Volume 4, Issue 6, 2026

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

ASSESSMENT OF TINNITUS SEVERITY USING THE TINNITUS HANDICAP INVENTORY: A CROSS-SECTIONAL STUDY AT THE AUDIOLOGY CENTRE, LAHORE

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DOI: https://doi.org/10.5281/zenodo.21127998

Keywords
Tinnitus, Tinnitus Handicap Inventory, THI, Tinnitus Severity, Psychosocial Distress, Pakistan

Article History
Received: 25 April 2026
Accepted: 08 June 2026
Published: 21 June 2026

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Abstract

Background: *Tinnitus is a common auditory symptom which causes profound psychosocial distress and impairment in quality of life.*

Objective: *To evaluate the severity of tinnitus among adult patients attending a specialized audiology centre in Lahore, Pakistan with the help of Tinnitus Handicap Inventory (THI).*

Methodology*: The methods used were cross sectional study in Audiology Centre Lahore during January to December 2025. A total of 108 adult patients (5.3%) were eligible for the THI and completed it from a total of 2,050 patients screened. Due to the confirmation of non-normal data distribution, non-parametric statistical analyses were used.*

Results*: The internal consistency of the THI was good (Cronbach's $\alpha = 0.937$). The most common category was Grade 4 (Severe Handicap) which accounted for 29.6% of all cases. In 44.4% of cases, tinnitus was severe and catastrophic. Gender was not significantly associated with THI severity grade ($\chi^2(4) = 4.559$, $p = .336$) and there was no significant association between age and THI score ($rs = -0.157$, $p = .104$).*

Conclusion*: Tinnitus severity is high among the patients of the audiology clinics in Lahore. Routine THI screening is recommended in clinical practice in Pakistan.*

INTRODUCTION

Tinnitus is an important worldwide public health issue. Tinnitus is a common condition affecting over 740 million adults worldwide (1–2% severe, disabling) [1–3]. According to a recent study, 1 in 7 adults suffers from tinnitus [4].

The term tinnitus is often used to describe the perception of sound in the ears in the absence of an external stimulus, and is typically described as a ringing, buzzing, hissing or humming sound [5–7]. It is not a disease in itself, but can be experienced differently in terms of its intensity, frequency, duration and impact [8]. These may be caused by: hearing loss; ear infections; ototoxic drugs; Meniere's disease; otosclerosis; Eustachian tube dysfunction; head or neck trauma; temporomandibular joint (TMJ) disorders [9].

Tinnitus impacts so much more than the auditory system, as it affects many areas of quality of life. Chronic tinnitus can make it difficult to

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

concentrate, communicate, and can lead to anxiety, irritability and depression [10]. Sleep is particularly disturbed, since lack of noise increases sensitivity to it [11]. It may also lead to fatigue and lack of concentration with chronic sleep loss [12]. Tinnitus can be distressing, and lead to social withdrawal and reduced overall quality of life when severe.

The Tinnitus Handicap Inventory (THI) was developed by Newman et. al. (1996) and is a validated tinnitus survey that measures functional, emotional, and catastrophic reactions to tinnitus [13–14].

Methodology

Study Design and Setting

A cross-sectional study was conducted over one year at the Audiology Centre, Lahore, Pakistan, from January 2025 to December 2025.

Participants and Sampling

A convenience sampling technique was employed. A total of 2,050 patients were screened; 108 adult patients (5.3%) fulfilled inclusion criteria and were enrolled.

Inclusion Criteria:

Adult patients aged 18–76 years; subjective tinnitus as primary complaint; either gender; willing to complete the THI.

Exclusion Criteria:

Objective/pulsatile tinnitus; middle ear pathologies (AOM, TM perforation, OME); pre-existing psychological disorders; inability to provide informed consent.

Sample Size Adequacy

Sample size was evaluated using G*Power 3.1. For a chi-square test with 5 categories, effect size w = 0.3, alpha = 0.05, power = 0.80, a minimum of 82 participants was required. We had a larger sample size of 108, which exceeded this and provided adequate statistical power.

