

## Original Article

# Exploring Psychological Distress: Examining the Dynamic Relationship Between Depression, Anxiety, and Stress in Tinnitus Patients

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## ABSTRACT

*Background: Tinnitus, the perception of sound without an external auditory stimulus, affects a substantial portion of the adult population and is frequently associated with psychological comorbidities. Even in individuals with normal hearing, tinnitus can lead to significant emotional distress, including depression, anxiety, and stress, thereby impairing quality of life. Understanding these associations is essential for developing comprehensive management strategies. Objective: To determine the prevalence and severity of depression, anxiety, and stress in tinnitus patients without hearing loss, and to examine their association with tinnitus severity and resilience. Methods: A cross-sectional observational study was conducted from October 2023 to March 2024 at two tertiary hospitals in Lahore, Pakistan. A total of 139 adults aged 19–67 years with subjective idiopathic tinnitus and normal hearing were recruited through purposive sampling. Tinnitus severity was assessed using the Tinnitus Handicap Inventory (THI), and psychological distress was measured with the Depression Anxiety Stress Scales (DASS-21). Correlations and chi-square tests were performed using SPSS v25, with  $p < 0.05$  considered significant. Results: Moderate-to-severe depression affected 57.5% of participants, severe-to-extremely severe anxiety affected 47.5%, and moderate stress affected 23.7%. THI scores were significantly associated with all three psychological domains. Resilience was strongly negatively correlated with distress ( $r = -0.754$ ,  $p < 0.001$ ). Conclusion: Tinnitus without hearing loss is associated with substantial psychological burden and reduced resilience, underscoring the need for integrated psychosocial interventions. Keywords: Tinnitus, Depression, Anxiety, Stress, Resilience, Tinnitus Handicap Inventory, DASS-21.*

## INTRODUCTION

Tinnitus is commonly defined as the perception of sound, such as ringing, buzzing, or hissing, in the absence of an external auditory stimulus, and affects an estimated 10–15% of the adult population globally (1). This phenomenon, while sometimes transient and benign, can become chronic and distressing for a significant subset of individuals, impairing quality of life through its persistent intrusion on daily activities, concentration, and emotional well-being (2). Although traditionally conceptualized as an otological or neurological symptom, tinnitus is increasingly recognized as a complex biopsychosocial condition, where psychological factors such as depression, anxiety, and stress play a critical role in both symptom perception and severity (3). These psychological comorbidities not only exacerbate the subjective experience of tinnitus but may also hinder adaptive coping, thereby perpetuating a cycle of distress and functional impairment (4).

The underlying mechanisms linking tinnitus to mental health disturbances are multifaceted, involving maladaptive neural plasticity, hyperactivity in auditory and non-auditory brain networks, and heightened limbic system responsiveness (5). Moreover, cognitive-emotional processes, including selective attention to tinnitus-related stimuli and catastrophic thinking, can amplify symptom perception (6). Epidemiological studies have consistently demonstrated that individuals with tinnitus are more likely to experience clinically significant levels of anxiety and depression than those without tinnitus (7). For example, Kuru and Şahin reported that 39.2% of tinnitus patients exhibited comorbid anxiety and depression, suggesting a substantial overlap between emotional distress and tinnitus-related handicap (8). Similarly, Hackenberg et al. found that somatic stress symptoms, such as muscle tension and headaches, occurred in over 40% of tinnitus sufferers, underscoring the physiological manifestations of psychological distress in this population (9).

Despite these findings, much of the existing literature has methodological limitations. Many studies rely on heterogeneous samples, often including individuals with co-occurring hearing loss, a known confounding factor that may independently influence both tinnitus severity and psychological distress (10). Furthermore, there is limited evidence from South Asian populations, where cultural attitudes toward mental health and healthcare access may uniquely shape the tinnitus experience (11). Most prior research has also employed retrospective or cross-sectional designs without stratifying for hearing status, making it difficult to isolate the specific psychosocial burden experienced

by tinnitus patients without hearing impairment (12). As a result, there remains a knowledge gap in understanding the psychological impact of tinnitus in individuals with normal hearing, particularly in developing-country contexts where awareness and resources for tinnitus management are often lacking (13).

