

Noise induced hearing loss in dental professionals: An audiometric analysis of dental professionals

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Abstract: A Dental Staff encounters various occupational hazards like noise induced hearing loss due to various sources like high speed turbine hand piece, low speed hand piece, ultrasonic scaler, ultrasonic cleaner, stone mixers, suction pumps etc. This study was conducted to evaluate the hearing threshold level of 20 dental staff using pure tone audiometer in five different frequencies in comparison to 20 physicians who are not exposed to such noise. The results of this study showed significant changes in hearing threshold level at 3000 Hz and 4000Hz in dental staff. Also the findings showed that exposed group showing more hearing loss in left ear while the physicians showed no hearing loss. This study affirms the need for periodic audiometric evaluation for all dental professionals to identify hearing loss at a early stage and prevent permanent hearing loss.

Keywords: Acoustic hazards, audiometric analysis, hearing threshold levels, noise induced hearing loss, ultrasonic scalers.

I. Introduction:

A risk to a person arising out of employment is defined as occupational hazard¹. Dental professionals encounter various occupational hazards during their day to day professional life. Noise induced hearing loss is a significant occupational hazard among them. A dental staff is constantly exposed to noise during their work. The sources of these noises include high speed turbine hand piece, low speed hand piece, ultrasonic scaler, ultrasonic cleaner, stone mixers, suction pumps etc... Noise exposure to a loudness of ≥ 85 db for about 8 hrs on daily basis can produce permanent hearing loss². With advent of new technologies the dental equipments have lesser degree of noise which is lower than 85 db. However, use of aged and worn out instruments produce noise of more than 85db loudness even upto 100dB which is very common in a general dental practitioner setup. This study aims at identifying hearing loss in dental professionals at our hospital specifically in the department of periodontics and endodontics where the noise generating instruments are used frequently.

II. Materials and methods:

This is a prospective case control study which included 40 subjects who were divided into two groups. The first group comprised of 20 dental professionals with noise exposure and second group consisted of 20 physicians with no or minimal noise exposure. Exclusion criteria is subjects above 50 years of age to exclude age related hearing loss and those who gave a history of exposure to other high levels of noise and with diseases which resulted in hearing loss. All the group 1 subjects has been in this profession for than 5 years. They were asked to fill a questionnaire which included details of age, previous noise exposure, ear diseases, their dental specialty, instruments used and duration of exposure to noise on daily basis. Informed consent was taken from all the subjects. All the subjects were tested at our audiology department in our hospital. A GSI 61 clinical audiometer (gsi Grasan-Stadler) which was calibrated to the standard was used. Frequencies from 500 Hz - 8000 Hz were tested. The study was approved by ethics committee of our hospital.

III. Results.

Table 1: Average Age of 2 Groups

Group	Mean age
Dental staff	36.5
Physicians	43.6

Table 2: Average hearing threshold level (in dB) at different frequencies

Group	Average hearing threshold level in db at diff frequencies					
	500	1000	2000	3000	4000	8000
Dental staff (R)	5	10	10	25	30	15
(L)	10	10	15	35	25	10
Physicians (R)	5	10	15	15	15	15
(L)	5	5	10	10	15	10

Average difference between exposed and unexposed group was found to be significant ($p < 0.01$). Average Db level rounded to the nearest 5Db.

Table 1 shows age of 2 groups. As the average age was different, the hearing threshold was taken as variate and age as covariate which takes this difference into account.

The hearing threshold was compared at five frequencies for both left and right ears. This table shows changes in hearing threshold at 3000Hz and 4000Hz in exposed group. Also the table shows that exposed group showing more hearing loss in left ear. This could be attributed to the fact that all study subjects were right handed. The physicians had no hearing loss in both ears. The results are similar to various studies conducted in the past which confirms the presence noise induced hearing loss in dental professionals.^{3,4}

IV. Discussion

OSHA (occupational safety and health act) regulations for industry limit for workers exposure to study noise levels of 90dB in a 8 hr time period⁵. NIOSH (the national institute of safety and health) recommends time spent exposed to the noise should be reduced by half as sound level doubles⁶. The factors which increase noise exposure, hazards on operator include:

1. Intensity of noise
2. Frequency of vibration
3. Total time of exposure
4. Aging
5. Quality of instrument
6. Intervals between exposure

Noise induced hearing loss occurs in two stages:⁷

- a. Temporary threshold shift (reversible)
- b. Permanent threshold shift (due to long term exposure and not reversible).

