

SELF-REPORTED HEARING-RELATED COMPLAINTS AMONG DENTAL PROFESSIONALS: A QUESTIONNAIRE-BASED SURVEY.

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ABSTRACT

Background: As a result of workplace noise, dental personnel are potentially predisposed to auditory and non-auditory effects of noise which may expose hidden or imminent hearing impairment. There is the need to capture these self-reported hearing and hearing-related complaints using well designed questionnaires as a prelude to formal audiometric tests.

Materials And Methods: This was a cross-sectional self-administered questionnaire study conducted between the periods April to August 2015. Participants were given questionnaires to fill and return which captured socio-demographic data and exposure to noise at workplace and symptoms experienced. Upon return of the questionnaire, each questionnaire was examined to ensure they were properly filled with signed consent. All data and findings were evaluated anonymously.

Results: One hundred and thirty eight questionnaires were returned giving 86% response rate, 35(25.4%) reported hearing impairment. Eighteen (13.0%) respondents have experienced tinnitus, while 20 (14.5%) of the respondents experienced Hyperacusis, another 53(38.4%) of the respondents also have difficulty hearing in places with competing noise. Stress and sleep disturbance were also common complains.

Conclusion: The presence of especially tinnitus, hyperacusis, impaired hearing in areas with competing sounds are all symptoms indicative of imminent hearing impairment that could be used to predict undetected hearing losses among dental personnel.

KEYWORDS: self-report, hearing complaints, questionnaire, dentistry, dental turbine.

INTRODUCTION

Noise can be defined as an unwanted sound from any source, more so, sound may also be regarded as pleasant or unpleasant depending on the intensity, frequency, and/or duration.¹ In dental practice, tools such as amalgamators,

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vibrators, model trimmers, aspirators, dental turbines, ultrasonic scaler, dental compressors and various other dental equipment produce varying levels of sound intensity. These sound levels can range from 66dB to 91dB, and occasionally can be as high as 100dB with the use of old high-speed hand-pieces. The use of these devices are said to potentially predispose dental personnel to hearing impairment and related hazards or complaints.^{2,3}

In a study by Cabrera and Lee, high environmental noise in hospitals was adjudged to be responsible for abnormal hearing among healthcare workers,⁴ while orthopaedic staff were reported to experience the highest prevalence of hearing-associated problems, due to high powered tools in orthopaedic theatres.⁵ Furthermore, in a



related study exposure to continuous or intermittent loud noise, can be responsible for sleep disturbances, and certain other physiological processes such as increased heart rate, blood pressure, catecholamine secretion, adrenalin secretion, vasoconstriction of the extremities, and pupillary dilatation.⁶

Assessment of hearing loss, as part of health surveillance in many workplaces, hospitals inclusive, can be quite expensive and many employers in most countries are usually reluctant to undertake this. Therefore, a cheaper and more appealing alternative would be a questionnaire-based specific assessment to identify those workers with no hearing loss and thus eliminating the need to perform audiometry in these workers. Some researchers however do not agree the questionnaire is sensitive enough to be used as a pre-audiometric screening tool for noise induced hearing loss or that dental personnel are not exposed to noise intensities enough to experience a noise-induced hearing loss.^{7,8,9} Codes of practice dictates that employers provide adequate health surveillance and to provide criteria that determine when this should be carried out, but this is yet to be developed in many workplaces in Nigeria. The ideal approach would include workplace assessment, controlling noise at its source and periodic audiometric screening. It might also serve as a useful epidemiologic tool to determine the burden in the country as a whole if used in conjunction with audiometric surveys.⁷

Recently questionnaire studies have reported an increasing prevalence of subjective hearing impairment in different age groups.^{10,11} More so, self-reported hearing impairments have been shown to be well correlated with pure tone audiometry (PTA) hearing loss and as such could be used to predict PTA detected hearing losses.¹⁰ A questionnaire-based survey might also help highlight undetected risks to hearing and grounds for screening

audiometry. In the study by Ahmed et al., it concluded that, where audiometry is not routinely available, costly or time consuming, self-reported data can provide a relatively quick and inexpensive means of identifying subjects with hearing loss and estimating the prevalence of hearing loss.¹²

