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SELF-PERCEIVED HEARING LOSS AMONG DENTAL PROFESSIONALS IN A METROPOLITAN CITY AND THE SOUND LEVELS IN DENTAL CLINICS

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ABSTRACT

Introduction: Occupational noise exposure in dental offices is a significant concern, potentially leading to noise-induced hearing loss (NIHL) among dental professionals. This study examines sound levels in dental clinics and evaluates the prevalence of self-reported hearing impairment among dental practitioners in Chennai City.

Methods: This two-month cross-sectional study was conducted in two dental institutions and ten private clinics. Noise levels were assessed using a sound level meter, measuring at three different locations within each clinic during peak hours and regular times. A total of 80 dental practitioners with over five years of experience participated in a structured questionnaire survey. The survey explored their awareness and experiences with NIHL. Descriptive statistics were used, and the Fischer exact test was performed, with a significance level set at $p < 0.05$.

Results: Prosthodontics departments exhibited the highest average sound level (87.9±9.67 dB), while Periodontics had the lowest (78.1±8.63 dB). Dentists who worked over 7 hours daily were likelier to report hearing impairment (63.6%, p=0.02). Those with 5-10 years of practice frequently experienced tinnitus and ear fullness (40%, p=0.038).

Discussion: The study highlights significant occupational noise levels in dental offices, which contribute to hearing impairment among dental professionals. Despite the risks, hearing protection is underutilized. Noise levels often surpass NIOSH's recommended limit, correlating with increased hearing impairment ($p<0.014$).

Conclusion: Urgent interventions are necessary to reduce noise exposure in dental clinics. Implementing noise control strategies and enhancing awareness among dental professionals are vital steps for improving occupational health in dental settings.

Keywords: Noise-Induced Hearing Loss, Dentists, NIOSH Guidelines, Hearing Impairment, Occupational Hazards

INTRODUCTION

Occupational health aims to foster the well-being of individuals across various professions by ensuring their physical, mental, and social welfare. The World Health Organization (WHO) introduced a healthy workplace model emphasizing factors such as the physical work environment, personal health resources, psychosocial work settings, and community involvement.[1] Despite these efforts, occupational disorders remain a critical issue globally, with only 2% of cases being adequately addressed. Each year, millions of people suffer from work-related health problems, including exposure to various hazards like noise, radiation, and poor lighting.[2,3]

Noise, one of the most underestimated occupational hazards, is essentially unwanted sound that can cause hearing damage if it exceeds certain limits.[4] According to the Global Burden of Disease Report 2019, over 140 million people globally suffer from hearing loss, and this number is expected to rise, particularly in developing nations, by 2040. [5] Noise-induced hearing loss (NIHL) is a gradual, bilateral sensorineural hearing loss that results from prolonged exposure to excessive noise. It is considered the second most common form of sensorineural hearing loss, affecting around 5% of the world's population.[6]

NIHL can either be temporary or permanent, with the initial frequencies affected being 3,000 Hz, eventually extending to 250 Hz. Most cases of hearing loss due to noise exposure reach their peak within the first 10 to 15

years and generally do not exceed 75 dB for high frequencies and 40 dB for low frequencies.[7] Individuals often realize they have a hearing problem only after significant damage has occurred, as the symptoms develop slowly over time. Continuous exposure to high noise levels can also lead to secondary complications such as tinnitus, stress, hypertension, and difficulty understanding speech in noisy environments. The National Institute for Occupational Safety and Health (NIOSH) recommends a maximum noise level of 85 dB over an 8-hour workday to minimize the risk of NIHL.[8]

Dentists, like other professionals, face numerous occupational hazards, with hearing impairment being one of the least addressed.[9] The dental environment exposes practitioners to various sources of noise, including high-speed and low-speed handpieces, suction devices, ultrasonic instruments, and other equipment. Over time, constant exposure to these noise sources can contribute to hearing loss and secondary complications.[10]

While dental practitioners typically use protective gear like gloves, masks, and goggles, the use of hearing protection is rare. [11] This oversight may stem from a lack of awareness regarding the risks of noise exposure or a disregard for the benefits of hearing protection.

METHODOLOGY

A cross-sectional study was conducted over two months across three dental institutions and ten private clinics in Chennai City. Ethical approval was obtained before the study. The research focused on dental professionals in various departments, including Prosthodontics, Endodontics, Periodontics, Orthodontics, and Pedodontics. The study aimed to evaluate noise levels in dental clinics and gather subjective data on hearing issues experienced by dental practitioners.

Noise Measurement: NIOSH guidelines measured Noise levels using a sound level meter. Measurements were taken three times at each workplace – during peak hours and on two average working days. A total of 3 noise measurements were collected at each location while dental procedures were being performed.

Survey of Dentists: The study included full-time dental practitioners aged between 23 and 60 with over five years of practice. Dentists with pre-existing hearing conditions or those on ototoxic medications were excluded from the study. Potential participants were approached in their clinics or departments, where the study's objectives were explained, and they were invited to participate. A structured questionnaire consisting of 18 closed-ended questions was used to collect data. The questionnaire covered demographic information, professional experience, and awareness of noise-induced hearing loss.

