



Review Article

Perception of Noise Generated in Dental Offices as an Occupational Hazard -A Questionnaire Based Study.

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Abstract:

Background: World Health Organization stated that “noise must be recognized as a major threat to human well-being.” The operating tools commonly used in dental clinics such as airtoror, micro motor, sonic and ultrasonic scalers, compressor, suction generate potential noise which has hazardous effects on the dentist, dental assistants/technicians and also patients, resulting in both auditory and non-auditory effects.

Aim: The aim of the present study is to assess the knowledge and Awareness of Noise Pollution Generated in Dental Care Facilities among Clinicians using a structured questionnaire in-order to sensitize the dental fraternity on the importance of preventing occupational hazards.

Materials and Methods: Informed Consent was obtained from 100 voluntary dental professionals and information regarding their knowledge and awareness towards noise pollution in dental clinics was obtained by a self-made structured questionnaire comprising 22 questions. The Data was compiled and analysed with SPSS 22 software.

Results: The study population consisted of 31 male and 69 female dentists, out of which 85% perceived noise in dental operatory as an occupational hazard in terms of annoyance factors like tinnitus, difficulty in focussing and headache. Only 57.1% of the subjects were aware of the Maximum permissible levels of noise in a dental set up. Around 74.3% of the subjects have taken measures for noise reduction in practice, most common among them is placing compressors outside the clinic (28%).

Conclusion: In the era of digitalisation, we face numerous consequences in our workplace due to noise. This study has thrown insights on the general awareness levels of Noise induced Occupational Hazard among dentists which is not very satisfactory, and thus necessary steps need to be followed to combat such factors which may have long term effects like Tinnitus, Headache. Dentists at the least must avoid other noise producing hazardous activities and switch to noise free environments as much as possible.

Keywords: noise pollution in dental clinic, Dental college, tinnitus, Patient’s satisfactory level.

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INTRODUCTION

Noise pollution is one of the most important problems of the contemporary world. It occurs when an “unwanted or a disturbing sound” interferes with the normal activities of one’s life thereby disrupting its quality. Noise is often thought to produce auditory and non-auditory effects like hypertension, sleep disturbance, decreased learning performance, stress reactions, interference with communication and concentration, annoyance, mental fatigue and a reduction in efficiency[1-4]

Oral health related Quality of Life (OHRQoL) [5] is closely related with many health related disturbances leading to depression. NIOSH has recognized noise as one of the ten leading causes of work-related diseases and injuries[6-8] When sound is higher than 35 decibels, harmful effects like mechanical damage to the basilar membrane of ear, vascular narrowing and ischemia leading to hearing deficiency, elevated pulse rate, increase in blood pressure with risk of hypertension, nervousness and headache may occur[9] leading to hearing loss often referred to as noise induced hearing loss (NIHL) and tinnitus[10,11]

The acoustic environment of learning-teaching activities at a dental college is characterized by high-speed turbine handpieces (noise in the range of 81.42 dB), low-speed handpieces, high-velocity suction, ultrasonic instruments and cleaners, vibrators and other mixing devices, model trimmers (laboratory electromotor 74.95 dB, turbine handpiece 72.91 dB, low speed handpiece 69.71dB) and also worth mentioning are air conditioners and their compressors[12,13]. In dental learning areas, teachers and students are likely to be exposed to continuous high levels of noise and are vulnerable to various hearing and mental disturbances[14,15]. The issue of noise gets even more complicated when one consider the hard surfaces of the flooring in institutions which do not absorb sound because infection-control protocols demand easy to clean surfaces like tile on the floors of dental offices, rather than sound-absorbing materials like carpet thereby amplifying the sound level manifold times.

Moving on to Dentists and dental auxiliaries, working in dental clinics and laboratories, a study has suggested that they are very frequently exposed to harmful noise levels, create a greater risk for laboratory personnel whose working hours are also more than 8 hours. Dental hygienist are also prone to hearing problem due to working more with ultrasonic scalers which produce 85.3 dB of sound and working for a minimum of 8-10 hours per day.

Treter et al in his study suggested that patients getting treated in a dental clinic when undergoing a procedure experience annoyance and anxiety owing to the duration of the noise, the age of the individual and his/her physical condition, sensitivity and tolerance levels[16,17] nevertheless the fact that patients treated in a noise-reduced environment show greater satisfactory level cannot be overruled , and these patients are more likely to visit the dental clinic for a dental treatment in the future[18]. Therefore a necessary reduction of noise exposure is required for acoustic comfort both for patient and the dental personnel working on the patient as recommended by NIOSH where the basic Permissible Exposure Levels of noise must be below or equivalent to 85 dB(A) for 8 h/day in-order to minimize occupational noise induced hearing loss[19]

In our study we intend to bring out the noise awareness of dental students, faculty and dental specialists in a dental institute and dental clinic, and also find out noise induced disturbances they face, on a day-to-day basis correlating them with the working hours, and evaluate the various measures they undertake to combat noise, in a dental set up.

