

Audiological, Psychological, and Cognitive Characteristics of Tinnitus Sufferers

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Abstract: ***Background:** Tinnitus is the perception of sound in the absence of an external acoustic stimulus and is frequently associated with emotional distress, psychological disturbances, and impaired cognitive functioning. Although tinnitus is a common audiological complaint, its influence on psychological well-being and cognitive performance remains an important area of clinical investigation. **Objective:** The present study aimed to evaluate the audiological, psychological, and cognitive characteristics of individuals with tinnitus and compare these findings with those of individuals with tinnitus accompanied by mild hearing loss and normal-hearing controls. **Methods:** A comparative observational study was conducted involving 30 participants divided into three groups: Tinnitus Group (TIG; n = 10) with normal hearing, Tinnitus with Hearing Impairment Group (TWHIG; n = 10) with mild hearing loss, and Normal Control Group (NCG; n = 10). All participants underwent pure-tone audiometry and completed standardized questionnaires, including the Nature of Tinnitus Questionnaire, Tinnitus Reaction Questionnaire (TRQ), Symptom Checklist-90-Revised (SCL-90-R), and Cognitive Failures Questionnaire (CFQ). Data were analyzed to compare tinnitus characteristics, psychological distress, and cognitive functioning among the groups. **Results:** Tinnitus was predominantly bilateral, high-pitched, and of moderate loudness. Most participants reported greater tinnitus severity during quiet environments and early morning hours. Both tinnitus groups demonstrated significantly higher psychological distress and cognitive failure scores than the control group. Participants with tinnitus exhibited elevated SCL-90-R and CFQ scores, indicating greater emotional distress, anxiety, depressive symptoms, and reduced cognitive efficiency. **Conclusion:** Tinnitus has a significant adverse effect on psychological health and cognitive functioning irrespective of the presence of mild hearing loss. Comprehensive assessment of tinnitus should therefore include psychological and cognitive evaluation to facilitate holistic patient management and improve treatment outcomes.*

Keywords: Tinnitus, Psychological Distress, Cognitive Function, Hearing Loss, Audiological Assessment

1. Introduction

Tinnitus is defined as the perception of sound in the absence of an external acoustic stimulus and is one of the most common symptoms encountered in audiological and otolaryngological practice (Slater & Terry, 1978). Individuals with tinnitus describe the perceived sound as ringing, buzzing, hissing, roaring, clicking, whistling, or humming, which may be intermittent or continuous and can vary considerably in pitch and loudness. Although tinnitus itself is not a disease, it is a symptom associated with a wide range of auditory and systemic disorders, including sensorineural hearing loss, noise exposure, ototoxicity, Ménière's disease, metabolic disorders, and age-related auditory degeneration (Tyler & Baker, 1983). Epidemiological studies indicate that tinnitus affects approximately 10–15% of the adult population, while nearly 1–3% experience severe symptoms that significantly interfere with daily functioning and quality of life (Baguley, McFerran, & Hall, 2013).

The underlying pathophysiology of tinnitus is complex and multifactorial. Although cochlear damage is considered the initiating factor in many cases, increasing evidence suggests that tinnitus results from maladaptive neuroplastic changes within the central auditory nervous system. Reduced peripheral auditory input leads to increased spontaneous neuronal firing, enhanced neural synchrony, and cortical reorganization, resulting in the persistent perception of phantom sounds (Eggermont & Roberts, 2015). Furthermore, interactions between the auditory pathways

and non-auditory brain regions, particularly the limbic and autonomic nervous systems, contribute to the emotional distress and persistent awareness commonly experienced by tinnitus sufferers (Jastreboff, 1990).

