

Tinnitus; an Index of Noise Pollution amongst Church Worshippers in Port Harcourt Metropolis



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Abstract

Background: In this region, Christians constitute the majority of the population and as such most attend church at least once in a week. In recent times church music has changed from quiet hymns to very loud music with the full works. This obtains both in the orthodox and Pentecostal churches. The worshippers therefore are often exposed to very loud sounds without wearing protective hearing devices, hence may not be spared the attendant consequences. The aim of this study therefore is to determine the effect of loud music on the ears of worshippers in the churches, using tinnitus as an index.

Patients and Method: This is a quantitative descriptive study with data obtained by a self-administered questionnaire that was distributed in four randomly selected worship centers within Port Harcourt metropolis; two Pentecostal, one Protestant and one Catholic within a three month period; December 2017 to February 2018. Port Harcourt is the capital of Rivers state and majorly consists of Christian population. It has numerous number of churches scattered all over the metropolis. Worshippers that have been attending the said churches that gave their consent were included while first time attendees were excluded as well as those with previous ear problems prior to this study. Worshippers with discharging ears of any kind were excluded. A sound level meter by Audio control (23MB downloaded from Android play store on Huawei mobile) was also used to determine the average sound level during services in these worship centers. Ethical approval for the study was obtained from the hospital ethical committee. Results were analyzed with SPSS version 20 and presented in simple statistical tables.

Introduction

Tinnitus is defined as perception of sound in the absence of an external stimuli [1]. It can coexist with hearing loss as well as be noise induced. Tinnitus can be a transient sensation in which case it ceases spontaneously lasting just few seconds. It can also be permanent as such affecting the quality of life and interfering with daily life activities [2]. Noise exposure is the commonest cause of tinnitus [3]. According to WHO, noise ranks second in disease causing pollution in the world [4] and tinnitus is the 3rd worst symptom affecting humans exceeded only by intense and intractable pains and dizziness [5]. About 15-20% of world population suffers from tinnitus and in about 25% of this affected population, it interferes with daily activity [6]. Though there is presently designed programs and regulations on occupational exposure to noise, there are little or no regulations for exposure to recreational or leisure noise. There are numerous sources of leisure noise and music is prominent among these [7]. Music in discos routinely exceed 90dBA [8], the sound levels in these places can be very high, causing tinnitus and temporary hearing impairment [9]. Exposures to noise levels up to 90dB frequently causes the hair cells especially the outer hair cells of the inner ear to degenerate during such exposures [10]. In addition to the loudness, the duration of exposure to the noise also determines the safety and permissibility [11].

The more intense the sound and longer exposure, the more the damage to the hair cells [12]. Sound pressure levels (SPL) in churches can be high, in Brazil in four hour worship; a level of 85dB has been recorded. The worshippers including their religious leaders are exposed to health hazards during such church services from high sound levels that can lead to noise induced hearing loss [13]. The high levels therefore compare to the SPL found in music studios, industrial environments like oil rigs, high noise recreational environment such as night clubs [12,13]. It is also of note that young adults expose themselves to high levels of noise from personal listening devices, attending night clubs and other loud leisure noise because they are not aware of the import of such exposures and the resulting tinnitus. About 89.5% of young adults had transient tinnitus after exposure to excessive noise [14]. It is known that intermittent tinnitus is related to excessive noise exposure [14] and the onset of tinnitus could be due to exposure to such excessive noise [15]. In Nigeria, there are numerous worship centers in the capital cities [16]. With the attendant noise pollution. In addition, these church buildings because often are built without consideration to acoustics become closed places where sounds are easily propagated and therefore high risks in producing noise induced hearing impairment [17]. Therefore, a regulation was put in place by the National environmental noise

standard and regulations enforcement Agency that the maximum permissible noise level in worship centers should not exceed 75dB [18] There is little work on effect of church music on hearing in our environment. This study therefore is aimed at finding effect of the noise levels in our churches on the worshippers using tinnitus as an index.

Results

Table 1: Socio-demographics characteristics of church worshippers.