Data Collection Instruments

Before administration of THI, all patients had an otoscopy, pure tone audiometry (PTA) and tympanometry done. The severity grade classification of the THI is presented in Table 1.

Table 1. THI Severity Grade Classification

Grade	Severity	Score Range
Grade 1	Slight / No Handicap	0 – 16
Grade 2	Mild Handicap	18 – 36
Grade 3	Moderate Handicap	38 – 56
Grade 4	Severe Handicap	58 – 76
Grade 5	Catastrophic Handicap	78 – 100

Ethical Considerations

This study has been done according to the Declaration of Helsinki (2013 revision). All participants were given written informed consent. All data was anonymised and kept securely.

Statistical Analysis

Multiple analyses were performed on the data collected and were conducted with IBM SPSS Statistics v22.0. Shapiro-Wilk test was used to confirm the distribution was not normal and for such cases, non-parametric tests were used. The Cronbach's alpha was used to check the reliability of THI. The age–THI correlation was evaluated using Spearman's rho. Mann Whitney U was used to compare the genders. Age groups were compared by Kruskal-Wallis to determine significance.

Figure 5 presents the Normal Q-Q plots for THI scores by gender, confirming non-normal

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

distribution in both groups and justifying the use of non-parametric tests.

Results

Participant Characteristics

A total of 108 patients (65 males, 60.2%; 43 females, 39.8%) were selected, representing 5.3% of the 2,050 patients presenting during the study period. The age ranged from 18 to 76 years (Mean = 45.44 years, SD = 13.78). The THI score ranged from 4 to 98 (Mean = 47.8, SD = 26.2). Figure 1 illustrates the age distribution, with the highest frequency in the 50–60 year age group.

Instrument Reliability

The 25-item THI demonstrated excellent internal consistency (Cronbach's α = 0.937, n = 108), confirming its suitability for use in a Pakistani adult clinical population (Table 2).

Table 2. Reliability Statistics — Tinnitus Handicap Inventory (THI)

Parameter	Value
Cronbach's Alpha	0.937
Number of Items	25
N of Valid Cases	108
N of Excluded Cases	0
Interpretation	Excellent internal consistency

Assessment of Normality

The Shapiro-Wilk test confirmed non-normal distribution of THI scores in both male (W = 0.919, p < .001) and female groups (W = 0.941, p = .029). Non-parametric tests were therefore used for all subsequent analyses. Descriptive statistics by gender are presented in Table 3.

Table 3. Descriptive Statistics of THI Score by Gender

Statistic	Male (n = 65)	Female (n = 43)
Mean THI Score	47.20	48.70
95% CI Lower Bound	40.70	40.56
95% CI Upper Bound	53.70	56.83
Median (IQR)	56.00 (52)	44.00 (44)
Std. Deviation	26.241	26.428
Minimum	4	8
Maximum	98	94
Skewness	-0.179	0.072
Kurtosis	-1.369	-1.279
Shapiro-Wilk (W)	0.919	0.941
Shapiro-Wilk (p)	< .001	0.029

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Statistic	Male (n = 65)	Female (n = 43)
Distribution	Non-normal	Non-normal

