

**PROFILING ANXIETY - DEPRESSIVE AND PERSONALITY  
TRAITS IN INDIVIDUALS WITH TINNITUS**

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## **LIST OF ABBRIVATIONS**

**THI:** Tinnitus Handicap Inventory

**STAI:** State-Trait Anxiety Inventory

**IDS-SR<sub>30</sub>:** Inventory of Depressive Symptomatology – Self Report

**16PF:** Sixteen Personality Factor Questionnaire

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## **INTRODUCTION**

The word “tinnitus” originated from the Latin word “tinnier” meaning to “ring” or “tingle” like a bell. Tinnitus has been defined as a condition where there is a sensation of sound but there is no corresponding sound in the acoustic environment (Slater & Terry, 1987). Jastreboff and Hazell (1993) defined tinnitus as the perception that results exclusively from the activity within the nervous system without any corresponding mechanical, vibratory activity within the cochlea, and not related to external stimulation of any kind. McFadden (1982) suggested that “tinnitus is the conscious expression of a sound that originated in an involuntary manner in the head of the owner or may appear to do so”. ASHA (2005) defined tinnitus as the perception of sound in the head when no external sound is present.

Tinnitus is a symptom, not a disease (Fowler, 1944; cited in Heller & Bergman, 1953). Tinnitus represents one of the most common and distressing otologic problems. It causes various somatic and psychological disorders that interfere with the quality of life. Many authors (Scott, Lindberg, Lyttkens & Melin, 1985; Sweetow, 1986; Kirsch, Blanchard & Parnes, 1987) have expressed tinnitus, as a phenomenon more similar to chronic pain. Both chronic pain and tinnitus are subjective, invisible symptoms which only the patient can observe. Also, in both there is a constant, aversive stimulation which can dominate the sufferer's thoughts and lifestyle, resulting in significant interference with daily functioning and subsequent anxiety, depression, and other somatic complaints.

Assessing the effects of tinnitus on an individual's life is a complex issue due to a variety of factors: (a) Tinnitus is an entirely subjective experience that can only be described by patient report (Jacobson, 2000; Meikle, 2003); (b) Results of psychoacoustic testing of tinnitus perception have been shown repeatedly to have little if any correlation with the degree of tinnitus impact (Sullivan et al., 1988; Coles, 2000; Henry & Meikle, 2000); (c) As with chronic pain syndromes, psychological factors play a critical role in determining an individual's reactions to tinnitus (e.g., some people are accustomed to solving their own problems whereas others need a great deal of support; (Sullivan et al., 1988; Erlandsson, 2000); and (d) there are individual differences in daily lifestyle, as well as individually distinct acoustic environments, that may make some patients more prone to intrusive tinnitus. Henry and Wilson (2001) also opined that the effects of tinnitus on quality of life are highly individualized, and personality characteristics may predispose a person to experience tinnitus as a "distressing" symptom.

### **Need for the study**

Tinnitus is a symptom that requires a careful history and various examinations to classify its type, identify any associated disease, understand the psychological consequences and organize therapeutic considerations. Large individual differences exist with regard to audiologic, medical, and psychological characteristics of tinnitus sufferers (Meikle & Taylor-Walsh, 1984; Stouffer & Tyler, 1990; Hiller & Goebel, 1999; Savastano, 2004). Various studies (Jakes et al., 1985, Jakes, Hallam, Rachman & Hinchcliffe 1986; Lindberg et al., 1987; Dineen et al., 1997) have shown that the traditional audiological measures of tinnitus, such as pitch matching, loudness matching and minimum masking level, are only weakly related to self-reported levels of tinnitus

distress experienced by the individual. In Indian scenario, there is a lack of well established data on effects of tinnitus on psychological aspect of the sufferer. As the clinical population with tinnitus is increasing, there is a need to study the nature of tinnitus and its effects in Indian context in order to minimize the consequences and compromise on quality of life.

The purpose of this study, therefore, is to determine whether there are certain measurable personality characteristics unique to the tinnitus patient and also to better understand the various psychological profile personalities among these individuals to form individual based therapy programs.

### **Aim of the study**

The aim of the present study is to investigate the psychological profile and personality traits in tinnitus sufferers.

### **Objectives of the study**

1. To determine the relation between the nature (continuous or intermittent) of tinnitus and psychological profile in tinnitus sufferers.
2. To determine the relation between severity of tinnitus and psychological profile in tinnitus sufferers.
3. To investigate the personality traits in tinnitus sufferers.

## **REVIEW OF LITERATURE**

### **Epidemiology of tinnitus**

A brief spontaneous tinnitus, lasting from seconds to minutes is nearly a universal sensation (Axelsson & Ringdahl, 1989). Tinnitus occurs most commonly in adults though it is manifested among all age groups (Sataloff & Sataloff, 1993). According to the National Center for Health Statistics (1960–1962), tinnitus affected up to 30% of the adult population, with 6% of those individuals reporting unbearable symptoms. The study also showed a more significant difference between men and women with 12% of men over age 65 reporting tinnitus, compared with 7% of women. Men are described to experience the sensation more often than women, possibly related to the more impaired hearing thresholds in male population (Lockwood, Salvi & Burkard, 2002).

The 1996, National Center for Health Statistics survey found that the prevalence of tinnitus was 3% when all ages were considered. This was further evaluated to show a prevalence of 1% under the age of 45 and 9% over the age of 65. These numbers are reported to translate to roughly 36 million Americans with tinnitus (Adams, Hendersot & Marano, 1999). Although tinnitus is most prevalent between the ages of 40 to 70 years, it also affects children (Fortune, Haynes & Hall, 1999).