A pilot study was conducted on 15 dentists to test the reliability of the questionnaire, which yielded a Cronbach's alpha score of 0.81, indicating good reliability. The sample size was calculated using the formula $n = \frac{z^2 \times P \times (1-P)}{e^2}$ P = 0.16[12], e = 0.01, and $z^2 = 2.7$ at a 95% confidence interval. A final sample size of 80 was determined, accounting for a 5% non-response rate. After obtaining informed consent, the questionnaire was administered to 80 dental practitioners.

RESULTS:

Noise Levels in Dental Clinics: Across the 3 dental institutions and 10 private clinics studied, the Prosthodontics department exhibited the highest average sound levels (87.9±9.67 dB) during peak days, while the Periodontics department had the lowest levels (78.1±8.63 dB). Sound level variations were statistically significant on peak days and not on average days and all days. (Table 1)

The average age of the 80 participating dentists was 42±8.9 years, and 35 (43.75%) were female. Dentists working more than 7 hours daily reported a higher incidence of hearing impairment (63.6%), which was statistically significant (p=0.02). (Table 2) Additionally, practitioners with 5-10 years of experience were more likely to report symptoms like tinnitus and ear fullness (40%, p=0.038). (Table 3) A considerable proportion of clinicians (37.5%) reported experiencing hearing problems frequently compared to their peers. (Table 4, Graph 1)

DISCUSSION

This study aimed to investigate noise levels in dental offices during both peak and off-peak times and to assess the prevalence of self-perceived hearing loss among dental professionals.

The dental environment is inherently noisy, with numerous sound sources like high-speed handpieces, ultrasonic scalers, suction devices, mixers, and HVAC systems. NIOSH identifies NIHL as a significant occupational hazard, advising a maximum noise exposure level of 85 dB for an 8-hour workday.[11] In this study, the Prosthodontics department had the highest average sound levels (87.9±9.67 dB), exceeding recommended safety limits, while the Periodontics department had the lowest noise levels (78.1±8.63 dB). These findings are in line with previous studies that reported high noise levels in dental offices.[13,14]

Regarding the subjective experience of hearing impairment, 60% of participants in this study found their workplaces noisy and irritating, compared to 40% in a study by Dierickx et al.[10] Similarly, Bali et al.[15] reported that 56% of dentists were bothered by noise in their clinics.

The prevalence of self-reported hearing impairment was notably higher in this study (20%) than in some other studies, such as Osazuwa et al.[16] Nigerian study, where only 1.7% of dentists reported hearing problems. However, a study by Sharmila Azimi[17] in Afghanistan found that 2% of dental practitioners experienced significant hearing impairment. This study's higher prevalence rate may reflect the longer working hours and higher sound levels in the dental offices surveyed.

One limitation of this study is the small sample size and the potential for recall bias. Additionally, the focus on clinics within Chennai City may restrict the generalizability of the findings to other regions. Moreover, other factors contributing to hearing loss, such as age and personal noise exposure outside the workplace, were not accounted for.

CONCLUSION

This cross-sectional study highlighted the occupational noise exposure faced by dental professionals in Chennai City, revealing that noise levels in dental offices frequently exceed the recommended safety thresholds, particularly in Prosthodontics departments. Moreover, a significant proportion of dentists working in these environments reported experiencing hearing-related issues, with longer work hours and years of practice being associated with a higher risk of hearing impairment.

To protect dental professionals from the risk of NIHL, it is essential to implement strategies for reducing noise exposure in dental clinics. Additionally, raising awareness about the importance of hearing protection and the potential risks associated with long-term exposure to excessive noise is critical for improving the occupational health of dental professionals. Future studies with larger sample sizes and more extensive geographical coverage are necessary to better understand the prevalence of NIHL among dental professionals. Furthermore, longitudinal studies could help in identifying the long-term effects of noise exposure in dental settings.

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Conflict of Interest: None

TABLES AND GRAPH

Table 1: Distribution of sound levels within departments throughout different periods

	Workplace	Average Sound (Mean± SD)	F value	p-value
Average Sound on a peak day	Prosthodontics department	93.9± 9.67 dB	4.59	**0.045***
	Pedodontics department	89.3± 8.30 dB		
	Endodontics department	82.5± 4.71 dB		
	Orthodontics department	82.9± 9.38 dB		
	Periodontics department	81± 9.17 dB		
	Private Clinics	83.7± 8.90 dB		
Sound on average days	Prosthodontics department	87.7± 8.56 dB	0.579	0.79
	Pedodontics department	81.2± 9.01 dB		
	Endodontics department	78.3± 6.28 dB		
	Orthodontics department	81.9 ± 8.90 dB		
	Periodontics department	78.1± 8.63 dB		
	Private Clinics	79.7± 8.83 dB		
	Prosthodontics department	85.8± 4.94 dB	1.162	0.34

Average sound on all days	Pedodontics department	82.2± 6.52 dB		
	Endodontics department	80.4± 8.29 dB		
	Orthodontics department	82.4± 5.94 dB		
	Periodontics department	79.5± 7.89 dB		
	Private Clinics	81.6± 6.76 dB		

One way ANOVA

Table 2: Self-perceived hearing impairment among dental practitioners based on their average working hours.

