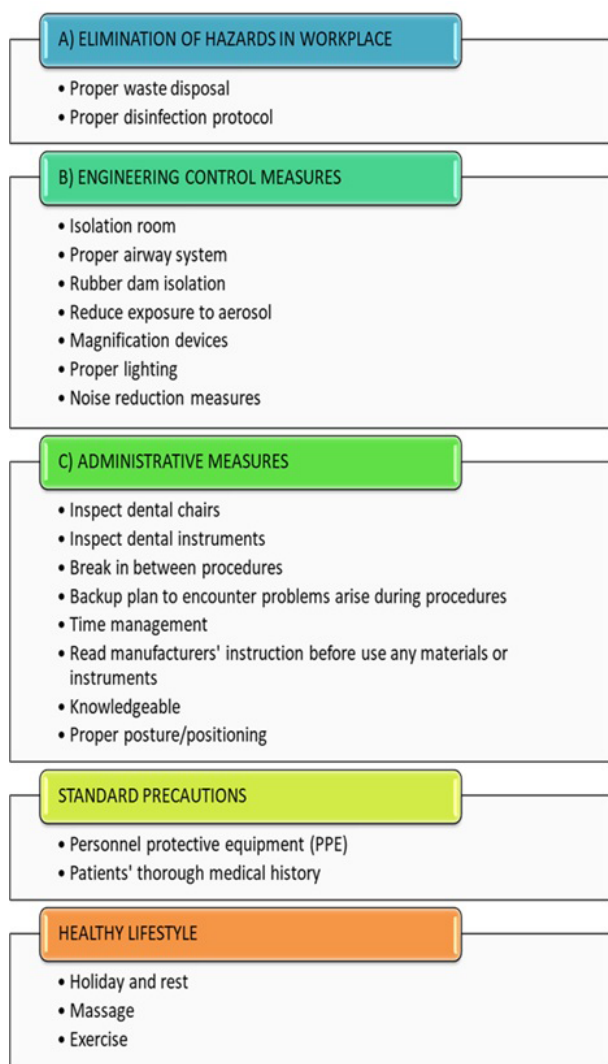
**Table IV: Dental surgeon's working positions in relation to their socio-demographic factors.**

Socio-demographic factors	Correct Posture (%)	Break in between procedure (%)	Indirect vision while treating maxillary teeth (%)	Bend neck/back (%)
<b>Gender</b>				
Male	43.5	41.7	41.7	54.5
Female	56.5	58.3	58.3	45.5
<b>Working experience (years)</b>				
1-10 years	34.8	37.5	37.5	45.5
11-20 years	56.5	58.3	58.3	45.5
More than 20 years	8.7	4.2	4.2	9.1
<b>Specialties</b>				
Conservatives/Endodontics	12	12.5	12.5	13.6
Dental Public Health	6	8.3	8.3	NA
Oral Maxillofacial Surgery	15.6	12.5	8.3	13.6
Oral Medicine and Oral Pathology	9	8.3	8.3	13.6
Orthodontics	6	8.3	8.3	NA
Paediatrics Dentistry	15.6	12.5	16.7	18.2
Periodontics	8.7	8.3	8.3	4.5
Prosthodontics	17.4	16.7	16.7	13.6
None	9.7	12.5	12.5	22.7

\*NA-not available

working position in relation to their socio-demographic factors. Based on the results, it showed that female dental surgeons practice better working position as compared to male dental surgeons; practising a correct posture, have a break in between procedures and use indirect vision while treating maxillary teeth. Besides, participants who were have working experience between 11-20 years have a practice better working position than younger dental surgeons (1-10 years of working experience).

Thematic analysis was carried out to identifying patterned meaning across a dataset in Section D (preventive measures). The process of thematic analysis was started with familiarisation of the data, coding and generating initial themes. The categorisation of the preventive measures taken by the participants was based on the guidelines prevention strategies in occupational hazards prepared by the Occupational Safety and Health Branch (OSH), Hong Kong (10). Based on the analysis, most participants have taken preventive measures to reduce these occupational hazards. The result is categorised into five main themes, as stated in Figure 1 (Preventive measures taken by dental surgeons in order to prevent occupational hazards in dental practice), which were



**Figure 1: Preventive measures taken by dental surgeons in order to prevent occupational hazards in dental practice.**

the elimination of hazards in the workplace, engineering control measures, administrative measures, standard precautions, and a healthy lifestyle.