A study by Coles (1984) found that 16% to 19% of people over the age of 17 had experienced spontaneous tinnitus lasting more than 5 minutes. Of these individuals, at least 8% experienced tinnitus as a moderate to severe annoyance or causing interference with sleep and 0.5% reported that tinnitus has severely hampered their ability to lead a

normal life (Coles, 1987). Stouffer and Tyler (1990) reported that sixty-eight percent of their patients heard tinnitus for more than 80% of the day.

When Caucasian and African–American populations were compared, the prevalence of tinnitus was found to be higher in Caucasians (9% versus 5.5%) (Adams et al., 1999). The study also found a slight difference in prevalence when groups were separated by family income level. Among the households making more than \$35,000 per year, 7.6% reported tinnitus, whereas 12.8% of families with incomes less than \$10,000 reported tinnitus.

### **Etiology**

Tinnitus is known to be caused by many factors. There is enormous variability of dysfunctions within the peripheral and/ or central parts of the auditory system which might result in tinnitus. Moreover many of these abnormalities are not easily identified by its effect on hearing (Jastreboff & Hazell, 1993). A specific event, such as an explosion or unusually loud noise, or a combination of events such as a long history of working in a noisy environment, can cause tinnitus.

Objective tinnitus can be caused by middle ear muscle spasms, palatal myoclonus, vascular abnormalities of carotid artery or jugular venous system or patulous eustachian tube (Fortune et al., 1999). The causes of subjective tinnitus according to Schleuning (1998) can be physiological (stress), neurological (meningitis, acoustic neuroma), vascular (anemia), metabolic (hyperthyroidism), medical (TMJ problems, dental problems, Arnold Chiari malformation, traumatic head injury, skull surgeries) or otologic (Meniere's disease, wax build-up in the ear canal, severe ear infection, ototoxic drugs).

In a study by Hiller and Goebel (1999), 1995 respondents were asked whether there existed a medical diagnosis related to the cause of their tinnitus. The following etiologic conditions were to be rated as predefined categories: inner ear dysfunction, conductive hearing loss, sudden hearing loss, vascular dysfunction, cervical spine dysfunction, craniomandibular dysfunction, acoustic trauma or noise exposure, Ménière disease, severe head injury, acoustic neuroma, neurologic disease, ototoxic substance intake, and known family history of hearing disorder. Since etiologies do not exclude each other, the respondents were allowed to make multiple choices. The results showed that the most common associated otologic condition was subjective hearing loss, followed by vertigo or dizziness and hyperacusis. Hyperacusis according to strict criteria was present in 7.3%. The most prevalent etiologic factors, with rates of approximately 30%, were sudden hearing loss, cervical spine dysfunction, and disturbance of blood circulation. Rare conditions with rates less than 5% were conductive hearing loss, tinnitus due to ototoxic substance and severe head injury. Acoustic neuroma was found to be the cause of tinnitus in only 1% of the population studied.

### **Classification of tinnitus**

Based on the symptoms, tinnitus has been classified as subjective and objective (Heller, 2003). Subjective tinnitus is heard only by the patient, whereas objective tinnitus can be heard by both the patient and the examiner. It has been reported that objective tinnitus usually has an identifiable acoustic source. This type of tinnitus has also been called vibratory or extrinsic tinnitus or pseudotinnitus. The prevalence of objective tinnitus is reported to be less than 1% of patients who report tinnitus as a main complaint (Longridge, 1981). Patients with this type of tinnitus will often have no other symptoms

such as hearing loss, fullness, or vertigo (Fortune et al., 1999). Subjective tinnitus is reported to be more commonly idiopathic (subjective idiopathic tinnitus). Other names used for subjective tinnitus in the past include “tinnitus aurium” and “nonauditory tinnitus”. In subjective tinnitus, the neural signals corresponding to the tinnitus, which are present in the auditory cortex, may have been produced by a lesion in the cortex itself or at any further stage in the auditory pathway. Thus subjective tinnitus is found to arise within the cochlea or in the subsequent stages of the auditory system (Slater & Terry 1987).

Tinnitus has also been classified in a manner analogous to hearing loss according to the site of injury or generation (Tyler & Babin, 1986); that is, whether it is middle ear, sensorineural, or central tinnitus. It has been hypothesized that mild to moderate tinnitus may be generated in the ear, whereas, severe tinnitus may be generated in the central nervous system (Moller, 2000).

Tinnitus is said to be temporary if it lasts for minutes to hours after noise exposure that is sufficiently intense and /or prolonged which causes temporary damage to the ear. Chronic tinnitus is the one that lasts for more than five minutes and more than a week or present continuously (Dodie, 2004).

### **Tinnitus and hearing loss**

There exists a clear relation between hearing loss and tinnitus (Meikle, 1991; Axelsson & Barrenas, 1992; Davis & Refaie, 2000) and it can be a symptom of a condition that causes hearing loss, or it can exist without any hearing loss (Heller, 2003). Various authors have found that the majority of tinnitus patients have some degree of

hearing loss (Axelsson & Ringdahl, 1989; Vernon, 1998; Davis & Rafaie, 2000; Henry & Wilson, 2001). Vernon and Meikle (2000) reported that 70 to 80% of tinnitus patients have “*significant hearing difficulties*”. Sanchez et al. (2005) studied the association between tinnitus and hearing loss. The author found that 85 to 90% of the patients with tinnitus present some level of hearing loss and only 4 to 8% of them present normal audiogram.