Variables (N = 94)	Frequency	Percentage (%)
Age category		
<15 years	4	4.3
15 – 24 years	12	12.8
25 – 34 years	22	23.4
35 – 44 years	22	23.4
45 – 54 years	8	8.5
55 – 64 years	18	19.1
65 and above	8	8.5
Sex		
Male	54	57.4
Female	40	42.6
Denomination		
Catholic	80	85.1
Protestant	2	2.1
Pentecostal	12	12.8

Table 2: church-related characteristics of worshipper.

Variables (N = 94)	Frequency	Percentage (%)
Frequency of church worship sessions		
Once a week	16	17
Twice a week	32	34
Thrice a week	18	19.1
>3 times a week	28	29.8
How long worshippers has been in church		
<3 months	6	6.4
3 – 6 months	6	6.4
7 – 12 months	6	6.4
1 – 5 years	18	19.1
>5 years	58	61.7
Loudness of music during church session		
Loud	46	48.9
Very loud	34	36.2
Extremely loud	14	14.9
Proximity of worshippers to loudspeaker		
Close	26	27.7
Not so close	54	57.4
Far	14	14.9
Variables (N = 72)	Frequency	Percentage (%)

Table 3: church-related characteristics of worshipper.

Variables (N = 72)	Frequency	Percentage (%)
Frequency of tinnitus		
Once per month	26	36.1
Twice per month	16	22.2
Thrice per month	12	16.7
4 times per month	8	11.1
5 and above	10	13.9
Tinnitus stopped spontaneously		
Yes	68	94.4
No	4	5.6
Duration tinnitus stopped		
Within 24 hours	48	66.7
Within a week	22	30.6
Has not stopped	2	2.8
Same hearing after tinnitus stopped		
Yes	44	55.6
No	32	44.8
See doctor for tinnitus		
Yes	16	22.5
No	56	77.8

Table 4: Socio-demographic characteristics vs tinnitus in church worshippers.

Variables	Tinnitus		Total N = 94 n (%)
	Yes N=72 n (%)	No N=22 n (%)	
Age category			
<15 years	0 (0.0)	4 (100.0)	4 (100.0)
15 – 24 years	12 (100.0)	0 (0.0)	12 (100.0)
25 – 34 years	10 (45.5)	12 (54.5)	22 (100.0)
35 – 44 years	16 (72.7)	6 (27.3)	22 (100.0)
45 – 54 years	8 (100.0)	0 (0.0)	8 (100.0)
55 – 64 years	18 (100.0)	0 (0.0)	18 (100.0)
65 and above	8 (100.0)	0 (0.0)	8 (100.0)
Fisher’s exact test = 35.151; p-value = 0.0001*			
Sex			
Male	44 (81.5)	10 (18.5)	54 (100.0)
Female	28 (70.0)	12 (30.0)	40 (100.0)
Chi-square = 1.690; p-value = 0.194			
Denomination			
Catholic	58 (72.5)	22 (27.5)	80 (100.0)
Protestant	2 (100.0)	0 (0.0)	2 (100.0)
Pentecostal	12 (100.0)	0 (0.0)	12 (100.0)
Fisher’s exact test = 4.877; p-value = 0.112			

*statistically significant

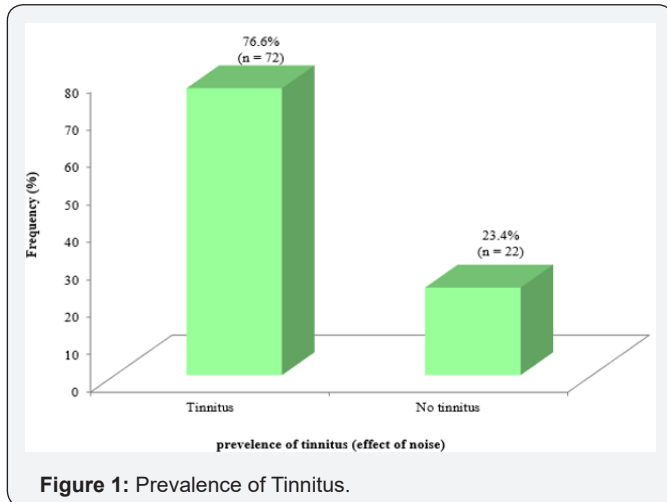


Figure 1: Prevalence of Tinnitus.

