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Original Research Article

Quality of life of tinnitus patients with and without hearing loss

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ABSTRACT

Background: Tinnitus is a common, irritating and often disturbing symptom. It poses big challenge to the patients' management and affects their quality of life (QoL). Tinnitus is one of the most common otological symptoms associated with hearing loss. The aim of the study was to determine the quality of life of adult tinnitus patients and the effect presence of hearing loss has on the quality of life.
Methods: All consenting adults presenting with tinnitus with or without associated hearing loss were recruited. Sociodemographic information, clinical assessment, pure tone audiometry (PTA) and QoL assessment with Tinnitus Functional Index (TFI) were carried out. The data collected were analysed and results were presented in tables and simple chart.
Results: The age range of participants was between 18 and 80 years with a mean age of 51.94 years±17.41. Male to female ratio was 1:1.4. The relationship between tinnitus and associated hearing loss was statistically significant with moderate hearing loss found as commonest. Sensorineural hearing loss was the commonest type found. Tinnitus was mostly described as a big problem. The relationship between the TFI scores and presence of hearing loss as well as degree of hearing loss was statistically significant.
Conclusions: Tinnitus has a significant health burden which tends to increase with co-existing hearing loss. PTA assessment and measurement of QoL should be advocated as routine for tinnitus patients no matter the cause of tinnitus and also especially among those with self-professed normal hearing.

Keywords: Hearing loss, Pure tone audiometry, Tinnitus, Tinnitus functional index

INTRODUCTION

Tinnitus is defined as an unwanted sound or noise perceived in the ears or in the head unrelated to any external source or stimuli.[1,2] It is an inability to perceive silence.3 In terms of auditory abilities; tinnitus can be described as the perception of sound that results exclusively from activity within the nervous system without any corresponding mechanical or vibratory activity within the cochlea.[3,4] Tinnitus is one of the most common otological symptoms associated with hearing loss especially the sensorineural type.[5] In general terms, a person is said to have "hearing loss" if the tones are presented at higher intensities (above the normal reference values) for them to be heard. In other words, the more thresholds deviate from the normal reference values, the worse the hearing loss.[6,7]

The two most common types of hearing loss associated with tinnitus are noise-induced hearing loss (NIHL) and presbycusis.8 It can either occur alone or as part of symptoms complex of certain otological diseases like

Meniere's disease, ototoxicity, noise induced sensorineural hearing loss (NIHL) or presbycusis.[8,9]

Therefore, clinical and audiological evaluations become imperative to rule out the external and middle ear pathologies.[4] Ukaegbe et al observed that out of 10 (23.3%) subjects with hearing loss, conductive hearing loss was the commonest type of hearing loss observed in 6 (13.9%), while sensorineural hearing loss was seen in 7% of the participants and mixed hearing loss in only 2.3%.[10] The conductive hearing loss observed in the subjects may be attributed to some subclinical middle ear disease such as Eustachian tube dysfunction which implies that these subjects are likely to improve with therapy. The subjects need further middle ear analysis which was not available in this research.[10] The study defer from the findings by Monzani et al where sensorineural hearing loss was the commonest hearing loss amongst the tinnitus patients.[11] The elevated pure tone average (PTAv) observed among patients with tinnitus in the same study indicated that they are more likely to experience one form of hearing loss than those without tinnitus.

Researchers have suggested that the quality of life of patients is reduced as a result of the severe distress of tinnitus with depression and anxiety were found to be the commonest psychological comorbidities suffered by these patients.[12] It can also lead to activity limitation, such as difficulties in executing regular daily activities, restriction of participation as well as cognitive effects (difficulty with attention and concentration), anxiety, psychological distress communication and listening problems (hearing problems), frustration, tension, inability to work, and reduced efficiency.[13] Tinnitus Functional Index (TFI) has been selected as a standard instrument for measuring the health related quality of life (HRQoL) in both clinical and research settings.[14] TFI can serve as a valuable tool for facilitating understanding of tinnitus and for refining treatments.[14]

In our locality, there is still a paucity of data on the hearing thresholds of tinnitus patients especially among those with self-professed normal hearing and no additional otological symptoms. It is therefore very important to determine their pure tone audiometric hearing thresholds of adult patients who present to Ear, Nose and Throat (ENT) clinic with tinnitus for better counseling and overall management of the tinnitus patient.