More than half of the participants (67%) included Personal Protective Equipment (PPE) as their preventive measures in regard to occupational hazards, while 54% of them included proper posture during the dental procedure to prevent and minimise occupational hazards. Besides that, 26% of the participants mentioned having work rotations or took a break in between the procedures to reduce fatigue and possible dental mishaps caused by an excessive workload. Another one-third of dental surgeons (26%) included holiday, rest, massage and exercise as their approach to control the incidence of occupational hazards.

Magnification devices such as dental loupes and microscopes have been used by dental surgeons (18%) as one of the preventive measures that they took during their dental practices. Besides that, 15% of the participants practised proper waste disposal in

their work environment, while 10% of dental surgeons suggest regular inspection of the dental chair and the dental instruments. Other preventive measures stated by the participants were proper airway system, time management, use of isolation room when treating contagious patients, adequate disinfection and practised aerosol reduction procedure to discourage infective agents carried by the spreading aerosol.

Besides that, they also mentioned the use of a rubber dam to help to provide safe work conditions. Proper lighting and noise reduction protocol was practised by the participants as their method of preventing occupational hazards. One dental surgeon (3%) expressed that a backup or reinforcement plan as occupational hazards prevention. Another preventive measure mentioned by the dental surgeons (3%) understood the manufacturers' instruction before using any instruments or materials. One dental surgeon (3%) stated that a thorough medical history of the patients must be obtained to let the dental surgeons be highly aware of any diseases.

## DISCUSSION

Occupational hazards can be divided into five categories, which are physical, biological, psychological, chemical and musculoskeletal disorders. In this study, we found out that 39% of the dental surgeons had to experience visual discomfort, similar to the study conducted by Sandeepa et al. (11), where 36% of the participants having eye injury (11). The visual problem could be due to low illumination and excessive brightness from the light source. We also found in the current study that 5% of the practitioners had a hearing issue. Modern dental equipment's noise and sound level are below 85db, and the risk of having hearing loss is negligible. Loss of hearing, acoustic stress, and impaired concentration power affected the individual exposed to frequencies above 3000 Hz regularly (6).

The frequency of needle stick injury among participants was 28.2%, lower than the study done by Reddy et al. (8) and Permi et al. (12), which reported that 59% and 48.4% of participants had experienced needle stick injury, respectively (8 & 12). Meanwhile, the frequency of the participants injured by cutting from a sharp object other than a needle was 38.4%. These different results can be due to the study populations' difference and the infection control programs regularly conducted in the polyclinic of the present study. Having a good training, not rushing and high precaution to be the best effective methods for preventing needlestick injuries.

Musculoskeletal disorders are common among dentists. The most-reported area of pain in this study was at the shoulder and neck (64%), followed by the lower back region (56%) and the wrist (44%). This finding is similar to the study by Lin et al. (13), in which the most common pain experienced at the shoulder (75.1%), neck (71.6%)



and the lower back (66.5%) (13). However, in a study done by Shrestha et al. (14), the most common pain was experienced at the lower back (79.4%), followed by neck (58.8%) and shoulder pain (47.1%) (14). Usage of medication to ease the pain also is assessed. Only 24% of the participants took the medication to ease the pain in the current study. Examples of the medication taken were analgesias, such as Arcoxia, Sodium Naproxene, Xanax, and Paracetamol.

The finding of correct posture while providing a dental treatment from this current study is quite similar to the study done by Shrestha et al. (14), which reported 82% of dental surgeons thought they were practising the correct posture (14). The current study also reported that 87.2% of dental surgeons take frequent breaks during dental procedures that are quite similar to the Shrestha et al. (14), where it was reported that 85.3% of the participant take frequent breaks between procedures. From this report, they also observed that frequent breaks during the work did not influence the frequency of neck pain or the pain in the shoulder.