Similarly, two recent questionnaire based surveys reported 11.3% dentists from Thailand had hearing problems or were not sure about their hearing capacity,¹³ and 5% from United Arab Emirates with hearing problems.¹⁴ Furthermore, in another related study by Khan et al., subjective hearing-related complaints such as headaches, sleep disturbance, noise irritation, hearing damage and tinnitus were reported among dentists in Karachi. Tinnitus, in particular has been variably reported among dentists, as a contributing element in hearing loss and non-dentists alike following exposure.^{10,15,16}

To this end, it is reasonable to foresee that dental personnel in our environment may be exposed to the hazards of powered dental devices and hence, at risk of hearing impairment or hearing-related complaints, more so, studies in this area and among these professionals are poorly researched.

Therefore, the aim of this study is to evaluate self-reported hearing and hearing-related complaints through the use of questionnaires among dental personnel in Kano city.

MATERIALS AND METHODS

This was a cross-sectional self-administered questionnaire-based survey to involve consenting dental professional within Kano state, specifically those working at the tertiary, secondary, and primary health centres as well as in private practice. The study was conducted between the periods April to August 2015; all participants live and work within the state.

Sample size was calculated using 11.3%¹³ (the proportion of dentistry personnel estimated to



have hearing loss from a previous study) and a minimum estimated sample size study worked out to be 161 approximately (including allowance made for non-respondents). A non-random sampling technique was utilised to capture all successive consenting dental professional within the state, as the number of these professionals are quite few.

A questionnaire was developed to target dental professionals and was divided into two parts. The questions in the first part were related to demographic information such as age, gender, marital status, educational level, dental specialty and place of practice; the second part, had questions pertaining to exposure to noise in the workplace, environmental and familial predisposing factors and respondents feelings towards noise in the clinic and/or its effect.

Prior to conducting this survey, the investigators pilot-tested the survey questionnaire among 10 eligible subjects who were dental therapist/hygienist. These were not subsequently included in the final data set.

Eligibility criteria: Age 16 to 65 years; dental personnel resident in Kano state.

Exclusion criteria: Non-Dental personnel, refusal to participate, ill-health, already hearing impaired prior to working in the industry.

The questionnaire contained detailed information about the survey in a separate leaflet. Participants were given the questionnaires to fill and return including a consent form. Upon return of the questionnaire, each questionnaire was examined to ensure they were properly filled and the consent form duly signed. Forms returned unfilled were regarded as non-response and therefore not included in the overall data set. All data and findings were evaluated anonymously. Eight (8) forms were filled incompletely and as such discarded. Audiometric tests was not conducted for the respondents.

Ethics Statement

The research protocol for this survey was reviewed and ethical clearance was obtained from the health research ethics committee of Aminu Kano Teaching Hospital, Kano. This study was conducted with full compliance of research ethics norms, and more specifically the codes and practices established by the World Medical Association (Declaration of Helsinki-2013).

Data Analysis

Analysis was performed with IBM SPSS (for windows version 20), frequencies were used to estimate the magnitude of responses and Chi-square crosstabs to determine relationship between variables. A *P* level of <0.05 was used for evaluating statistical significance (95% Confidence interval)

RESULTS

One hundred and thirty eight questionnaires were returned properly filled and with written consent giving 86% respondent rate. The highest respondents in this survey were youths in the 16-35years age bracket (85.5%). Among respondents 63were females (45.7%) and 75 (54.3%)were males (female: male ratio 1:1.2) while more than half 87(63.0%) were never married. Majority of our respondents were Dental Surgeon Assistants (DSA) followed by Dental Hygienist with 58(42%) and 40(29%) respectively. Almost all 137(99.3%) of the respondents have post-secondary education while more than a quarter 43(31.2%)work in a tertiary health centre with majority 97(70.3%) of the respondents haven worked for 5years or less in the specialty. Table 1.