METHODS

This was a hospital based cross-sectional study carried out at University of Ilorin Teaching Hospital, Ilorin. All consenting adults of age 18 years and above, presenting to ENT clinic with tinnitus (as their primary complaint) regardless of the presence or absence of hearing loss were recruited after a detailed explanation of the purpose of the study and procedures involved. The TFI questionnaire was administered to each consenting subject. Clinical assessment was carried out which includes history taking, ENT examination, pure tone audiometry (PTA). Convenience sampling technique was used to collect the data within a period of nine (9) months.

Approval was obtained from the Ethical Review Committee before commencement. The socio demographic data and clinical details of each participant were obtained using the investigator designed proforma. The health-related quality of life questionnaire was administered by investigator to all participants. At the end of the completed questionnaire, the total score for each respondent was calculated. It ranged from 0 to 250. The 25 TFI items were rated over the maximum value of 10. The TFI scores were also based on percentage. This provides the respondent's overall score within 0-100 range.

All the participants had pure tone audiometric test done using a clinical audiometer: MAICO Diagnostic GmbH, Salzufer 13/14, 10587 Berlin, Germany; calibrated in 2017 using sound level meters (Testo 815). The audiometric test was carried out at the E.N.T. department audiology room with a sound booth. The procedure was explained to each patient. The level of hearing loss was graded according to the World Health Organization Grading of Hearing Impairment: Normal hearing (≤25 dB HL), Mild hearing loss (26-40 dB HL), Moderate hearing loss (41-60 dB HL), Severe hearing loss (61–80 dB HL), and Profound hearing loss (≥81 dB HL).15 The hearing loss was also classified as sensorineural hearing loss (if both the air and bone conduction thresholds are above 25 dB HL with air-bone gap <10 dB HL), conductive hearing loss (in cases where air and bone conductions are >25 dB HL and <25 dB HL respectively and air-bone gaps of ≥10 dB HL) and mixed hearing loss (if both the air and bone conduction thresholds are above 25 dB HL with air-bone gaps of ≥10 dB HL).[16,17]

The data collected were sorted and checked for errors before analysis. Statistical analysis was carried out using SPSS (Statistical Product and Service Solutions) version 20. Results were presented in simple charts and tables. Spearman's rank Correlation was obtained for the relationships between total symptoms score from the health-related quality of life questionnaire, pure tone audiometry (PTA) findings and tinnitus match. The association between continuous variables and specific outcome variables were tested using chi square, where the assumptions are met. For all statistical studies, p-value≤0.05 was considered as being statistically significant. Discussions and conclusions were drawn from the outcome of the results.

RESULTS

A total of 122 adults with tinnitus participated in the study. As shown on Table 1, the age range was between 18 and 80 years with a mean age of 54.94 years±17.41.

Table 1: Age and sex distribution, tinnitus localization and associated hearing loss among participants.

Variable	Frequency	%
Age (years)		
18-30	16	13.1
31-40	17	13.9
41-50	20	16.4
51-60	23	18.9
61-70	27	22.1
71-80	19	15.6
Total	122	100
Mean±SD	54.94±17.41	
Range	18 – 80	
Sex		
Male	50	41
Female	72	59
Total	122	100
Tinnitus localization		
Right sided tinnitus	35	28.7
Left sided tinnitus	51	41.8
Bilateral tinnitus	36	29.5
Total	122	100
History of self-reported hearing loss (n=122)		
Present	68	55.7
Absent	54	44.3
Total	122	100
Unilateral/bilateral hearing loss (n=68)		
Right (unilateral) hearing loss	16	23.5
Left (unilateral) hearing loss	29	42.7
Bilateral hearing loss	23	33.8
Total	68	100

Table 2: Relationship between tinnitus and hearing loss.

Presence of hearing loss	Unilateral tinnitus	Bilateral tinnitus	χ^2	P value
	N (%)	N (%)		
No hearing loss	40 (46.5)	14 (38.9)	42.798^{Y}	<0.001*
Unilateral hearing loss	42 (48.8)	3 (8.3)		
Bilateral hearing loss	4 (4.7)	19 (52.8)		
Total	86 (100.0)	36 (100.0)		

χ2: Chi square test; Y: Yates corrected Chi square; *: p value <0.05

Table 3: The frequency of the degree and types of hearing loss among participants.

