**TYPE AND DEGREE OF HEARING LOSS IN PATIENTS WITH TINNITUS**

Hina Sultana¹, Nazia Mumtaz², Tayyaba Dawood¹

**Abstract**

**Background:** Tinnitus is a global public health issue. It is a mysterious and complex disorder of auditory system. Tinnitus is presented as a phantom sensation which is not associated with an external sound stimulus. Hearing loss is considered to be the most important risk factor for tinnitus.

**Objective:** The objective of this study is to determine the type and degree of hearing loss in tinnitus sufferers.

**Patients & Methods:** An observational study conducted at the ENT/audiology department of Mayo Hospital, Lahore from 1 May 2017 to 30 December 2017. One hundred and ten (n=110) patients of both gender between age 10 to 70 years, who had tinnitus (clinically examined by tuning fork tests and later on confirmed by pure tone audiometry and tympanometry) with history of unilateral or bilateral tinnitus of more than eight months duration were included in the study.

**Results:** There were 56.4% (62/110) males and 43.6% (48/110) females in the study sample. A total of 25.5% (n=28) were identified as moderate hearing impairment. Moreover, it was also observed in the study that the moderate hearing impairment was more prevalent in people of 10-40 age group (21/110) (P<0.05). The sensorineural hearing loss was more prevalent in 67 patients suffering from tinnitus. Among gender distribution males were having prevalent sensorineural hearing loss (n=55/62) while females were having more conductive hearing loss (n=20/48).

**Conclusion:** A significant percentage of patients with tinnitus were studied and it was concluded that moderate degree sensorineural hearing loss was more prevalent in patients with tinnitus.

**Key Words:** Tinnitus, hearing impairment, pure tone audiometry.

**Introduction**

Tinnitus is a mysterious and complex disorder of auditory system. The word “tinnitus” is derived from the Latin “tinnier” meaning “ring”. In its most common form, tinnitus is presented as a phantom sensation which is not associated with an external sound stimulus.¹

Hearing loss is considered to be the most important risk factor for tinnitus. Epidemiological studies showed that about one third of the population experiences tinnitus at least once in their life and about 1–5% develop serious psychosocial complications. Tinnitus prevalence increases to 70–85% in the hearing-impaired population.²

Tinnitus is mostly associated with moderate degree of hearing loss.²³ Pitch of the tinnitus is related to the most disturbed frequency of hearing loss, that the tinnitus spectrum has a shape that is similar to the pure tone audiogram. In subjects with a high-frequency tinnitus spectrum the audiogram indicated a high-frequency hearing loss.³

The presence of tinnitus progressively increases with increasing age (12% after the age of 60; 5% in the 20–30 age group), and this is not related to the progressive reduction in hearing.⁴

In most cases, despite appropriate medical examination, the origin of tinnitus is unknown but it is well documented that tinnitus and hearing deficit are often related phenomena; sensorineural hearing losses (SNHL) which is mostly due to excessive noise exposure is considered the first causes of tinnitus.⁵

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Tinnitus can be also due to other inner ear dysfunctions, such as those associated with sudden hearing loss or acoustic trauma, or part of otological and neurological diseases such as Meniere’s disease, conductive hearing loss, acoustic neuroma or severe head injury and excessive noise exposure.⁶

All structures of the auditory system have been suggested as possible sites of generation for tinnitus, from periphery to auditory cortex. Hearing loss associated with tinnitus can be mild, moderate, severe and profound. Mostly the hearing loss associated with tinnitus is of sensory neural type.⁷

Chronic tinnitus is often accompanied by a hearing impairment and there is a consensus that this audiological condition is triggered by central de-afferentation. Usually moderate degree sensorineural hearing loss is present in association with tinnitus. Tinnitus is also associated with conductive hearing loss and this tinnitus usually disappears after treatment. Conductive hearing loss associated with tinnitus is usually of mild to moderate degree.⁸
Methodology