During the survey, question regarding subjective feeling of hearing impairment, showed that majority 82(59.4%) of the respondents never experienced any change in hearing while 35(25.4%) reported that often their hearing is impaired, 13(9.4%) cannot say and 8(5.8%) have rarely experienced any hearing impairment. Among those that sometimes experienced hearing impairment, males were highest in number 22(29.3%). Figure 1



Regarding other ear/hearing related complaints, majority 120(87.0%) have never experienced tinnitus while 18(13.0%) have experienced it, however more males 11(14.7%) and fewer females 9(11.1%) complained about tinnitus. Less than a quarter 20(14.5%) of the respondents experienced Hyperacusis while majority 118(85.5%) have no such experience. Fifty three (38.4%) of the respondents have also noticed difficulty hearing in places with background noise while 85(61.6%) have no such difficulty. Figure 2

In addition, about a quarter 36(26.1%) of respondents experienced sleep disturbance while 102(73.9%) have no sleep-related problems. Almost a quarter 31(22.5%) of respondents admitted to feeling stressed after

work hours but majority 107(77.5%) have no such feeling. Headaches were however complained of by more than half 81(58.7%) of respondents while less than half 57(41.3%) were headache-free. Figure 2

In order to determine if there was any association between demographic, social and work related factors on one hand and subjective complaints of hearing impairment on the other, bivariate analysis revealed association with only years of practice (< 5years) and age of dental turbine in use (1-5yrs) table 2. Other variables tested such as "use of-" and "age of ultrasonic scalar" and other types of noisy equipment revealed no association ($P > 0.05$), data not shown.

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Table 1: socio-demographic characteristics of respondents.

Variable	Sex		
	Male	Female	Total
Age groups(years)			
16-25	23 (30.7%)	37 (58.7%)	60 (43.5%)
26-35	37 (49.3%)	21 (33.3%)	58 (42.0%)
36-45	9 (12.0%)	2 (3.2%)	11 (8.0%)
46-55	6 (8.0%)	2 (3.2%)	8 (5.8%)
56-65	0 (0.0%)	1 (1.6%)	1 (0.7%)
Marital Status			
Married	30 (40.0%)	17 (27.0%)	47 (34.1%)
Single	42 (56.0%)	45 (71.4%)	87 (63.0%)
Widowed	0 (0.0%)	1 (1.6%)	1 (0.7%)
Others	3 (4.0%)	0 (0.0%)	3 (2.2%)
Educational level			
Secondary	1 (1.3%)	0 (0.0%)	42 (30.4%)
Certificate	16 (21.3%)	26 (41.3%)	63 (45.7%)
Diploma	42 (56.0%)	21 (33.3%)	22 (15.9%)
First degree	10 (13.3%)	12 (19.0%)	7 (5.1%)
Postgraduate	4 (5.3%)	3 (4.8%)	3 (2.2%)
Medical Fellowship	2(2.7%)	1 (1.6%)	
Place of Practice			
Primary health Centre	9 (12.0%)	9 (14.3%)	18 (13.0%)
Secondary facility	9 (12.0%)	3 (4.8%)	12 (8.7%)
Tertiary facility	25 (33.3%)	18 (28.6%)	43 (31.2%)
Private practice	17 (22.7%)	12 (19.0%)	29 (21.0%)
Others	15 (20.0%)	21 (33.3%)	36 (26.1%)
Years of Practice			
5	45 (60.0%)	52 (82.5%)	97 (70.3%)
6-10	20 (26.7%)	8 (12.7%)	28 (20.3%)
11-15	6 (8.0%)	1 (1.6%)	7 (5.1%)
16-20	2 (2.7%)	1 (1.6%)	3 (2.2%)
21	2 (2.7%)	1 (1.6%)	3 (2.2%)



Table 2: Sociodemographic and work-related factors correlated with subjective complaints of hearing impairment during the survey