Even when the permanent hearing loss occurs the person may not notice it as he develops other compensatory methods to communicate. Hence it is identified only when significant difficulties are experienced.

Dental Professionals encounters various hazards during their profession⁸

1. Air borne disease transmission like tuberculosis, influenza, pneumonic plague etc...
2. Vibrational hazards causes "white finger" due to disruption of blood flow to fingers.
3. Thermal hazards
4. Auditory hazards

Dental practitioners and staff are exposed to various sound sources during their practice. The various sound sources include high and low speed turbine hand pieces, ultrasonic scalers, stone mixers etc...The sounds produced by different equipments in dental offices were studied by Kilpatrick⁹ and is listed in Table 3:

Table 3

High speed turbine	70- 92 dB
Ultrasonic cleaner	90 dB
Ultrasonic scaler	86 dB
Stone Mixers	84 dB
Low Speed Handpiece	74 dB

Equipments which are aged and worn out produces noise of more than 100dB. Noise exposure in dental professionals are intermittent but the risk for NIHL exists due to the long term exposure. This study shows a reduction in the hearing threshold level 3000 Hz and 4000 Hz and it is more pronounced in left ear which is due to right-handedness of majority of dental professionals. Our questionnaire revealed that no precautions were taken by them to reduce noise exposure.

The study hence calls for the need for health education among dental professionals so as to teach them different ways to reduce noise exposure during their practice.

Methods for prevention and control of noise exposure:

- a. Avoid use of aged and worn out equipments¹⁰

- b. Regular maintenance of the devices
- c. Proper acoustic treatment for dental office, walls ceilings and floors.¹¹
- d. Use of ear plugs and muffs.¹⁰
- e. Distance of 35cm between device and ear.⁹
- f. Activation of equipments only during procedures.
- g. Compressors to be placed outside dental office or in an isolated area.
- h. Periodic audiometric evaluation for early detection.

V. Conclusion

This study shows a significant reduction in hearing threshold level in 3000 Hz and 4000 Hz in exposed group. This could be attributed to the long term noise exposure during their profession. As the hearing loss is in higher frequencies, they don't notice it so as to seek medical attention. Hence periodic audiometric evaluation for all dental professionals should be made mandatory as to identify hearing loss at a early stage and to prevent a permanent hearing loss. Also health education stressing on use of noise protectors, proper maintainence of devices should be included in the curriculum of all dental professionals

Reference

- [1]. Fasunioro A, Owotade FJ, occupational hazards among clinical dental staff. *J.Contemp dent pract* 15, 2004, 134-152.
- [2]. Cantwell KR, Tunturi AK and Manny RR; Noise from Highspeed Dental Handpieces. *J.AM Dental association* 61,1960,571.
- [3]. Taylor W, Pearson J, The Hearing Threshold Levels Of Dental Practitioners Exposed To Air Turbine drill Noise, *Brit Dent J* 118,1965,206
- [4]. Howard H, ubic K, Antony J and Joseph botta, Hearing loss and the high speed dental handpiece, *AJPH* 17(6), 1980, 633-635
- [5]. Fabry, D.A, Hearing loss as occupational hazard. *Northwest Dentistry*, 74,1995, 29-32.
- [6]. Feuersten JF, *Occupational hearing conservation*, in J Katz(Ed),Handbook of clinical audiology. (Philadelphia:Lippincott H Williams and Wilkins 2002) 569.
- [7]. Melnick W, *Industrial Hearing Conservation*, in J Katz, Handbook of clinical audiology (Philadelphia: Lippincott H Williams and Wilkins 1985)721-741.
- [8]. Hyson, J.M,The air turbine and hearing loss. Are dentists at risk? *J Am Dent Assoc*, 133, 2002; 1639-1642.
- [9]. Kilpatrick HC, Decibel ratings of dental office sounds, *J Prosthet Dent*, 45, 1981, 175-178.
- [10]. P. Roshan Kumar, Puneet Sharven, Kalavathi N, Kashinath KR, Hearing damage and its prevention in dental practice *Journal of dental sciences and research*,2(2),2011,1-5.
- [11]. Wagner, How healthy are today's dentists? *JADA*, 110, 1985, 17-24.