It was an observational study conducted at the ENT/Audiology department of Mayo Hospital, Lahore. Study was conducted for a period of eight months from 1st May 2017 to 30th December 2017. Patients of both gender between age 10 to 70 years, who had tinnitus (clinically examined by tuning fork test, later on confirmed by pure tone audiometry and tympanometry) with history of unilateral or bilateral tinnitus of more than 8 months duration were included in the study. Otoscopy, Tuning fork test, Pure Tone Audiometry and Tympanometry was done on these subjects in audiological room to evaluate hearing status of study participants. Only adult male and female of 10-70 years age group are included in this study while syndromic adults were excluded. After taking the history, explaining the study purpose and taking the consent adult audiological tests were performed. Audiological tests measured the type and degree of hearing loss. There are three types of hearing loss. Sensorineural hearing loss is impairment in sensory and neural apparatus, conductive loss is impairment of conductive apparatus while mixed is impairment of both areas. Normal hearing is 0-20dbHL, mild hearing loss is 21-40dbHL, moderate hearing loss is 41-55dbHL, severe hearing loss is 56-70dbHL, severe to profound hearing loss is 71-90dbHL while more than 90dbHL is categorized as profound hearing loss. All the demographic data and questionnaire (which was approved by ethical committee of mayo hospital) results noted on the predesigned preformed and statistical analysis of data was performed using SPSS-version 20. Results were stratified for confounding variables like age, gender, occupation etc. Independent T-test was applied to assess the significance of difference and $P \leq 0.05$ was considered significant.

Results

A total of 110 patients were included in the study. There were 56.36% (62/110) males and 43.6% (48/110) females in the study sample. Occupation, type and degree of hearing loss was significantly associated with gender ($p<0.05$). Further detail of distribution of occupation, type, degree of hearing and with gender is shown in table 1.

### Table 1: Gender based distribution of variables

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>14(22.58%)</td>
<td>12(25%)</td>
<td>26(23.63%)</td>
<td></td>
</tr>
<tr>
<td>House Wives</td>
<td>0(0%)</td>
<td>28(58.3%)</td>
<td>28(25.45%)</td>
<td></td>
</tr>
<tr>
<td>House Maids</td>
<td>0(0%)</td>
<td>4(8.3%)</td>
<td>4(3.63%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Factory</td>
<td>28(45.16%)</td>
<td>0(0%)</td>
<td>28(25.45%)</td>
<td></td>
</tr>
<tr>
<td>Workers</td>
<td>20(32.25%)</td>
<td>4(8.3%)</td>
<td>24(21.81%)</td>
<td></td>
</tr>
<tr>
<td>Office Workers</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree of Hearing Loss</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>7(11.2%)</td>
<td>4(8.3%)</td>
<td>11(10%)</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>0(0%)</td>
<td>12(25%)</td>
<td>12(10.9%)</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>24(38%)</td>
<td>4(8.3%)</td>
<td>28(25.4%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Severe</td>
<td>7(11.29%)</td>
<td>0(0%)</td>
<td>7(6.3%)</td>
<td></td>
</tr>
<tr>
<td>Severe to profound</td>
<td>10(16.12%)</td>
<td>4(8.3%)</td>
<td>14(12.7%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>55(88.70%)</td>
<td>20(41.61%)</td>
<td>75(69.39%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Hearing Loss</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>7(11.2%)</td>
<td>8(16.6%)</td>
<td>15(13.6%)</td>
<td></td>
</tr>
<tr>
<td>Conductive</td>
<td>0(0%)</td>
<td>20(41.61%)</td>
<td>20(18.18%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Mixed</td>
<td>0(0%)</td>
<td>8(16.6%)</td>
<td>8(7.27%)</td>
<td></td>
</tr>
<tr>
<td>SNHL</td>
<td>55(88.70%)</td>
<td>12(25%)</td>
<td>67(60.9%)</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Tinnitus is generally classified as either objective or subjective. Objective tinnitus is an acoustic sound produced within the body and is audible to other people. Subjective tinnitus is also an acoustic sound produced within the head but is only perceived by the sufferer.9 Although the majority of those affected by tinnitus habituate to the condition and do not seek treatment, 10–20% experience tinnitus as a severe handicap. Those who live with tinnitus may be burdened by comorbid stressors such as sleep disorders, depression, anxiety disorder, and suicidal ideation. These conditions negatively impact many aspects of daily life, causing impairments in work and memory and reducing quality of life.10 Tinnitus is more common in males than in females because of the reason that men are more exposed to occupational noise. In our study 90% of the patients who have tinnitus are suffering from hearing loss of varying degree, among which moderate type of hearing loss is most prevalent and 10% have normal hearing and only tinnitus complain. Most recent studies in the literature show that the prevalence of patients with tinnitus and normal hearing is around 8% to 10% and our study also confirms the same figure.11
The pitch of tinnitus corresponds to the frequency region of hearing loss. In case of low-frequency hearing loss, the tinnitus is low pitched, but in high-frequency hearing loss the tinnitus has a high-pitched ringing or hissing sound. Occupational noise exposure and its effects on hearing are well described in industrial-like, traditionally male-dominated settings such as proved in our results that male factory workers have most prevalent sensorineural hearing loss accompanied with tinnitus. High sound levels, regardless of their source, can cause hearing loss, tinnitus and sound sensitivity, and may also result in sound-induced auditory fatigue.

