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Occupational Noise Exposure and Hearing Impairment among Employees of Nightclubs in Port Harcourt Metropolis

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Hearing loss due to noise exposure in occupational settings is a significant health problem with economic consequences. Studies have implicated entertainment noise in contributing to the burden of hearing loss. This study was undertaken to determine the level of occupational noise exposure and hearing impairment among employees of night clubs in Port Harcourt metropolis.
Methodology: The study was carried out in Port Harcourt metropolis and employed a descriptive cross sectional design. A multi-stage sampling method was used to select 260 employees whose data were captured using a semi-structured interviewer administered questionnaire. An android based hearing test and sound pressure level meter were also used to collect data on hearing loss and to record sound pressure level of the night clubs during normal activities. Data collected was analyzed using SPSS version 20.
Results: The study found that average sound level of night clubs in Port Harcourt metropolis was 100.9dBA. Additionally, majority (93.7%) of employees work more than 8 hours daily and most

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(98.8%) of these employees do not use hearing protection devices. The commonest (69.9%)reason for not using was management's failure to provide. The study also revealed that 71.1% of the respondents had mild hearing loss.
Furthermore, the results showed that hearing loss was associated with age (*P* = .003), sex (*P* = .01), educational status (*P* = .000) and previous exposure to occupational noise (*P* = .000). Similarly, there was a relationship between duration of employment (*P* = .04), job description (*P* = .01) and hearing loss.
Conclusion: Based on this study finding, workers are exposed to sound levels above the maximum permissible limit of 85 dB for more than 8 hours daily and majority of these workers do not wear hearing protection devices. This could possibly be the reason for the high prevalence of hearing loss among employees of night clubs in Port Harcourt. Also, hearing loss was associated with age, sex, level of education, previous exposure to occupational noise, duration of employment and job description. It is therefore imperative for nightclub owners to be aware of the dangers of excessive noise and subsequently provide hearing protection devices for employees of these night clubs especially the disk jockeys, bouncers, bartenders and also wait-staff perhaps if noise reduction is not feasible.

Keywords: Noise exposure; hearing loss; employees; night club; Port Harcourt metropolis.

1. INTRODUCTION

One of the prevalent public health problems currently is the noise pollution and consequently its effects on health, including hearing [1]. Hearing loss is defined as worsening of hearing acuity and is usually expressed as an increase in the hearing threshold [2]. The normal hearing range for adult is 0 – 25 dB [3]. The second most common but preventable cause of hearing loss among adults is noise-induced hearing loss which accounts for 7 -16% of disabling hearing loss [4-6]. Noise-induced hearing loss (NIHL) may occur because of continuous or intermittent exposure to loud noise [7]. The largest burden of noise induced hearing loss has been through occupational exposures [8]. Hearing loss due to noise exposure in occupational settings is a significant health problem with economic consequences [9]. Noise at work is a global problem, covering a wide range of industry sectors, occupations, and workplaces. However, noise-induced hearing loss can also be due to unsafe recreational, residential, social, and military service-related noise exposures [8].

Studies have implicated entertainment noise in contributing to the burden of hearing loss. According to WHO, one in three adults has some level of measurable hearing loss and some 1.1 billion teenagers and young adults are at risk of hearing loss due to exposure to damaging levels of sound at noisy entertainment venues such as bars and nightclubs [10]. Nightclubs are places of entertainment open until late at night, formerly offering food, drink, a floorshow, dancing, etc., but now usually featuring loud amplified music for dancing [11].

Nightclubs are entertainment/recreational centres often seen as safe and free from danger or harm to employees and patrons but for even the safest clubs and bars, the largest unforeseen danger for employees and patrons is noise, even though the usual definition of noise as unwanted sound may not be applicable in this context [12]. Patrons visit these establishments often for listening to music at high level. Music played in nightclubs produce dangerously loud noise. A study conducted to determine the cumulative effect of noise exposure from attendance at dance clubs and nightclubs on whole of life noise exposure in Australia found that noise levels of nightclubs range from 90.7 – 105.7 dBA [13]. Also, a study conducted to assess the occupational noise exposure and hearing loss of nightclub workers in Tarakan City, Indonesia, found that the overall average sound level of the nightclubs was 107.22dBA [14]. The noise intensity in this environment can be so high that patrons may experience symptoms of temporary hearing loss.