The clinical presentation of tinnitus varies considerably among individuals. Some patients perceive mild symptoms that have little impact on their daily activities, whereas others experience severe sleep disturbances, impaired concentration, communication difficulties, anxiety, depression, irritability, and reduced occupational efficiency (Tyler & Baker, 1983). Previous investigations have demonstrated that the severity of tinnitus is often determined not by its acoustic characteristics but by the individual's psychological response and coping ability (Hallam, McKenna, & Shurlock, 2004). Consequently, assessment of tinnitus requires a multidimensional approach that includes audiological evaluation, psychological assessment, and measurement of cognitive functioning.

Psychological disturbances are among the most frequently reported consequences of chronic tinnitus. Several studies have identified elevated levels of anxiety, depression, obsessive-compulsive symptoms, somatization, and emotional distress in individuals with persistent tinnitus (Halford & Anderson, 1991; House & Brackmann, 1981). According to the cognitive-behavioral model proposed by Dineen et al. (1997), the degree of tinnitus-related disability depends largely on the individual's beliefs regarding tinnitus, emotional reactions, and coping strategies rather than on the auditory sensation itself. Persistent tinnitus may trigger negative emotional responses that further increase awareness

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of the symptom, creating a self-perpetuating cycle of distress.

In addition to psychological impairment, tinnitus has been shown to adversely affect cognitive functioning. Many individuals complain of reduced attention, impaired concentration, forgetfulness, decreased working memory, and difficulty performing mentally demanding tasks (Andersson et al., 2000). Hallam, McKenna, and Shurlock (2004) reported that individuals with tinnitus demonstrate significantly greater cognitive failures than normal-hearing controls, suggesting that tinnitus consumes cognitive resources that would otherwise be available for attention and memory processes. These cognitive deficits may substantially reduce academic performance, occupational productivity, and overall quality of life.

Several standardized instruments have been developed to evaluate the multidimensional effects of tinnitus. Pure-tone audiometry remains the gold standard for determining hearing sensitivity, while tinnitus-specific questionnaires such as the Tinnitus Reaction Questionnaire (TRQ) assess tinnitus-related emotional distress (Wilson, Henry, Bowen, & Haralambous, 1991). The Symptom Checklist-90-Revised (SCL-90-R) provides a comprehensive assessment of psychological symptoms, including depression, anxiety, hostility, somatization, and obsessive-compulsive features (Derogatis, 1994). Similarly, the Cognitive Failures Questionnaire (CFQ), developed by Broadbent et al. (1982), evaluates self-reported cognitive difficulties encountered during everyday activities. Together, these instruments facilitate a comprehensive understanding of the audiological, psychological, and cognitive impact of tinnitus.

Although numerous studies have investigated either the audiological or psychological aspects of tinnitus, relatively few have comprehensively examined the combined audiological, psychological, and cognitive characteristics in individuals with tinnitus, particularly by comparing patients with normal hearing, patients with mild hearing impairment, and healthy controls. Such comparative analyses are essential for understanding the broader impact of tinnitus and for developing multidisciplinary rehabilitation strategies.

Therefore, the present study was undertaken to investigate the audiological, psychological, and cognitive characteristics of tinnitus sufferers. Specifically, the study aimed to compare tinnitus characteristics, psychological distress, and cognitive functioning among individuals with tinnitus with normal hearing, individuals with tinnitus associated with mild hearing loss, and normal-hearing adults without tinnitus. The findings are expected to contribute to a more comprehensive understanding of tinnitus and emphasize the importance of incorporating psychological and cognitive assessment into routine audiological management.

Aim of the Study

The present study aimed to investigate the audiological, psychological, and cognitive characteristics of individuals with tinnitus and to compare these characteristics among tinnitus sufferers with normal hearing, tinnitus sufferers with mild hearing impairment, and individuals without tinnitus.

Objectives

- To study the audiological characteristics of tinnitus in terms of pitch, loudness, laterality, duration, and perceived severity.
- To assess the psychological impact of tinnitus using the Tinnitus Reaction Questionnaire (TRQ) and the Symptom Checklist-90-Revised (SCL-90-R).
- To evaluate cognitive functioning in tinnitus sufferers using the Cognitive Failures Questionnaire (CFQ).
- To compare the audiological, psychological, and cognitive characteristics among tinnitus patients with normal hearing, tinnitus patients with mild hearing impairment, and normal-hearing individuals without tinnitus.
- To determine the relationship between tinnitus severity, psychological distress, and cognitive performance.

