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The relationship of perceived severity of tinnitus with depression, anxiety, hearing status, age and gender in individuals with tinnitus

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Abstract

Introduction: The present study investigated the relationship between the perceived tinnitus severity, depressive and anxiety symptoms in individuals with tinnitus. An attempt was also made to see if any relationship exists between the perceived tinnitus severity and the age, gender or hearing status of the sufferer. **Materials and Methods:** Fifty individuals (31 males, 19 females) with tinnitus (age range 19 to 60 years) were enrolled in the study. After the routine pure tone audiometry, each participant completed the Tinnitus Handicap Inventory, the State-Trait Anxiety Inventory and the Inventory of Depressive Symptomatology-Self Report-30. **Results:** A significant correlation ($r = 0.585$, $p < 0.01$) was found between the perceived tinnitus severity, as indicated by the Tinnitus Handicap Inventory scores and depressive symptoms. Tinnitus Handicap Inventory scores also correlated significantly with both state and trait anxiety levels ($r = 0.602$, $p<0.01$; $r = 0.426$, $p < 0.01$ respectively). Furthermore, age, gender and hearing status did not significantly influence the perceived severity of tinnitus. **Conclusion:** The results support the view that there is a strong relation between tinnitus and anxiety-depressive symptoms. Further, perceived severity of tinnitus is not influenced by age, gender and hearing status of the individual.

Keywords: age and sex distribution, anxiety, depression, hearing, tinnitus.

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INTRODUCTION

Tinnitus has been defined as a condition where there is a sensation of sound but there is no corresponding sound in the acoustic environment[1]. Subjective tinnitus is found to be present in about 85% of the individuals seeking help from an Otologist[2]. It affects around 15% of the world population and this prevalence increases to 33% in individuals aged over 60 years[3]. Approximately 20% of tinnitus individuals experience the disorder to a degree that their quality of well-being and productivity are impaired[4].

Tinnitus may be associated with more than 300 diseases. Hiller & Goebel[5] showed that the most common associated otologic condition was subjective hearing loss, followed by vertigo or dizziness and hyperacusis. Sanchez[6] studied the association between tinnitus and hearing loss and found that 85 to 90% of the individuals with tinnitus present some level of hearing loss and only 4 to 8% present normal hearing sensitivity.

Many researchers[7-9] have linked tinnitus, as a phenomenon, to chronic pain. Both chronic pain and tinnitus are subjective, invisible symptoms which only the patient can experience. Also, in both there is a constant, aversive stimulation which can dominate the sufferer's thoughts and lifestyle, causing a significant interference with daily functioning. Psychological reactions and negative associations can exacerbate the condition and, in effect, amplify the perception of tinnitus resulting in subsequent anxiety, depression, and other somatic complaints[8,10]. Several studies[7,11,12] ave also found that individuals with tinnitus were more socially withdrawn, reactive to stress, alienated, emotionally disturbed and less self-controlled. Study by Makar et al.[13] found a significant correlation between the tinnitus severity and sleep disturbances, depression and anger.

Psychoacoustic measures, such as loudness or pitch, are reported to show little or no relationship to the distress reported by tinnitus individuals[4,14]. Hence, self-report measures are the standard means of determining severity of tinnitus-related distress.

One of the most common psychopathologies clinically observed in tinnitus individuals is depression. In comparison to 14 control individuals presenting with hearing loss but no tinnitus, Harrop-Griffiths et al.[15] found tinnitus individuals to have a greater lifetime prevalence of major depression than the controls (62% vs. 21%) and a significantly higher prevalence of current major depression (48% *vs*. 7%). Stephens & Hallam[16] also found elevations on the anxiety and depression scales of the Crown-Crisp Experiential Index for individuals suffering from tinnitus. In a study by Folmer et al.[17], 160 participants with tinnitus completed the State-Trait Anxiety Inventory (STAI) and an abbreviated version of the Beck Depression Inventory (aBDI). The self-rated tinnitus severity was found to be highly correlated with individuals degree of sleep disturbance, STAI, and aBDI scores. The authors concluded that the severity of chronic tinnitus is correlated with the severity of insomnia, anxiety, and depression.