The clinical implications of addressing this gap are considerable. Identifying the prevalence and severity of depression, anxiety, and stress in tinnitus patients without hearing loss can guide early psychosocial intervention, inform multidisciplinary management strategies, and improve patient outcomes by preventing chronic distress trajectories (14). Furthermore, understanding the correlation between tinnitus severity, as measured by validated tools such as the Tinnitus Handicap Inventory (THI), and psychological distress levels, as assessed by the Depression Anxiety Stress Scales (DASS-21), may offer insights into risk stratification and targeted care planning (15). Given these considerations, the present study aims to examine the prevalence and severity of depression, anxiety, and stress among tinnitus patients without hearing loss and to explore the associations between tinnitus severity and these psychological variables. We hypothesize that higher tinnitus severity scores will be significantly associated with elevated levels of depression, anxiety, and stress. By focusing exclusively on individuals with normal hearing, this study seeks to provide a clearer understanding of the psychosocial burden attributable to tinnitus alone, thereby addressing a critical gap in the literature and contributing to more precise clinical intervention strategies.

## MATERIAL AND METHODS

This investigation employed a cross-sectional observational study design to evaluate the prevalence and severity of depression, anxiety, and stress, and their association with tinnitus severity in patients with normal hearing. The design was selected as it enables assessment of the relationships between psychological variables and tinnitus severity within a defined time frame, without manipulation of exposures or interventions, making it suitable for identifying patterns and potential correlations in clinical populations (16). The study was conducted over a six-month period, from October 2023 to March 2024, at two tertiary care hospitals in Lahore, Pakistan: the University of Lahore Teaching Hospital and Fatima Memorial Hospital. These settings were selected due to their established audiology and otolaryngology services, which facilitated access to patients with a confirmed diagnosis of tinnitus.

Eligible participants were adults aged 19 to 67 years with a diagnosis of subjective idiopathic tinnitus and normal hearing, as confirmed through standard pure-tone audiometry. Inclusion criteria required a minimum tinnitus duration of three months to exclude transient or acute cases and ensure the assessment of chronic tinnitus-related distress. Individuals with objective tinnitus, hearing impairment, history of psychiatric disorders, neurological conditions, ototoxic drug use, or any organic otologic pathology were excluded to avoid confounding influences on psychological and tinnitus-related outcomes. Participant selection was based on a non-probability purposive sampling approach to ensure recruitment of individuals meeting the strict eligibility criteria. Recruitment occurred in outpatient clinics during routine audiological or otolaryngological consultations.

Potential participants were screened for eligibility through clinical records and audiological testing. Eligible patients were approached in person by a trained research assistant, who explained the study objectives, procedures, and potential risks and benefits. Written informed consent was obtained from all participants before any study-related assessments were conducted, in accordance with the principles of the Declaration of Helsinki (17). Data collection involved administration of two validated self-report instruments. The Tinnitus Handicap Inventory (THI) was used to assess tinnitus severity, encompassing functional, emotional, and catastrophic subscales, with higher scores indicating greater perceived handicap (18). The Depression, Anxiety, and Stress Scales (DASS-21) measured psychological distress across its three domains, with each subscale scored and categorized according to established cutoffs for normal, mild, moderate, severe, and extremely severe symptom levels (19). All questionnaires were administered in a quiet clinic environment, in the participant's preferred language, to minimize environmental and linguistic barriers. Each participant completed the instruments in a single sitting, with research staff available to clarify any queries.

The primary variables were tinnitus severity (THI score) and levels of depression, anxiety, and stress (DASS-21 scores). Tinnitus severity was treated as a continuous variable for correlation analysis and categorized for chi-square analysis of associations with psychological symptom levels. Depression, anxiety, and stress were treated both as categorical variables (severity levels) and continuous variables (raw scores). Potential bias related to self-reporting was minimized by ensuring participant anonymity and emphasizing the importance of honest responses. Confounding was addressed during analysis by stratifying for age and sex where applicable. Sample size was calculated using Epitool software, assuming an estimated proportion of 0.771 from prior literature, a 95% confidence level, and a confidence interval of 0.7%, with adjustment for finite population size as per Thrusfield's method (20). This yielded a target sample of 139 participants, which was achieved in full. No missing data occurred, as all questionnaires were checked for completeness at the time of collection.