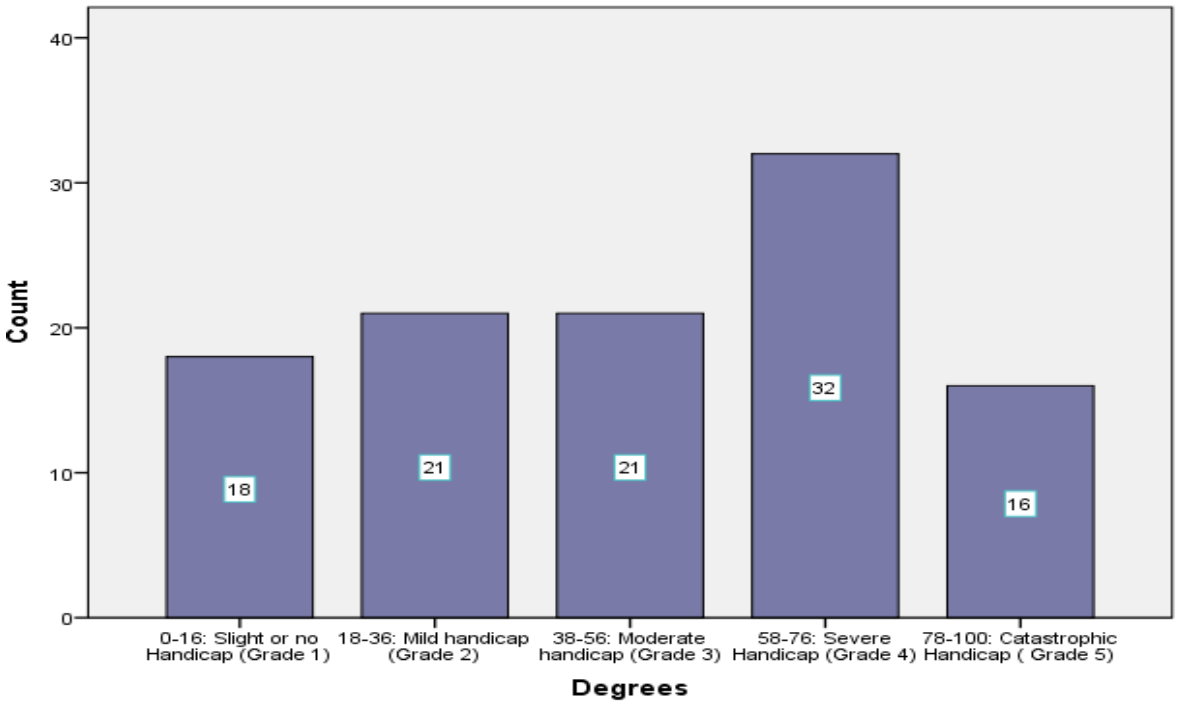

Figure 1. Age Distribution of the Tinnitus Patients

THI Severity Distribution

Table 4 shows the distribution of severity grades of THI by sex. Among males (n = 65), Grade 4 was most prevalent (35.4%). Female patients (n = 43) had a more balanced profile with significant numbers of Grade 5 patients (20.9%). No cells with expected count < 5 (Minimum count was 6.37). Table 5 shows there was no statistically significant association between gender and severity grade of THI ($\chi^2(4) = 4.559$, $p = .336$) as determined by a chi-square analysis.

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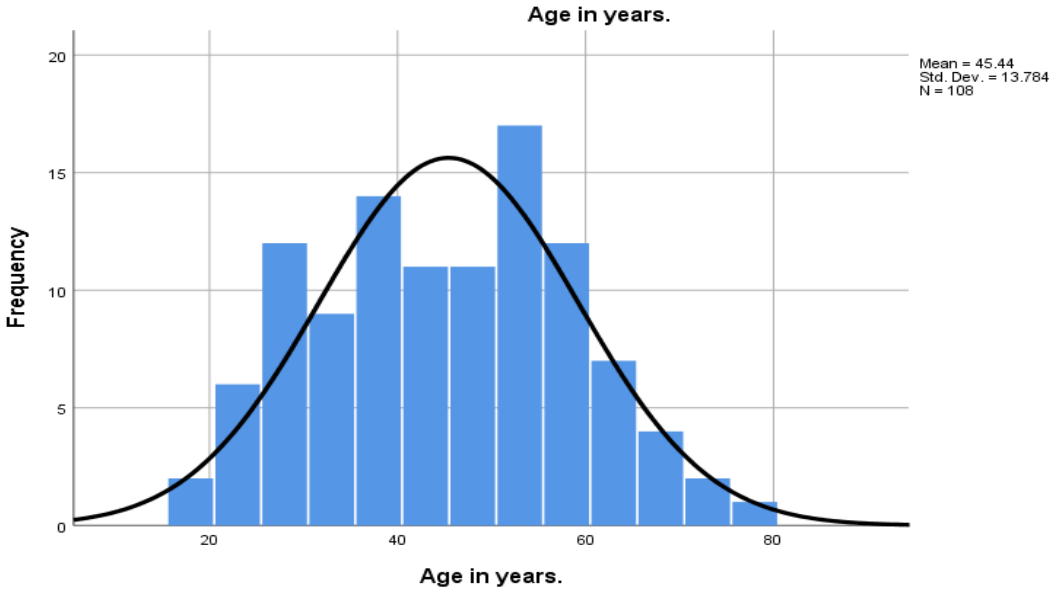