Variable	Frequency	%
Degree of hearing loss		
Normal hearing	31	25.4
Mild	30	24.6
Moderate	32	26.2
Severe	19	15.6
Profound	10	8.2
Total	122	100
Type of hearing loss		
Normal hearing	31	25.4
Conductive	19	15.6
Sensorineural	46	37.7
Mixed	26	21.3
Total	122	100

The highest number of participants was found in age group 61-70 with 27 (22.1%) participants, followed by age groups 51-60 and 41-50 with 23 (18.9%) and 20 (16.4%) participants respectively. The participants were made up of 72 (59.0%) females and 50 (41.0%) males with a male to female ratio of 1:1.4. Out of the 122 participants, 86 had unilateral tinnitus while 36 presented with bilateral tinnitus. Overall, 244 ears were analysed out of which 158 ears experienced tinnitus.

Hearing loss was an associated symptom among 68 participants with 29 (42.7%) left sided, 16 (23.5%) right sided and 23 (33.8%) had associated hearing loss on both ears. Complaints of hearing loss was noticed in 91 ears among the participants. Table 2 showed the relationship between tinnitus symptoms and associated hearing loss. Out of 86 patients with unilateral tinnitus, 42 (48.8%) also had unilateral hearing loss. More than half of the participants with bilateral tinnitus 19 (52.8%) had hearing loss on both ears. The association between tinnitus and associated hearing loss was statistically significant (p value <0.001).

The pie chart of Figure 1 represents the hearing loss found in tinnitus ears (number of tinnitus ears, n=158). It showed that 138 (87.3%) of participant ears with tinnitus also had one degree of hearing loss or the other (PTAv >25 dB HL). Table 3 showed the degree and types of hearing loss in the unilateral tinnitus and the worse ear in bilateral tinnitus. Moderate hearing loss was found to be the commonest with 32 (26.2%) participants. Other degrees of hearing loss: mild, severe and profound hearing loss were found among 30 (24.6%), 19 (15.6%), 10 (8.2%) participants respectively. Types of hearing loss revealed 61 (50.0%) participants with sensorineural hearing loss while 35 (28.7%) and 26 (21.3%) had mixed and conductive hearing loss respectively.

Table 4: Relationship between tinnitus functional index scores and the presence of hearing loss and the degree of hearing loss.

Variable	Grades of TFI scores					
	Small problem	Moderate problem	Big problem	Very big problem	χ^2	P value
	N (%)	N (%)	N (%)	N (%)		
Associated hearing loss						
No hearing loss unilateral	13 (24.1)	21 (38.9)	14 (25.9)	6 (11.1)	13.248[Y]	0.039*
Unilateral	4 (8.9)	16 (35.6)	19 (42.2)	6 (13.3)		
Bilateral	0 (0.0)	5 (21.7)	12 (52.2)	6 (26.1)		
Degree of hearing loss						
Normal	9 (29.0)	15 (48.4)	6 (19.4)	1 (3.2)		
Mild	2 (6.7)	7 (23.3)	15 (50.0)	6 (20.0)		
Moderate	2 (6.2)	14 (43.8)	14 (43.8)	2 (6.2)	31.774[Y]	0.001*
Severe	4 (21.1)	5 (26.3)	5 (26.3)	5 (26.3)		
Profound	0 (0.0)	1 (10.0)	5 (50.0)	4 (40.0)		

χ2: Chi square test; Y: Yates corrected Chi square; *: p value <0.05 (i.e. statistically significant)

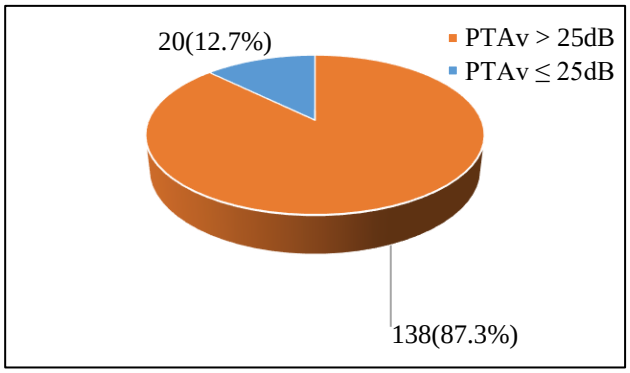

Figure 1: Hearing loss chart in tinnitus ears.

