


Impact of Noise on the Hearing and Tinnitus among Dental Students, Interns, and Dental Practitioners: A Cross-sectional Study

Souad H Alhaider¹, Rafi A Togoo², Reem M Hakami³, Noha S Alzamil⁴, Abeer A Alassmi⁵, Aseelah A AlShahrani⁶, Raida A Moadi⁷, Tasneem S Ain⁸ 

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ABSTRACT

Aim: To assess the impact of noise on hearing and tinnitus among dental students, interns, and dental practitioners.

Materials and methods: The presentation was carried out on 100 subjects, including dental students, interns, and dental faculty, using a self-administered questionnaire for demographic data, information regarding noise exposure, and precautions taken by dental professionals in dental set-up. To analyze the knowledge and awareness of dental professionals regarding the impact of noise on hearing and the protection of ears, 14 well-constructed questions were framed and asked of the subjects. The data obtained were subjected to statistical analysis.

Results: The majority of subjects were consultants, followed by technicians and dental students. Maximum subjects, 62%, had 5–10 years of experience. The maximum exposure was 4–6 hours, with only 2% of subjects diagnosed with hearing loss, but 29% complained of tinnitus. Most dental professionals were not using hearing protective aids, and they did not even feel that the noise of the dental set-up could cause hearing loss or tinnitus. Few felt headaches and sleep disturbance. Noise levels were found to be maximum in the laboratory, followed by the Department of Periodontics, Restorative Dentistry, and Pedodontics, with a statistically significant relation (p -value < 0.05) between the specialty and level of hearing loss.

Conclusion: Around 2% of the subjects were diagnosed with hearing loss, while 29% complained of tinnitus, which was minimal and intermittent. The dental professionals had limited knowledge about the effects of noise levels on health.

Clinical significance: The present study provides insight into the impact of noise generated in dental set-up due to various dental equipment and thus the dental professionals and students would take necessary precautions as well as treat work-related hearing disorders at the earliest.

Keywords: Dental professionals, Dental specialties, Dental students, Noise.

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INTRODUCTION

In general, noise is considered an intolerable sound, a kind of pollution measured in decibels (dB).¹ Noise related to occupation² is an intolerable sound experience in work settings that can produce auditory and non-auditory impacts like tinnitus, headache, increased stress, mental fatigue, irritation, respiratory rate, heart rate, and blood pressure. Prolonged exposure to such noise can cause harmful effects like insomnia, loss of hearing, and deterioration of life quality.^{3,4}

Hearing loss due to occupation is the second most common occupational disease affecting professionals. Occupational hearing loss is an irreversible preventable condition causing detrimental effects on the ears due to increased noise levels for a prolonged period. The dental set-up has various types of equipment like ultrasonic scalers, handpieces, and suction devices, generating noise that can impact dental professionals. Initially, dental equipment produced noise exceeding the safety limit of 80 dBA. However, nowadays, due to technical improvements, the sound levels have been set within the safety limits of the National Institute for Occupational Safety and Health (NIOSH) (85 dBA at 40 hours per week).^{5,6}

Dental professionals, students, practitioners, and technicians are exposed to different dental types of equipment while working in different dental departments leading to various harmful effects.

¹⁻⁷Department of Pediatric Dentistry & Orthodontic Sciences, College of Dentistry, King Khalid University, Abha, Saudi Arabia

⁸Division of Preventive Dentistry, College of Dentistry, King Khalid University, Abha, Saudi Arabia

Corresponding Author: Tasneem S Ain, Division of Preventive Dentistry, College of Dentistry, King Khalid University, Abha, Saudi Arabia, Phone: +966550540602, e-mail: tain@kku.edu.sa

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Different specialty treatments can produce different noise levels that need to be quantified to take suitable preventive measures.

Various studies have been conducted to assess the amount and degree of hearing loss based on profession, dental specialties, experience of practice, age of dental professionals, time, type, and intensity of noise exposure.⁷⁻¹² Few studies have been reported in different regions of Saudi Arabia, but studies lack the assessment of dental specialties with hearing loss.^{1,13,14} Thus, the present study

was conducted to assess the impact of noise on hearing and tinnitus among dental students, interns, and dental practitioners.

