

Noise Levels in UAE Dental Clinics: Health Impact on Dental Healthcare Professionals

Hussein M Elmehdi*

Applied Physics Department, College of Sciences, University of Sharjah P.O. Box 27272 Sharjah, United Arab Emirates

*hmelmehti@sharjah.ac.ae

Abstract- In this paper, we report the effect of noise levels in dental clinics on professionals working in these clinics. Our approach included conducting surveys and interviews in a number of UAE dental clinics. Out of the 200 surveys distributed, 177 surveys were collected. The survey focused on investigating the health effects of noise encountered in the clinics on the hearing as well as interference with communication with patients and dental assistances.

The results showed that in total 21% of the dental professionals reported hearing related problems, which occurred after they have joined the clinic. It was also found that 16% of respondents have experienced tinnitus and 37% have difficulty in communicating with their patients because of noise. While the results varied among the five categories of professionals (dentists, hygienists, technicians, dental assistances, and administrative staff), it was found that noise encountered in the clinics is linked to Noise Induced Hearing Loss (NIHL) and interference with communication. No age or gender gaps were observed. Education is needed to help diminish the pervasiveness of the hazards of noise.

Keywords- Noise in Dental Clinics; Health Impact; Dental Healthcare Professionals

I. INTRODUCTION

There is great interest in investigating health effects associated with noises in dental clinics on dental professionals working in these clinics. This is due to several studies linking noise originating from devices used in clinics to induced hearing loss. Studies have shown that these noises range from 66 dB to 91 dB [1-3], and for some special devices, the noises have been reported to reach 100 dB [4]. Such high levels are considered harmful, especially when the exposure extends over long periods such as the case with dental professionals who tend to be exposed up to eight hours on daily basis.

Noises originate from commonly used dental devices such as high and low rotation pens, suction tube, compressor, spitters, straight piece, photopolymerizer, angled-design turbine handpieces, low-speed angled-design handpieces, lab electromotor handpieces, high and low-speed turbine handpieces, stone mixers, lab machines, ultrasonic scalers, and ultrasonic cleaners. For dentists working in these clinics for extended periods of time, the primary health concern associated with these noises is what is known as Noise Induced Hearing Loss (NIHL) [5-7]. According to the National Institute for Occupational Safety and Health (NIOSH), noise-induced hearing loss is the most common occupational injury [6, 7]. It is well established that the factors contributing to NIHL include intensity of sound, duration and sound spectrum (frequency). These three elements of sound, which include time characteristics and the physical make-up of the noise, interact to put an individual at risk for hearing loss [8, 9]. For example, the greater the intensity of the sound (or the higher the dB level), the greater the risk of NIHL [10]. However, long exposure to moderately high noise levels (85-95 dB) gradually causes permanent damage [10]. The prolonged exposure can change a temporary threshold into a permanent one. Figure 1 shows the relationship between noise levels in dB and the maximum daily-allowed exposure. As is evident, the relationship is not linear owing to the non-linear effects of noise.

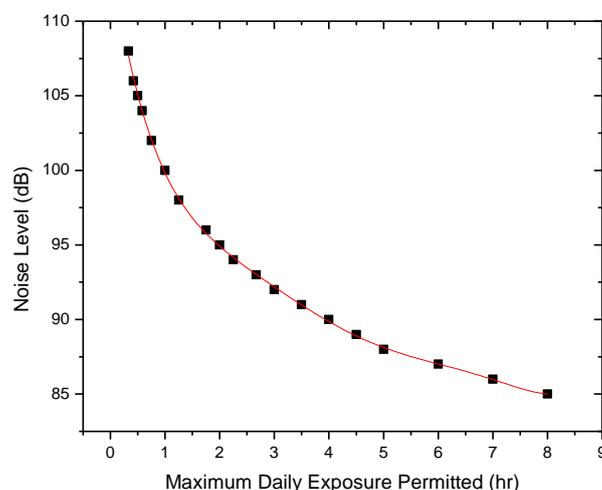


Fig.1 Limits of tolerance for continuous or intermittent noise (Data taken from references [1-10])

In the United Arab Emirates (UAE) there are no laws or standards regulating noise exposure or limits in dental clinics. In a previous study [11], we have reported that noise levels in UAE dental clinics reach as high as 87 dB on the A scale. Our previous study focused on the effect of such noises on the fear and anxiety such noises may cause among patients visiting the clinics. A natural extension of the study was to investigate the health effects of such noises over prolonged exposures, on the dental professionals working on these clinics. As highlighted above, even though these noises are intermittent and may depend on the type of treatments that are scheduled and the type of equipment used, they have the potential to cause NIHL. It should be noted that in developing countries such as the UAE, where older equipments are still in use in dental clinics, noise levels as well as exposure duration are expected to be high. For example, older drills may produce louder sounds of 100 dB [12]. The higher intensity reduces the allowable exposure time to two hours per day.