There were ninety four worshippers, 57.4% males and 42.6% females. The catholic denomination comprised 85.1% while Pentecostal which is the least, made up 12.8%. The average sound level is also highest in the Pentecostal and catholic

churches 98.4dBA and 98.3 dBA respectively while it is lowest in the protestant church 87.6dBA. The age 25-44years were more affected with 22.4% (Tables 1& 2). Tinnitus was present in 76.6% of the respondents, (Figure 1). Majority of the respondents has been worshippers for more than 5yrs; 61.7%. About 48.9% found the music loud while 14.9% found it extremely loud, Table 3. Incidentally 59.6% of these worshippers are aware of the effect of noise on their hearing. In the majority 66.7% the tinnitus stopped within 24 hours while in 30.6% it lasted up to a week and in2.8% it did not cease. The hearing was not the same after the tinnitus in 44.8%, (Table 3) When the sociodemographic characteristics are considered there is statistical significance of tinnitus with age distribution; p-value of 0.0001 (Table 4). In terms of denomination, catholic denomination had 72.5% of worshippers with tinnitus while the rest all had 100% but this difference is not statistically significant. There is however significant chances of developing tinnitus the closer the worshippers sit to the loud speakers. The length of time the worshipper has been attending church as well as the frequency is significant in the developing of tinnitus (Tables 5 & 6).

Table 5: Church-related characteristics vs tinnitus in church worshippers.

Variables	Tinnitus		Total N = 94 n (%)
	Yes N=72 n (%)	No N=22 n(%)	
How long worshippers have been attending church			
<3 months	6 (100.0)	0 (0.0)	6 (100.0)
3 – 6 months	2 (33.3)	4 (66.7)	6 (100.0)
7 – 12 months	6 (100.0)	0 (0.0)	6 (100.0)
1 – 5 years	14 (77.8)	4 (22.2)	18 (100.0)
>5 years	44 (75.9)	14 (24.1)	58 (100.0)
Fisher's exact test = 8.000; p-value = 0.060			
Frequency of church worship			
Once a week	14 (87.5)	2 (12.5)	16 (100.0)
Twice a week	24 (75.0)	8 (25.0)	32 (100.0)
Thrice a week	16 (88.9)	2 (11.1)	18 (100.0)
>3times a week	18 (64.3)	10 (35.7)	28 (100.0)
Fisher's exact test = 4.596; p-value = 0.200			
Loudness of music during church session			
Loud	32 (69.6)	14 (30.4)	46 (100.0)
Very loud	26 (76.5)	8 (23.5)	34 (100.0)
Extremely loud	14 (100.0)	0 (0.0)	14 (100.0)
Chi-square = 5.546; p-value = 0.062			
Proximity to loudspeaker			
Close	24 (92.3)	2 (7.7)	26 (100.0)
Not so close	42 (77.8)	12 (22.2)	54 (100.0)
Far	6 (42.9)	8 (57.1)	14 (100.0)
Chi-square = 12.512; p-value = 0.002*			

*statistically significant.

Table 6: Church related characteristics versus tinnitus awareness in worshippers.