MATERIALS AND METHODS

The present analytical cross-sectional observational study was carried out on 100 subjects, including dental interns, students, and faculty members. The study was conducted from May to November 2021. All the dental students, interns, staff, dental assistants, and technicians willing to participate were included in the study. Those who underwent some treatment/surgeries related to the hearing were excluded from the study. Informed written consent was obtained from all subjects prior to their enrolment in the study. To analyze the knowledge and awareness of dental professionals regarding the impact of noise on hearing and the protection of ears, 14 well-constructed close-ended questions were framed and asked. The validity of the questionnaire was evaluated and found to be appropriate ($\alpha = 0.85$). The study was conducted following the Declaration of Helsinki and was approved by the Ethical Committee of the Institute (ECM, 2021: IRB/KKUCOD/ETH/20021-22/038). The demographic data included the gender distribution, years of experience, and occupation details of the subjects. The response to all these questions was recorded in a face-to-face manner. The confidentiality of the responses was assured to the respondents. The level of noise generated by dental equipment in different specialty departments and their impact on the hearing loss of subjects were also assessed. For hearing tests "online application" (mini-hearing test) was used by the examiner. The application categorized the hearing loss into—none, slight, mild, and moderate, which was expressed in numerical as 0, 1, 2, and 3, respectively.

The data obtained were analyzed using IBM Statistical Package for the Social Sciences version 20.0 software. Descriptive statistics, that is, frequencies and percentages, were computed. The comparative analysis was done using the Chi-squared test.

RESULTS

Out of 100 participants, 57% were males, maximum belonging to 30–40 years of age-group. A total of 41% of the subjects were faculty members, 21% were technicians/lab assistants, 20% were dental students, and 18% were interns. Maximum subjects, 62%, had 5–10 years of experience (Table 1).

Response to the questionnaire was assessed. The maximum exposure was 4–6 hours, with only 2% diagnosed with hearing loss, but 29% complained of tinnitus, which was minimal and intermittent. Most dental professionals were not using hearing protective aids, and they did not even feel that the noise of the dental set-up could cause hearing loss or tinnitus. About 43% felt headaches after work, but most did not suffer from sleep disturbance (Table 2). Noise levels were found to be maximum in the laboratory rooms (with a means value of 77.33 ± 1.36), followed by the Department of periodontics (73.1 ± 2.40), restorative dentistry (72.2 ± 2.69), and pedodontics (71.33 ± 1.50). A statistically significant relation (p -value < 0.05) was observed between specialty and level of hearing loss (Table 3).

The maximum noise levels were detected in the dental laboratory. It was observed that dental professionals and students had limited knowledge about the effects of noise levels on health, and they were not even aware of using hearing aid precautions during work.

DISCUSSION

In the dental workplace, hearing impairment and tinnitus are common problems due to exposure to various noise-producing equipment in different dental specialties and laboratories. Nevertheless, dental healthcare workers are not careful regarding these hearing issues and pay little attention to precautionary measures. Besides dentists, assistants, and technicians, dental interns, and students should also remain vigilant regarding hearing disorders encountered when they start doing clinical and laboratory work in dental offices (especially while using high vacuum suction, air-rotors, micromotors, scalers, etc.).

Thus, the present survey was conducted to assess dental healthcare workers' incidence, awareness, and knowledge about occupation-induced hearing disorders and tinnitus. The dental interns, students, and dental health care workers, that is, dentists, consultants, specialists, dental technicians, and assistants, were assessed.

About 2% of the dental healthcare workers encountered work-related hearing loss, and 29% suffered from tinnitus. Similar to the current study, Elmehdi¹⁴ found that dental professionals suffered from hearing disorders, but the prevalence in their study was much higher. They found that 37% of the professionals reported tinnitus, and 21% had hearing-related problems. Sidley¹⁵ found that 31.85% of subjects in South Africa suffered from tinnitus. A comparatively lower percentage of hearing impairment in our study indicates that the dental equipment used in our dental set-up is technically improved and produces noise within the safety limits of NIOSH.