Present also in nightclubs are various categories of employees, working and performing different tasks to ensure the proper functioning of the nightclub and customer satisfaction. These employees include waitstaff, disk jockeys (DJs), bartenders, bouncers or security, dancers etc. [15]. Most employees of nightclubs where loud music is played for long hours are not aware of the risk and as such don't wear protective devices. Hearing protective devices is not generally considered to be viable by employees

as frequent verbal communication with customers is vital [16].

Besides the negative effects on hearing, noise-induced hearing loss imposes a heavy social and economic burden on individuals, families, communities, and countries at large. The impact of hearing loss may be profound, with consequences for social, functional, and psychological well-being as well as the overall health of the individual [17]. In fact, studies have shown that uncorrected hearing loss gives rise to poorer quality of life, related to isolation, reduced social activity, and a feeling of exclusion, leading to an increased prevalence of symptoms of depression [18]. Occupational NIHL has also been associated with an increased risk for work-related injuries. For each decibel of hearing loss, a statistically significant increased risk was observed for work-related injuries leading to admission to hospital [19].

Several studies have been conducted assessing the extent of hearing impairment from different occupational settings within and outside Nigeria. However, most studies to date on sound levels in entertainment establishments such as nightclubs have concentrated on exposure levels for the attending public, rather than employees who may be at greater risk of hearing loss [1,13,20-22]. Additionally, with abundance of literature on sound levels in nightclubs, there are no published studies that have investigated the occupational noise exposure and associated hearing loss of employees in such establishments particularly in this environment.

2. MATERIALS AND METHOD

2.1 Study Area

This study was conducted in Port Harcourt metropolis, Rivers State. Port Harcourt metropolis consists of both Obio-Akpor and Port Harcourt City Local Government Areas. Obio-Akpor LGA has 17 electoral wards and PHALGA (as commonly referred) has 20 electoral wards. Port Harcourt metropolis is home to about 350 night clubs.

2.2 Study Design and Population

This study employed a descriptive cross sectional study design and the study population comprised all employees of nightclubs in Port Harcourt metropolis exposed to excessive noise equivalent or higher than 85 dB which was verified by means of sound level meter measurement. The estimated total population of employees of nightclubs in Port Harcourt metropolis is 5,250. The criteria established for inclusion of participants in the study were: All employees who have worked in the club for at least 6 months and were 18 years and above.

As exclusion criteria, participants who had visible evidence of heavy ear wax, visible congenital or traumatic deformity of the ear and a history of active drainage from the ear within the previous 90 days were not selected to participate in the study.

2.3 Sample Size Determination

The sample size was determined using the descriptive sample formula $n = \frac{Z^2pq}{d^2}$ [23] with the following assumptions: A prevalence of hearing impairment among employees of nightclubs of 81% obtained from a study was used as the proportion of attribute of interest (p) [24]. Using 5% marginal error at 95% confidence interval and after considering a 10% non-response rate, a sample size of 260 was gotten.

2.4 Sampling Method

A multi-staged sampling method was employed for this study. First, Port Harcourt metropolis was stratified into Obio-Akpor and Port Harcourt City Local Government Areas. Second, three wards were selected out of Obio-Akpor LGA and three wards out of Port Harcourt City LGA by simple random sampling method of balloting. The selected wards in OBALGA are wards 12, 14 and 15 while those in PHALGA were wards 1, 2 and 19. Third, nightclubs in each of the six selected wards within the two LGAs of Port Harcourt metropolis were identified. The number of nightclubs identified through this process was 54. The distribution of the nightclubs according to the wards is shown in Table 1 below.

