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Prevalence, Awareness and Preventive Measures of Occupational Hazards among Dental Professionals

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Abstract
Aims: This study was conducted to assess the prevalence, awareness, and health results of occupational hazards amongst Iraqi dentists and evaluate their preventive practices.
Materials and Methods: from March to June 2025, A descriptive cross-sectional survey utilizing a bilingual self-administered questionnaire was handed out manually and online among 201 dentists and senior students aged between 20-65 years, chosen by convenience sampling.
Results: The majority of participants were aged 23-29 years (45%), with a female predominance (60%). Most respondents (53%) had 1-5 years of experience. In physical hazards, musculoskeletal pain was widespread, with lower back pain being the most common at 67.7%. Exposure to infection and injury in biological hazards was also prevalent, and the most reported infection was herpes simplex at 5.5%. In chemical hazards and Allergic reactions to dental materials, bio-aerosols were reported by 39.3%, being the most frequent sensitizing material. Tension headache was commonly reported by 59.2% in regard to facial pain. There were also varying levels of stress reported. In regard to preventive methods, 85% take Hepatitis B vaccination, and most of them adhere to infection control and personal protective equipment**.**
Conclusion: Iraqi dentists face many occupational hazards, having multiple risks on their health, with psychological stress, musculoskeletal disorders and radiation exposure being the most prevalent. These issues are escalated by limited awareness, unsafe procedures, and inadequate preventive measures. The findings emphasize the urgent need for directed interventions, including improved training for occupational hazards prevention, reinforced regulatory compliance, and systemically organized wellness policies for enhanced workplace safety in dental practice.
Keywords: Occupational hazards, preventive measures, infection control, musculoskeletal disorders, dental practice.

1. Introduction

Dentistry is increasingly considered a high-risk job due to constant exposure to a wide range of job-related hazards [1]. These include facial pain (tension-type headache, temporomandibular joint disorders, and bruxism), visual and auditory stress from noise and extended near-vision acts [2-6]. physical risks such as exposure to ionizing (X-rays) and non-ionizing radiation (LED curing lights), musculoskeletal disorders (e.g., neck, shoulder, and lower back pain) as a result of constant postures and repetitive movements and a biological risk that results from an increased risk of airborne infections and blood borne pathogens (e.g., HIV, HBV, and HCV), as well as bio aerosols that may

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contain bacteria, fungi, and patient-derived particles. These risks can emerge from routine contact with blood, saliva, aerosols, and surgical tissues [7-9]. Chemical hazards implicate respiratory or dermal irritation from disinfectants, radiographic developing agents, and volatile resin monomers, as well as allergic reactivity to latex gloves and dental materials [10-12]. Chronic professional stress, which results from strict clinical lists, high patient anticipation, and legal obligations, is the primary cause of psychological hazards. These agents lead to mental fatigue, burnout, and poor health outcomes [13-15]. The aim of this study is to assess the prevalence, knowledge, and health results related to occupational hazards, as well as the commitment to preventive measures among Iraqi dentists. Prior research shows there is little data on Iraqi dentists' awareness of the risks and poor adherence to preventive measures, which has an influence on the health of clinicians and patients [16].

2. Methods

2.1 Study design

A cross-sectional survey was carried out to assess the prevalence, level of awareness, and preventive measures concerning occupational hazards among dental professionals. A self-administered questionnaire (SAQ) was applied to collect data, and it was dispensed in paper form at Baghdad's dental clinics as well as online using Google Forms. For this research, a three-section bilingual questionnaire was formed:

1. Demographics (gender, age, experience, and location).
2. Workplace Risks (musculoskeletal disorders exposure, infections, hearing/vision problems).
3. Awareness and Prevention (vaccination, posture, safety procedures, and personal protective equipment use).

"Other" options for open-ended answers were added to multiple-choice questions. The appendix contains the complete questionnaire.

2.2 Participants

A total of 201 participants aged between 20 and 65 were enrolled, including final-year undergraduate dental students and postgraduate dentists, using a suitability sampling technique. In Iraq, taking a strong part in dental education or clinical workout was critical for eligibility.