2. Methodology

Study Design

A comparative cross-sectional observational study was conducted in the Department of Audiology to evaluate the audiological, psychological, and cognitive characteristics of tinnitus sufferers.

Participants

Thirty participants were recruited and divided into three equal groups comprising ten participants each.

- **Group I (Tinnitus Group; TIG):** Individuals with tinnitus and bilateral normal hearing (Pure Tone Average <25 dB HL).
- **Group II (Tinnitus with Hearing Impairment Group; TWHIG):** Individuals with tinnitus associated with mild hearing loss (Pure Tone Average ≤40 dB HL).
- **Group III (Normal Control Group; NCG):** Individuals with normal hearing and no history of tinnitus.

Participants were selected after obtaining informed written consent.

Inclusion Criteria

- Adults aged 18–60 years.
- Individuals with subjective tinnitus of at least three months' duration.
- Bilateral normal hearing for Group I.
- Mild sensorineural hearing loss not exceeding 40 dB HL for Group II.
- Normal-hearing adults without tinnitus for the control group.
- Willingness to participate in the study.

Exclusion Criteria

- Moderate to profound hearing loss.
- Active middle ear pathology.
- Neurological disorders.
- Psychiatric illness under active treatment.
- Cognitive impairment unrelated to tinnitus.
- History of otologic surgery or vestibular disorders.

Audiological Assessment

Each participant underwent a detailed case history, including demographic information, duration of tinnitus, onset,

laterality, pitch, loudness, and factors aggravating or relieving tinnitus.

Pure-tone audiometry was performed using standard Hughson–Westlake bracketing procedures to determine hearing sensitivity and classify participants into the respective study groups.

Psychological Assessment

Psychological characteristics were assessed using standardized questionnaires:

- **Nature of Tinnitus Questionnaire** to evaluate tinnitus characteristics.
- **Tinnitus Reaction Questionnaire (TRQ)** to determine tinnitus-related emotional distress.
- **Symptom Checklist-90-Revised (SCL-90-R)** to assess psychological symptoms including anxiety, depression, somatization, obsessive-compulsive behavior, hostility, interpersonal sensitivity, phobic anxiety, paranoid ideation, and psychoticism.

Cognitive Assessment

Cognitive functioning was assessed using the **Cognitive Failures Questionnaire (CFQ)** developed by Broadbent et al. The questionnaire measured attention, memory, perception, and everyday cognitive lapses experienced by participants.

All questionnaires were translated into Hindi and Gujarati using standardized translation and back-translation procedures to ensure linguistic validity and ease of administration.

Outcome Measures

The primary outcome measures included:

- Characteristics of tinnitus (pitch, loudness, laterality, and duration)
- Tinnitus-related distress (TRQ scores)
- Psychological profile (SCL-90-R scores)
- Cognitive functioning (CFQ scores)

Statistical Analysis

The collected data were analyzed using appropriate statistical software. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were calculated for all variables. Group comparisons were performed using one-way Analysis of Variance (ANOVA) followed by post hoc multiple comparison tests where appropriate. A **p-value <0.05** was considered statistically significant.

3. Results

A total of 30 participants were included in the present study and were equally distributed into three groups: Tinnitus Group (TIG; $n = 10$), Tinnitus with Hearing Impairment Group (TWHIG; $n = 10$), and Normal Control Group (NCG; $n = 10$). Comparative analyses were performed to evaluate the audiological characteristics of tinnitus, psychological status, and cognitive functioning among the three groups.

Demographic Characteristics

The mean age of participants in the TIG, TWHIG, and NCG groups was 35.0, 41.5, and 30.3 years, respectively. The TIG consisted of three males and seven females, the TWHIG included four males and six females, while the control group comprised seven males and three females. No participant was excluded after enrolment, and all completed the assessment protocol successfully.