Table 1. Distribution of nightclubs in selected wards of Port Harcourt metropolis

LGA	Selected wards	No of nightclubs
Obio–Akpor	12	8
	14	9
	15	9
Port Harcourt City	1	12
	2	7
	19	9
Total		**54**

Fourth, 5 nightclubs from each of the selected wards were selected through simple random sampling method of balloting using the list earlier obtained as a sampling frame. Next, there was an equal allocation of the sample size of 260 to the selected 30 nightclubs. This gave approximately 9 workers per nightclub. Lastly, 9 workers from each of the selected nightclubs who were exposed to loud noise among the staff were selected by simple random sampling method of balloting to take part in the study. These workers from each nightclub were approached to explain the purpose of the study and only those who gave informed consent were sampled for the study.

2.5 Study Tools and Procedure

2.5.1 Questionnaire

A semi-structured interviewer-administered questionnaire was constructed for nightclub employees based on those of other relevant studies [14]. The questionnaire was validated through a pilot study carried out on 26 employees of nightclubs within Ikwerre LGA of Rivers State. It composed of six sections: Section A obtained information on socio-demographics; Section B contained aural medical history; Section C obtained both previous and current occupational noise exposure history; Section D obtained information on current hearing status; Section E recorded sound level; Section F recorded level of hearing impairment.

2.5.2 Sound level measurement

The sound level of nightclubs was measured on specific nights, mostly weekends using the android based sound level meter application version 6.1.35 [25]. The test equipment was used and calibrated before each measuring session. All measurements were made in decibel dB (A) at four defined locations/areas within the nightclub which were the dance floor, DJ booth, bar and restroom corridor [26]. Measurement was taken four times; at 20:00 hours, 22:00 hours, 00:00 hours and 02:00 hours [27].

2.5.3 Audiometric evaluation

Audiometric assessment was done on eligible participants using the pre-validated android based hearing test application version 1.1.3 [28] (created by e-audiologia.pl.) by the principal researcher. Test was carried out in an area within the nightclub with minimal background noise through the following steps.

1. The participant was addressed on how to respond once the test has begun
2. The earphones were placed over the patient's ears.
3. The loudness dial of the study participant was set at 40dB.
4. The hearing test was done firstly on the left ear before moving to right ear
5. The test was done for frequencies 250, 500, 1000, 2000, 4000, 6000 and 8000Hz reducing the sound intensity by 5dB for each frequency using the buttons "I can hear' and 'I cannot hear'.
6. The lowest audible sound was confirmed using the button "Barely audible"
7. Hearing is normal if a response is obtained at ≤25dB across the screening frequencies

2.6 Data Management

The data collected were extracted from the questionnaire, coded and entered into Microsoft Excel version 2010. The entered data was cleaned and exported into Statistical Package for Social Sciences (SPSS version 20.0, IBM, Armonk, New York, United States of America) for analysis. Numerical data were summarized using mean and standard deviation and presented in the form of frequencies and percentages. Analysis of variance (ANOVA) test was used to determine mean difference between different locations/areas within nightclubs. Numerical data collected (e.g. age, number of working hours and hearing loss) were transformed into categorical dichotomous variables in order to determine association between key variables at $p \leq 0.05$ level of significance using for chi-square & logistic regression analyses. All results were presented using Tables 1 – 7.

2.7 Ethical Considerations

Ethical clearance was obtained from the Research Ethics Committee of the University of Port Harcourt. Permission to undertake this study was sought from the management of the nightclubs were eligible participants were selected for this study. Informed consent was obtained from eligible participants. Confidentiality was assured as names of clubs and respondents were not included.

3. RESULTS

Data for this study was collected using 260 interviewer-administered questionnaires.

However, after data cleaning which involved removal of questionnaires of respondents with uncompleted responses for key variables, 256 questionnaires were considered suitable for analysis. This gave a completion rate of 98.5%.