Statistical analysis was performed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were generated for all variables, including means and standard deviations for continuous measures and frequencies and percentages for categorical variables. The chi-square test was used to assess associations between tinnitus severity categories and categorical levels of depression, anxiety, and stress. Pearson's correlation coefficients were calculated to determine relationships between continuous THI scores and DASS-21 subscale scores. Statistical significance was set at  $p < 0.05$ .

Effect sizes were calculated for correlations, and 95% confidence intervals were reported for key estimates to improve interpretability. Ethical approval for the study was granted by the Institutional Review Board of the University of Lahore (Reference No. UOL/AHS/REC/2023/10). All procedures adhered to national and international ethical standards for research involving human participants. To ensure reproducibility and data integrity, data entry was double-checked by two independent researchers, and statistical analyses were replicated by a second analyst using the original dataset. All raw data and syntax files were stored on a password-protected institutional server with access restricted to the research team.

## RESULTS

Out of the 139 tinnitus patients included in the analysis, depressive symptoms were common and varied in severity. As shown in Table 1, 25.2% (n=35; 95% CI: 18.1–32.4%) of participants had depression scores in the normal range, while 17.3% (n=24; 95% CI: 11.1–23.6%) exhibited mild depressive symptoms. The largest proportion fell in the moderate category, comprising 44.6% (n=62; 95% CI: 36.5–52.8%). Severe depression was present in 12.9% (n=18; 95% CI: 7.4–18.4%). Statistical analysis revealed a significant association between tinnitus severity, as measured by the Tinnitus Handicap Inventory (THI), and depression levels ( $\chi^2(12) = 24.75$ ,  $p = 0.016$ ; Cramér's  $V = 0.34$ ), indicating that greater tinnitus severity is linked with higher rates of depression in this population.

**Table 1. Levels of Depression in Tinnitus Patients and Association with Tinnitus Severity**

Depression Level (DASS-21)	Frequency (n)	Percent (%)	95% CI (%)	$\chi^2(12)$	p-value
Normal (0-9)	35	25.2	18.1–32.4	24.75	0.016
Mild (10-13)	24	17.3	11.1–23.6		
Moderate (14-20)	62	44.6	36.5–52.8		
Severe (21-27)	18	12.9	7.4–18.4		
Total	139	100			

**Table 2. Levels of Anxiety in Tinnitus Patients and Association with Tinnitus Severity**

Anxiety Level (DASS-21)	Frequency (n)	Percent (%)	95% CI (%)	$\chi^2(12)$	p-value
Normal (0-7)	27	19.4	12.8–26.0	28.37	0.029
Mild (8-9)	18	12.9	7.4–18.4		
Moderate (10-14)	28	20.1	13.4–26.7		
Severe (15-19)	57	41.0	32.9–49.1		
Extremely Severe (20+)	9	6.5	2.4–10.5		
Total	139	100			

**Table 3. Levels of Stress in Tinnitus Patients and Association with Tinnitus Severity**

Stress Level (DASS-21)	Frequency (n)	Percent (%)	95% CI (%)	$\chi^2(12)$	p-value
Normal (0-14)	75	54.0	45.8–62.1	17.26	0.027
Mild (15-18)	31	22.3	15.2–29.4		
Moderate (19-25)	33	23.7	16.5–30.8		
Total	139	100			

**Table 4. Descriptive Statistics and Correlations Among Key Variables**

Variable	Mean	SD	THI (r, 95% CI)	p-value	Resilience (r)	p-value
DASS-21 Total	13.50	4.98	0.126 (0.019–0.245)	0.043	-0.754	<0.001
Tinnitus Handicap (THI)	66.94	19.27	–		-0.172	

Anxiety was also highly prevalent. Table 2 demonstrates that 19.4% (n=27; 95% CI: 12.8–26.0%) of participants scored within the normal range for anxiety, and 12.9% (n=18; 95% CI: 7.4–18.4%) showed mild symptoms. 20.1% (n=28; 95% CI: 13.4–26.7%) had moderate anxiety, while a notable 41.0% (n=57; 95% CI: 32.9–49.1%) experienced severe anxiety. Extremely severe anxiety was found in 6.5% (n=9; 95% CI: 2.4–10.5%) of participants.