Average working hours per day	Subjective feeling of hearing impairment					Fischer exact value	p-value
	never	rarely	sometimes	often	very often		
2-4 hours per day	6 (42.9%)	6 (42.9%)	0	2 (14.3%)	0	72.153	**0.002***
5-6 hours per day	1 (2.3%)	14 (31.8%)	20 (45.5%)	7 (15.9%)	2 (4.5%)		
more than 7 hours per day	1 (4.5%)	0	0	14 (63.6%)	7 (31.8%)		

Fischer exact test * Statistically significant

Table 3: Self-perceived hearing impairment among dental practitioners based on their years of experience

Years of clinical expertise	Subjective feeling of hearing impairment					Fischer exact value	p-value
	never	rarely	sometimes	often	very often		
<5-10 years	4 (16%)	10 (40%)	3 (12%)	4 (16%)	4 (16%)	16.343	**0.038***
11-15 years	2 (8%)	8 (32%)	6 (24%)	6 (24%)	3 (12%)		
More than 16 years	2 (6.7%)	2 (6.7%)	11 (36.7%)	13 (43.3.%)	2 (6.7%)		

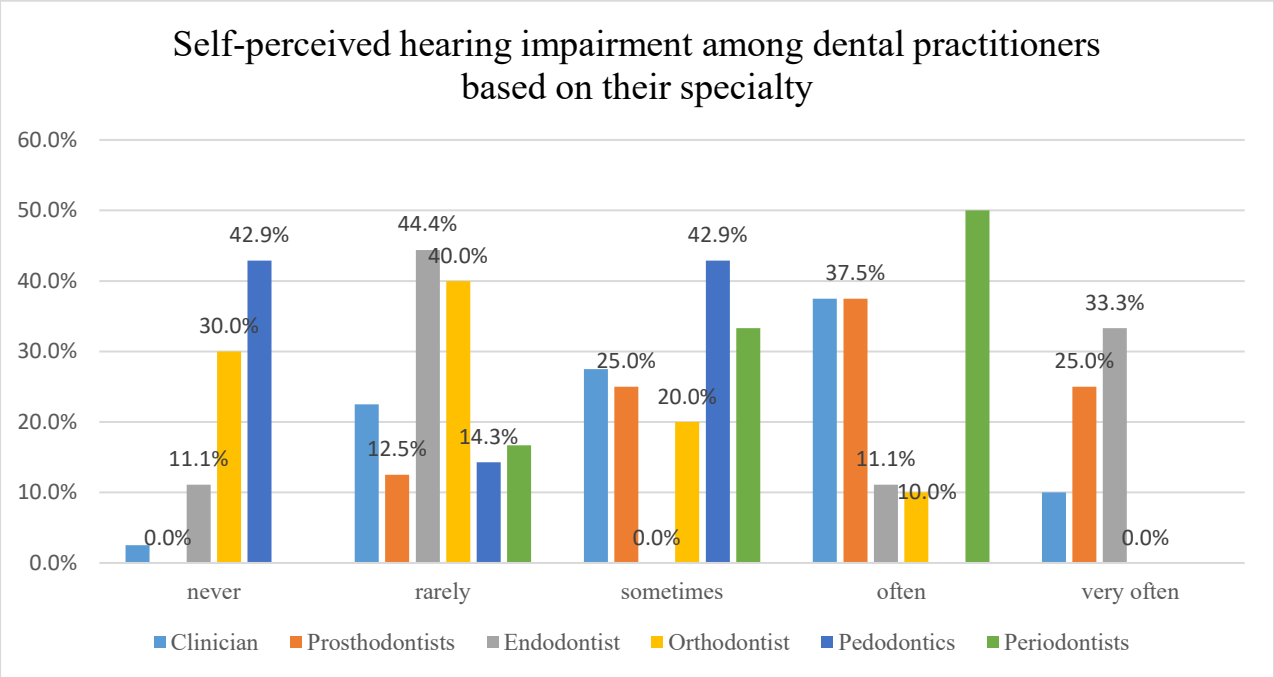
Fischer exact test * Statistically significant

Table 4: Self-perceived hearing impairment among dental practitioners based on their specialty

Department/practice	Subjective feeling of hearing impairment					Chi-square value	p-value
	never	rarely	sometimes	often	very often	36.396	**0.014***

Clinician	1 (2.5%)	9 (22.5%)	11 (27.5%)	15 (37.5%)	4 (10%)		
Prosthodontists	0	1 (12.5%)	2 (25%)	3 (37.5%)	2 (25%)		
Endodontist	1 (11.1%)	4 (44.4%)	0	1 (11.1%)	3 (33.3%)		
Orthodontist	3 (30%)	4 (40%)	2 (20%)	1 (10%)	0		
Pedodontics	3 (42.9%	1 (14.3%)	3 (42.9%)	0	0		
Periodontists	0	1 (16.7%)	2 (33.3%)	3 (50%)	0		

Fischer exact test * Statistically significant



Graph 1: Self-perceived hearing impairment among dental practitioners based on their specialty

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