Erlandsson, Hallberg and Axelsson (1992) investigated the relationship between audiological factors, psychological and psychosomatic factors in 163 tinnitus patients. A significant relationship was found in tinnitus severity and perceived attitudes and frequency of headaches, while social support did not form a crucial factor. Females as compared to males complained more about vertigo and unilateral tinnitus localization. More sleep disturbances were reported by older patients who also exhibited multiple tinnitus localizations. Further, Hiller & Goebel (2007) reported concentration difficulties in a large sample of 5958 tinnitus subjects due to permanent awareness of noise and inability to ignore the same.

### **Quality of tinnitus**

The quality of tinnitus may be described as ringing, hissing, ocean roar, clicking, pounding, cricket, etc. by the patients. Although the quality itself may not be diagnostically significant, it can alert the otologists to vascular and /or middle ear problems. Goldstein and Shulman (1981) attempted to correlate etiology with tinnitus quality and found the results to be non-specific. Tinnitus has been most commonly described as ringing (37.5%), buzzing (11.2%), cricket (8.5%), and hissing (7.8%) in a study by Stouffer and Tyler (1990).

## **Assessment of tinnitus**

Hall and Haynes (2001) suggest the following audiological assessment for individuals with tinnitus:

- Pure- tone audiometry for octave frequencies 250 Hz through 10,000 Hz and mid-octave at 1500 Hz, 3000 Hz and 6000 Hz.
- High frequency audiometry above 10,000 Hz if the thresholds for low frequencies are within normal limits and the results of otoacoustic emissions are also normal.
- Word recognition performance at patients' most comfortable level.
- Immittance measurements (tympanometry), but acoustic reflex thresholds only with caution.
- Distortion product otoacoustic emissions
- Auditory brainstem responses
- Vestibular

Along with audiological evaluations it is essential to carry out various psychoacoustical evaluations. These evaluations identify and quantify the subjective complaints of tinnitus. Vernon and Meikle (1988) stated that the psycho acoustical evaluation protocol for tinnitus of four main elements-

- Pitch matching
- Loudness matching
- Measurement of residual inhibition
- Feldmann's masking curves

Documentation of tinnitus loudness and pitch is important for providing baseline information to quantify the perceptual dimensions of tinnitus, to facilitate decisions regarding effective tinnitus masking, and to evaluate treatment effects (Vernon and Meikle, 2000). Since tinnitus is a subjective symptom, its clinical assessment relies mainly on the use of various tinnitus questionnaires. The results of the questionnaires can be used to assess individuals' perception of the degree of handicap caused by tinnitus, to determine the treatment candidacy, define subject samples for investigational studies, for demonstrating short and long term outcomes for medical, surgical and rehabilitative intervention and also as an effective counseling tool.

Dineen, Doyle and Bench (1997) found no significant correlation between self-reported tinnitus annoyance and measures of auditory sensitivity or even audiological measures of tinnitus characteristics such as its loudness, frequency and maskability. Hence, it is necessary to use both subjective and objective measures to identify those individuals with tinnitus most in need of intervention.

According to Schechter and Henry (2002), the minimal components of an assessment for tinnitus treatment should include, (1) A comprehensive audiologic and tinnitus-specific history. (2) Audiologic evaluation and site of lesion testing, (3) ENT medical evaluation and medical clearance, (4) Tinnitus measurements, including loudness and pitch matching, minimum masking levels and tests for residual inhibition, (5) Hearing aid-related measurements (most comfortable level, uncomfortable level, sound field testing, real ear testing), (6) Trial use of ear-level devices (hearing aids, tinnitus instruments, tinnitus maskers). (7) Evaluation of utility of compact discs, sound

conditions, or other augmentative sound generating devices, and (8) Provision of tinnitus education/counseling material.

### **Factors influencing tinnitus perception**

The psychological state of the patient at the time tinnitus is first perceived is reported to be an important factor for the manner in which the patient relates to the problem. Tinnitus can be little more than a nuisance to a person who is well integrated but can be a major source of suffering to someone already having problems with living (Vernon, 1982). Dineen, Doyle and Bench (1988) found that tinnitus sufferer's experiences stress from a number of sources not directly related to the tinnitus. Life stresses, such as career or domestic pressure and emotional states such as anxiety or depression, may affect the level of reaction to tinnitus and influence the choice of coping strategies that the individual applies to manage their experience of tinnitus. In other words, just as changes in physiological state can trigger tinnitus, psychological reactions and negative associations can exacerbate the condition and, in effect, amplify the perception of tinnitus. (Scott et al., 1985; Sweetow, 1986; Lindberg, Scott, Melin, & Lyttkens, 1987; Sweetow, 2000).

Sahley and Nodar (2001) proposed a model to explain how stress can exacerbate tinnitus. Their idea is that glutamate activity at the synaptic bases of inner hair cells is enhanced in response to opioid dynorphins that are released into the synapses during stressful situations.