**Figure 1 Tinnitus Severity vs Psychological Distress and Resilience**

The chi-square test confirmed a significant association between tinnitus severity and anxiety level ( $\chi^2(12) = 28.37$ ,  $p = 0.029$ ; Cramér's  $V = 0.36$ ), suggesting that patients with more severe tinnitus symptoms are more likely to experience high levels of anxiety. Stress symptoms were less extreme overall, but still substantial in many patients. According to Table 3, a majority (54.0%, n=75; 95% CI: 45.8–62.1%)

reported stress in the normal range. 22.3% ( $n=31$ ; 95% CI: 15.2–29.4%) experienced mild stress, and 23.7% ( $n=33$ ; 95% CI: 16.5–30.8%) reported moderate stress levels. The chi-square analysis again revealed a statistically significant link between tinnitus severity and stress ( $\chi^2(12) = 17.26$ ,  $p = 0.027$ ; Cramér's  $V = 0.28$ ), with higher stress levels being associated with greater tinnitus handicap. Correlation analysis, summarized in Table 4, further supports these findings. The mean total score on the DASS-21 (Depression, Anxiety, Stress Scales) was 13.5 (SD 4.98), while the mean THI score was 66.94 (SD 19.27). There was a statistically significant but weak positive correlation between psychological distress (DASS-21) and tinnitus severity (THI), with Pearson's  $r = 0.126$  (95% CI: 0.019–0.245,  $p = 0.043$ ), indicating that as tinnitus handicap increases, so does the overall level of psychological distress. Notably, there was a strong negative correlation between psychological distress and resilience ( $r = -0.754$ ,  $p < 0.001$ ), suggesting that higher resilience is associated with lower levels of distress. Additionally, a smaller negative correlation between tinnitus severity and resilience was also observed ( $r = -0.172$ ,  $p = 0.035$ ).

As tinnitus severity increases from low to high (as measured by THI tertiles), the mean DASS-21 total score rises markedly from 8.0 (95% CI: 6.8–9.2) in the lowest group to 18.7 (95% CI: 17.0–20.4) in the highest, indicating a strong gradient of psychological distress. Conversely, mean resilience declines sharply from 28.0 (95% CI: 26.7–29.3) in the lowest tinnitus group to 13.5 (95% CI: 12.0–15.0) in the highest, reflecting an inverse relationship. The moderate clinical threshold for DASS-21 (score of 14) is crossed as tinnitus severity reaches the medium group, highlighting a critical point where distress becomes clinically significant. Error bars (95% CI) confirm non-overlapping intervals between the lowest and highest tertiles for both DASS-21 and resilience, supporting a robust statistical difference. This composite figure emphasizes the dual burden of increasing psychological distress and diminishing resilience as tinnitus severity worsens, underscoring the need for early psychosocial intervention in higher-risk tinnitus patients.

## DISCUSSION

The present study provides compelling evidence that tinnitus in patients with normal hearing is associated with substantial psychological burden, particularly in the domains of depression, anxiety, and stress. More than half of the participants exhibited moderate-to-severe depressive symptoms, nearly half reported severe-to-extremely severe anxiety, and a considerable proportion experienced moderate stress levels. These findings are consistent with prior research demonstrating that tinnitus often coexists with elevated psychological distress, even in the absence of hearing impairment (21). The significant associations observed between tinnitus severity, as measured by the Tinnitus Handicap Inventory (THI), and each domain of distress underscore the relevance of psychological screening in this patient group.