In the present study, it was observed that maximum dental professionals were exposed to 4–6 hours of sound in the dental set-up; they reported either no or intermittent tinnitus that was either not or minimally bothering them. Myers et al.,¹⁰ also observed that time of exposure and years of practice directly influence the kind of tinnitus affecting the professionals of Oklahoma Dental Association.

On assessing the knowledge and awareness among dental professionals, it was found that although most of them realized that

Table 1: Frequency distribution of subjects based on demographic data

Parameters		Frequency	Percentage
Gender	Female	43	43.0
	Male	57	57.0
Age-groups	20–25	31	31.0
	25–30	27	27.0
	30–40	36	36.0
	40–50	6	6.0
Occupation	Consultant	4	4.0
	Dental intern	18	18.0
	Dental students	20	20.0
	General dentist	15	15.0
	Specialist	22	22.0
Experience	Technician/assistant	21	21.0
	2 years or less	13	13.0
	5–10 years	62	62.0
	10–15 years	16	16.0
	15–20 years	7	7.0
>20 years	2	2.0	
Total		100	100

Table 2: Distribution of study subjects according to responses to questionnaire

Questionnaire		Frequency	Percentage
Have you been diagnosed with a hearing loss?	No	92	92.0
	not sure	6	6.0
	Yes	2	2.0
How many hours a day do you exposed to loud sounds in dental field?	2 hours or less	33	33.0
	4–6 hours	46	46.0
	8–10 hours	21	21.0
Do you experience tinnitus (ringing buzzing, or noises in the ears)?	No	71	71.0
	Yes	29	29.0
If you answered yes to previous questions, how bothersome is your tinnitus?	Highly	3	3.0
	Minimum	28	28.0
	Not at all	69	69.0
Is your tinnitus constant or intermittent?	Constant	4	4.0
	intermittent	29	29.0
	No thing	67	67.0
Do you wear ear protection in your office?	No	71	71.0
	Sometimes	10	10.0
	Yes	19	19.0
Do you feel that your work as a dentist has caused a change in your hearing?	No	54	54.0
	Not sure	28	28.0
	Yes	18	18.0
Do you feel that your work has caused a change in your tinnitus?	No	52	52.0
	Not sure	34	34.0
	Yes	14	14.0
During the workday, would you describe your office as?	Very quiet	5	5.0
	Somewhat quiet	12	12.0
	Somewhat noisy	71	71.0
	Very noisy	12	12.0
Do you suffer from sleep disturbance?	No	62	62.0
	Not sure	8	8.0
	Yes	30	30.0
Do you suffer from frequent headaches?	No	41	41.0
	Not sure	16	16.0
	Yes	43	43.0
Are you exposed to loud sounds outside the dental field (for example; listening to loud music, sound traffic, construction work)?	No	39	39.0
	Not sure	12	12.0
	Yes	49	49.0
If you answered yes to previous question, how many hours a day do you expose to loud sounds outside dental field?	2 hours or less	37	37.0
	4–6 hours	23	23.0
	>10 hours	1	1.0

the dental environment is somewhat noisy, they were mainly unaware that dental equipment could impact their hearing ability. Subjects mentioned that they were not using any protective measures to protect their ears. Many of them reported sleep disturbance and headaches. Similar to the current study, Dierickx et al.,¹⁶ observed different grades of hearing loss, tinnitus, and annoyance among dental professionals. Similarly, Ma et al.,¹⁷ revealed that the sharpness of the sound of dental equipment is one of the vital risk factors causing nausea, headache, fatigue, irritation, hypertension, and tinnitus among dental professionals in Hong Kong.

It was also found that many dental professionals were exposed to high sound levels outside the dental field (such as, listening to loud music, the sound of traffic, and construction work) for

around 2–4 hours. Besides dental noise, this could also be one of the additive reasons for tinnitus and headache among the study subjects. The level of noise produced in different specialties and its impact on hearing loss among dental professionals and other dental personnel was evaluated. It was observed that the noise levels were maximum in the laboratory, followed by the Department of Periodontics, Restorative Dentistry, and Pedodontics. Statistically, a significant relation (p -value < 0.05) was observed between noise levels of specialty and level of hearing loss. Thus, this indicates that dental noise significantly impacts hearing ability among study subjects with nondental noise.