	Subjective change in hearing	Percentage	Bivariate
SEX			
Male	22	29.3%	Exact .371
Female	13	20.6%	
Age groups(years)			
16-25	13	37.1%	Exact .170
26-35	16	45.7%	
36-45	1	2.9%	
46-55	4	11.4%	
56-65	1	2.9%	
Marital Status			
Married	14	40.0%	Exact .070
Not-married	18	51.4%	
Widowed	0	0.0%	
Others	3	8.6%	
Educational level			
Secondary	1	2.9%	Exact .096
Certificate	6	17.1%	
Diploma	17	48.6%	
First degree	9	25.7%	
Postgraduate	0	0.0%	
Medical Fellowship	2	5.7%	
Place of Practice			
Primary health Centre.	2	5.7%	Exact .437
Secondary facility	1	2.9%	
Tertiary facility	16	45.7%	
Private practice	5	14.3%	
Others	11	31.4%	
Years of Practice			
5	18	51.4%	Exact .006
6-10	10	28.6%	
11-15	3	8.6%	
16-20	2	5.7%	
21	2	5.7%	
Average work time			
8hrs	20	57.1%	Exact .333
<8hrs	15	42.9%	
Age of dental turbine			
<1yr			Exact .025
1-5yrs	9	33.3%	
>5yrs	13	48.1%	
	5	18.5%	



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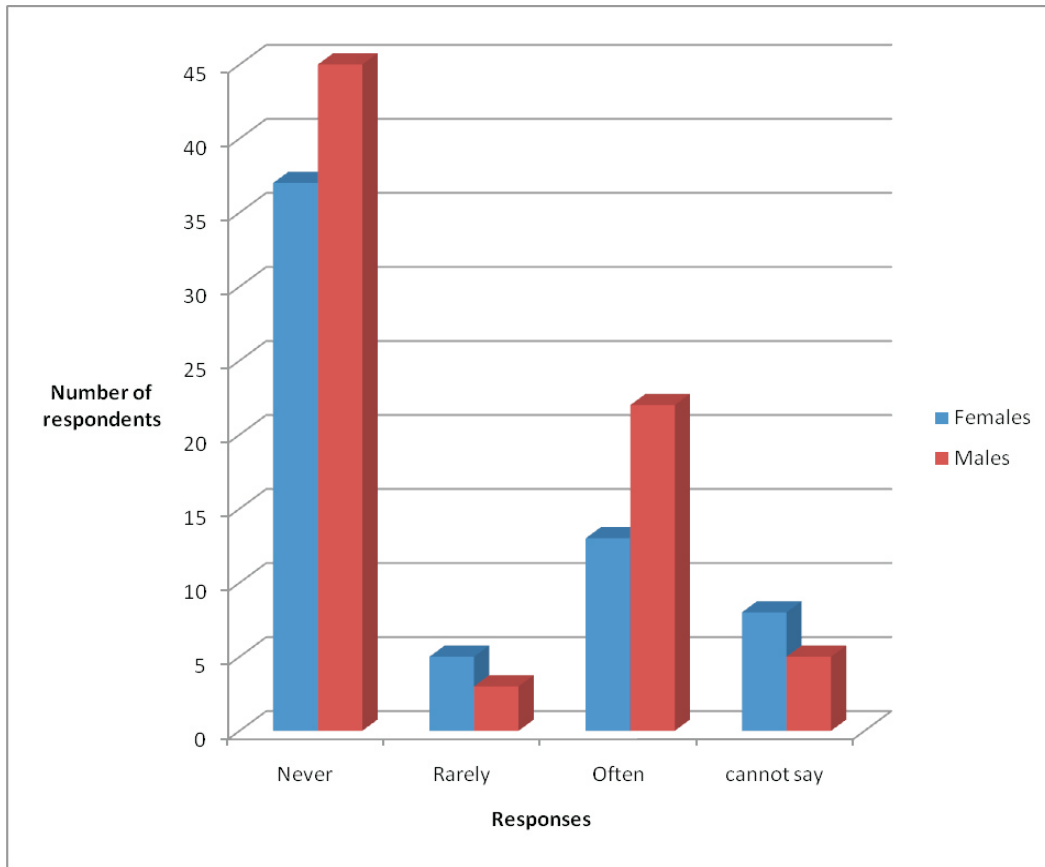