Though there is enormous literature on various psychopathologies and emotional distress resulting from tinnitus, only a couple of studies[17-19] have attempted to reveal the relation between the perceived tinnitus severity and the degree of emotional distress. Newman et al.[18] reported a significant but low correlations between the Tinnitus Handicap Inventory and the Beck Depression Inventory ($r = 0.32$). A relatively higher correlation of 0.585 was reported by Robinson et al.[19] between the two measures. Folmer et al.[17] found that tinnitus individuals with current depression scored significantly higher than individuals without depression on all 12 questions relating to tinnitus severity. The authors conclude that depression and tinnitus severity are linked.

Review of literature shows a clear relation between hearing loss and tinnitus[20-22] and it can be a symptom of a condition that causes hearing loss, or it can exist without any hearing loss[23]. Various authors have found that the majority of tinnitus individuals have some degree of hearing loss[21,24,25]. Vernon & Meikle[26] reported that 70% to 80% of their tinnitus individuals have "significant hearing difficulties". But, the relation between the hearing status and the handicap experienced due to tinnitus has not been reported in any of these studies.

While tinnitus occurs in individuals of all ages, it most commonly occurs among adults. Further, a more significant difference is reported between men and women with 12% of men over age 65 reporting tinnitus, compared with 7% of women (National Center for Health Statistics, 1960-1962).

Though there is enormous data available regarding the psychological and audiological profiles of individuals with tinnitus in western context, such studies are very limited[27] in Indian context. In this context, the present study examined the relation between the tinnitus severity, depressive and anxiety symptoms. Also, an attempt was made to see if there was any relation between hearing status, age and gender with the participants' tinnitus severity, depressive and anxiety symptoms. The findings of the study would help in understanding the degree of tinnitus and its influence on psychological status of an individual and further developing an appropriate counseling tool in tinnitus management.

PARTICIPANTS AND METHODS

Participants

Fifty individuals with tinnitus in the age range of 19 to 60 years were enrolled for the study. This sample included 31 males (mean age 42.7 years, range 19 to 60) and 19 females (mean age 38.31years, range 20 to 60).

All the participants were selected based on convenient sampling method. Both, individuals with normal hearing and hearing impairment were selected for the study. All the participants experienced tinnitus during the time of evaluation. Individuals with significant mental health problems were excluded. It was also made sure that the participants did not have any previously diagnosed psychological problems prior to the onset of tinnitus through informal questioning.

Among the 50 participants, 20 (40%) had left-sided localization of tinnitus, 16 (32%) had right sided tinnitus and 14 (28%) had tinnitus equal in both ears and/or in the head. Duration of tinnitus experience ranged from 7 to 3600 days.

Procedure and Instruments

Routine ENT examination was performed prior to the audiological evaluations. Pure-tone thresholds were obtained at octave intervals between 250 Hz and 8000 Hz for air conduction and between 250 Hz and 4000 Hz for bone conduction using the modified Hughson-Westlake procedure[28]. The evaluation was carried out in an acoustically treated suite. Participants with a pure-tone threshold of less than or equal to 25 dB[29] HL were considered as having normal hearing sensitivity. Participants then completed both the distress and the tinnitus severity measures which are described below.

Emotional distress measures

Inventory of Depressive Symptomatology-Self Report-30 (IDS-SR_{30}). The self rated IDS[30] has been designed to assess the severity of depressive symptoms. Participant has to select from the four options for each of the 30 items based on his past 7 days experience. Each item is rated from 0 to 3. Based on the total score, which ranges from 0 to 84, the severity of depressive symptoms can be profiled as mild, moderate, severe and very severe. Its reliability and criterion & construct validity has been reported to be high[31].