Coping strategies are found to differ from patient to patient. Such strategies are necessary in order to maintain a well-integrated personality (Gardner, 1982). Failure to

cope is reported to cause psychological reactions including depression, withdrawal, physical illness and even suicide (Tyler & Baker, 1983; Reich & Johnson, 1984; Johnstone & Walker, 1996; Ridner, 2004). Tinnitus noises could become troublesome if the patient focuses the attention on the tinnitus (Hallam, Jakes & Hinchcliffe, 1988) with tinnitus-related distress likely being modulated by its uncontrollability and maladaptive coping strategies (Hallam et al., 1988; Zachariae, et al., 2000).

Kirsch et al., (1987) reported that slow coping tinnitus subjects were very similar in their psychological profiles to the patients with chronic pain (headache), while the high coping tinnitus subjects were similar to the non-patient control subjects. Budd and Pugh (1996) from the factor analysis of the Tinnitus Coping Style Questionnaire (TCSQ) showed that “maladaptive coping,” but not “effective coping,” is related to reports of subjective tinnitus severity and emotional distress.

### **Impact of tinnitus**

The overall impact of the tinnitus on the individual is influenced by the characteristics of that particular individual (Dauman & Tyler, 1992). Studies by Coles, Davis and Haggard (1981) and Coles (1984) found that 0.5% of the tinnitus sufferers are prevented from leading a normal life. Several studies (House and Brackman, 1981; Kirsch, Blanchard & Parnes, 1989; Makar, Biswas & Shatapathy, 2011) have found that individuals with tinnitus were more socially withdrawn, reactive to stress, alienated, emotionally disturbed and less self-controlled. The authors found that tinnitus had interfered with the participants enjoyment, relaxation, sleep, and forced them to avoid quiet environmental and social situations. The authors found a significant correlation

between the impact of tinnitus and disturbance of sleep caused by it with increase in depression and anger.

Tinnitus is reported to evoke several psychological and social consequences as sound evokes strong emotional reactions because of its importance to survival and because it is the primary medium for spoken language (Hallam, Rachman & Hinchcliffe, 1984; Sweetow, 1995; Hazell, 1999). Most sounds that have little meaning or are not interpreted as a threat are quickly habituated (not reacted to) by the central nervous system (Domjan & Burkhard, 1986). The link between emotion and sound may be the basis for the distress in some tinnitus patients (Hallam et al., 1984; Jastreboff, Gray, & Gold, 1996).

According to Jastreboff's neurophysiological model, in clinically significant tinnitus, in addition to the auditory system, two other systems are involved; the limbic and the autonomic nervous system (ANS). Both limbic and ANS are normally activated by both pleasant and unpleasant stimuli and their action is essential for our well-being and effective functioning. A problem arises when highly and inappropriately activated by a neural stimulus, such as tinnitus. The tinnitus signal itself is innocent and is not causing any harm. The problem develops when tinnitus becomes associated with something negative or unpleasant and as a result produces strong reactions in limbic and ANS. Thus, it sets up a vicious circle involving these 3 interconnected systems (Auditory, limbic and autonomic nervous systems). Further, this temporal association of stimulus and reaction is sufficient to create a conditioned reflex, without the necessity for additional reinforcement. Since the ANS is activated at the behavioural level, this results in a

constant state of alertness and disables the individual from focusing attention on anything else but his/her tinnitus.

In an attempt to assess the impact of tinnitus on everyday life Stiegler et al., (2006) obtained subjective responses from 331 tinnitus sufferers. The author found that 6.9% patients felt that the tinnitus is not disturbing them, 15.4% felt occasional trouble but without significant impact on daily life, 21.4% experienced a medium, 28.7% a high grade, and 27.5% patients experienced a very severe impact on their daily life.

Jakes, Hallam, Chambers, and Hinchcliffe (1985) analyzed tinnitus complaints collected from 82 neuro-otology patients. Patients objected to the persistence of their tinnitus and reported sleep disturbance, emotional distress, and interference with passive auditory leisure time activities. Patients' awareness of tinnitus correlated significantly with self-reported tinnitus loudness and the unpleasantness of their tinnitus. Jakes et al. (1985) concluded that work and family life were dramatically affected by tinnitus.

A study by Tyler and Baker (1983) found that tinnitus was associated with hearing difficulties in 53%, effects on lifestyle in 93%, effects on general health in 56%, and emotional difficulties in 70% of the sample (72 participants). Getting to sleep was the most frequently mentioned difficulty; approximately 50% of the participants reported of disturbed sleep. Many respondents had indicated that they experienced depression, annoyance, confusion and insecurity.

Using the Cognitive Failure Questionnaire (CFQ), Alam et al., (2012) found that cognitive failure were greater in the tinnitus group, followed by tinnitus with hearing loss, and least in normal controls. Similar results were obtained by Hallam, McKenna and

Shurlock (2004) who found that everyday cognitive failures were highest in the tinnitus group compared to the hearing impaired group and the normal hearing control group. In addition, the authors found that the tinnitus group responded significantly more slowly than the control groups under dual-task conditions in the reaction time task. Studies (Tyler & Baker, 1983; Andersson, Khakpoor, & Lyttkens, 2002) have also found that many people who report tinnitus also experience poor mental concentration. Eccleston and Crombez (1999) opined that lack of attention and concentration found in these individuals may be because, the tinnitus may interrupt and distract from ongoing activity.

Further, Rossiter, Stevens and Walker (2006) found that the reading span of the tinnitus group was significantly shorter than that of the control group. The tinnitus group recorded slower reaction times and poorer accuracy in the most demanding dual task context.