Table 2. Socio-demographics of respondents

Characteristics	Frequency (n=256)	Percentage (%)
Age (in years)		
≤23	117	45.7
>23	139	54.3
Mean age: 24.1 ± 2.4 years		
Sex		
Male	93	36.3
Female	163	63.7
Marital Status		
Single	254	99.2
Married	2	0.8
Level of education		
≤Secondary	191	74.6
Tertiary	65	25.4
Religion		
Christianity	252	98.4
Islam	3	1.2
Judaism	1	0.4
Ethnicity		
Igbo	134	52.3
Ikwerre	40	15.6
Efik/Ibibio/Anang	26	10.3
Ijaw	16	6.3
Ogoni	14	5.5
Urhobo	9	3.5
Yoruba	5	1.9
Others	12	4.7

Table 2 shows that 45.7 % of respondents were ≤ 23 years old while 54.3% were older than 23 years (mean = 24.1 ±2.4 years). More than half (63.7%) were females while men were 36.3%. Majority (99.2%) of respondents were single. In terms of educational status, almost three-quarter of respondents (73.8%) had completed secondary education. The table also shows that majority of the respondents (99.2%) were single. The Ibos were the dominant ethnicity with 52.3%, followed by Ikwerre (15.6%) and majority of the respondents (98.4%) were Christians.

Table 3 shows that 42.2% of the respondents had worked a noisy job while 57.8% had not worked a noisy job. Majority of respondents who previously worked noisy jobs (98.2%) worked in a nightclub. Most (74.2%) of the respondents have been working in their current organization for ≤ 12months while 25.8% have been working for more than 12 months. Also majority of respondents (65.6%) work as wait-staff, 11.3% work as bartenders, 6.6% work as DJs and 4.7% work as bouncers. Over three-quarter of respondents (76.9%) work 11 – 14 hours daily and 4 – 6 days weekly while 5.5% of respondents work for ≤ 3 days a week. A total of 253 respondents (98.8%) from 256 respondents do not wear hearing protection devices while at work. Of which over half (69.9%) of the respondents mentioned they weren't using hearing protection devices because the management didn't provide any.

Table 3. Occupational history of respondents

Characteristics	Frequency (n=256)	Percentage (%)
Previous work exposure to noise		
Yes	108	42.2
No	148	57.8
Length of employment		
≤ 12 months	190	74.2
> 12 months	20	25.8
Job description		
Wait staff	168	65.6
Bartender	29	11.3
Disk jockey	17	6.6
Bouncer	12	4.7
Supervisor	10	3.9
Cleaner	9	3.5
Dancer	4	1.5
Others	5	1.9
Number of days worked in a week (n=256)		
≤ 3	14	5.5
4-6	197	76.9
7	45	17.6
Mean days: 5.8 ± 1.02 days		
Number of hours worked in a day (n=256)		
3-6	3	1.2
7-10	43	16.8
11-14	197	76.9
> 14	13	5.1
Mean duration: 12.3 ± 2.8 hours		

Table 4 shows that the average sound level of nightclubs is 100.9 dBA with mean sound levels range from 95.9 - 105.2 dBA. Additionally, table 3 shows that sound levels from the dance floor and disk jockey booth areas of the nightclubs had the highest average (110 dBA & 109.5 dBA respectively) while the restroom corridor had the lowest average (86.8dBA).

Table 5 shows a summarized result of audiometry done on study participants. A total of 182 respondents (71.1%) had mild hearing loss,

while 74 respondents (28.9%) did not experience any hearing loss.

Table 6 shows that respondents who have worked longer than 12 months have a statistically significant higher proportion for hearing loss compared to those who have worked for ≤ 12 months (81.8% vs. 67.4%). The logistic regression analysis showed that respondents who have worked longer than 12months were 2.17 times at odds of having hearing loss compared to those who have worked for ≤ 12months (*P* = .04).

3.1 Factors Associated with Hearing Loss

Chi-square test showing odds ratio was performed in order to show if there is an association between some factors and hearing loss.