2.3 Data collection and analysis

Over three months, data were gathered via a descriptive cross-sectional survey using a bilingual, self-administered questionnaire distributed both online and manually. Participants were informed about the study objectives and confidentiality assurances prior to participation. Reminders were sent to raise the response rate. All responses were gathered and entered into a spreadsheet for analysis. The frequencies of occupational hazard prevalence, awareness, and preventive practices among respondents were examined using descriptive statistics.

3. Results and Discussion

The survey involved a total of 201 dental practitioners from various areas of Iraq; the ages of respondents range from 20 to 65, and the majority are between 23 and 29. Professionals aged 20 to 22 occupy 37% of the total, followed by those aged 23 to 29 make up 45% and those aged 30 and above, at 18%. Gender is presented as 60% female and 40% male, suggesting that respondents' gender diversity is fairly distributed. At the same time, there is a preponderance of early-career

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professionals, with 53% having 1–5 years of experience, 27% having 5–10 years, and 20% having above 10 years.

Prevalence

As shown in Fig. 1, the survey showed that musculoskeletal disorders (MSDs) were highly prevalent, with lower back pain being the most common at 67.7%, followed by neck pain, shoulder pain, hand and wrist pain, and general muscle pain. Only 9.5% of respondents reported experiencing no pain.

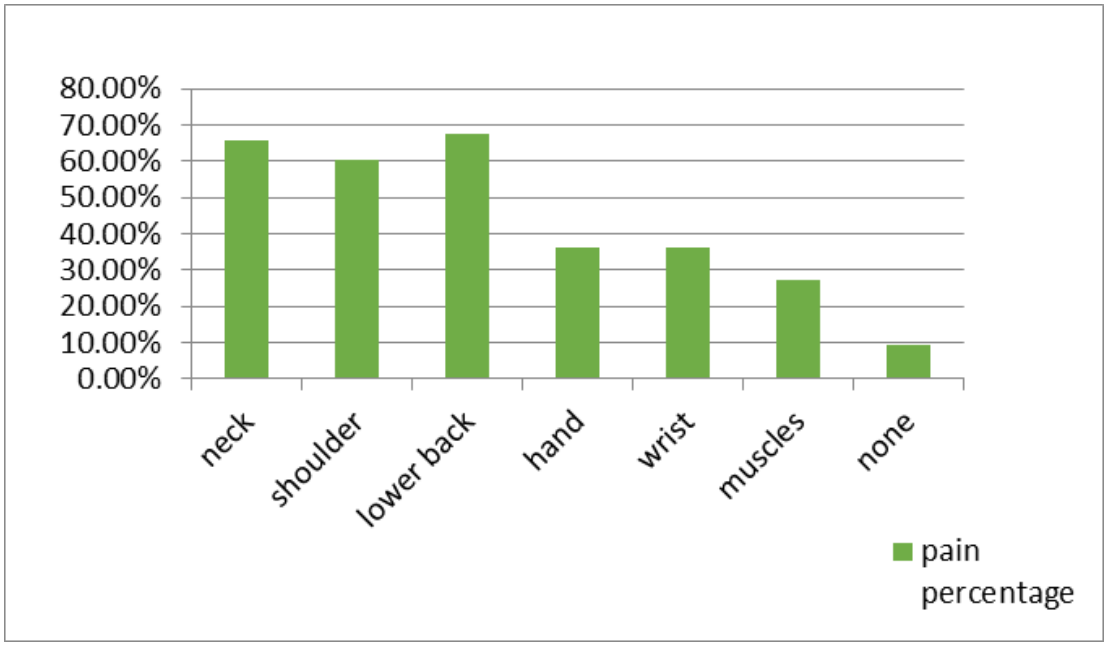

Fig. 1 Percentage of pain regarding musculoskeletal hazards among respondents.

Allergic reactions and exposure to chemical hazards (e.g., latex, sterilizing agents, dental materials, and bio-aerosols) were also clearly observed. Bio-aerosols were the most common sensitizing material, reported by 39.3% of respondents, while the most frequent allergic reaction was skin problems such as redness, dryness, and cracking, reported by 31.8%, as illustrated in Fig. 2.