Figure 1: Subjective feeling of hearing impairment by respondents

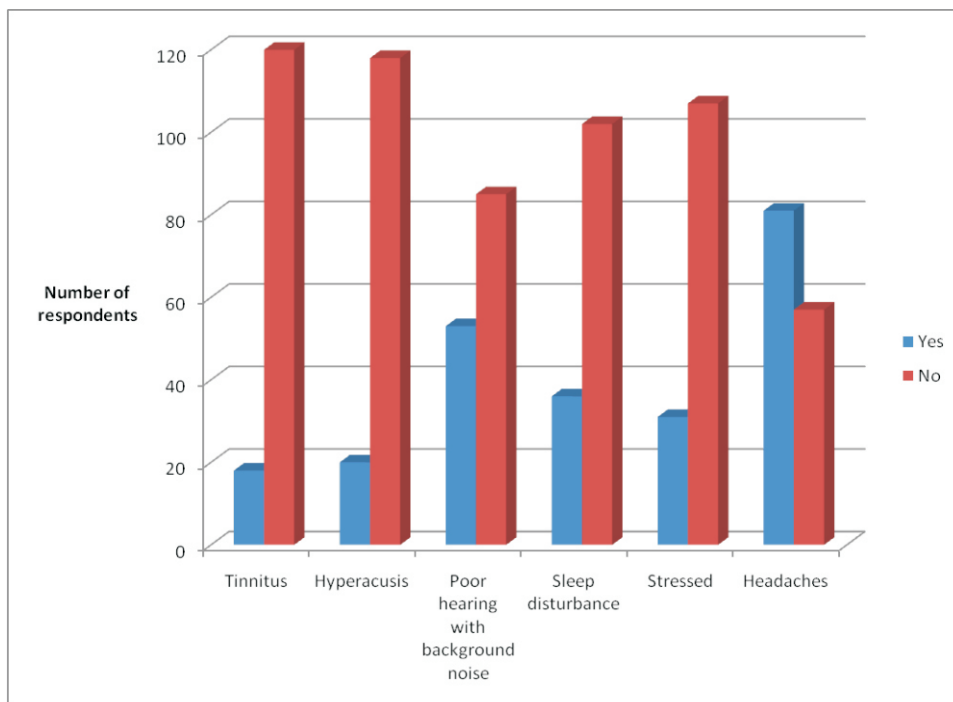


Figure 2: Hearing related complaints of respondents



DISCUSSION

This study focused basically on Dental professionals looking to see if they have subjective complaints of hearing impairment and hearing-related complaints following exposure to workplace noise. This study revealed that a younger age group with males outnumbering females, have at least a post-secondary qualification, and have worked for at least 5 years were at risk for hearing related complaints. Meaning more males than females were exposed to noise from dental hand tools, this is however, not surprising because the handling of machinery causing vibration and noise is said to be more common in male-dominated occupations¹⁷ which probably explains our finding as well. This is even more prevalent in our environment where there is more emphasis on male than on female education.¹⁸

The question to elicit subjective hearing loss was used to screen those adjudged to have hearing impairment, about 35 respondents reported perceived hearing impairment (giving a prevalence of 25.4%). Figure 1. Among this cohort, gender specific prevalence was higher among males (29.3%) than females (20.6%) since males predominate in the profession as mentioned earlier. This is in contrast to a similar study whence subjective hearing impairment was reported with 18.5% of the men and 14.8% of the women reporting slightly impaired hearing.¹⁰ This difference may be explained by difference in questionnaire wording and/or our study populations.