Audiological Characteristics of Tinnitus

Detailed case history revealed that tinnitus was predominantly **bilateral** in both tinnitus groups. Bilateral tinnitus was reported by 70% of participants in the TIG and 60% of participants in the TWHIG. Right-ear tinnitus was observed in 30% of the TIG and 10% of the TWHIG, whereas isolated left-ear tinnitus was comparatively uncommon.

The majority of participants described tinnitus as **continuous** rather than intermittent. Continuous tinnitus was reported by 80% of individuals in both tinnitus groups, while only 20% experienced intermittent symptoms.

Regarding tinnitus quality, most participants described the perceived sound as **high-pitched**. Approximately 80% of subjects in both tinnitus groups reported a high-pitched tinnitus, whereas only a small proportion perceived a low-pitched sound.

Assessment of perceived loudness demonstrated that tinnitus was generally of **moderate intensity**. Approximately 70% of participants in both tinnitus groups rated their tinnitus as moderately loud. Only a few participants described it as loud, whereas the remaining participants perceived it as soft.

Most participants also reported that the loudness and pitch of tinnitus remained relatively stable over time. Nearly 60–90% indicated no significant change in loudness, while approximately 80% stated that the pitch remained constant.

When questioned regarding situations in which tinnitus became more disturbing, the majority reported that symptoms were most noticeable during **quiet environments** and **early morning hours**. Sixty percent of participants in the TIG and 70% in the TWHIG experienced greater tinnitus awareness in quiet surroundings, whereas nearly half of the participants reported worsening symptoms immediately after waking.

Tinnitus-Related Distress

The emotional impact of tinnitus was evaluated using the Tinnitus Reaction Questionnaire (TRQ). Both tinnitus groups demonstrated high TRQ scores, indicating moderate-to-severe tinnitus-related distress.

The average TRQ score was **51.4** in the TIG and **54.9** in the TWHIG. Participants commonly reported frustration, emotional discomfort, sleep disturbances, reduced concentration, irritability, and difficulty coping with persistent tinnitus. These findings indicate that tinnitus substantially affects emotional well-being irrespective of the presence of mild hearing impairment.

Cognitive Function

Cognitive functioning was assessed using the Cognitive Failures Questionnaire (CFQ).

The TIG demonstrated the highest level of cognitive impairment, with a mean CFQ score of 52.43 ± 4.10 , followed by the TWHIG with 39.83 ± 3.84 . In contrast, the NCG exhibited a substantially lower mean score of 11.48 ± 4.10 .

Participants with tinnitus reported frequent memory lapses, distractibility, forgetfulness, reduced concentration, and difficulty maintaining attention during routine daily activities. Although the TIG showed higher cognitive failure scores than the TWHIG, both tinnitus groups demonstrated considerably poorer cognitive performance than the control group.

Psychological Characteristics

Psychological well-being was evaluated using the Symptom Checklist-90-Revised (SCL-90-R).

The overall psychological distress score was highest in the TIG (126.88 ± 14.06), followed by the TWHIG (105.16 ± 13.15), while the NCG exhibited the lowest score (31.00 ± 14.06).

Further analysis of individual SCL-90-R domains demonstrated elevated scores across nearly all psychological dimensions in tinnitus sufferers. Compared with controls, participants with tinnitus experienced significantly greater:

- Somatization
- Obsessive-compulsive symptoms
- Interpersonal sensitivity
- Depression
- Anxiety
- Hostility
- Phobic anxiety
- Paranoid ideation
- Psychoticism
- Additional psychological distress

Among these domains, depression, anxiety, somatization, and obsessive-compulsive symptoms were particularly prominent. Individuals with tinnitus frequently reported emotional exhaustion, excessive worry, irritability, sleep disturbances, reduced confidence, and social withdrawal.