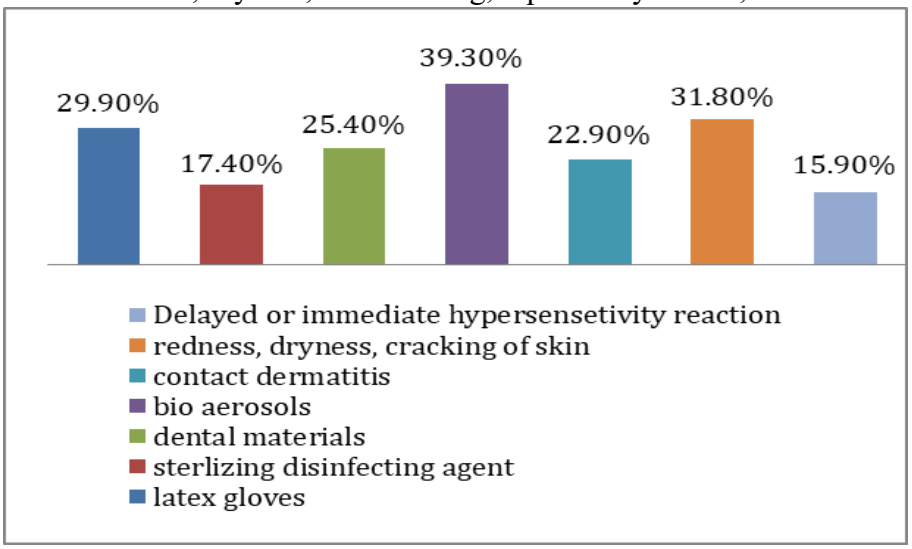

Fig. 2 Percentage of exposure to allergic materials and allergic reactions among respondents.

Meanwhile, 39.8% of people did not show any type of allergy to these materials, and 50.2% did not report any allergic reactions. Fig. 3 shows that another type of physical hazard reported by the respondents was vision-related issues, with eye pain, fatigue, and discomfort being the most

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common, reported by 58.2%. Hearing hazards were also noted, with headaches and impaired concentration being the most frequently reported symptoms, at 62.2% and 17.4%, respectively.

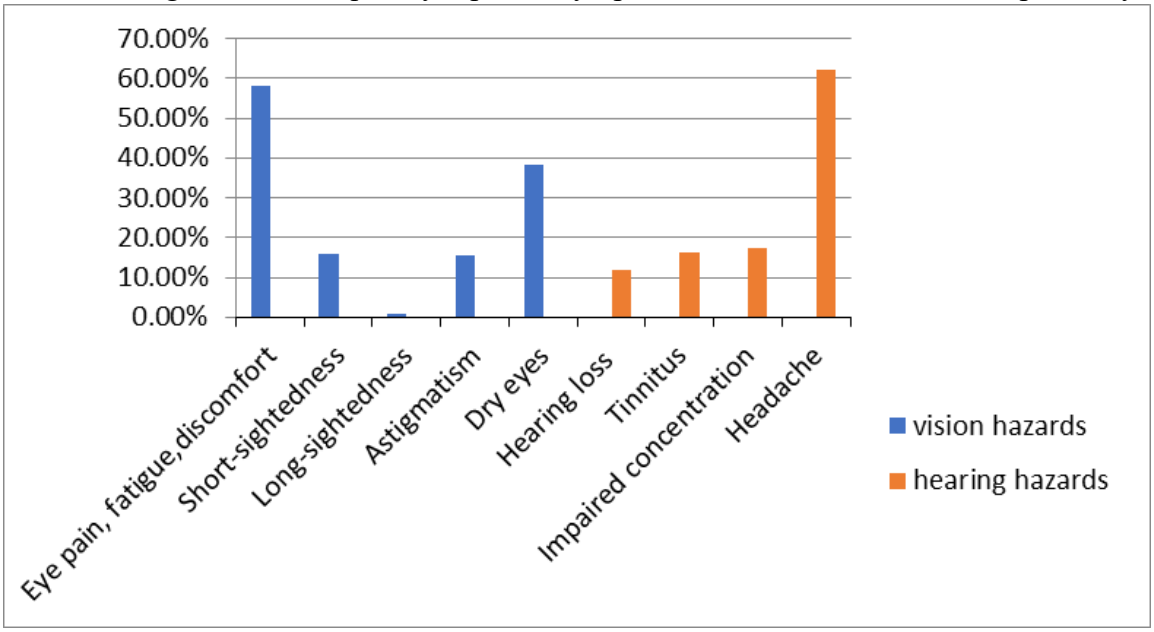

Fig. 3 Vision and hearing hazards among respondents.

