

HEARING PROBLEMS AMONG DENTAL PERSONNEL



Khalid A. Al Wazzan*, BDS, MS
Mohammed Q. Al Qahtani**, BDS, MSD
Salah E. Al Shethri**, BDS, MSD
Hamad S. Al-Muhaimeed***, MD
Nazeer Khan****, BDS, MSc, PhD

OBJECTIVE: In the practice of dentistry, dentists and dental auxiliaries are exposed to noise of different sound levels. The aim of this study was to determine the prevalence of hearing problems among dental personnel from Riyadh city, Saudi Arabia.

METHODS: Two hundred and four dental personnel (91 dentists, 72 dental assistants, 29 dental technicians and 12 dental hygienists) completed a questionnaire, were interviewed and observed during practice. The response rate was 82%.

RESULTS: The data obtained showed that 34 candidates (16.67%) had tinnitus, 30 (14.71%) had difficulty in speech discrimination and 63 (30.88%) had difficulty in speech discrimination in a background noise. Dental technicians were the most affected groups. The incidence of these symptoms was more in personnel exposed to dental field noise for more than 4 hours daily. None of the candidates with complaint had sought medical advice.

CONCLUSION: Hearing problems among dental personnel are not of a severe nature. However, the hearing problems can happen due to dental field noise. Dental technicians are more prone to hearing problems. It is recommended that the dental field team should wear ear protector to reduce the hazards of dental field noise.

KEY WORDS: Dental team, ergonomics, occupational hazard, tinnitus, sensory neural hearing loss, noise-induced hearing loss.

INTRODUCTION

Noise, or unwanted sound, is one of the most pervasive occupational health problems¹. It is the second most common cause of sensorineural hearing loss². The extent of damage depends primarily on the intensity of the noise and the duration of the exposure. Noise-induced hearing loss (NIHL) can be temporary that results from short-term exposures to noise, with normal hearing returning after a period of rest¹. However, long-term exposure to moderately noise levels, 85-95 decibels (dB), over a period of time may gradually cause permanent damage. The prolonged exposure can change a temporary threshold shift into a permanent one. Tinnitus has been described as the sensation of noise in one or both ears such as ringing, hissing, buzzing or pulsating sounds. It can accompany both immediate and gradual NIHL².

The Occupational Safety and Health Administration (OSHA), United States Department of Labor, requires employers to develop and implement a noise monitoring program when employees exposed to noise equal or exceed 85 dB over 8 working hours¹. If this happened, OSHA requires employers to notify employees, to establish and maintain an audiometric testing, and to train workers how to prevent occupational hearing loss. When hazardous noise have not yet been eliminated, OSHA also requires employers to provide hearing protectors and ensure wearing them by the workers¹.

Dental personnel are exposed to noise of different sound levels while working in dental clinics or laboratories. Dental laboratory machine, dental hand-piece, ultrasonic scalers, amalgamators, high-speed evacuation, and other items produce sound noise at different sound levels, which is appreciable.

Virtually all noise levels at dental clinics were below 85 dB^{3,4}. Bahannan et al³ investigated the noise level of various dental hand-pieces. Their findings showed that the noise level of high-speed turbine handpiece was 72.91 dB and for low-speed angled handpiece was 69.71 dB. They indicated that the noise levels measured during cutting were significantly higher than those determined

* Associate Professor, Department of Prosthetic Dental Sciences King Saud University, College of Dentistry.
 ** Lecturer, Department of Restorative Dental Sciences King Saud University, College of Dentistry.
 *** Professor, Department Otorhinolaryngology, King Saud University, College of Medicine.
 **** Associate Professor, Department of Preventive Dental Sciences, King Saud University, College of Dentistry.

Correspondence: "Dr. Khalid A. Al Wazzan" <alwazzan@ksu.edu.sa >

without cutting. Berek et al⁵ measured the spectra of the sounds generated by high-speed air turbines, ranging from audible to ultrasonic frequencies (0-70 kHz). Their results showed that, in a normalized spectrum, the amplitude of the ultrasonic component reaches 115 dBspl for 46.5 kHz and is 76% greater than that of the audible component. They concluded that such values, both in terms of frequencies and amplitude, reach levels which may provoke short- or long-term negative physiological disturbances and hearing-damage risk. Altinoz et al⁶ tested⁵ high-speed dental air turbines under free and operating working conditions. They reported that under any working conditions high-speed dental air turbines produce frequencies (average 6860 Hz) high enough to cause hearing loss.

Questions have been raised in the literature about the impact of dental hand-pieces upon hearing health of dentists^{3,4,6-10}. The impaired hearing among dentists has been investigated by several authors. However, conflicting results were presented. Weatherston et al⁹ found that the hearing levels of dental faculty members were markedly different from those of dental students in University of Tennessee. Zubick et al¹⁰ found that the physicians have better hearing threshold levels than dentists, notably in the 4000Hz frequency range. They also reported that the left ear of right handed dentists showed a greater loss of hearing which they related to proximity to the noise source. Coles and Hoare⁷ reported two cases of NIHL in dentistry. Hinze et al⁸ recommended that the dentist should wear ear protectors and described directions for constructing them in the dental clinic.