### **Psychological consequences of tinnitus**

Tinnitus is known to greatly influence the psychological equilibrium of the individual. Study by McKeena, Hallam and Hinchcliffe (1991) found that around 44 to 45% of tinnitus patients, seen by a specialist were diagnosed as requiring psychological intervention. These findings confirm that it is quite common for tinnitus patients to say that they find their tinnitus stressful. Stress in this instance would be either that stimulus which provokes bodily reactions or the state of bodily reaction resulting from factors (the tinnitus) that alter an existing equilibrium.

According to Jakes, et al., (1985), the emotional distress emerged as a separate factor in their factor analysis of tinnitus complaints. In general, these results suggest that

tinnitus, like other chronic conditions, may be associated with psychological distress (particularly anxiety and depression) and personality changes.

### ***Anxiety and depression in tinnitus sufferers***

Anxiety has been defined as an unpleasant emotion triggered by anticipation of future events, memories of past events, ruminations about the self. It is a physiological and psychological state characterized by somatic, emotional, cognitive and behavioral components (Seligman, Walker & Rosenhan, 2001). Depression or depressive disorders are defined as mental illness characterized by a profound and persistent feeling of sadness or despair and/or loss of interest in things that were once pleasurable.

Johnson (1982) opines that one of the most common psychopathologies clinically observed in tinnitus patients is depression. Feelings of hopelessness, self-pity, inadequacy, along with a dependence on others to solve problems, withdrawal from social situations, and frequency of other illnesses are examples of these depression-related states.

In comparison to 14 control patients presenting with hearing loss but no tinnitus, Harrop-Griffiths, Katon, Dobie, Sakai and Russo (1987) found tinnitus patients 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%). In a study by Folmer, Griest, Meikle and Martin (1999), tinnitus patients with current depression scored significantly higher than patients without depression on all 12 questions relating to tinnitus severity. They conclude that depression and tinnitus severity are linked.

Stephens and Hallam (1985) found elevations on the anxiety and depression scales of the Crown-Crisp Experiential Index for individuals suffering from tinnitus. The author commented that if the individual is able to adapt and deal effectively with the stress, then the anxiety and depression accompanying that stress may subside.

A total of 160 patients were asked to rate the severity and loudness of their tinnitus (Folmer, Griest and Martin, 2001). The participants also 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 patients' 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. These relationships were the same for many patients with chronic pain.

Andersson et al., (2000) found that individuals with tinnitus scored significantly higher than normal hearing controls on the Beck Depression Inventory (BDI) and the Spielberger Trait State Anxiety Inventory (STAI-S). But these measures did not correlate with the Stroop test. The authors concluded that the results indicate that tinnitus patients have impaired cognitive performance overall, but hearing impairment cannot be excluded as a possible confounder.

Bartels, Middel, Van der Laan, Staal & Albers (2008) studied 265 subjective tinnitus sufferers using general health related quality of life, tinnitus specific quality of life and coping abilities. They have reported of highest associations seen in impaired quality of life and coping strategies in anxiety plus depression subgroup. They have further

suggested that additive effects of anxiety and depression be considered during clinical investigations.

In an attempt to address the question whether the help-seeking and non-help-seeking tinnitus sufferers differ in psychological and somatic profiles, Scott and Lindberg (2000) found that the groups differed both on the trait and state scales for anxiety, depression and reaction to stress even when hearing impairment was controlled. The authors confirmed a link between anxiety, depression, reactions to stress and chronic tinnitus. They concluded that subjects with disabling tinnitus are more burdened with more severe somatization problems which might result in a less adaptive repertoire of coping strategies.

### ***Personality changes in tinnitus sufferers***

Angler (2009) defines personality as a particular combination of emotional, attitudinal, and behavioural response patterns of an individual. Various biological, physiological, medical, environmental, cultural and psychological factors are known to influence an individual's personality. Among the many factors, tinnitus can cause deleterious effect on personality. Rate of personality disorders in tinnitus sufferers is found to be 50%, which is significantly higher than 10-13% that is estimated in the normal population (Erlandsson, 2000).

In an attempt to assess the psychological distress associated with tinnitus Wilson, Henry, Bowen and Haralambous (1991) developed the Tinnitus Reaction Questionnaire (TRQ). Frequency analysis of the TRQ questions indicated that tinnitus patients judged that their tinnitus made them feel unhappy, tense, and irritable, less interested in going

out, depressed, and annoyed; interfered with sleep, enjoyment of life, ability to work, concentration, and relaxation; and led them to avoid noisy situations and social situations.

Significantly perceived handicap and personality changes have been described in approximately 40 to 50% of people with tinnitus (Bauch, Lynn, Williams, Mellon & Weaver, 2003). This is related to a variety of tinnitus-related complaints, including anxiety, depression, insomnia, concentration problems, irritability, anger, frustration, inability to relax, feelings of helplessness, avoidance of noisy or quiet situations, withdrawal from social events, and emotional problems in relationships with family, friends, and colleagues.

House (1981) found that tinnitus patients obtained elevated scores on scales 1 (Hypochondriasis), 2 (Depression), 8 (Schizophrenia), and 9 (Hypomania) of the Minnesota Multiphasic Personality Inventory. House's (1981) reports on the Minnesota Multiphasic Personality Inventory (MMPI) profiles of 132 tinnitus patients indicated that 48 subjects could be categorized as depressive, 54 as presenting with conversion neurosis, and 30 as borderline personalities. On the other hand, Gerber, Nehemkis, Charter, and Jones (1986), found no evidence of abnormal MMPI profiles for tinnitus sufferers as a group, although a small subgroup (13%) had "typical psychosomatic or hysterical profiles".