In this paper, our aim is to investigate the possible health effects attributed to noises in UAE dental clinics and its impact on healthcare professionals working in these clinics. Professionals investigated include dental assistances, doctors and office workers. The approach taken in this study included onsite measurements of noise levels in dental clinics. In addition, a survey questionnaire was distributed to professionals working in these clinics, with the aim of investigating possible health effects, especially NIHL, on professionals working in these clinics.

II. MATERIALS AND METHODS

Noise levels were assessed using a precision portable sound level meter Nor140 (Norsonic, Norway) using the dBA scale. The meter responds to sound similar to the human ear. It consists of a microphone, which is fitted with three sound weightings A, B and C. The meter detects sound and converts it into a digital signal via electronic circuits, from which the meter displays a digital reading for sound levels in any of the mentioned weighted scales. The A-weighting, which is characterized by major discrimination against very low frequency sounds, was used because it closely simulates the perception of the human ear. Noise in the clinic was assessed by placing the digital meter in the waiting area and in the middle of the clinic away from the walls. To assess the noise from various handpieces, the sound level meter was placed 5 – 7 cm away from the sound source (dental tools) at an angle close to 45°. The test procedure was to take the measurement for 20 seconds while the handpiece in question is operating at its maximum speed. For reproducibility, each measurement was repeated 5 times from different angles. The average of the 5 readings was calculated and taken as the sound level for that particular handpiece. The noise generated from several common dental handpieces was measured, including compressed air nozzle, ultrasonic scaler, mixing equipment, high-speed drill, air suction unit and steam cleaning.

To assess the health effect of such noises on professional working in these clinics, we have used a survey questionnaire, which included two parts. The first part included demographic information such as age, gender, speciality and role, years of experience, education and city of residence or clinic location. The second part of the survey included questions aimed at investigating the possible health effects due to these noises and possible links to NIHL. The survey was conducted in 27 dental clinics distributed throughout the cities of Abu Dhabi, Dubai, Sharjah and Ajman, which were the major cities in the United Arab Emirates.

III. RESULTS AND DISCUSSION

A. Assessing Noise in Dental Clinics

The results of the noise level measurements as described in the previous section are summarized in Table 1 below. While the noise levels shown in Table 1 indicate that the background noise level (when none of the devices are in use) is 65 dB(A), the noise made by various devices used in the dental clinics varies from 72 dB(A) to 85 dB(A) for the ultrasonic scaler and 87 dB(A) for high speed compressed air handpieces. Exposure to such noise levels has proven to be a cause of concern if the exposure times are extended [13-15]. For professionals working in the dental clinic, such noises are indeed a cause of concern because of the link of extended exposure to induced hearing loss and tinnitus among dental healthcare professionals that has been reported [14-16]. It should be noted that the measurements reported in Table 1 are in agreement with similar studies [17, 18].

TABLE 1 THE MEAN VALUES OF NOISE IN DENTAL CLINICS

Device	Average Sound Level dB*
Background	65 ± 2
Aspirator	72 ± 3
Compressed Air	87 ± 3
Mixers	77 ± 3
Handpiece with high speed air suction	75 ± 2
Handpiece with low speed air suction	72 ± 3
High Speed Drill	84 ± 2
Ultrasonic Scaler	85 ± 3

*Measurements were taken on the A-scale

B. Survey Results

Two hundred and seventy seven copies of the questionnaire were distributed, one hundred and seventy seven of which were collected. Surveyed subjects included dentists, dental assistances, dental hygienists and technicians from clinics distributed over the four major UAE cities. The age of subjects interviewed ranged from 26 to 52 years, with the age category of 25 – 30 years comprises 72% of the subjects, with higher number of females in all categories. The distribution of profession and gender is summarized in Table 2.

TABLE 2 DISTRIBUTION OF RESPONDENTS AMONG THE PROFESSIONAL EXAMINED

Professionals	Male	Female	Total
Dentists	30 (41.67%)	42 (58.33%)	72 (40.68%)
Dental Assistances	9 (19.15%)	38 (80.85%)	47 (26.55%)
Dental hygienists	7 (33.33%)	14 (66.67%)	21 (11.86%)
Dental Technicians	21 (77.78%)	6 (22.22%)	27 (15.25%)
Administrative Staff	2 (20%)	8 (80%)	10 (5.65%)
Total	69 (38.98%)	85 (48.02%)	177

The survey questions were all multiple-choice questions. The first question was on the frequency of dental devices use. More than 98% of the subjects reported that they are exposed to noises in the dental clinic on daily basis over extended periods. Subjects were asked if they have experienced hearing problems in the past five years. As shown in Figure 2, 21% of the respondents have experienced hearing problems in the past five years.