Over half of the participants (84.6%) among dental surgeons who participated in this study had an indirect vision while treating maxillary teeth. The finding contradicted a study conducted by Chopra et al. (1), in which only 29.4% of participants used indirect vision during maxillary teeth treatment (1). Direct vision, while treating the maxillary teeth, could make dental surgeons bend their neck in order to get a clear vision, and could create excessive stress over the muscle and predispose them to musculoskeletal disorders.

Dentists are predisposed to numerous sources of stress, anxiety and depression. In this study, 33.3% of them are stressed out when their patient is not satisfied with the treatment given. It was supported by a study involving 3500 dentists, 38% of whom were surveyed as being always anxious (15). The reason for the greater contribution of this stress among dental surgeons could be uncooperative patients, over workload, time pressures, patient demands, low self-esteem and challenging environment (3).

The categorisation of the participants' preventive measures taken was based on the guidelines prepared by the OSH, Hong Kong, to prevent occupational hazards (10). The result is categorised into five main themes; the elimination of workplace hazards, engineering control measures, administrative measures, standard precautions, and healthy lifestyles.

About 15% of thirty-nine participants practised proper waste disposal in their work environment. The previous study reported that sharp needles, blades and broken instruments are among the hazardous sources that can cause cuts, and are also potential infection delivery agents (3). Proper disinfection has also been included

as one of the workplace hazards elimination by 3%. According to the glossary by the Centers for Disease Control and Prevention (CDC), disinfection is defined as the thermal or chemical destruction of pathogens (16). The proper disinfection of the work environment, therefore, helped to prevent possible cross-infection (16).

Dental surgeons (18%) stated magnification devices such as the dental loupes and microscopes as one of the preventive measures they took during their dental practices as they effectively prevented traumatic injury to the spinal column following prolonged static body postures. Another preventive measure reported by dental surgeons falling within this specified strategy is the proper airway system (8%), where low ventilation rates are associated with increased infection rates.

The use of isolation rooms when treating patients who are contagious or potentially contagious was reported by 5%. Isolation refers to measures taken to prevent pathogenic spread from one patient to another patient, healthcare workers, and even visitors. Two dental surgeons (5%) reported performing aerosol reduction procedures to discourage infectious agents transported by the spreading aerosol. Our oral cavity had fungi and viruses from the respiratory tract. Some of the microorganisms can undergo changes that lead to alteration of its virulence and pathogenicity characteristics.

Employers should provide a safe work environment and provide employees with clear guidelines to ensure the best possible safety in the workplace. About 54% of dental surgeons included proper posture or positioning during the dental procedure as one of the preventive measures they took to prevent or minimise occupational hazards. Allowing the dental surgeons to have work rotations or breaks between the procedures was stated by 26% of dental surgeons to minimise fatigue and possible dental mishaps caused by an excessive workload. Besides, 10% of dental surgeons listed regular inspections of the operating dental chair and the instruments.

Over half of the dental surgeons (67%) included PPE as their preventive measures for occupational hazards. This finding is supported by the guidelines of the United States Occupational Safety and Health Administration, which stated that PPE was used to minimise exposure to hazards that may lead to severe injuries and illnesses (16).

It is recommended that dental surgeons adopt a healthy lifestyle despite a busy schedule of working. About one-third (26%) of dental surgeons included vacation, rest, massage and exercise as their approach to control occupational hazards incidence. It is supported by OSH, Hong Kong that a healthy lifestyle includes enough rest and sleep, a balanced diet, regular exercise, and also refraining from smoking and alcohol (10).

## CONCLUSION

Work-related pain is common among dental surgeons. The most affected pain area is the shoulder and neck, followed by back pain and wrist pain, although they are usually moderate. Female dental surgeons who had working experience between 11-20 years, practise better working positions than male dental surgeons and working experience 1-10 years. They practise a correct posture, break in between procedures and use indirect vision while treating maxillary teeth. Occupational hazards can be alleviated effectively using a comprehensive approach that includes preventive education, postural and positioning strategies, and frequent breaks with stretching. It is essential for dentistry to incorporate these strategies into practise that will improve productivity and enhance occupational safety and health.

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