In a study by Bartels et al. (2009), 265 consecutive tinnitus patients were asked to complete the Hospital Anxiety and Depression Scale, the Maastricht Questionnaire, the Type D Scale (DS14), the Short-Form Health Survey 36, and the Tinnitus Reaction Questionnaire. The prevalence of Type D personality was 35.5%. Type D patients tend to

experience increased negative emotions, generally feel sad and have a gloomy view of life, while not sharing these emotions with others due to fears of how they may react (Denollet, 2005). Bartels et al. found that the Type D patients were significantly more anxious, depressed, and vitally exhausted, and experienced more impaired health-related quality of life and increased tinnitus-related distress compared with non Type D. Type D was also a direct predictor of poor mental and physical health related quality of life and increased tinnitus-related distress, although this influence was mainly mediated by symptoms of depression and anxiety.

From a sample of 100 individuals with tinnitus, Collect, Mousseu, Disant, Ahami and Morgan (1990) found that the overall profile was normal on Minnesota Multiphasic Personality Inventory (MMPI). However, males obtained higher scores on the depression scale, long duration of tinnitus was related to higher hypochondria scores and hearing loss was associated with psycho asthenia.

Halford & Anderson (2004) scrutinized 112 tinnitus sufferers to study the relation between tinnitus and personality. They concluded that tinnitus was associated with elevated anxiety and depression. Increased age led to decreased depressive tendencies while males were associated with lower scores on anxiety and depression. A study on 146 moderate to severe tinnitus patients further highlighted the significant correlation in anxiety sensitivity with tinnitus distress with females exhibiting more signs of anxiety sensitivity (Andersson & Vretblad, 2000).

On the other hand, few studies (Meric, Gartner, Collet & Chery-Croze, 1998; Vallianatou, Christodoulou, Nestoros & Helidonis, 2001) have also found no peculiar

personality profile in their subjects with chronic tinnitus assessed with the Minnesota Multiphasic Personality Inventory (MMPI), even though the first authors found a correlation between MMPI depression scale and the Tinnitus Handicap Questionnaire.

## **METHOD**

The present study was proposed to investigate psychological profile of the tinnitus sufferers, relation between the severity and nature of tinnitus with the psychological profile and also to document the personality traits of tinnitus sufferers.

### **Participants**

Hundred individuals with tinnitus in the age range of 18 to 60 years were considered for the study. All the participants were selected based on convenient sampling method. Among this 50 participants were from audiology clinic of Department of Speech and Hearing, MCOAHS, Manipal and remaining 50 were from audiology clinic of All India Institute of Speech and Hearing, Mysore. Both, individuals with normal hearing and with hearing impairment were included. All the participants experienced tinnitus during the time of evaluation in one or both ears or in the head. Participants with significant mental health problems were excluded from the study. An informed consent was taken from the participants prior to carrying out the evaluation.

### **Instrumentation**

A Type I diagnostic audiometer with Telephonics TDH-39 headphones was used to estimate the air conduction thresholds and to carry out speech audiometry (ANSI S3.6, 1996). Calibrated Radio Ear B-71 bone vibrator was used to estimate bone conduction thresholds. The same audiometer and headphones were also used to present stimuli for carrying out the tinnitus evaluation. A calibrated clinical immittance meter was used to evaluate the middle ear status.

## **Test environment**

Hearing and tinnitus evaluations were carried out in an acoustically treated suite. It was ensured that the noise levels were within the permissible limits as recommended by ANSI S3.1 (1991).

## **Procedure**

### ***a) Hearing evaluation***

Pure-tone thresholds were obtained in octave intervals between 250 Hz to 8000 Hz for air conduction and between 250 Hz and 4000 Hz for bone conduction using the modified Hughson-Westlake procedure (Carhart & Jerger, 1959). Speech Identification Scores (SIS) was obtained under headphones using the Kannada monosyllabic word test (Yathiraj & Vandana, 1998) at 40dB SL (re. pure tone average). Tympanometry was carried out using a 226 Hz probe tone to make note of the middle ear status.

### ***b) Tinnitus evaluation***

This included, pitch matching, loudness matching and residual inhibition measures. These evaluations were carried out before administering the psychological questionnaires.

#### ***Pitch matching***

This measure attempted to quantify the tinnitus for frequency. Two alternative forced choice (2AFC) method was used (Vernon & Ferwick, 1984). With this method two stimuli are presented in an alternating manner and the participant is forced to choose which tone of the two is most like their tinnitus. The stimuli used were pure tone or narrow band noise at 20 dB SL (re. pure tone average), depending on the subjective

description of the perceived tinnitus. The participants were instructed to match the sharpness or flatness of the sound ignoring its loudness. They were also reminded that it may not be an exact match but a close approximation.

In case of unilateral tinnitus, pitch matching was done in the side opposite to the side where tinnitus was perceived and in bilateral tinnitus cases it was done in the ear opposite to the ear with predominant tinnitus. Pitch matching was done in the right ear if tinnitus was heard equally loud in both ears.

After the pitch match was done, octave confusion test was performed to confirm the pitch match result utilizing two AFC procedures. Here, the tone/NBN selected by the individual as his or her pitch match and a tone/NBN one octave above/below that frequency was presented. If the individual was able to confirm the originally selected pitch, then the octave test was considered as negative. The pitch matched tinnitus was taken as the reference signal for the loudness match.

