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Corresponding Author

Dr. P. Himabindu,
Department of ENT, Mamata Medical College, Khammam, India

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Clinical Profile and Audiological Evaluation of Patients Presenting with Tinnitus in a Tertiary Care Centre

Dr. P. Himabindu

Department of ENT, Mamata Medical College, Khammam, India

ABSTRACT

Tinnitus is the perception of sound in the absence of an external auditory stimulus and is commonly associated with hearing impairment and other otological disorders. It significantly affects the quality of life of affected individuals and represents a frequent complaint in ENT practice. Aim of the study was to evaluate the clinical profile and audiological findings among patients presenting with tinnitus in a tertiary care centre. This hospital-based cross-sectional observational study was conducted in the Department of ENT, Mamata Medical College and General Hospital, Khammam. A total of 75 patients presenting with tinnitus were included in the study. Detailed clinical history, otological examination, and audiological evaluation including Pure Tone Audiometry and impedance audiometry were performed. Data were analyzed using SPSS version 20.0, and $p < 0.05$ was considered statistically significant. The majority of patients belonged to the age group of 41-50 years (29.3%), with male predominance (57.3%). Bilateral tinnitus was observed in 49.3% of patients, and ringing was the most common perceived sound (45.3%). Hearing loss was the most common associated symptom (69.3%). Noise exposure was identified as the major risk factor (34.7%). Sensorineural hearing loss was the predominant audiological finding (61.3%). A statistically significant association was observed between duration of tinnitus and hearing loss ($p = 0.041$). Tinnitus is commonly associated with sensorineural hearing loss and occupational noise exposure. Comprehensive clinical and audiological evaluation is essential for early diagnosis and effective management.

INTRODUCTION

Tinnitus is defined as the perception of sound in the absence of an external acoustic stimulus and is commonly described by patients as ringing, buzzing, hissing, roaring, whistling, or clicking sounds in one or both ears. It is a symptom rather than a disease and represents one of the most frequent otological complaints encountered in clinical practice. Tinnitus can occur intermittently or continuously and may vary in intensity, pitch, and severity. Although it is often considered a benign condition, persistent tinnitus can significantly affect an individual's quality of life by causing sleep disturbances, difficulty in concentration, emotional distress, anxiety, depression, and impaired social functioning^[1].

The prevalence of tinnitus has increased over the past few decades owing to urbanization, increased exposure to occupational and recreational noise, aging populations, and a rising incidence of hearing impairment. Epidemiological studies have estimated that tinnitus affects approximately 10-15% of the adult population, with severe or bothersome tinnitus affecting about 1-2% of individuals^[2]. The symptom is more common among older adults and is frequently associated with sensorineural hearing loss, although it may also occur in individuals with normal hearing thresholds. Several etiological factors have been implicated in the development of tinnitus, including presbycusis, noise-induced hearing loss, ototoxic drug exposure, chronic otitis media, Ménière's disease, metabolic disorders, vascular abnormalities, temporomandibular joint dysfunction, and psychological stress^[3].

The exact pathophysiological mechanisms underlying tinnitus remain incompletely understood. Current evidence suggests that tinnitus results from aberrant neural activity within the auditory pathway following peripheral auditory damage. Cochlear injury may lead to altered spontaneous firing rates and maladaptive neuroplastic changes in the central auditory system, resulting in the perception of phantom auditory sensations^[4]. The heterogeneity of tinnitus presentations highlights the complex interplay between peripheral auditory dysfunction and central neural mechanisms.

Audiological evaluation forms the cornerstone of tinnitus assessment. A comprehensive evaluation includes detailed history taking, otological examination, pure-tone audiometry, speech audiometry, impedance audiometry, and other specialized tests when indicated. Audiological investigations help identify the presence, type, and degree of hearing loss and aid in determining the possible etiology of tinnitus. Previous studies have demonstrated a strong association between tinnitus

and high-frequency sensorineural hearing loss, emphasizing the importance of systematic hearing assessment in affected individuals^[5]. Furthermore, audiological profiling assists clinicians in planning appropriate therapeutic interventions and counseling strategies.

Several studies have evaluated the demographic and clinical characteristics of tinnitus patients. Hoffman and Reed reported that tinnitus prevalence increases with advancing age and is closely associated with hearing impairment^[6]. Nondahl *et al.* observed that hearing loss and occupational noise exposure were significant predictors of tinnitus occurrence in adults^[7]. Sindhusake *et al.* identified age, hearing impairment, and noise exposure as major risk factors contributing to tinnitus severity and persistence^[8]. Henry *et al.* emphasized the importance of detailed audiological assessment in understanding tinnitus characteristics and guiding management protocols^[9]. Shargorodsky *et al.* further highlighted the growing burden of tinnitus and its association with hearing deficits among the general population^[10].