State-Trait Anxiety Inventory (STAI). State anxiety has been defined as an unpleasant emotional response while coping with threatening or dangerous situations[32], which includes cognitive appraisal of threat as a precursor for its appearance[33]. Trait anxiety refers to stable individual differences in a tendency to respond with an increase in state anxiety while anticipating a threatening situation. Form Y of STAI[34] was utilized for the present study to assess the presence or absence of state and trait-anxiety in individuals with tinnitus. It has 20 items each for assessing trait and state anxiety. The participants were instructed to respond on a 4 point rating scale to indicate his feeling at the time of evaluation and general feeling on the state and trait evaluation questionnaires respectively. Internal consistency coefficients for the scale have ranged from .86 to .95; test-retest reliability coefficients have ranged from 0.65 to 0.75 over a 2-month interval[34].

Tinnitus severity measure

Tinnitus Handicap Inventory (THI).The subjective severity of the handicap experienced due to tinnitus was assessed using the 25 item, beta version of the THI[18]. For each item on the inventory, the participants were instructed to respond with "yes" (4 points), "sometimes" (2 points), or "no" (0 point). These responses are summed, with the total score ranging from 0 to 100 points. Depending on the total score the handicap caused by tinnitus could be identified as slight, mild, moderate, severe and catastrophic[35]. Test-retest reliability of the THI is 0.92[36], and internal consistency is excellent (Cronbach's $\alpha = 0.93$)[18].

Data Analysis

The scores obtained from the 50 participants on the audiometric and psychological measures were tabulated. The data thus obtained was subjected to statistical analyses, using SPSS (Version 16). Descriptive statistics was obtained for both distress and tinnitus severity measures. To study the relationship of the perceived severity of tinnitus with depression, anxiety and age Pearson's product moment correlation was carried out. Nonparametric Mann-Whitney test was carried out to study the relation between perceived severity of tinnitus with gender and hearing status.

RESULTS

Sample characteristics

Among the fifty participants, 19 (38%) had normal hearing sensitivity. Rest 31 (62%) participants had some degree of hearing impairment ranging from mild to severe in one (64.5%) or both (35.5%) the ears.

Table 1 shows the mean, SD, minimum, maximum and range of scores across the measures. The mean IDS score for the sample was 25.16 ($\sigma = 11.76$) which corresponds to depressive symptoms of a mild degree. 20% of the participants showed no signs of depression whereas 32%, 34% and 14% of them showed mild, moderate and severe depressive symptoms respectively.

Table 1. Mean, SD, minimum, maximum and range of scores across the measures.

Measure	Mean	SD	Minimum	Maximum	Range
THI	36.80	23.01	2	84	82
IDS-SR_{30}	25.16	11.76	3	54	51
STAI-S	39.76	11.08	24	64	40
STAI-T	42.58	10.82	26	70	44

THI: Tinnitus Handicap Inventory; IDS-SR_{30}: Inventory Depressive Symptomatology-Self Report-$_{30}$; STAI-S: State-Trait Anxiety Inventory - State; STAI-T: State-Trait Anxiety Inventory - Trait.

The mean THI score was 36.80 (σ = 23.00), indicating moderate grade of perceived handicap. For the THI, 24% of the individuals reported a slight handicap; 28% reported a mild handicap; 24% reported a moderate handicap; 16% reported a severe handicap; and 8% reported a catastrophic handicap.

Correlation between the perceived tinnitus severity with depressive and anxiety symptoms

Figure 1 shows the distribution of individuals on the basis of THI and IDS-SR_{30} scores. There was a significant correlation ($r = 0.585$, $p < 0.01$) between THI and IDS scores. A significant correlation was also found (Figure 2) between THI and STAI-S scores ($r = 0.602$, $p < 0.01$) and THI and STAI-T scores ($r = 0.426$, $p < 0.01$). STAI-S and STAI-T scores also correlated significantly with IDS-SR_{30} ($r = 0.688$, $p < 0.01$ and $r = 0.570$, $p < 0.01$ respectively, Figure 3).