With respect to tinnitus as a hearing-related complaint (figure 2), only about 13.0% of respondents have experienced tinnitus, this was more common among men (14.7%) than women (11.1%). This is higher than study reported from Sweden¹⁹ which found 8.9% of men and 6.1% of women aged 20 through 49 years who had constant or nearly constant tinnitus. However, some studies looking at relationships between tinnitus and gender in

related studies with 68 and 50 tinnitus patients respectively, using the Tinnitus handicap inventory, the authors concluded that gender had no influence on tinnitus.^{20,21} This discrepancy with our study may be due to our larger sample size and perhaps an obviously higher male to female ratio. Although in the Swedish study wherein a larger population than ours was studied, their rates were lower by almost half. The utility of self-reported complaints of tinnitus is also clearly depicted by the studies of Giuseppe and Stefano²² and in the Norwegian study²³ where their respondents (10% and 7% of them respectively) reported experiencing tinnitus.¹⁹

Regarding responses to Hyperacusis (oversensitivity to loud sounds), the near equal estimates between male and females 14.7% and 14.3% from our study respectively does not agree with a recent finding in Karachi¹ where females had a higher ratio. This study alluded that the higher ratio of females complaining about hyperacusis could be due to the sensitivity levels of females as compared to male dental practitioners. At best this may be anecdotal but we are unable to explain why our findings revealed near equal estimates. There is need for more research in this regard, as this survey can neither agree nor disagree with the viewpoint.

Poor hearing in areas with background noise was a feature with 38.4% of respondents, this was higher than the report from a similar study looking at subjective symptoms of exposure to ultrasonic noise, 26.3% of their cohort complained that noise interfered with conversations.²⁴ This complaint is synonymous with "early cochlear changes" (early dysfunction in hearing acuity) as a result of undue exposure to noise and warrants further assessment by a hearing healthcare specialist.

The combination of tinnitus, Hyperacusis and problems with hearing in situations with competing noise all signify retrocochlear disease and this affects speech intelligibility



and impairment in social relations and productivity. Using a questionnaire can help to identify personnel at risk prior to formal assessment, requiring acoustic reflex testing, otoacoustic emissions, and auditory brainstem response, further tests may then be required depending on the outcome of these.

It seemed that a sizeable number of respondents may also be at risk of psychosocial dysfunction which may ultimately affect their activities of daily living index. At least one out of every 4 of our respondents (26.1%) complained of sleep disturbance as a result of workplace noise exposure, another 22.5% complained of feeling stressed after work while 58.7% had headaches. Several studies have also identified these subjective symptoms as typical for workers exposed to ultrasounds of variable frequencies or noisy equipment by dental personnel.^{1,24,25}

Although the influence of a possible high environmental noise, Ototoxicity, genetic predisposition as additional confounders was not explicitly investigated in this study concerning the risk of hearing loss in dentistry personnel as it is beyond the scope of this survey.

In the future, controlled studies among dental professionals would be required using standard audiometry and otoacoustic emission (OAE) audiometry to evaluate the impact of noise on their hearing acuity.

One of the limitations in this survey is the inability to use controls and performing the survey without using a formal audiometric test as a gold standard (Audiometry). And thus may have affected the quality of outcome for this survey. Similarly, the lack of a sound level meter to measure noise levels in the dental clinics would have objectively showed the environmental noise levels that the dental professionals are exposed to on a typical day. The author is unable to determine the effect of

bias due to non-respondents. Moreover, this study is based on self-reported exposure meaning that information or recall bias may have also occurred.

While the strength of this study, lies in the ability to use questionnaire to identify personnel at risk of workplace noise exposure and a high response rate (86%), bearing in mind how few and scattered these professional are in the metropolis of Kano. Furthermore, we are not aware of any other study that has reported on exposure to noise and work related hearing risk in a hospital setting not to mention in dental practice in Northern Nigeria.

CONCLUSION

Several factors put dental professionals at risk for hearing related complaints, including but not limited to years of practice, gender, daily working hours, and use of high powered dental devices. This study proposes using self-reported complaints of tinnitus, hyperacusis, impaired hearing in areas with competing sounds as symptoms indicative of a potential hearing impairment that could be used to predict undetected or imminent hearing impairment. Although there are other multiple variables to consider and as such further research is required to validate this. Where resources are scarce, well-designed questionnaires may be useful as a part of a screening battery for work related noise induced hearing loss.

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