Table 4. Sound level of nightclubs

Club	Mean sound level (dBA)				Mean
	Bar	Dance floor	DJ booth	Restroom corridor	
A.	102.0	104.8	104.0	94.3	101.3
B.	105.3	109.3	108.8	91.8	103.8
C.	104.5	107.8	107.5	92.3	103.0
D.	102.3	103.0	103.3	92.0	100.1
E.	100.0	100.5	100.3	91.8	98.1
F.	105.3	107.5	107.3	94.0	103.5
G.	100.5	104.0	104.0	86.3	98.7
H.	106.8	110.0	109.5	94.5	105.2
I.	100.8	105.0	105.0	92.5	100.8
J.	102.3	102.8	102.5	92.0	99.9
K.	98.5	102.5	102.8	92.3	99.0
L.	104.3	106.5	107.5	93.5	98.6
M.	106.3	106.5	106.5	93.0	103.1
N.	102.8	104.8	105.0	97.3	102.4
O.	101.3	102.5	102.8	93.0	99.9
P.	104.3	105.0	105.0	94.3	102.1
Q.	99.8	101.3	101.5	92.5	98.8
R.	98.0	98.8	98.5	88.3	95.9
S.	102.5	103.0	104.0	100.0	102.4
T.	100.0	101.8	101.5	93.0	99.1
U.	103.5	103.5	102.5	91.0	100.1
V.	102.8	102.8	102.3	92.0	99.9
W.	102.8	103.8	103.8	93.8	101
X.	102.8	102.0	101.8	95.8	100.6
Y.	98.3	99.3	99.3	89.5	96.6
Z.	104.3	105.0	103.8	96.5	102.4
AA.	102.5	104.3	104.3	92.0	100.8
BB.	104.3	104.3	104.3	91.8	101.1
CC.	106.3	107.5	107.0	91.3	103.0
DD.	102.3	102.5	102.3	96.0	100.8
Overall mean					*100.9± 5.3dBA*

Table 5. Level of hearing loss among nightclub employees

Characteristics	Hearing loss range (dB)	Frequency (n=256)	Percentage (%)
Hearing loss			
Yes	26 - 40	182	71.1
No	≤ 25	74	28.9

Table 6. Relationship between duration of noise exposure and hearing impairment

Characteristics	Hearing loss		Total	*df*	*χ2 (P-value)*	OR (95% CI)
	Yes Freq (%)	No Freq (%)				
Employment duration in current organization						
≤ 12 months	128(67.4)	62(32.6)	190(100.0)	1	4.29	2.17R
>12 months	54(81.8)	12(18.2)	66(100.0)		(.04)*	(1.09 - 4.37)
Total	**182(71.1)**	**74(28.9)**	**256(100.0)**			

R= Reciprocal odds ratio

Table 7. Factors associated with hearing loss

Variable	Hearing loss		Total	*df*	*χ2 (P-value)*	OR (95% CI)
	Yes Freq (%)	No Freq (%)				
Age						
>23 years	110 (79.1)	29 (20.9)	139 (100.0)	1	8.74	2.37
≤23 years	72 (61.5)	45 (38.5)	117 (100.0)		(*.003*)*	(1.36-4.12)
Total	**182(71.1)**	**74(28.9)**	**256(100.0)**			
Sex						
Male	76 (81.7)	17 (18.3)	93 (100.0)	1	7.23	2.40
Female	106 (65.0)	57 (35.0)	163 (100.0)		(*.007)**	(1.30-4.45)
Total	**182(71.1)**	**74(28.9)**	**256(100.0)**			
Educational status						
≤Secondary	122 (63.9)	69 (36.1)	191 (100.0)	1	17.72	6.79R
Tertiary	60 (92.3)	5 (7.7)	65 (100.0)		(*.000*)*	(2.56–22.56)
Total	**182(71.1)**	**74(28.9)**	**256(100.0)**			
Previous exposure to noise at work						
Yes	92 (85.2)	16 (14.8)	108 (100.0)	1	18.05	3.71
No	90 (60.8)	58 (39.2)	148 (100.0)		(.000)*	(0.14-0.50)
Total	**182(71.1)**	**74(28.9)**	**256(100.0)**			
Job description						
Wait-staff	105 (62.5)	63 (37.5)	168 (100.0)	9	*20.50*	*.025**
Bartender	25 (86.2)	4 (13.8)	29 (100.0)			
Disk Jockey	16 (94.1)	1 (5.9)	179 (100.0)			
Bouncer	11 (91.7)	1 (8.3)	12 (100.0)			
Supervisor	9 (90.0)	1 (10.0)	10(100.0)			
Cleaner	7 (77.8)	2 (22.2)	9 (100.0)			
Dancer	4(80.0)	1 (20.0)	5 (100.0)			
Driver	1(50.0)	1 (50.0)	2 (100.0)			
Manager	2(100.0)	0 (0.0)	2 (100.0)			
Total	182(71.1)	74(28.9)	256(100.0)			