Variables	Awareness of effect of noise		Total N = 94 n (%)
	Total N = 94 n (%)	Aware N=56 n (%)	
How long worshippers have been attending church			
<3 months	2 (33.3)	4 (66.7)	6 (100.0)
3 – 6 months	6 (100.0)	0 (0.0)	6 (100.0)
7 – 12 months	0 (0.0)	6 (100.0)	6 (100.0)
1 – 5 years	8 (44.4)	10 (55.6)	18 (100.0)
>5 years	40 (69.0)	18 (31.0)	58 (100.0)
Fisher’s exact test = 18.171; p-value = 0.0001*			
Frequency of church worship			
Once a week	4 (25.0)	12 (75.0)	16 (100.0)
Twice a week	22 (68.8)	10 (31.2)	32 (100.0)
Thrice a week	10 (55.6)	8 (44.4)	18 (100.0)
>3times a week	20 (71.4)	8 (28.6)	28 (100.0)
Chi Square = 10.815; p-value = 0.013*			
Loudness of music during church session			
Loud	28 (60.9)	18 (39.1)	46 (100.0)
Very loud	22 (64.7)	12 (35.3)	34 (100.0)
Extremely loud	6 (42.9)	8 (57.1)	14 (100.0)
Chi-square = 2.028; p-value = 0.363			
Proximity to loudspeaker			
Close	12 (46.2)	14 (53.8)	26 (100.0)
Not so close	32 (59.3)	22 (40.7)	54 (100.0)
Far	12 (85.7)	2 (14.3)	14 (100.0)
Chi-square = 5.919; p-value = 0.052			

Discussion

This study even though it was carried out in three major worship centers in Port Harcourt metropolis, had only 94 members that consented and filled the self - administered questionnaire properly. The catholic denomination constituted the greater percentage 85.1% of the study while the least was the protestant. We could not deduce an explanation for this. The finding of more males being affected than females is similar to a study in Brazil by Flores et al.[19] The age’s 15-44years were the most affected and this constitutes the youth and the work force. Among the respondents, 76.6% had tinnitus and about 36.1% has been suffering intermittent tinnitus at least once a month. About 13.9% have up to more than five episodes in a month. It is important to note that intermittent tinnitus is often as a result of excessive noise exposure [14]. In majority of these 66.7% there was spontaneous resolution within 24 hours however a good percentage 30.6% lingered up to a week, but in 2.8% it did not resolve. It is known that ringing tinnitus is also related to excessive noise [20]. In about 44.8% of these worshippers their hearing was gradually being affected since it was not the same after the tinnitus. This lays credence to the study that found temporary shifts in threshold of hearing to be insidious [21] Tinnitus was found to be significantly present in almost all the age category. This shows that the risk of deleterious effect of

excessive noise exposure in the churches is significant for all ages with a p-value of 0.0001. The study also shows that from about age 44 years, the risk of developing tinnitus and possible hearing loss on exposure to excessive noise is even greater, 100% of them developed tinnitus.

The length of time the worshippers had been in church and their frequency of worship when compared with their awareness of effect of the noise on their ear are statistically significant. They tend to be more aware of the effect. In addition, the closer they are to the loud speakers, the more their chances to develop tinnitus. The average sound levels are highest in the Pentecostal church followed closely by the Catholic Church. It is of note that these levels are much higher than the prescribed 75dB A by the Nigerian national environmental noise standard and regulation Act [18]. Most times, the worship sessions in these churches last 2-7 hours, yet the noise levels compare to that in some industrial environments. When there is such high intensity of sound, the duration of exposure should be less. This is because the higher the sound and longer the exposure, the more the damage to the hair cells [12]. In such settings, high intense sounds from music has been associated with temporary hearing impairment [22]. There is therefore need to educate the public on the effects or risks of damage to the hearing from exposure to loud sounds from music [23] this is because loud sounds are not that offensive to the ear

until they reach up to 120dB A [24] This could explain why just about 14.9% only found the noise extremely loud amongst the respondents while 48.9% found the music often loud and 27.7% of them sits lose to the loud speakers. It is important to note that tinnitus could be the first symptom of hearing dysfunction [25].

Recommendations

There is need for education and public enlightenment on the dangers of loud sounds to the ears. Educate the public on the significance of tinnitus and what to do to avoid it. There should be effort at enforcing strict adherence to the law concerning sound levels in worship centers

Conclusion

The worship sessions in our churches appear to have become too loud as evidenced by the high sound levels. This has begun to affect the ear health of the worshippers with the attendant presence of intermittent tinnitus in majority of them. Public education on this is of great importance.

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