Figure 2. Distribution of the THI Scores between Tinnitus Patients

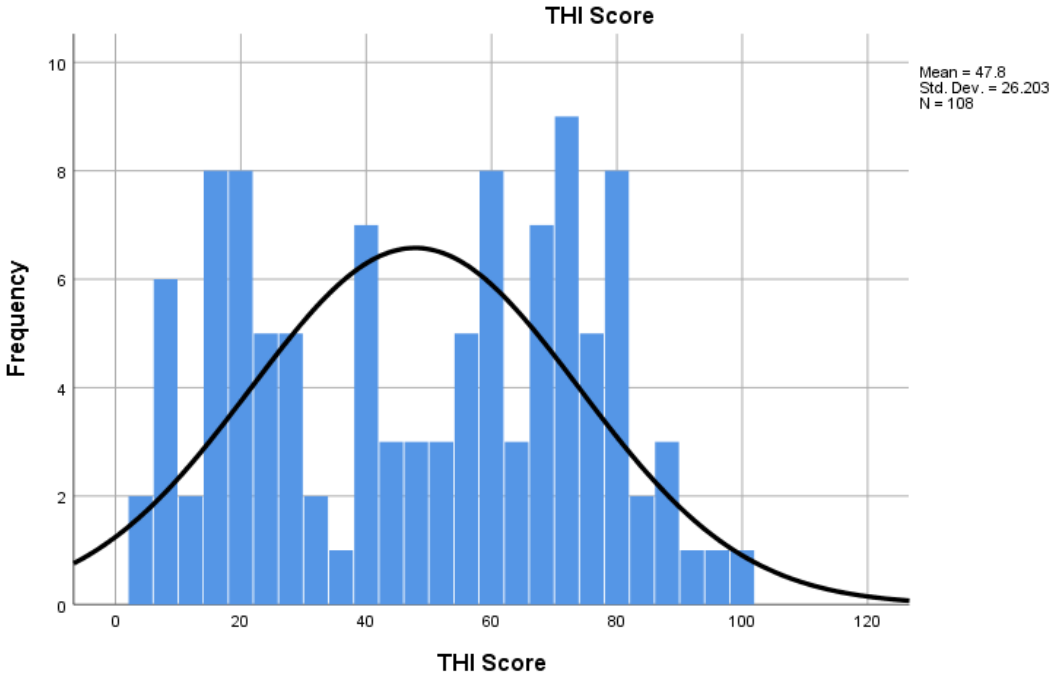

Figure 3. Overall THI Severity Grade Distribution

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ISSN: (e) 3007-1607 (p) 3007-1593