On the other hand, Forman-Franco et al¹¹ found that when comparing the hearing levels, as adjusted for age, of the general population with the hearing levels of 70 dentists, no statistical decrease in hearing thresholds were found. The audiological evaluations they have used were consisting of hearing thresholds at eight frequencies (500 to 800 Hz) and impedance audiometry. Rahko et al¹² found that no significant differences in ordinary or high-frequency hearing between a group of Finland dentists and the controls. Finally Wilson et al¹³ measured the sound levels in the clinical settings. They concluded that hearing-damage risk is small among dentists using modern equipment. In a survey of 178 dentists in southern Thailand, hearing problems were reported at 3.4 per cent, while 7.9 per cent were not sure of their hearing capacity¹⁴.

The noise levels in dental laboratories was reported to be much higher than those in dental clinics especially with some cutting activities^{3,4}. Steam cleaning, and sandblasting for instance can produce noise levels up to 90

dB, and compressed air blasts up to 96 dB⁴. Bahannan et al³ reported higher noise level with laboratory engines (81.42 dB) and laboratory electromotor (74.95 dB) than for the high- and low-speed handpiece (72.91 dB and 69.71 dB respectively). However, no data were published in evaluation of the long-term impact of laboratory engines upon hearing health of dental technicians.

The issue of long-term ultrasonic noise exposure and its possible effect on the dental hygienists' hearing status has been also raised. Wilson et al¹⁵ tested hearing of 20 dental hygienists with a high ultrasonic usage rate and a matched group of 20 dental hygienists who had a low ultrasonic usage rate in Hampton Roads areas of Virginia. They concluded that ultrasonic noise may affect dental hygienists' hearing at 3000 Hz, but loss of hearing observed at the higher frequencies may be attributed to other unidentified factors present in both groups. Dental assistants, on the other hand, were found to have normal ordinary or high-frequency hearing as compared with control group¹².

However, no data was available in the literature, as far as authors' knowledge, about the prevalence of hearing problems among dental personnel in Saudi Arabia. Therefore, the aims of this study were to investigate the prevalence of hearing problems among dentist and dental auxiliary in Riyadh, Saudi Arabia and to develop some guidelines to reduce the dental occupational hazards.

MATERIALS AND METHODS

Two hundred and four dentists and dental auxiliary in Riyadh, Saudi Arabia participated to answer a self-administered questionnaire about hearing problems in the previous 5 years. Multiple choice closed-ended questions were used. The candidates were interviewed afterwards to clarify any confusion and to fill up any missing data. The candidates were also observed during their routine practice to check if they were wearing any kind of ear protectors and the frequency of wearing.

The candidates were selected from the following dental care facilities in Riyadh city, Armed Forces Hospital, King Saud University College of Dentistry Riyadh Medical Complex, Primary Health Care Center and some Private Clinics. The selection of the dental personnel was based on the willingness of the participant to take part in the study.

Two investigators were calibrated by training sessions in regard to performing the interview and observing candidates. A pilot study was conducted on twenty subjects to test the convenience of questionnaire and inter examiner variability. The inter examine

agreement was 90 per cent and questionnaire was found convenient for dental personnel to answer.

The data was analyzed by SPSS package (version 10). Chi-Square test was utilized to determine the relationship of positive responses with nature of job or working hours.

RESULTS

Two hundred and fifty questionnaires were distributed and 204 were received (82% response rate). Among two hundred and four respondents 91 (44.6%) were dentists, 72 (35.3%) dental assistants, 29 (14.2%) dental technicians, and 12 (5.9%) dental hygienists. The sample population included 87 (42.6%) men and 117 (57.4%) women, with age range from 21-56 years (**Table 1**). The prevalence of hearing problem symptoms in relation to line of work was given in **Table 2**. It is found that 34 subjects (16.67%) were suffering of tinnitus and

Table 1. The subjects classification by profession and gender.

Profession	Men	Women	Total (%)
Dentist	53	38	91 (44.60)
Dental Assistant	5	67	72 (35.30)
Dental Technician	24	5	29 (14.20)
Dental Hygienist	5	7	12 (5.90)
Total (%)	87 (42.60)	117 (57.40)	204 (100)

Table 2. The prevalence of hearing problems symptoms in relation to nature of job.

	Dentist	Dental assistants	Dental technicians	Dental hygienists	Total	P
Tinnitus	14 15.38%	10 13.89%	9 31.03%	1 8.33%	34 16.67%	0.144
Difficulty in speech discrimination	12 13.19%	9 12.50%	7 24.14%	2 16.67%	30 14.71%	0.468
Difficulty in speech discrimination with background noise	30 32.97%	20 27.78%	10 34.48%	3 25.00%	63 30.88%	0.830

the dental technicians were more prone to this problem, as 31% of them confirmed it. However, no significant difference was found in relation to nature of job ($P=0.144$). Regarding the difficulty in speech discrimination (loss of intelligibility of sounds) 30 candidates (14.71%) claim this symptom. Dental technicians were relatively more affected group, though, no significant difference was found among dental personnel ($P=0.468$). It was found that 63 subjects (30.88%) had difficulty in speech discrimination in a background noise. This symptom in particular was more prevalent than the others. None of the candidates with hearing problems had sought medical advice. The prevalence of tinnitus was significantly related to dental personnel with more than 4 hours daily noise exposure ($P=0.009$) (**Table 3**). None of the candidates were found to use any kind of ear protectors.