#### *Loudness matching*

Loudness match was done by using an ascending procedure in the same ear where pitch matching was done. This procedure was selected to avoid the accidental production of residual inhibition, which in turn could cause an underestimate of the loudness of the tinnitus (Vernon & Fenwick, 1984). The pitch matched tinnitus signal was presented and the subject was asked to indicate when the signal was barely audible (threshold) and later, when the signal was equally as loud as his/her tinnitus. The difference in levels between the thresholds and at which tinnitus was matched for loudness was considered as the loudness of tinnitus. It was expressed in SL with reference to threshold. The intensity was

increased in 2 dB steps up to threshold and 1dB from there till the loudness match was obtained.

### *Residual inhibition*

Residual inhibition is the temporary suppression or elimination of tinnitus that is often observed following auditory stimulation (Vernon & Meikle, 1988). A broad band noise was presented at 10 dB SL (re: Minimum masking Level) for 60 seconds to both ears under headphones. The intensity difference in dB between the threshold for the masking tone and the lowest level at which complete masking occurs is termed the Minimum Masking Level (Vernon & Fenwick, 1984). During the procedure, participants were instructed to sit comfortably and relax. At the end of 60 seconds the participants were asked to indicate if there was any perceptual change in their tinnitus. The results of the residual inhibition can be interpreted as positive complete, positive partial, negative and rebound based on the subjective description of the perceptual change in tinnitus (Goldstein & Shulman, 1991).

### **c) Psychological evaluation**

#### *The Tinnitus Handicap Inventory (THI)*

The THI (Newman, Jacobson & Spitzer, 1996) is a self-report measure that can be used in a busy clinical practice to quantify the impact of tinnitus on daily living. For the present study, the 25 item beta version of THI was used. The 25 items have been further grouped into sub scales; functional, emotional and catastrophic. For each item on the inventory, the participants were instructed to respond with “yes” (4 points), “sometimes” (2 points), or “no” (0 points). These responses were 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 (McCombe et al, 2001). Higher scores represented greater perceived handicap. Test-retest reliability of the THI is 0.92 (Newman, Sandridge & Jacobson 1998), and internal consistency is excellent (Cronbach's  $\alpha = 0.93$ ) (Newman et al., 1996).

#### *The State-Trait Anxiety Inventory (STAI)*

State anxiety has been defined as an unpleasant emotional response while coping with threatening or dangerous situations (Spielberger, 1983), which includes cognitive appraisal of threat as a precursor for its appearance (Lazarus, 1991). 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 (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) 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 (Spielberger et al., 1983).

#### *Inventory of Depressive Symptomatology – SR<sub>30</sub> (IDS-SR<sub>30</sub>)*

The self rated 30 items Inventory of Depressive Symptomatology (IDS-SR<sub>30</sub>, Rush et al., 1986; Rush, Gullion, Basco, Jarrett, & Trivedi, 1996) was used to assess the severity of depressive symptoms in tinnitus sufferers in the current study. It has four

options for each question to be ticked based on the last week's experience. Each item is rated 0-3. 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 and construct validity have been reported to be high (Rush et al., 1996).

#### *The Sixteen Personality Factor Questionnaire (16PF)*

16PF is a multiple-choice personality questionnaire. It is a comprehensive measure of normal personality that can be used in any setting where an in-depth, integrated picture of the whole person is desirable (Cattell, Cattell, and Cattell, 1993). The questionnaire was used to analyze personality traits namely, extraversion, anxiety, tough poise and independence. The Sixteen Personality Factor Questionnaire (16PF) Form C was selected for the study. Form C contains 105 items requiring an average of 25 minutes to complete. The instrument uses a "forced-choice format" which provides three alternative responses to each item. The questionnaire measures 16 primary and 5 global, functionally independent and psychologically meaningful dimensions. A set of eight second order traits can be calculated by combining various primary scales. These composite scores provide additional information about the personality of the individual. Further, the possible coping mechanism adapted by tinnitus sufferers to overcome tinnitus effects would be obtained based on the findings from 16 PF.

#### **Statistical analysis**

Current study uses exploratory cross-sectional standard group comparison study design. Further, the relation between the nature and severity of tinnitus and the psychological profile of the tinnitus sufferers was determined by employing descriptive analysis.

## RESULTS

### *Population Characteristics*

The sample was composed of 58 males and 42 females. The mean age of the participants was 39.91 years (SD = 12.59 years). Table 1 shows the mean, minimum and maximum age the male and female participants.

Table 1. *Mean, minimum and maximum age of male and female participants.*

	<b>Mean Age (years)</b>	<b>Minimum Age (years)</b>	<b>Maximum Age (years)</b>
<b>Male</b>	38.57	19	60
<b>Female</b>	40.16	18	60

The primary complaints of all the participants are tabulated in Table 2. The pure tone audiometric thresholds were  $\leq 25$  dB HL bilaterally in 38% of the participants. 34% of the individuals had unilateral hearing loss and the rest 28% of them had bilateral hearing impairment ranging from mild to profound degree. Among the participants with hearing loss, the type of hearing loss was conductive in 30.65%, sensori-neural in 48.39% and mixed in 20.97%.