Although tinnitus is commonly associated with hearing loss. Other medical factors become increasingly prevalent and must be considered as potential causes of tinnitus. These factors include conditions such as vascular disease, middle-ear disease, diabetes, hypertension, autoimmune disorders, and degenerative neural disorders, tympanic membrane perforation, hearing loss, rhinosinusitis, and balance problems (occurrence of dizziness or imbalance, subjective positional vertigo, falling attack, and vestibular dysfunction) with or without concomitant hearing loss.

Persons with profound hearing loss (deafness) often do not complain of tinnitus. In other words, cochlear damage does not always result in tinnitus. It may also be the case that cochlear damage may be slight and not significant enough to cause substantive change in auditory sensitivity but our study reveals that person suffering from moderate degree hearing loss have significant degree of tinnitus.

Chronic tinnitus is often accompanied by a hearing impairment, but it is still unknown whether hearing loss can actually cause tinnitus. Persistent tinnitus may rapidly become a source of serious disturbance and handicap at psychological and socio-professional levels; In fact in 1–3% of the general population, the tinnitus affects the quality of life, involving sleep disturbance, work impairment, and psychiatric distress. In our study it is evident that females who are house wives have more dominant tinnitus that is accompanying hearing loss.

Tinnitus is a distressing symptom, provoking an important decrease in the quality of life in 20% of tinnitus sufferers that is strongly correlated to many factors. Literature data, suggests that the hearing status and the tinnitus greatly depend on each other, the higher the pitch of tinnitus, the worse is the life quality of the sufferer.

**Conclusion**

A significant percentage of patients with tinnitus of more than eight months duration were found to have hearing impairment. Moderate degree SNHL was more prevalent in both genders and all age groups. Our mostly daily conversation sounds are present within this language spectrum so it will largely effect the communication and life of a person. This study concludes that tinnitus patients in our local population have more prevalence of sensorineural hearing loss followed by conductive hearing loss; this will further aid the Audiologists and ENT physicians to recognize and administer treatment to the patients, and also guide them about preservation of hearing.

**References**


Authors' contributions:
Hina Sultana: Conception and design of the work and revising it critically for final approval. Responsible for data integrity.
Nazia Mumtaz: Revising article critically for important intellectual content for final approval. Responsible for data integrity.
Tayyeba Dawood: Revising article critically for important intellectual content for final approval. Responsible for data integrity.