As shown in Table 1, herpes simplex was the most common reported infection at 5.5% of the respondents, followed by hepatitis B at 1.5%, while aerosol contamination was the highest reported biological hazard in this study, representing 78.1% followed by needle stick injuries, which were reported by 64.2% of respondents. Facial pain disorders, including migraines, temporomandibular joint (TMJ) problems such as bruxism, and tension headaches, were frequently reported, with tension headaches being the most common at 59.2%. Furthermore, stress levels among the participants were rated on a scale from 0 to 10, with majority of the responses tending toward the higher end of the scale. Also, about 72.1% of respondents felt that their work negatively affects their daily life.

Table 1. Percentages of exposure to hazards among respondents.

Hazard	Options	Percentage
Biological hazards (infections)	Hepatitis B	1.5%
	TB	0%
	Herpes simplex	5.5%
	HIV	1.5%
	AIDS	0%
	None	94.5%
Biological hazard (injuries)	Needle stick injury	64.2%
	Aerosol contamination	78.1%
	None	8.5%
Facial pain conditions	Migraine	11.9%
	TMJ problem (bruxism)	34.8%
	Tension headache	59.2%
	None	24.9%
Psychological hazards (stress level)	0	0.5%
	1	0%

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	2	0%
	3	1%
	4	4.5%
	5	6%
	6	13.4%
	7	22.4%
	8	26.4%
	9	13.4%
	10	12.4%
Do you feel your work impacts your normal life negatively in any way? For example, lack of freedom, family issues, heavy workload, and high responsibility?	yes	72.1%
	no	27.9%

Lastly, radiation issues ranked lowest, with chronic skin cancer, bone marrow suppression, infertility, harm to the fetus, eye damage, head and neck tumors, leukemia, and thyroid cancer all reported at 0%, while only thyroid cancer was reported by 0.5% of respondents.

Awareness and prevention:

- **Hepatitis B vaccination:** 76.6% of respondents are fully vaccinated, while 23.4% are unclear of their status and have incomplete vaccinations.
- **Personal protective equipment (PPE) usage:** 97% stated that they always wear gloves and masks; 55% wear them daily, while 45% wear face shields infrequently or never. Concurrently, 3% admitted to not always using PPE.
- **Infection control compliance:** There is a good adherence to the recommended hand hygiene practices reported by 86% of participants both before and after each visit. 98% of instruments are adequately disinfected. 65% of garbage is disposed of properly, and 79% of participants clean their surroundings appropriately.

This study explores the awareness, prevalence, and prevention of workplace hazards among dentists in Iraq. The findings show that even though a variety of occupational health issues are faced by many dental practitioners, awareness and preventive measures remain insufficient in many areas, stressing the necessity for safety protocols, advanced workplace ergonomics and stress management strategies. The results of this study showed that musculoskeletal disorders were one of the most prevalent occupational hazards reported by the respondents, and lower back pain was the most commonly experienced condition, followed by neck pain, shoulder pain and hand and wrist pain. This aligns with Vodanović et al. [17], who also discovered that 55-80% of dentists have pronounced musculoskeletal disorders, with back pain representing the highest fraction of cases among them. These conditions arise because of poor ergonomics, prolonged static postures and lack of support during procedures. This highlights the need for ergonomic modifications in dental practice and physical activity to reduce the effects of the mentioned hazards [17]. According to the results obtained from the participants, several medical conditions were related to facial pain such as bruxism, disorder in the TMJ, migraine and tension headache. Moreover, some bad habits can aggravate the condition, like severe clenching and incorrect positioning.

These problems are worsened by the fact that 81% of participants do not take breaks in between visits. This comes in relation to a study by Wieckiewicz et al. [18], investigating psychosocial aspects of bruxism, found that chronic stress, exacerbated by contemporary lifestyle factors such as

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high-pressure work situations, directly associates the elevated stress levels in dental practice with an increase in bruxism and subsequent facial pain among dentists.