Despite numerous international studies, there remains limited data regarding the clinical presentation and audiological characteristics of tinnitus patients attending tertiary care centres in developing countries. Variations in environmental noise exposure, occupational patterns, healthcare accessibility, and demographic factors may influence the profile of tinnitus patients in different regions. Moreover, many previous studies have focused primarily on prevalence estimates or treatment modalities, while fewer studies have comprehensively correlated clinical features with audiological findings in tertiary healthcare settings. This lack of region-specific data represents an important research gap.

Therefore, the present study aims to evaluate the demographic characteristics, clinical presentation, associated risk factors, and audiological findings among patients presenting with tinnitus. Understanding these parameters may facilitate early diagnosis, appropriate audiological assessment, and improved management strategies for individuals suffering from this distressing symptom.

MATERIALS AND METHODS

Study Design and Setting: The present study was a hospital-based cross-sectional observational study conducted in the Department of Otorhinolaryngology (ENT), Mamata Medical College and General Hospital, Khammam. The study was carried out among patients presenting with complaints of tinnitus attending the ENT outpatient department during the study period. Ethical clearance was obtained from the Institutional Ethics Committee

prior to commencement of the study, and informed consent was obtained from all participants before enrollment.

Study Population: A total of 75 patients presenting with tinnitus were included in the study. Patients were evaluated clinically and audiotologically to assess the clinical profile and hearing status associated with tinnitus.

Inclusion Criteria:

- Patients aged more than 18 years
- Patients presenting with subjective tinnitus
- Patients willing to participate in the study
- Patients providing informed written consent

Exclusion Criteria:

- Patients with objective tinnitus
- Patients with psychiatric illness affecting communication or cooperation
- Patients with congenital ear anomalies
- Patients with history of recent ear surgery or trauma
- Critically ill patients unable to undergo audiotological evaluation
- Patients unwilling to participate in the study.

Study Tools: The following tools and instruments were used for the study:

- Pre-designed semi-structured proforma for clinical data collection
- Detailed clinical history and otorhinolaryngological examination
- Otoscopic examination
- Tuning fork tests
- Pure Tone Audiometry (PTA)
- Impedance audiometry/Tympanometry
- Relevant laboratory and radiological investigations wherever indicated

Data Collection: Data collection was carried out in the following steps:

- Detailed demographic information including age, gender, occupation, and socioeconomic status was recorded.
- Clinical history regarding onset, duration, laterality, type, and severity of tinnitus was obtained.
- Associated symptoms such as hearing loss, vertigo, ear discharge, ear pain, and headache were documented.
- History of noise exposure, systemic illnesses, ototoxic drug intake, and previous ear diseases was elicited.
- Complete ENT examination was performed for all patients.

- Audiotological assessment including Pure Tone Audiometry and impedance audiometry was conducted in all participants.
- The audiotological findings were correlated with the clinical profile of the patients.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 18.0. Descriptive statistics such as mean, standard deviation, frequency, and percentage were used to summarize the data. Appropriate statistical tests such as Chi-square test and Student's t-test were applied wherever necessary. A p-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSIONS

Variable	Number of Patients (n)	Percentage (%)
Age Group (years)		
18-30	12	16.0
31-40	18	24.0
41-50	22	29.3
51-60	15	20.0
>60	8	10.7
Gender		
Male	43	57.3
Female	32	42.7
Mean age: 44.8 ± 12.6 years		

Clinical Parameter	Number of Patients (n)	Percentage (%)
Duration of Tinnitus		
<6 months	28	37.3
6-12 months	24	32.0
>12 months	23	30.7
Laterality		
Right Ear	20	26.7
Left Ear	18	24.0
Bilateral	37	49.3
Type of Sound Perceived		
Ringing	34	45.3
Buzzing	18	24.0
Hissing	12	16.0
Whistling	11	14.7

The majority of patients with tinnitus belonged to the age group of 41-50 years, accounting for 29.3% of the study population, followed by 31-40 years (24.0%). The mean age of the participants was 44.8 ± 12.6 years, indicating that tinnitus was more commonly observed in middle-aged individuals. Male predominance was noted, with males constituting 57.3% of the cases. These findings are comparable with earlier epidemiological studies which reported higher prevalence of tinnitus among middle-aged and elderly males, possibly due to increased occupational noise exposure and hearing impairment.