Comparison Between Study Groups

Comparative analysis revealed that both tinnitus groups consistently demonstrated poorer psychological and cognitive outcomes than the normal control group.

Although participants with tinnitus and normal hearing generally exhibited slightly higher psychological distress and cognitive failure scores than those with mild hearing impairment, these differences were not statistically significant for most variables. This finding suggests that the psychological and cognitive burden experienced by tinnitus sufferers is primarily related to the tinnitus itself rather than the presence of mild hearing loss.

4. Overall Findings

The present study demonstrates that tinnitus is associated with substantial psychological distress and impaired cognitive functioning. Participants with tinnitus exhibited significantly greater emotional disturbances and cognitive failures than individuals without tinnitus.

The findings further indicate that tinnitus negatively influences attention, memory, emotional stability, and overall quality of life. Persistent tinnitus appears to interfere with routine daily activities, particularly in quiet environments, leading to increased stress, anxiety, and difficulty concentrating.

Overall, the results emphasize that tinnitus should not be considered merely an auditory symptom but rather a multidimensional condition requiring comprehensive audiological, psychological, and cognitive evaluation for effective clinical management.

5. Conclusion

The present study highlights the multidimensional impact of tinnitus on individuals by demonstrating its significant audiological, psychological, and cognitive consequences. The findings indicate that tinnitus is not merely an auditory symptom but a complex clinical condition that adversely affects emotional well-being, cognitive functioning, and overall quality of life. Participants with tinnitus, irrespective of the presence of mild hearing impairment, exhibited considerably higher levels of psychological distress and cognitive difficulties than individuals without tinnitus.

Audiological assessment revealed that tinnitus was predominantly bilateral, high-pitched, continuous, and of moderate loudness. Most participants reported that their tinnitus became more noticeable during quiet environments and early morning hours, suggesting that environmental factors and reduced external auditory stimulation increase tinnitus perception. These findings emphasize the importance of comprehensive tinnitus evaluation beyond conventional hearing assessment.

The psychological assessment demonstrated significantly elevated scores on the Symptom Checklist-90-Revised (SCL-90-R), indicating increased levels of anxiety, depression, somatization, obsessive-compulsive symptoms, interpersonal sensitivity, and emotional distress among tinnitus sufferers. Similarly, the Tinnitus Reaction Questionnaire (TRQ) showed that tinnitus substantially affected emotional stability, sleep quality, concentration, and daily functioning. The Cognitive Failures Questionnaire (CFQ) further revealed that individuals with tinnitus experienced frequent attention deficits, memory lapses, distractibility, and reduced cognitive efficiency compared with the normal control group.

Interestingly, the psychological and cognitive burden was evident even among participants with normal hearing, suggesting that tinnitus itself, rather than hearing loss alone, is responsible for much of the emotional and cognitive impairment. This finding highlights the need for clinicians to

recognize tinnitus as a disorder with significant psychological and neurocognitive implications.

The results of the present study support the use of multidimensional assessment protocols that include audiological, psychological, and cognitive evaluations in the routine clinical management of tinnitus. Early identification of emotional distress and cognitive impairment may facilitate timely referral for psychological counseling, cognitive rehabilitation, and tinnitus management programs, thereby improving overall patient outcomes.

Although the present study was limited by a relatively small sample size and a single-center design, it provides valuable evidence regarding the broad impact of tinnitus on affected individuals. Future research involving larger multicenter samples, advanced neurophysiological investigations, and longitudinal follow-up is recommended to better understand the mechanisms underlying tinnitus-related psychological and cognitive dysfunction and to develop more effective multidisciplinary intervention strategies.

In conclusion, tinnitus significantly impairs psychological well-being and cognitive functioning regardless of the presence of mild hearing loss. Therefore, successful tinnitus management should adopt a holistic, patient-centered approach that integrates audiological rehabilitation with psychological support and cognitive assessment to enhance quality of life and long-term treatment outcomes.

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