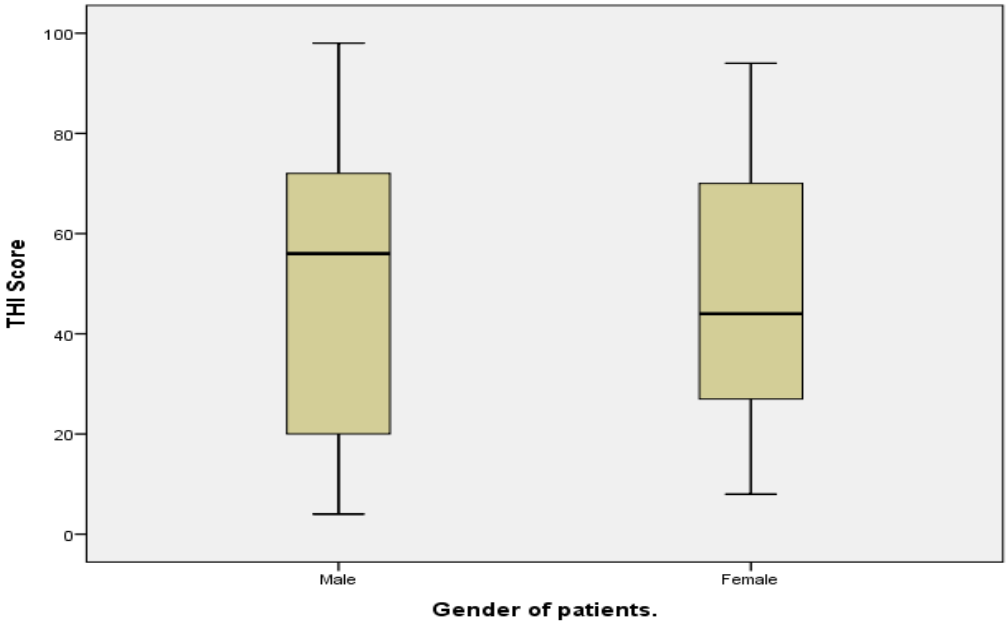

Figure 4. Box Plot of THI Scores by Gender

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ISSN: (e) 3007-1607 (p) 3007-1593

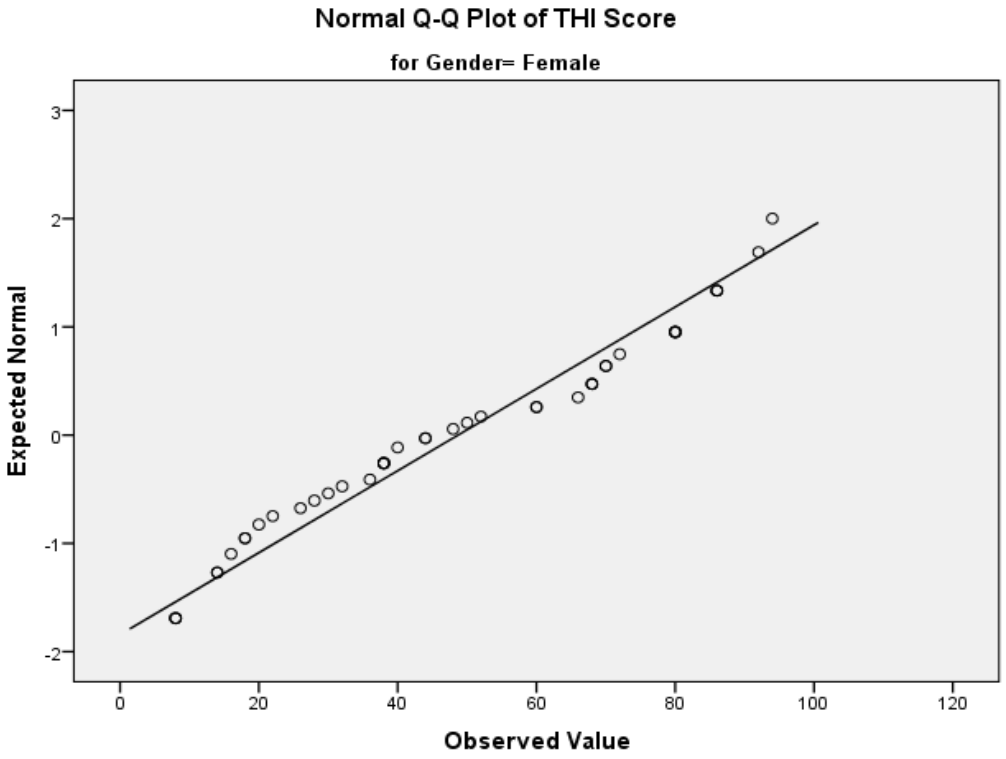

Figure 5. Normal Q-Q Plots of THI Score of Male and Female patients

Association Between Gender and THI Severity

The distribution of THI severity grades by gender is presented in Table 4. Among males (n = 65), Grade 4 was most prevalent (35.4%). Female patients (n = 43) showed a more evenly distributed profile, with notable Grade 5 representation (20.9%). No cells had expected count < 5 (minimum = 6.37). Chi-square analysis revealed no statistically significant association between gender and THI severity grade ($\chi^2(4) = 4.559$, $p = .336$), as shown in Table 5.