Among the study participants, tinnitus duration of less than six months was observed in 37.3% of patients. Bilateral tinnitus was the most common presentation, seen in nearly half of the patients (49.3%). Ringing sensation was the predominant

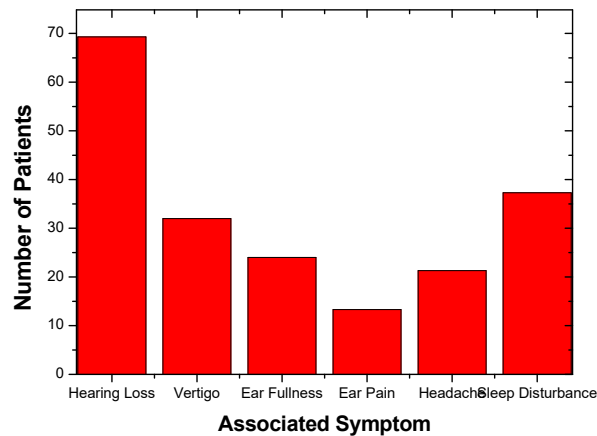


Fig. 1: Associated Symptoms among Patients with Tinnitus (n = 75)

Table 3: Risk Factors Associated with Tinnitus among Study Participants (n = 75)

Risk Factor	Number of Patients (n)	Percentage (%)
Noise Exposure	26	34.7
Hypertension	20	26.7
Diabetes Mellitus	16	21.3
Ototoxic Drug Intake	9	12.0
Smoking	22	29.3
Chronic Otitis Media	14	18.7

Table 4: Audiological Findings among Study Participants (n = 75)

Audiological Parameter	Number of Patients (n)	Percentage (%)
Type of Hearing Loss		
Sensorineural Hearing Loss	46	61.3
Conductive Hearing Loss	12	16.0
Mixed Hearing Loss	7	9.3
Normal Hearing	10	13.4
Degree of Hearing Loss		
Mild	24	32.0
Moderate	20	26.7
Severe	11	14.6
Profound	3	4.0

type of sound perceived by the patients, accounting for 45.3% of cases. These findings correlate with previous studies which have shown bilateral ringing tinnitus as the most frequent clinical manifestation associated with cochlear pathology and sensorineural hearing loss.

Hearing loss was the most common associated symptom among patients with tinnitus, present in 69.3% of cases. Sleep disturbance was reported by 37.3% of patients, indicating the significant impact of tinnitus on quality of life. Vertigo and ear fullness were also common associated complaints. These findings emphasize the multifactorial nature of tinnitus and its association with vestibulocochlear dysfunction. Earlier studies have similarly reported hearing impairment as the most strongly associated symptom among tinnitus patients.

Noise exposure was identified as the most common risk factor associated with tinnitus, observed in 34.7% of patients, followed by smoking and hypertension. Chronic exposure to loud sounds may result in cochlear hair cell damage leading to tinnitus perception. Systemic

illnesses such as hypertension and diabetes mellitus may contribute to microvascular compromise of the cochlea. Similar associations have been reported in earlier studies, highlighting the importance of identifying modifiable risk factors for early prevention and management.

Sensorineural hearing loss was the predominant audiological finding, affecting 61.3% of patients. Mild and moderate hearing loss were the most commonly observed degrees of impairment. Only 13.4% of patients demonstrated normal hearing thresholds. These findings support the strong association between tinnitus and sensorineural auditory dysfunction. Previous audiological studies have consistently shown that tinnitus frequently coexists with high-frequency sensorineural hearing loss secondary to cochlear degeneration or noise-induced auditory damage.

A statistically significant association was observed between longer duration of tinnitus and the presence of hearing loss ($p = 0.041$). Patients with tinnitus duration greater than 12 months showed a higher prevalence of hearing impairment compared to those with shorter duration of symptoms. This finding suggests that chronic tinnitus may be associated with progressive cochlear dysfunction. Similar observations have been documented in previous studies where prolonged tinnitus duration correlated with worsening audiological abnormalities and reduced auditory function.

Tinnitus is one of the most common otological symptoms encountered in ENT practice and is frequently associated with hearing impairment and other auditory disorders. The present study was conducted to evaluate the clinical profile and audiological characteristics of patients presenting with tinnitus in a tertiary care centre. A total of 75 patients were included in the study and were assessed clinically and audiological.

Table 5: Association between Duration of Tinnitus and Hearing Loss (n = 75)

Duration of Tinnitus	Hearing Loss Present n (%)	Hearing Loss Absent n (%)	Total	Chi-square Value	p-value
<6 months	16 (57.1%)	12 (42.9%)	28	4.86	0.041*
6-12 months	18 (75.0%)	6 (25.0%)	24		
>12 months	18 (78.3%)	5 (21.7%)	23		

*Statistically significant

In the present study, the majority of patients belonged to the age group of 41-50 years (29.3%), with a mean age of 44.8 ± 12.6 years. These findings are consistent with the observations of Shargorodsky *et al.*^[10], who reported increasing prevalence of tinnitus with advancing age, particularly among middle-aged and elderly individuals. Similarly, Sindhusake *et al.*^[8] observed that the prevalence of tinnitus increased significantly with age due to progressive cochlear degeneration and age-related auditory dysfunction. The higher prevalence among middle-aged individuals in the present study may be attributed to cumulative occupational noise exposure and increasing incidence of sensorineural hearing loss.