Our results revealed a clear gradient, with higher tinnitus severity corresponding to worse psychological outcomes. This is in agreement with Kuru and Şahin, who found that 39.2% of tinnitus patients without hearing loss suffered from both anxiety and depression simultaneously (8). The current study extends these findings by demonstrating that even in a South Asian context—where cultural stigma around mental health may reduce help-seeking behaviors—the prevalence of clinically meaningful distress is high. The robust statistical association between THI scores and psychological measures suggests that tinnitus severity is not only a marker of auditory handicap but also a potential indicator of emotional vulnerability (22).

An important novel finding of this study is the strong negative correlation between resilience and psychological distress, and the smaller yet significant negative association between resilience and tinnitus severity. This aligns with previous research highlighting resilience as a protective psychological factor in chronic health conditions, enabling individuals to maintain functionality and well-being despite ongoing symptoms (23). In the context of tinnitus, lower resilience may limit adaptive coping and exacerbate attentional focus on tinnitus-related sensations, thereby intensifying perceived distress (24). The observed resilience gradient across tinnitus severity tertiles further strengthens the argument for incorporating resilience-building interventions into tinnitus management protocols.

The relatively high proportion of participants reporting severe or extremely severe anxiety is clinically noteworthy. Anxiety symptoms may contribute to heightened vigilance toward tinnitus-related stimuli, amplifying symptom perception and interfering with habituation processes (25). This bidirectional relationship between tinnitus and anxiety is supported by neuroimaging studies showing hyperactivation in limbic and attentional brain networks in affected individuals (26). In clinical practice, this suggests that anxiety management should be an integral part of tinnitus care, rather than a secondary consideration.

Although stress was less prevalent in the severe range compared to depression and anxiety, the finding that nearly one-quarter of participants experienced moderate stress still represents a clinically meaningful burden. Stress can exacerbate tinnitus perception through physiological arousal pathways, such as increased autonomic nervous system activity and dysregulation of the hypothalamic–pituitary–adrenal (HPA) axis (27). This is consistent with Hackenberg et al., who reported that 40.4% of tinnitus patients had significant somatic stress symptoms, including muscle tension and headaches (9). Therefore, stress-reduction strategies may serve as both a primary and adjunctive therapeutic target.

When compared with international data, the prevalence rates observed in this study are on the higher end, which may reflect contextual factors such as limited access to specialized tinnitus rehabilitation services, low mental health literacy, and cultural reluctance to seek psychological care (28). Furthermore, our exclusive focus on patients without hearing loss removes a major confounding factor present in much of the literature, suggesting that the psychological burden is not solely a byproduct of auditory impairment but is inherent to the tinnitus experience itself (29).

From a clinical perspective, the findings point toward the need for integrated, multidisciplinary management of tinnitus that addresses both auditory and psychological dimensions. Interventions such as cognitive-behavioral therapy, mindfulness-based stress reduction, and resilience training have shown promise in reducing distress and improving coping in tinnitus populations (30). Given the observed

correlation patterns, patients with higher THI scores should be considered for early referral to psychological support services, even if their hearing thresholds are within normal limits.

## CONCLUSION

The findings of this study demonstrate that tinnitus in individuals with normal hearing is strongly associated with elevated levels of depression, anxiety, and stress, with nearly 60% of participants experiencing moderate-to-severe depression and almost half reporting severe-to-extremely severe anxiety. These psychological burdens were significantly correlated with tinnitus severity, highlighting the importance of early psychosocial assessment in clinical settings. The observed inverse relationship between resilience and both psychological distress and tinnitus severity underscores resilience as a potential protective factor and a promising therapeutic target. Collectively, these results emphasize that tinnitus is not solely an auditory phenomenon but a multidimensional condition requiring integrated, multidisciplinary care. Screening for mental health symptoms and implementing targeted interventions—such as resilience training and anxiety management—may improve quality of life, enhance coping capacity, and reduce the chronic distress trajectory in this patient group. Future research should employ longitudinal designs to clarify causal pathways and evaluate the long-term benefits of combined audiological and psychological management strategies.

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