MATERIALS AND METHODS

This is a pilot study with 100 subjects of Undergraduate and postgraduate dental students, dental faculty and dental specialists working in clinic and institution as sample size. Dental technician/hygienist/assistants, non-teaching staff and patients were excluded. This study primarily assessed to know the knowledge and awareness of noise pollution among dental professionals and was approved by the Institutional review board, SRM university (SRMU/M&HS/SRMDC/2022/S/002).

Questionnaire was designed as a Survey which included totally 14 questions. The sampling frame comprised of 100 responses. Questions included occupation, age, gender, nature of dental practice (clinic/institute/both), average total hour spent per day in work place, total hour spent using instrument like sonic/ultrasonic scalers, micromotor, aerotor, high vacuum suction, or any other noise producing device and also total number of hours spent when a fellow dentist was using these instruments. To check the awareness about noise pollution in dental clinic, questions like normal range of hearing for human, maximum allowed noise in dental clinic, is noise pollution an occupational hazard for dental professionals, is any measure being taken for noise reduction, If yes what kind of preventive measures have been taken, Any symptoms of tinnitus or difficulty in speech and any family history of hearing disorder.

RESULTS

The study included 100 individuals, with 31 male subjects and 69 female subjects with average age between 30 years and average work experience of 6.5 years.

Annoyance factors like tinnitus, headache, difficulty in focussing were some of the factors noted in the present cohort. With an absolute frequency of 35 headache was more prevalent in the subjects, patients also suffered from attention deficit in the work atmosphere (33). Tinnitus a variety of sound that is heard when no corresponding external sound is present is known to be of a distracting factor in youngsters. In our study surprisingly 11 subjects had experienced tinnitus which has to be taken into serious consideration with the present situation taken into account. Overall around 85% of the subjects have reported Noise as an occupational hazard in terms of annoyance factor causing difficulties like tinnitus, difficulty in focusing and headache. Studies involving noise exposure in Dental institutions show us a noise levels of 70 to 96 db which suggest that dental work places are prone to occupational hazards[20,21]

Table 1: Table describing complaints and symptoms related to Noise exposure reported by dentists:

Reported Complaint	Absolute frequency	Relative frequency
Tinnitus	11	0.11
Headache	35	0.35
Difficulty in focussing	33	0.33
No complaints	21	0.21

In our study 57.1% of the subjects were aware of the Maximum permissible level of noise in dental a set-up, however 42.9% were not sure of the Permissible Exposure Limit. This must be taken into serious consideration and noise combatting techniques must be taught using various awareness programme and specific medical camps must be undertaken to prevent Noise induced hearing loss.

The gender comparison (Table 2) for different methods of noise combat in dental office was done in order to assess the perception of dental practitioners. 54.7% of the subjects suggested an economical method of placing the compressor outside the clinic. However with space constraints in many dental clinics such methods could not be of much help to the practitioners as well as patients. Ear plugs another choice for noise prevention were suggested by only 8.9% of the subjects. Being a health professional such methods might not be very efficient, however further research on ear plugs could be a good method. Calibration of dental devices in a periodic manner is a must and need to be done regularly, however this might not help in noise combat completely. Around 24% and 25.9% of subjects suggested calibration of dental devises periodically and appropriate false ceiling with carpets and rugs respectively, which are some simple methods to prevent noise in dental offices.

Table 2: Comparative Analysis of preventive methods Between male And female:

S no	Adverse Effect	Male (n=31)	Female (n=69)	Total (10)	SD	p value
1.	Preventive method as compressor outside clinic	8 (25.8%)	20 (28.9%)	28 (54.7)	6	< 0.0001
2.	Preventive method as calibrating dental device	3 (9.6%)	10 (14.4)	13 (24)	3.5	< 0.0001
3.	Preventive method as False ceiling	4 (12.9%)	9 (13)	13 (25.9)	2.5	< 0.0001
4.	Preventive method as ear plugs	1 (3.2%)	4 (5.7%)	5 (8.9)	1.5	< 0.0001

Table 3: Table describing frequency of measures for combating Noise in Dental office:

Reported Measure	Absolute Frequency	Relative frequency
False ceiling	13	0.13
Calibration of noise generators	13	0.13
Wooden flooring	8	0.08
Ear plugs	5	0.05
Compressor outside clinic	28	0.28
No measures taken	23	0.23

The relative frequency of different noise combatting methods are described in table 3. The interesting fact from this table is that 23 subjects have not taken any measures for prevention of noise. A higher percentage of subjects have suggested compressor the most noise producing equipment outside the clinic. Although other devices like airtotor, suction device, ultrasonic scalers produce equally high decibel of sound, our study was limited to questions pertaining to compressor.