The present study demonstrated male predominance, with males accounting for 57.3% of cases. Similar findings were reported by Nondahl *et al.*^[7], who observed a higher prevalence of tinnitus among males, likely related to greater occupational and environmental noise exposure. A study by Hoffman and Reed^[6] also reported increased tinnitus prevalence among men compared to women. The male predominance observed in the present study may therefore be explained by occupational risk factors and lifestyle-related exposures.

With regard to clinical characteristics, tinnitus duration of less than six months was observed in 37.3% of patients, while 30.7% reported symptoms persisting for more than one year. Bilateral tinnitus was the most common presentation, observed in 49.3% of patients. Similar observations were reported by Henry *et al.*^[9], who noted bilateral tinnitus as the predominant clinical presentation in patients with cochlear pathology. The bilateral nature of tinnitus may reflect diffuse auditory system involvement rather than localized ear pathology.

In the present study, ringing sensation was the most frequently perceived tinnitus sound, reported by 45.3% of patients, followed by buzzing and hissing sounds. These findings are comparable to those reported by Baguley *et al.*^[1], who described ringing as the most common tinnitus perception among affected individuals. The predominance of ringing tinnitus may be related to altered spontaneous neural activity within the auditory pathways following cochlear damage.

Among the associated symptoms, hearing loss was present in 69.3% of patients and represented the most common accompanying complaint. Sleep

disturbance was observed in 37.3% of cases, while vertigo was present in 32.0% of patients. These findings are similar to those reported by Folmer and Griest, who demonstrated a strong association between tinnitus and hearing impairment, with significant adverse effects on sleep quality and daily functioning^[11]. The high prevalence of hearing loss observed in the present study supports the concept that tinnitus frequently arises secondary to auditory dysfunction.

Noise exposure emerged as the most common risk factor, affecting 34.7% of patients. Smoking and hypertension were also commonly identified. These findings are in agreement with the study conducted by Sindhusake *et al.*^[8], who identified occupational noise exposure as a major etiological factor for tinnitus. Similarly, Pinto *et al.* reported significant associations between tinnitus and systemic conditions such as hypertension and metabolic disorders^[12]. Chronic noise exposure can result in irreversible cochlear hair cell damage, thereby initiating abnormal neural activity responsible for tinnitus perception.

Audiological evaluation revealed sensorineural hearing loss (SNHL) in 61.3% of patients, making it the most common audiological abnormality. Conductive hearing loss and mixed hearing loss were less frequently observed. Similar findings were reported by König *et al.*^[5], who demonstrated a strong relationship between tinnitus and sensorineural hearing loss, particularly involving high-frequency auditory thresholds. A study by Savastano also found that the majority of tinnitus patients exhibited varying degrees of sensorineural hearing impairment^[13]. These observations suggest that cochlear dysfunction remains one of the principal mechanisms underlying tinnitus development.

Regarding the degree of hearing loss, mild hearing loss was observed in 32.0% of patients, followed by moderate hearing loss in 26.7%. These findings are comparable to those reported by Kim *et al.*, who found that mild-to-moderate sensorineural hearing loss represented the most common audiometric pattern among tinnitus patients^[14]. Early cochlear damage may therefore manifest clinically as tinnitus before progression to severe hearing impairment.

An important finding of the present study was the statistically significant association between duration of tinnitus and hearing loss ($p = 0.041$).

Patients with tinnitus duration greater than 12 months demonstrated a higher prevalence of hearing impairment compared to those with shorter symptom duration. Similar findings were reported by Mazurek *et al.*, who observed that chronic tinnitus was associated with progressive deterioration of auditory function and worsening audiometric thresholds^[15]. This suggests that prolonged tinnitus may indicate ongoing cochlear or neural auditory dysfunction.

The findings of the present study highlight the importance of detailed audiological evaluation in all patients presenting with tinnitus. Identification of associated hearing loss and risk factors can facilitate early diagnosis and appropriate management. Furthermore, understanding the clinical and audiological profile of tinnitus patients can help clinicians provide targeted counseling and rehabilitative interventions aimed at improving quality of life.

CONCLUSION

The present study demonstrated that tinnitus was more commonly observed among middle-aged males and was frequently associated with hearing loss. Bilateral tinnitus and ringing-type perception were the predominant clinical presentations. Noise exposure, smoking, and hypertension emerged as important risk factors. Sensorineural hearing loss was the most common audiological abnormality, and a significant association was observed between longer duration of tinnitus and hearing impairment. Comprehensive clinical assessment combined with detailed audiological evaluation plays a crucial role in identifying underlying auditory dysfunction and guiding effective management strategies for patients with tinnitus.

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