The relationship between the grades of TFI scores and presence of hearing loss in one or both ears was statistically significant as shown on Table 4 (p value=0.039). Similarly, the association between the TFI scores and the degree of hearing loss in the unilateral tinnitus and the worse ear in bilateral tinnitus had a statistically significant difference (p value=0.001).

DISCUSSION

In this study, there appear to be a gradual increase in frequency of tinnitus with increase in age. The mean age of tinnitus patients was about 55 years and highest frequency found in the age group of 61 to 70 years. In a similar study, Fackrell et al found mean age of 53.6 years. Okhakhu et al reported a mean age of 46.8 years while Bhatt et al found 53.1 years.[18-20] In an epidemiological data, Martines et al supported a strong association between tinnitus and increasing age. In consonance with this study, they found that tinnitus affected patients between 51 and 70 years of age more frequently with a mean age of 58.10 years.[21] In a Nigerian study on the prevalence and correlates for tinnitus among elderly patients, Sogebi et al, found that majority of tinnitus patients were between the age range of 60 and 69 years.[5] This work also agreed with other studies involving higher number of older individuals with tinnitus.[9,22] However, exposure to recreational and occupational noise as well as illicit use of drugs has been identified as likely causes of increase prevalence among younger and mid adults compared with the older cohorts.[23]

Majority of tinnitus patients in this study were females with male to female ratio of 1:1.4. This is similar to the findings in previous studies, however, some other studies found a higher number of male participants presenting with tinnitus.[2,12,16,18,19,24-27] Despite the conflicting data on the effect of gender on characteristics of tinnitus and its intensity, female gender is more likely to perceive annoyance of tinnitus earlier than male counterparts irrespective of their age. It has also been reported that the psychosomatic complaints related to tinnitus are likely to be more frequent among females compared to male gender.[26]

About 56% of tinnitus patients also complained of hearing loss in this study with a statistically significant association (p value<0.001) between tinnitus and the associated hearing loss. Hearing loss was also more associated with the ear experiencing tinnitus than the contralateral ear. This is likely to be because some ear disorders have both tinnitus and hearing loss as part of the disease spectrum. In addition, the factors responsible for tinnitus are also likely to cause an associated hearing loss and vice versa.[9] Similar study by Gibrin et al also reported a statistically significant difference between tinnitus and hearing loss, with a strong association between the side affected by tinnitus and the side of hearing loss.[16] Out of the tinnitus participants studied by Mazurek et al, 83% had hearing loss.[28] This was also in agreement with a study on the review of the current state of knowledge on tinnitus in relation to hearing loss.[29] Martines et al found a statistically significant increase risk of tinnitus in presence of hearing loss.[21] Vernon and

Meikle also reported that 70% to 80% of tinnitus patients had significant hearing impairment. They concluded that populations with more prevalent hearing loss will have a correspondingly higher prevalence of tinnitus.[30] Results from a Canadian study also indicated that four in every five adults had tinnitus with a degree of hearing loss.[23]

Out of the 138 ears with a degree of hearing loss on pure tone audiometry, only 91 ears had complaints of hearing loss. That is, about 30% of tinnitus patients in this study had hearing loss without knowing it. The number of tinnitus patients with unreported hearing loss shed more light on the need to routinely evaluate the pure tone audiometric thresholds of tinnitus patients despite their claim of normal hearing. Mild to moderate hearing loss was found to be common among tinnitus patients while the prevalence of profound hearing loss was less than 10%. Thirunavukkarasu et al, in their study found more number of individuals with moderate degree of hearing loss with lesser percentage of mild and profound degree of hearing loss.[31] It can be inferred based on these results that a great number of tinnitus patients had hearing loss with significant effect on their quality of life. They however presented to the hospital due to the effect of the unwanted tinnitus. In fact, the combination of tinnitus and hearing loss will possibly increase the help-seeking behaviours of participants.[23] Cases where the presence of tinnitus predate the hearing loss indicate that a subclinical level of damage has already occurred in the ears.[23]