Table 4. Distribution of THI Severity Grades by Gender

THI Grade	Severity	Male n (%)	Female n (%)	Total n (%)
Grade 1	Slight/No Handicap (0–16)	12 (18.5%)	6 (14.0%)	18 (16.7%)
Grade 2	Mild Handicap (18–36)	11 (16.9%)	10 (23.3%)	21 (19.4%)
Grade 3	Moderate Handicap (38–56)	12 (18.5%)	9 (20.9%)	21 (19.4%)
Grade 4	Severe Handicap (58–76)	23 (35.4%)	9 (20.9%)	32 (29.6%)
Grade 5	Catastrophic Handicap (78–100)	7 (10.8%)	9 (20.9%)	16 (14.8%)

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ISSN: (e) 3007-1607 (p) 3007-1593

THI Grade	Severity	Male n (%)	Female n (%)	Total n (%)
Total	–	65 (100%)	43 (100%)	108 (100%)

Table 5. Chi-Square Test Results between Gender vs THI Severity Grade

Test	Value	df	p (2-sided)	Result
Pearson Chi-Square	4.559	4	.336	Not Significant
Likelihood Ratio	4.591	4	.332	Not Significant
Linear-by-Linear	0.107	1	.743	Not Significant
N of Valid Cases	108	–	–	–
Cells with Expected Count < 5	0 (0.0%)	–	–	Assumption Met

There were no statistically significant differences between genders for continuous THI score on Mann-Whitney U test. However, the mean rank for females was slightly higher (55.74) than for males (53.68) (U = 1344.000, Z = −0.336, p = .737). The distributions shown in figure 4 overlap, and there is no meaningful difference between the sexes.

Association Between Age and THI Severity

Spearman rank correlation analysis showed a negative correlation between age and THI score which was not significant (rs = −0.157, p = .104, n = 108) and was therefore not a significant predictor of severity (Table 6). The Kruskal-Wallis analysis revealed that there was a decreasing mean rank for each age band with increasing age (Table 7), although this was not significant (H(3) = 1.92, p = 0.58).

Table 6. Spearman Correlation between Age vs THI Score

Parameter	Value
Test Used	Spearman's rho
N	108
Correlation Coefficient (rs)	−0.157
Sig. (2-tailed)	0.104
Direction	Negative (weak)
Statistical Result	Not Significant (p > 0.05)

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ISSN: (e) 3007-1607 (p) 3007-1593

Table 7. Kruskal-Wallis Test THI Score by Age Group

Age Group	Age Range	N	Mean Rank
Group 1	18 – 30 years	20	60.43
Group 2	31 – 45 years	34	57.32
Group 3	46 – 60 years	40	51.16
Group 4	61 – 76 years	14	48.71
Total	–	108	–

Discussion

These findings emphasize a substantial challenge in the clinical scenario of Pakistan. Although tinnitus was a small proportion of consultations (5.3%), the severity distribution is interesting, 44.4% of individuals were in the Severe or Catastrophic severity range. These results are consistent with international literature, which has focused on the psychosocial impact of tinnitus [16–19].

High numbers of Grade 4 and Grade 5 handicap scores is indicative of a vicious circle that is characteristic of tinnitus: Sound causes emotional distress, which makes people more aware of the sound. Despite the exclusion of patients with prior psychological distress, high THI scores indicate that tinnitus is an important source of irritability, concentration problems and sleep disturbances in patients with tinnitus.

The internal consistency of the THI was excellent (Cronbach's α = 0.937), which is a sign of reliability and good practice in clinical audiology practice in Pakistan.

The peak age group was 50–60 which correlates with the tinnitus trigger of presbycusis [20]. The Spearman correlation ($r_s = -0.157$, $p = .104$), however, did not show a significant age–THI relationship, and may be an indication of heterogeneity in clinical presentation or to an overwhelming influence of noise from psychosocial or occupational sources on severity. The Kruskal-Wallis analysis revealed a non-significant non-stepped mean rank trend (younger patients having higher THI scores) ($H(3) = 1.92$, $p = .58$), and should be explored in prospective studies.