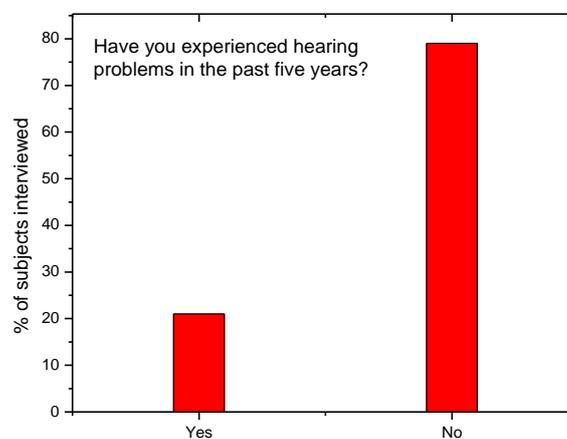


Fig. 2 The response to the question: “have you experienced hearing problems in the past 5 years, after joining the dental clinic?”

The following question asked respondents about the hearing loss symptoms they have experienced after they started working in the clinic. Figure 3 shows the results compiled from the collected surveys. The results show that dental technicians are the highest among the five examined categories when it comes to tinnitus symptoms, where 37% reported that they have experienced tinnitus-like symptoms. Administrative staff came last at 7%, while dentists, hygienists and dental assistances were both at around 15%. The following questions asked respondents about the interference of noise with communication with the patients. With the exception of the administrative staff, the results show that 27% - 39% of the professionals working in the dental clinic felt that noise interferes with their communication inside the clinic. Technicians and dentists scored the highest among the categories at 39%.

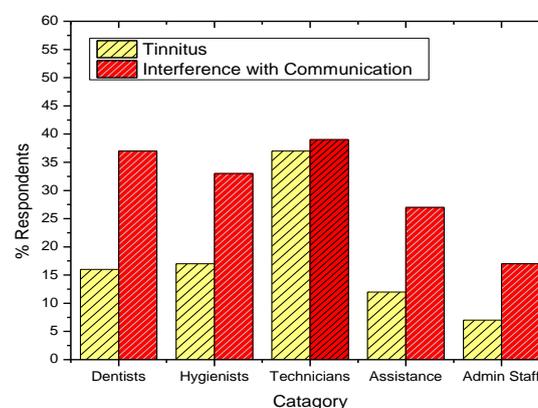


Fig. 3 Response to the questions: “over the past 5 years, have had induced hearing problems (tinnitus)?”; “have you experienced communication problems because of noise?”

When compared to the number of hours spent in the clinic, the results showed that there is a noticeable increase in tinnitus and difficulty in communication, where professionals who were exposed for longer hours (>5 hrs/day) reported higher number of tinnitus and communication difficulties. In comparison with similar studies in the region, a study to determine the prevalence of hearing problems among dentists in Saudi Arabia concluded that 16.6% had tinnitus, 14.7 % had difficulty in speech discrimination and 63% had problems with speech discrimination in a background noise. They also found that the dental technicians were the most affected group and the incidence of these symptoms was more in personnel exposed to dental noise for more than 4 hours per day. They recommended that the dental field team should wear ear protector to reduce hazards of dental field noise [17].

IV. CONCLUSIONS

Our study indicates that noise encountered in UAE dental clinics may be linked to tinnitus symptoms as well as speech communication difficulty. However, these adverse effects are not severe and are limited to 37% (for tinnitus) and 39% (for communication difficulties) as maximum percentages among the examined professionals. Keeping in mind that research has shown that exposure to noise over long extended time will eventually result in induced hearing loss, it is apparent that noise has an adverse health effect on a large portion of dental professionals. An important finding was the fact that many of these dental professionals were aware of the adverse health effects, but very few of them used acoustic protective gears, such as earplugs. This makes awareness programs and training workshops top priority in the UAE to educate these professionals about issues related to adverse effects of noise and protection techniques. In addition, dental professionals should be advised to undergo regular audiometry check-ups, which should help individuals to discover induced hearing loss earlier. Furthermore, noise limits and regulations should be established to limit the exposure and noise levels.

ACKNOWLEDGMENT

The author would like to thank the University of Sharjah for funding this project. The author would also like to thank the all dentals professionals who took part in this study.

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