It was also observed that almost 80% of the participants either had sensorineural hearing loss as the only hearing loss type or in combination with conductive hearing loss as mixed hearing loss, Martines et al, Monzani et al, Goyal et al, Thirunavukkarasu et al and Swain et al reported similar findings in their own studies.[11,25,31-33] However, this finding was at variance with the work on the influence of tinnitus on the audiometric threshold of sufferers where Ukaegbe et al found a predominant number of participants with conductive hearing loss.[10] Their finding is likely to be a reflection of the low number of participants with hearing loss (23.3%) in their study.[10] The prevalence of sensorineural hearing loss among tinnitus patients supports an established fact that many of the causes related to tinnitus have their sources from the inner ear. Goyal et al further classified sensorineural hearing loss type into those who had sensory (cochlear) hearing loss and retro cochlear hearing loss.[25] Tinnitus has also been described as aberrant auditory signals caused by alterations in the spontaneous activity of the neurons in the auditory cortex and loss of cochlear hair cells or their functions.[34,35] Also supporting these theories was the study by Ishak et al, where a significantly more abnormal transient otoacoustic emissions were observed in tinnitus ears.[36] However, in this study, the above observations were limited by the subjectivity of the pure tone audiometric tinnitus assessment. Therefore, cochlear and retro cochlear functions could be better assessed in further studies with otoacoustic emission audiometry (OAE) and auditory brainstem response (ABR).

The relationship between the TFI scores and presence of hearing loss as well as the degree of hearing loss was statistically significant. With these results, one can infer that the associated hearing loss whether unilateral or bilateral, has significant impact on the intensity of tinnitus on the patients' HRQoL. This is consistent with the findings of Ukaegbe et al, Mazurek et al and Dias et al.[10,28,37] Also, Savitri et al, Hiller et al and Joo et al concluded that the coexistence of tinnitus with hearing loss appear to have a greater risk of deteriorating HRQoL and this seems to be of clinical relevance for the prediction of high tinnitus annoyance levels.[38,39,40] Tinnitus is a potential debilitating symptom which can be a source of distress to the affected individual especially when there is associated hearing loss.[10] Ding et al added that, with the treatment of hearing loss; tinnitus and it's negative impact on patients' quality of life will surely be ameliorated.[27] Although, Falkenberg et al argued that tinnitus patients with no hearing loss tend to have more anxiety disorders than those with hearing loss.[4]

Similar to the statistically significant association between the degree of hearing loss and TFI grading, Dziendzie et al found a positive correlation between the total TFI scores and average air conduction thresholds.[41] With an increase in hearing threshold, a larger tinnitus severity was observed.[41] The association between degree of hearing loss and the TFI grading found a statistically significant difference in this study. Mazurek et al and Dias et al also concluded that the severity of the discomfort induced by tinnitus is a reflection of the degree of hearing impairment in a tinnitus patient.[28,37] However, this does not agreed with the findings of Pinto et al on the impact of gender, age and hearing loss on tinnitus severity, Noroozian et al on effect of age, gender and hearing loss on the degree of discomfort due to tinnitus and Mondelli et al on correlation between the audiologic findings and tinnitus disorder.[42-44] The aspects of quality of life affected also differ between individuals but the commonest are psychological or emotional effects, impact on lifestyle, sleep disturbance, auditory and health effects.[45] However, the impact of tinnitus on quality of life is highly individualized; therefore, personality characteristics may predispose some people to experience tinnitus as a ''distressing'' symptom as compared with others who have better coping strategy.[13,21]

CONCLUSION

The prevalence of tinnitus appears to increase with age. This study found a statistically significant association between the self-reported tinnitus and associated hearing loss as well as between the degree of hearing loss and health related quality of life measure with tinnitus functional index among adult tinnitus patients. Therefore, tinnitus has a significant health burden which tends to

increase with co-existing hearing loss. Pure tone audiometric assessment and measurement of HRQoL should be advocated as routine for tinnitus patients no matter the cause of tinnitus. They can help to identify the key problem areas in the relationship between tinnitus and hearing loss as well as monitoring the effects of the tinnitus on the tinnitus patient and the quality of its management.

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