Table 7 showed that age (*P* = .003), sex (p = .01), educational status (*P* < .001), previous exposure to noise at work (*P* < .001) and job description (*P* = .03) were significantly associated with hearing loss.

4. DISCUSSION

Findings of this study show that the sound level of all nightclubs within Port Harcourt metropolis exceeds the maximum permissible noise limit. In Nigeria, the maximum permissible noise limit for places or venues of entertainment is about 85 dBA for 8 hours per day [29]. The average sound level of night clubs in Port Harcourt metropolis was 100.9 dBA with a range of 95.9 - 105.2dBA. Additionally, the sound levels across nightclubs were observed to rise with time with peak value of 115dBA. Furthermore, the DJ booth and dance floor were the areas within the nightclubs with the highest sound level (103.9 & 104.1 dBA respectively), while the restroom corridor had the lowest (92.9 dBA). Consequently, this high sound level may have devastating effects

especially on workers who spend most of their time in the dance floor areas, DJ booth and the bar areas. Moreover, this wide sound level range is similar to findings the study in England UK, in Australia and in Tampa, Florida [13,24,27,30].

However, the average sound level from this study is higher than findings reported by a similar studies carried out in nightclubs in Edinburgh, UK [30], in Australia [13,26], in Ireland [31] and in France [32]. The disparity in the average sound level may not be unconnected to the method of data collection. The Australia study collected sound level data from six undefined points of the nightclubs whereas in this study, sound level was measured at different times (with a two-hour interval) from four defined areas of the nightclubs. Meanwhile the Irish study used a type 1 fixed position sound level meter whereas this study measured sound level using a pre-validated mobile sound level meter application.

On the other hand, this study finding is lower than the 107.2dBA reported in Tarakan, Indonesia [14]. This may not be unconnected to a smaller same size (five nightclubs) sampled from which may not be entirely representative of the population.

According to the audiometry, majority (71.1%) of nightclub employees had mild hearing and none had moderate or severe hearing loss. The high sound intensity has a big role towards this high prevalence of hearing loss. Studies have shown that nightclub workers exposed to high level of sound intensity, showed lots of symptoms of tinnitus and decreased hearing quality after work [33]. The level of hearing loss in this study is comparable with the findings reported from the study carried out in France [32] but lower than the 88.9% level of hearing loss found in Tarakan, Indonesia [14]. The finding of this study is higher than studies in UK [34] and Egypt [35]. The small sample size of the UK study comprising of 28 participants, of which only 14 gave consent to take part were not representative enough to give reliable results besides the possibility of selection bias. Additionally, the UK study focused majorly on university student employees working part-time (up to 16 hours / week) while this study focused on the adults who have worked in their current organization for 6 months or more. The Egyptian study on the other hand, sampled employees of different professions as compared to the Egyptian study that assessed hearing loss on only professional DJs.

The duration of noise exposure in a single day and the length of employment in a nightclub may affect the occurrence of hearing loss. In Port Harcourt metropolis, almost all nightclub employees work 6 days a week and more than 8 hours daily. This study found that the longer the duration of employment the higher the likelihood of hearing loss. A study confirmed that the longer the individual experience in this profession is, being exposed to high sound levels, the worse the audiometric threshold [36]. However, there was no statistically significant relationship between the duration of work per day and hearing loss in this study. This finding is similar to that of the Indonesian study [14].