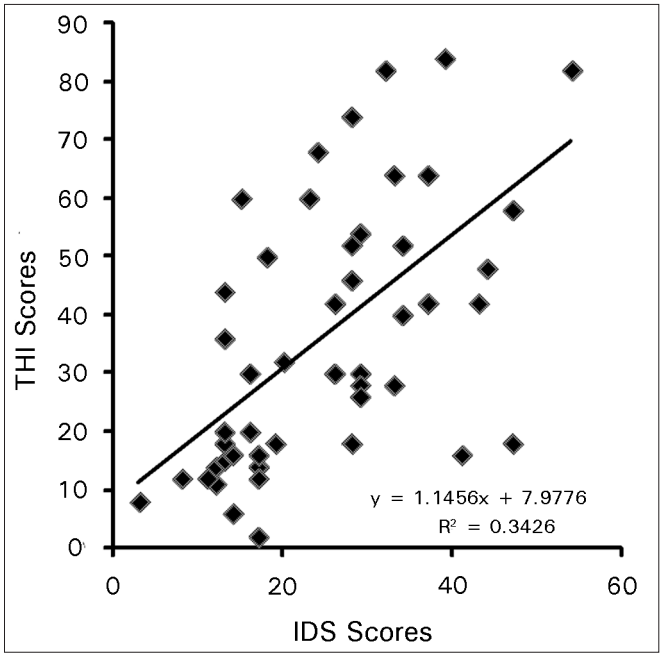

Figure 1. Distribution of participants according to Tinnitus Handicap Inventory (THI) and Inventory for Depressive Symptomatology (IDS).

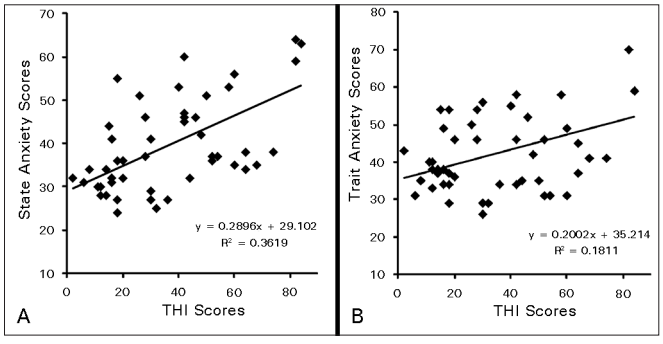

Figure 2. Distribution of participants according to A: Tinnitus Handicap Inventory (THI) and State anxiety scores; B: Tinnitus Handicap Inventory (THI) and Trait anxiety scores.

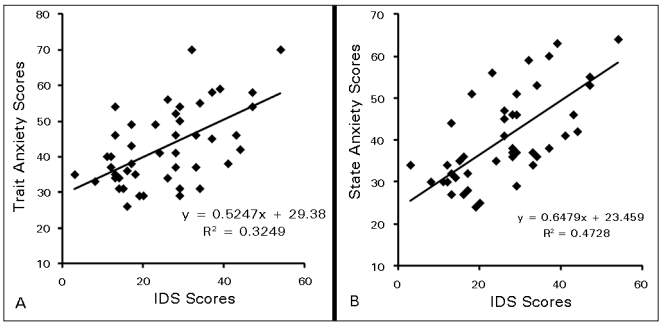

Figure 3. Distribution of participants according to A: Inventory for Depressive Symptomatology (IDS) and State anxiety scores; B: Inventory for Depressive Symptomatology (IDS) and Trait anxiety scores.

Relation between the perceived tinnitus severity with age, gender and hearing status

No significant correlation ($r = 0.114$, $p > 0.05$) was found between age of the participant and the THI scores. The results of the nonparametric Mann-Whitney showed no significant relationship between gender and hearing status ($Z = -1.52$, $p > 0.05$; $Z = -0.24$, $p > 0.05$ respectively) with perceived tinnitus severity.