DISCUSSION

This cross sectional study examined the prevalence of hearing problems in dental personnel in Riyadh, Saudi Arabia by means of a self-report questionnaire. Although the response rate for this study was good, one of the major limitations of this type of research is that participants are self-selected which may lead to a form of selection bias influenced by non-responders. The population surveyed was working in Riyadh city, the capital and the largest urban metropolis of Saudi Arabia and comprised a relatively young population of dental personnel.

The results of this survey showed that the dental technicians had the highest incidence of all the three symptoms; 31.03% of them had tinnitus, 24.14% had difficulty in speech discrimination and 34.48% had difficulty in speech discrimination in a background noise

Table 3. The relationship of hearing problems symptoms and duration of daily noise exposure.

	<4H	>4H	Total	P
Tinnitus	7 8.43%	27 22.31%	34 16.67%	0.009
Difficulty in speech discrimination	11 13.25%	19 15.70%	30 14.71%	0.627
Difficulty in speech discrimination with background noise	24 28.92%	39 32.23%	63 30.88%	0.615

(Table 2). This can be explained by the high noise level produced by the dental laboratory equipments^{3,4}. The noise level reported for some laboratory equipment was above 85dB⁴, the widely used benchmark standard¹. This indicate that the dental technicians and other personnel who spend many hours in noisy dental laboratories may be at risk.

The dentist, dental assistants and dental hygienist fall relatively in the same range of incidence since they are exposed nearly to the same level of noise. The noise levels of modern dental clinic equipment have now fallen below 85dB, which indicate that the risk of hearing loss is minimal^{3,4}.

The most common hearing problem reported by the surveyed candidates was the difficulty in speech discrimination in a background noise (30.88%). The prevalence of the other two symptoms was 16.67% for tinnitus and 14.71% for difficulty in speech discrimination (Tables 2). The present study indicated that incidence of the three symptoms increases when the daily noise exposure increases (Tables 3). However, none of the candidates with symptoms sought medical advice. This indicates that the hearing problems among dental personnel are not of a severe nature. Chowanadisai et al¹⁴ found that few dentists (3.4%) in southern Thailand reported hearing problems and only 7.9 per cent were not sure of their hearing capacity. Nevertheless, the population they have surveyed was working in a newly industrialising and rural, provincial part of Thailand which may limit comparison with this study with populations of dentists from metropolitan area.

If ears are exposed to any loud noise for long time, hearing ability will be permanently damaged^{1,7}. Fortunately, the incidence of NIHL can be reduced or eliminated through the successful application of hearing conservation and engineering controls¹. It is recommended that the dental personnel wear ear

protectors during work^{7,8}. Ear plugs or ear muffs can be used, however, the latter is impractical in the dental field. Unfortunately, none of the candidates in this study were using any kind of ear protectors. Altinoz et al⁶ indicated that the personnel who work in noisy environments should not engage noisy activities immediately following working day. They stated that 'The ear begins to recover its hearing ability when it is allowed to rest.'

At present, the audiometric testing is considered the best way to detect hearing loss. Dental personnel are advised to carry out regular audiometry checkups. The regular testing should identifies those who have started to lose their hearing, before they acquire significant auditory impairment^{3,6,7}.

It seems producing dental hand-pieces with further noise control is necessary. Manufacturers are urged to improve the quality in the aspect of decreasing the sound level produced by high-speed dental air turbines. Furthermore, friction increases with old and damaged machinery, the sound level will be even more which reflect the importance of maintenance care⁷, and periodic replacement. During the construction, design and decoration of the dental clinic, it is also recommended to consider using sound absorbent materials to minimize the noise level⁶.

Continuing education programs would be beneficial to decrease the risk of noise- induced hearing loss among dental personnel. Moreover, the dental schools curricula ought to include educational knowledge about the occupational health problems.

There are fewer hazards nowadays from noises in the dental offices and the risk to hearing damage would appear to be minute, however if the necessary precautions were not take those hazards are not quite nil. One of the limitations of this study is that the hearing test was not used to determine the hearing status of the candidates. Thus, further research using audiometric testing is required to investigate the hearing health of dentists and other dental personnel in Saudi Arabia.

CONCLUSION

Within the limitation of this study, the following conclusions were drawn;

1. The hearing problems among dental personnel are not of a severe nature.
2. Hearing problems can happen due to dental field noise.
3. Dental technicians are more prone to hearing problems than other dental personnel.

4. Incidence of hearing problems increases with the increase of daily noise exposure.

RECOMMENDATIONS

It is recommended that the dental field team should have ear protectors to reduce the hazards of dental field noise, particularly dental technicians and those who are exposed to dental noise for long periods daily.

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