Finally, this study found that there are other factors which are associated with hearing loss such as age, sex, educational status, previous exposure to noise at work and job description. Being older (> 23 years old) increases the possibility of hearing loss among employees of nightclub is comparable to the study in Singapore [37]. Additionally, being male as well as having completed tertiary education may possibly increase the likelihood of having hearing impairment/loss. This however, may not be unconnected to the fact that most of the employees with tertiary education are older and had previously being exposed to noise at work. Those who had previously worked in a noisy environment are about 3.71 times more likely to experience hearing loss compared to those who had not been previously exposed to noise at work (OR = 3.71; 95%CI: 0.14 - 0.50; $P < .01$).

For the job description, findings from this study reveal that majority (94.1%) of the Disk Jockeys had hearing loss followed closely by bouncers of which 91.7% of them had hearing loss, then the 88.9% of the supervisors, 86.2% of the bartenders and 62.5% of wait-staff had hearing loss. The high rate of hearing loss found among Disk Jockeys could possibly be due to the level of sound they are often times exposed to in the DJ booth as evidenced from findings of this study. This finding is similar to reported findings in Egypt [35], in Brazil [38], in France [31]. The high proportion of hearing loss also found among bartenders and bouncers may possibly be due to the fact that these workers are not in constant motion and are confined to their duty post. Therefore, they get are exposed to high level of sound from both the bar and dance floor areas respectively. This is in agreement with findings reported by in Florida, USA [29]. Wait-staff on the other hand, could be seen at different areas most

times away from the noise unless their services are needed. This however, may not be unconnected to the lower proportion of hearing loss found among them in this study.

5. LIMITATIONS

a. Due to the inability to get all participants to do the conventional laboratory pure tone audiometry in a sound booth, an area in the study location with minimal background noise was used. Also, there was no chance to confirm if the respondent's answers were correct, so the study relied on the honesty of respondents.
b. There seemed to be no registered association of nightclub owners, so there was difficulty in getting a list of all registered/licensed nightclubs in Port Harcourt metropolis. So, nightclubs were identified on sight by the researcher.

6. CONCLUSION

Findings of this study reveal that employees of nightclubs in Port Harcourt metropolis are exposed to sound levels above the maximum permissible limit of 85 dB for more than 8 hours daily despite existing laws on safe work noise. This could possibly be the reason for the high level (71.1%) of hearing loss found among nightclub employees. Additionally, other factors such as age, sex, level of education, previous exposure to occupational noise, duration of employment and job description were associated with hearing loss. Therefore, it becomes imperative to protect employees of nightclubs from excessive noise due to loud music in order to reduce this burden of hearing loss. There is also urgent need to enforce already existing laws on work noise reduction, though in this case might not be feasible, as well as the provision and strict compliance to the use of hearing protection devices. Finally, the call for further research into this area in Nigeria and Africa cannot be over-emphasized.

7. RECOMMENDATIONS

To reduce the noise workers of nightclubs are exposed to and burden of hearing impairment among these employees, the following recommendation are proposed.

a. The owners/employers of the nightclub should be made aware of the hazard to hearing existing in their organization. This information should subsequently be relayed to the employees.
b. The owners of nightclubs should make efforts to controlling the intensity of the sound. Although this might not be practical because that's the soul of its patronage. Notwithstanding, hearing protection can be provided for employees, especially the disk-jockeys, bartenders, bouncers and also the wait-staff.
c. Nightclub owners should as well provide adequate rest period for employees. A good job rotation system might be a good solution to reduce the duration of exposure of exposure to such excessive noise.
d. The government should do more routine in measuring the noise exposure level in every nightclub.
e. The government should develop and enforce strict legislation on recreational/ leisure noise.

CONSENT

Informed consent was obtained from eligible participants. Confidentiality was assured as names of clubs and respondents were not included.

ETHICAL APPROVAL

Ethical clearance was obtained from the Research Ethics Committee of the University of Port Harcourt. Permission to undertake this study was sought from the management of the nightclubs were eligible participants were selected for this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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