Similar results were found in a study by Baseer et al.,¹ who found that sounds generated from high-speed turbines, high-volume

Table 3: Effect of dental-specialty on the impact of noise

Specialty	Level of hearing loss		Noise levels	
	Score	Number of subjects	Mean	Standard deviation
Endodontics	0	2	66.1667	1.94079
	1	6		
	2	2		
	3	0		
Pedodontics	0	2	71.3333	1.50555
	1	3		
	2	3		
	3	0		
Periodontics	0	2	73.1667	2.40139
	1	2		
	2	2		
	3	0		
Prosthodontics	0	4	69.1500	3.67301
	1	4		
	2	4		
	3	0		
Restorative dentistry	0	8	72.2167	2.69623
	1	2		
	2	2		
	3	0		
Oral and maxillofacial surgery	0	2	67.7500	3.59374
	1	2		
	2	12		
	3	0		
Laboratory	0	6	77.3333	1.36626
	1	4		
	2	6		
	3	8		
Sterilization	0	2	67.8333	4.05249
	1	8		
	2	2		
	3	0		
Specialty vs hearing loss	<i>p</i> -value = 0.023*			

**p*-value < 0.05 is significant; analysis of variance statistical analysis

suction, ultrasonic scaler, amalgamators, etc., could be dangerous to dental professionals. Mojarad et al.,¹⁸ and Qsaibati and Ibrahim,¹⁹ also advocated that dental equipment can be hazardous for dental professionals leading to hearing loss and other disorders.

In 2021, the World Health Organization (WHO) launched the World Report on Hearing to prevent occupation-induced hearing impairments, stating a timely worldwide action to address and control hearing loss during a lifetime. WHO guidelines ensure a healthy lifestyle and low-cost hearing screening at regular intervals during lifetime.^{20,21}

Thus, appropriate precautions and preventive measures are beneficial in the clinical and laboratory set-up of dentistry to improve the quality of work. The implementation of these measures depends on the economic and social set-up of the country. Until now, limited studies have been reported in the literature that reveals specialty work and its effect on hearing disorders among dental healthcare workers in Saudi Arabia. Thus, the present study

can provide insight related to such commonly ignored topics, thus helping dental professionals take precautions and treat work-related hearing disorders at the earliest.

Limitations

The sample size is small. So, further studies should be planned to involve a larger sample and more objective evaluation by involving otolaryngologist specialist examinations could widen the applicability of results.

CONCLUSION

Around 2% of the subjects were diagnosed with hearing loss, while 29% complained of tinnitus, which was minimal and intermittent. The maximum noise levels were detected in the dental laboratory. It was observed that dental professionals and students had limited knowledge about the effects of noise levels on health, and they were not even aware of using hearing aid precautions during work. Thus, dental professionals and dental students should be given adequate awareness regarding the detrimental effects of noise generated during dental procedures, and protective measures for the same should be made compulsory during practice in dental clinics.