There was no gender (Chi-square $p = .336$, Mann-Whitney $p = .737$)–severity association. It is also consistent with Pinto et al., who also found no significant gender relationship in tinnitus related annoyance in a clinical sample when using the THI [21], suggesting that gender may not be a strong determinant of tinnitus handicap severity in other clinical samples.

Considering the fact that 44.4% is significantly affected, it is an emergency for multidisciplinary clinics in Pakistan including audiology and psychological counselling along with Tinnitus Retraining Therapy (TRT) and Cognitive Behavioural Therapy (CBT) in order to provide the necessary treatment.

Limitations

Convenience sampling reduces generalizability, cross-sectional design does not allow for causal inferences, no data on duration or laterality of tinnitus, audiometric thresholds, and comorbidities, and single-centre design. New research should be multi-centre, prospective, and have larger sample sizes.

Conclusion

This study has shown that there is a significant number of patients with severe and catastrophic tinnitus in an audiology clinic, 44.4% were found as Grade 4 or 5 on THI. In the Pakistani context, the THI had a high reliability (α = 0.937). Gender and age did not make significant differences in tinnitus severity. On-going screening of THI should be standard practice in all Pakistani audiology practice for early identification and multidisciplinary management.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

REFERENCES

Jarach CM, et al. Global Prevalence and Incidence of Tinnitus. JAMA Neurology. 2022;79(9):888–900.

RNID. Prevalence of tinnitus. Available from: https://rnid.org.uk

Shargorodsky J, Curhan GC, Farwell WR. Prevalence of tinnitus among US adults. Am J Med. 2010;123(8):711–8.

Henry JA, Dennis KC, Schechter MA. General review of tinnitus. J Speech Lang Hear Res. 2005;48(5):1204–35.

Chen Z, et al. Association between tinnitus and hearing impairment. Frontiers in Neurology. 2024;15.

Van Hoof L, et al. Tinnitus-specific and quality of life questionnaires. Frontiers in Neurology. 2022;13.

WHO. Deafness and hearing loss — Tinnitus. Available from: https://www.who.int

Maihoub S, et al. Tinnitus and Its Comorbidities. J Clin Med. 2025;14(4):1285.

Mayo Clinic. Tinnitus — Symptoms and causes. 2022. Available from: https://www.mayoclinic.org

Mayo Clinic Health System. Tinnitus and quality of life. Available from: https://www.mayoclinichealthsystem.org

Mountain ENT. How Quality of Life is Affected by Tinnitus. 2020.

ENT Physicians Inc. 3 Ways Tinnitus Impacts Quality of Life. 2020.

Newman CW, Jacobson GP, Spitzer JB. Development of the THI. Arch Otolaryngol Head Neck Surg. 1996;122(2):143–8.

Muhammad Zubair, Nazia Mumtaz, Ghulam Saqulain. Tinnitus related handicap in Pakistani population. J Pak Med Assoc. 2020:1–11.

Alkahtani R, et al. Tinnitus prevalence and quality of life. Indian J Otol. 2024;30:192–8.

Baguley D, McFerran D, Hall D. Tinnitus. Lancet. 2013;382(9904):1600–7.

Zeman F, et al. Tinnitus-related aspects for quality of life. Health Qual Life Outcomes. 2014;12:7.

Trevis KJ, McLachlan NM, Wilson SJ. Psychological mediators of chronic tinnitus. J Affect Disord. 2016;204:234–40.

Cima RF, et al. Tinnitus healthcare: A global overview. Ear Hear. 2019;40(5):861–9.

Biswas R, et al. Tinnitus prevalence in Europe. Lancet Reg Health Eur. 2022;12:100250.

Pinto PCL, Sanchez TG, Tomita S. The impact of gender, age and hearing loss on tinnitus severity. Braz J Otorhinolaryngol. 2010;76(1):18-24.