DISCUSSION

In this study, the relationship between perceived tinnitus severity, anxiety and depression was investigated among 50 adults with tinnitus. The large standard deviations associated with all three handicap measures show that reactions to tinnitus varied among individuals. Further, the observed wide range of scores demonstrates that the sample was heterogeneous with respect to self-perceived tinnitus handicap.

The mean THI scores indicated a moderate grade of handicap due to tinnitus. This finding shows that the tinnitus may be noticed even in the presence of background or environmental noise, although daily activities may still be performed and it frequently interferes with sleep and quiet activities[35]. A strong correlation resulted between THI scores and presence of anxiety/depression symptoms. This finding is in agreement with earlier studies reported in literature[37,38]. The results support the view that there is a connection between tinnitus and psychiatric disorders.

A high correlation between state and trait anxiety has been supported by the state-trait models. Spielberger et al.[34]characterized trait anxiety as a general disposition to experience transient states of anxiety, suggesting that these two constructs are inter-related. The main assumption of the state-trait models is that the effects of traits on behavior are mediated by states, i.e., that states influence more directly internal processing activities and have a more direct effect on behavior than do traits.

The $IDS\text{-}SR_{30}$ scores correlated significantly with both STAI-T and STAI-S scores. This shows that the presence of depressive symptoms also indicated the presence of anxiety conditions, and this is consistent with the hypothesis of a learned helplessness phenomenon[39]. According to Seligman, an individual subjected to a potentially threatening stimulus (tinnitus in our case) reacts by increasing his/her arousal to resolve the threat. When this reaction does not create any relief, the individual submerges into a depressive state in which the subject is conscious of his/her inability to confront that stimulus. Similar findings have also been reported by Crocetti et al.[38] This attracts a heightened concern in the Indian context as there are no adequate tinnitus specialty clinics for detailed assessment and providing treatment with a systematic approach such as tinnitus retraining therapy.

The results of the study also showed that there was no significant relationship between perceived tinnitus severity, age and gender. Pinto et al.[40] also found similar results in a group of 68 individuals with tinnitus in the age range of 24 to 83 years using the THI. No correlation between age and gender with the annoyance of tinnitus has also been reported by Meric et al.[41] Various studies[5,42] have also shown controversial results regarding the effect of age and gender on tinnitus annoyance. However, a direct comparison of the results of these studies cannot be made as the assessment tools used differ from one study to another.

We found no correlation between the hearing status of the individual and the degree of annoyance experienced by tinnitus. Baskill & Coles[43] suggested that the influence of hearing loss on the severity of tinnitus remains uncertain; they found that the auditory thresholds and perceived severity of tinnitus were poorly correlated. Savastano[44] using THI found that more severe hearing loss did not correlate with the severity of bothersome tinnitus. Diverging from our findings, Coles[45] found that individuals with mild hearing loss were mildly bothered and severe to profound hearing loss individuals severely bothered by tinnitus. Weisz et al.[46] suggested that increasing hearing loss was associated with absence from work due to tinnitus. Hallam et al.[47] opined that adjustment to tinnitus does not closely relate to the severity of the condition. Budd & Pugh[48] concluded that tinnitus sufferers adopt different and identifiable coping styles for dealing with their tinnitus irrespective of their peripheral hearing status. Their findings explain for the absence of correlation between the annoyance due o tinnitus and hearing status of the sufferer.

CONCLUSION

The present study aimed to examine the relationship between the perceived tinnitus severity, depressive and anxiety symptoms in individuals with tinnitus. The results support the existence of a significant relation between the perceived severity of tinnitus and reported anxiety and depressive symptoms manifesting in the form of a vicious cycle. The study also indicates the absence of relation between hearing status, age and gender with the perceived tinnitus severity.

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