Discussion:

Noise is considered as an unwanted by-product in a dental office. The working hours in a dental clinic therefore plays a major role, which in our study showed no significant difference between the male and female subjects that could be related to similar studies which stated that irrespective of the longer working hours of males there was no difference in perception of Noise exposure as a hazard to them. The effect of noise perception of dentist has a special significance in dental school environment because working in a dental institution pose an environment where noise generated from other colleagues' work-station cannot be ruled out, thus leading to a constant passive exposure of the same over longer hours. A dental institution with long working hours and numerous people around poses a more conducive environment for the dental fraternity.

In the present study it has been observed that 78% of dentists worked for more than 6 hours per day, and are exposed to continuous noise generators at the institution. Around 85% of the subjects have reported Noise as an occupational hazard in terms of annoyance factor causing harmful effects like headache, difficulty in focussing and Tinnitus. Therefore places such as these must be deemed as an abode for harmful occupational hazards, thereby needing awareness among the professionals working here.

In our study 57.1% of the subjects were aware of the Maximum permissible level of noise in a dental set up, however 42.9% were not sure of the Permissible Exposure Limit of noise. This must be therefore taken into serious consideration and Noise combatting techniques must be taught using various awareness programmes and specific medical camps must be undertaken to prevent Noise induced hearing loss.

The Consequences of hearing impairment happen over a period of time. Neglect from the dentists point of view on occupational hazards like long working hours, lack of ergonomic practice, use of noise producing equipment without protection have shown a positive correlation to hearing impairment over a long period of time. Other studies also suggest complaints like difficulty in focusing, stress, tinnitus, irritability and intolerance to high sound levels thus negatively affecting the lifestyle of the dentist, which tends to show up during clinical practice hours affecting dentist patient relationship[21,22] In our study, with relation to hazards of noise exposure, headache was experienced by 35%, difficulty in focusing was experienced by 33%, 10.9 % of subjects reported having Tinnitus which could be related to other studies which showed higher prevalence of hearing loss and tinnitus in female subjects[23] But studies having a male preponderance are also available in literature, thus it is inconclusive that gender plays a role in effects like Tinnitus, suggesting that the dental work system by itself is more conducive to professionals rather than the correlation to gender predisposition resulting in hypertension, sleep disturbance, decreased learning performance, stress reactions, interference with communication and concentration, annoyance, mental fatigue and a reduction in efficiency.[24,25]

With regards to ways in preventing noise exposure in dental set up, 74.3% prefer some kind of noise protection as they perceive it to be a risk factor out of which 28% suggested that noise generators like compressor could be placed outside, 13% suggested measures like periodic calibration of noise generating equipment, incorporating infrastructure changes like design of interiors of dental set ups with false ceiling and, 5% have suggested use of ear plugs which could also act as noise reducers. Majority have suggested to place the compressor outside the clinic compared to other preventive methods like ear plugs, wooden flooring and false ceiling, which suggests that compressors make a lot of noise which could be considered in the future for production of economical and noise free compressors or other technologies to improve the working of dental chairs. These are of more concern in dental institutions and hospital set ups. Also further studies involving clinicians working in clinic also need to be put under radar in-order to establish a stronger correlation for comparing institution and clinic working professionals.

However not many used these noise control measures in their routine practice to refrain from the noise related occupational hazard. For example in our study 25.7% did not take any noise combatting measures. studies suggest that awareness with regards to noise as an occupational hazard is not realized by many subjects thus hindering the use of noise control measures. However considering the long term effects of noise from evidence based research, the need for Hearing Conservation Programs are a need of the hour which would inculcate changes in clinical practice lifestyles, adapt to less noise producing equipment, thereby fostering a healthy life for a dental professional.[26]

Limitations of our study include confounding factors like lifestyle of patients including usage of headphones, noise perceiving ability of individuals,

Conclusion:

Viable noise control measure like placing compressor outside the clinic, high quality and noise free compressor, periodic calibration of noise generating dental equipment, and considering some noise reducing infrastructural changes like false ceiling, wooden flooring, using carpets and other options like using ear plugs could be incorporated on a day to day basis in order to prevent NIHL. Apart from these, Institutional setups must have frequent and periodic noise awareness programs to emphasise on regular medical check-up as a mandate in-order to safeguard the well-being of the working personnel and also ensure a safe workplace for all the working professionals.

In conclusion we would like to emphasize on conducting Noise Awareness Programmes for dentists as a mandate need of the hour programme as more young dentists start clinical practice and they need to be warned about the long-term ill effects of exposure to noise when working for long hours.

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Conflicts of interest

There are no conflicts of interest

Ethics Statement: The studies involving human participants were reviewed and approved by the Institutional Review Board of SRM University. Written informed consent to participate in this study was provided by the participants themselves.

Data Availability: Datasets related to this article will be available upon request to the corresponding author.

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