ORCID

Tasneem S Ain  <https://orcid.org/0000-0003-0021-7317>

REFERENCES

1. Baseer MA, Al Saffan A, AlMasoud SM, et al. Noise levels encountered in university dental clinics during different specialty treatments. *J Family Med Prim Care* 2021;10(8):2987–2992. DOI: 10.4103/jfmpc.jfmpc_966_20
2. World Health Organization. Environmental burden of disease series, no. 9. In occupational noise: Assessing the burden of disease from work-related hearing impairment at national and local levels 2004 Geneva. Switzerland World Health Organization (occupational noise: assessing the burden of disease from work-related hearing impairment at national and local levels). Report No.: 9. ISBN 92 4 159192 7
3. Tzivian L, Winkler A, Dlugaj M, et al. Effect of long-term outdoor air pollution and noise on cognitive and psychological functions in adults. *Int J Hyg Environ Health* 2015;218(1):1–11. DOI: 10.1016/j.ijheh.2014.08.002
4. Kadanakuppe S, Bhat PK, Jyothi C, et al. Assessment of noise levels of the equipments used in the dental teaching institution, Bangalore. *Indian J Dent Res* 2011;22(3):424–431. DOI: 10.4103/0970-9290.87065
5. Burk A, Neitzel RL. An exploratory study of noise exposures in educational and private dental clinics. *J Occup Environ Hyg* 2016;13(10):741–749. DOI: 10.1080/15459624.2016.1177646
6. Ramsey R, Greenough J, Breeze J. Noise-induced hearing loss in the military dental setting: A UK legislative perspective. *BMJ Mil Health* 2020;166(E):e53–e56. DOI: 10.1136/jramc-2018-001150
7. Bahannan S, El-Hamid AA, Bahnassy A. Noise level of dental handpieces and laboratory engines. *J Prosthet Dent* 1993;70(4):356–360. DOI: 10.1016/0022-3913(93)90222-a
8. Khaimook W, Suksamae P, Choosong T, et al. The prevalence of noise-induced occupational hearing loss in dentistry personnel. *Workplace Health Saf* 2014;62(9):357–360. DOI: 10.3928/21650799-20140815-02
9. Messano GA, Petti S. General dental practitioners and hearing impairment. *J Dent* 2012;40(10):821–828. DOI: 10.1016/j.jdent.2012.06.006
10. Myers J, John AB, Kimball S, et al. Prevalence of tinnitus and noise-induced hearing loss in dentists. *Noise Health* 2016;18(85):347–354. DOI: 10.4103/1463-1741.195809

11. Goswami M, Singh D, Vashist B, et al. Noise levels and sound pollution associated with various operative procedures and equipments in a pediatric dental environment-a clinical study. *J Oral Biol Craniofac Res* 2017;7(3):182–187. DOI: 10.1016/j.jobcr.2017.06.003
12. da Cunha KF, Dos Santos RB, Kliem CA Júnior. Assessment of noise intensity in a dental teaching clinic. *BDJ Open* 2017;3:17010. DOI: 10.1038/bdjopen.2017.10
13. Al Shayea Eman I. Prevalence of noise induced hearing loss and other associated risk factors among Saudi dental professionals. *J Res Med Dent Sci* 2020,8(4):17–23. <https://www.jrmds.in/articles/prevalence-of-noise-induced-hearing-loss-and-other-associated-risk-factors-among-saudi-dental-professionals-54359.html>
14. Elmehtdi HM. Noise levels in UAE dental clinics: health impact on dental healthcare professionals. *J Public Health Front* 2013;2:189–192. DOI: 10.5963/PHF0204002
15. Sidley CG. Prevalence of tinnitus and hearing loss in south African dentists and an investigation into possible connections with noise levels and frequencies in the dental environment [unpublished data] Stellenbosch, South Africa: University of Stellenbosch; 2004.
16. Dierickx M, Verschraegen S, Wierinck E, et al. Noise disturbance and potential hearing loss due to exposure of dental equipment in Flemish dentists. *Int J Environ Res Public Health* 2021;18(11):5617. DOI: 10.3390/ijerph18115617
17. Ma KW, Wong HM, Mak CM. Dental environmental noise evaluation and health risk model construction to dental professionals. *Int J Environ Res Public Health* 2017;14(9):1084. DOI: 10.3390/ijerph14091084
18. Mojarad F, Massum T, Samavat H. Noise levels in dental offices and laboratories in Hamedan, Iran. *J Dent Tehran* 2009;6(4):181–186. <https://fid.tums.ac.ir/index.php/fid/article/view/197>
19. Qsaibati ML, Ibrahim O. Noise levels of dental equipment used in dental college of Damascus university. *Dent Res J (Isfahan)* 2014;11(6):624–630. PMID: 25540655.
20. World Health Organization. World Report on Hearing. World Health Organization. Geneva, Switzerland: 2021. Licence: CC BY-NC-SA 3.0IGO.
21. Goderie T, van Wier MF, Stam M, et al. Association between speech recognition in noise and risk factors of cardiovascular disease. *Audiol Neurootol* 2021;26(5):368–377. DOI: 10.1159/000513551