Dental practitioners encounter radiation hazards, including ionizing radiation (from X-rays, which pose deterministic consequences such as cataracts and stochastic effects like cancer) and non-ionizing radiation (from curing lights, which can lead to visual damage)17, and this was witnessed in our survey as most respondents took x-rays daily while 70.1% of X-ray rooms were found to be unleaded, and the majority of respondents did not wear lead aprons or shielding, additionally more than half of the participants reported experiencing eye strain due to UV exposure from dental light-curing devices, yet did not use protective shields or UV-blocking glasses, necessitating strict protective measures such as barriers, monitoring badges, and UV-blocking eye wear. Many dental professionals in this study reported eye fatigue or discomfort and dry eyes due to extended close-up work and poor lighting, yet not all of them reported using protective eyewear. This comes in line with the researcher JoNell Bly, who found in 2020 that dentists frequently experience visual strain and decreased acuity due to prolonged focus on small operative fields under inadequate illumination; therefore, Bly advised routine eye exams, adjustable magnification systems, and appropriate operatory lighting [19].

Herpes simplex has been reported by some participants; however, most of them had no previous infection. Yet needle stick injuries and aerosol contaminations have been mentioned. This usually occurred during recapping of the dental syringe or at the needle's disposal. Nevertheless, most of the answers were encouraging since most of the dentists wore protective masks and gloves and followed the World Health Organization standards for sterilization. Because dental professionals are exposed to blood-borne viruses like HIV through needlestick injuries, contaminated tools and aerosols, preventing infection is still a major problem [8]. In 2018, a study conducted by Kobza et al. recommended good ventilation systems and wearing protective equipment to minimize the risk of infectious aerosols during treatment, which poses a serious occupational health risk [9].

Many participants suffered from allergic reactions from bioaerosols, dental materials and products, such as latex gloves and disinfectant materials, dermatitis and hypersensitivity reactions have also been reported. This will advocate the importance of finding alternatives with fewer allergic reactions. This comes in agreement with Ghambir et al. [11], due to improper ventilation procedures, acrylate proved to cause respiratory problems such as asthma and contact dermatitis. Also, prolonged contact with glove materials, dental polymers based on methacrylate, caused an allergy.

In this study, it was found that occupational stress was also one of the highly prevalent hazards among dental professionals, with many reporting negative impacts on their personal lives due to work demands, not engaging in regular physical activities, and working for extended hours. Similarly, a study by Pontes et al. done in 2024 examined the prevalence and effects of stress among dentists and discovered that the field is generally stressful, given the physical, chemical, biological, and mental risks involved, which can lead to anxiety, depression, burnout, and perhaps contemplation of suicide. According to the study, eliminating the mentioned stressors can enhance mental health outcomes, lower the risk of chronic diseases, and extend the lifespan and career of dental professionals [14].

4. **Conclusion**

This study highlights the high incidence of occupational risks among Iraqi dental practitioners, involving musculoskeletal problems, psychological stress, and exposure to harmful agents like bioaerosols, noise, and radiation. Although the protocols of infection control are acceptable, not all

areas of occupational safety have been addressed sufficiently. The results point to the essential need for enhanced ergonomic practices, good radiation protection, and the importance of psychological well-being as a pivotal role in occupational health. Raising awareness for the importance of wearing protective equipment regularly, and emphasising the importance of preventive measures such as continuous training, safety enforcement, and wellness at work initiatives, are the major points to mitigate the long-term risk.

Ethical approval:

This study was approved by the Ethics Committee of the University of Baghdad's College of Dentistry in accordance with the Helsinki Declaration of Ethical Principles for Medical Research with Human Subjects (Project no.1057725). The consent form was created in accordance with the Committee for Ethics/College of Dentistry, University of Baghdad's recommendations and electronically collected with the Google Form. The participants understood the purpose of the study and the confidentiality of their personal data when they agreed to complete the Google Form questionnaire.

Conflict of Interest: The authors declare no potential conflicts of interest.

Limitations of Study:

The small sample size of the present study, in addition to the relatively short time, would preclude precise data. A larger sample size is recommended to have a full vision of the occupational hazards related to dental practice.

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