Table 2. *Participants' primary complaints.*

<b>Complaint</b>	<b>% of total</b>
Tinnitus	52
Hearing loss	27
Dizziness	6
Ear pain	12
Others	3
<b>Total%</b>	<b>100</b>

### ***Tinnitus Characteristics***

The lengths of time for which the participants had experienced their tinnitus ranged from 1 day to 10 years. In total, 30 participants had intermittent tinnitus and the remaining 70 reported continues perception of tinnitus. Most participants had unilateral tinnitus (63%). Of those participants, 34 percent reported it on the left side and 29 per cent on the right. Only 5 participants perceived tinnitus in the head.

The frequencies of external sound best matching the participant's tinnitus sensation are shown in Figure 1. 15 participants reported that their tinnitus pitch best matched with the narrow band noises and a majority of 85 participants matched it with pure tones.

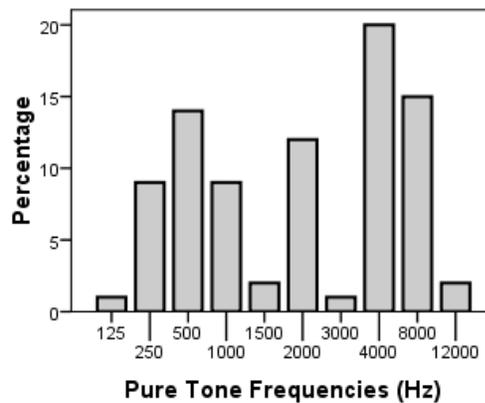


Figure 1. *Distribution of pure tone frequencies best matching the perceived tinnitus pitch.*

The results of the loudness matching task revealed that the perceived loudness of tinnitus ranges between 3dB SL to 30dB SL with a mean sensation level of 14.31dB. Figure 2 represents the sensation levels matched by the participants at the frequency of tinnitus.

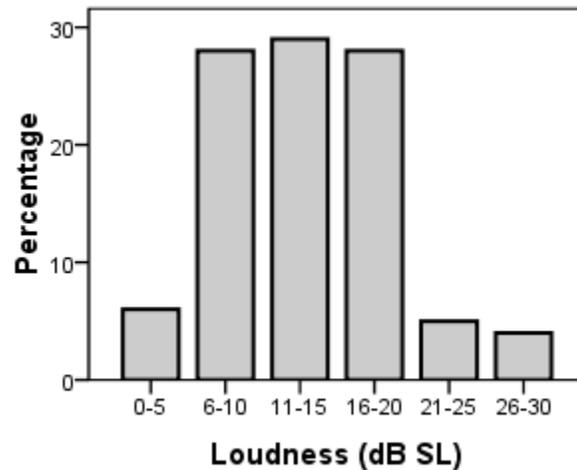


Figure 2. *Distribution of loudness sensation levels best matching the perceived tinnitus loudness.*

### ***Tinnitus Handicap Assessment***

The mean THI score was 27.25 (SD=22.50), indicating mild grade of perceived handicap. The scores further reveal that, 24%, 31%, 24%, 14% and 7% of the individuals experienced a slight, mild, moderate, severe and catastrophic handicap respectively.

### ***Psychological measures***

The mean, standard deviation and range of scores on the State- Trait Anxiety Inventory (STAI) and the Inventory for Depressive Symptomatology-Self Report-30 (IDS-SR<sub>30</sub>) are tabulated in Table 3. The mean IDS score for the sample was 23.23 which correspond to depressive symptoms of a mild degree. 27% of the participants showed no signs of

depression whereas 37%, 25% and 8% of them showed mild, moderate and severe depressive symptoms respectively.

Table 3. *Descriptive statistics for STAI and IDS-SR<sub>30</sub>*

<b>Measure</b>	<b>Mean</b>	<b>SD</b>	<b>Range</b>
<b>STAI-S</b>	38.06	10.91	20-64
<b>STAI-T</b>	37.18	11.57	20-70
<b>IDS-SR<sub>30</sub></b>	23.23	13.07	3-78

n=100

***Correlation between the perceived tinnitus severity with depressive and anxiety symptoms***

A significant correlation ( $r = 0.63$ ,  $P < 0.01$ ) was found between the perceived tinnitus severity, as indicated by the THI scores and depressive symptoms. The correlation was also significant between THI and STAI-S scores ( $r = 0.47$ ,  $P < 0.01$ ) and THI and STAI-T scores ( $r = 0.28$ ,  $P < 0.01$ ). STAI-S and STAI-T scores also correlated significantly with IDS-SR<sub>30</sub> ( $r = 0.52$ ,  $P < 0.01$  and  $r = 0.46$ ,  $P < 0.01$  respectively).

***Influence of gender***

Table 4 lists the mean and SD values of THI, STAI-S, STAI-T and IDS-SR<sub>30</sub> for males and females. Independent samples *t*-test revealed that there was no significant difference between the genders on the scores of THI [ $t(100) = 1.24$ ,  $p > 0.05$ ], STAI-S [ $t(100) = 1.27$ ,  $p > 0.05$ ], STAI-T [ $t(100) = 1.04$ ,  $p > 0.05$ ], and IDS-SR<sub>30</sub> [ $t(100) = 0.72$ ,  $p > 0.05$ ].

Table 4. *Mean and SD for males and females across different measures.*

	<b>Gender</b>	<b>Mean</b>	<b>SD</b>
THI	Male	39.62	22.41
	Female	33.98	22.48
STAI-S	Male	39.24	11.15
	Female	36.43	10.49
STAI-T	Male	38.21	10.93
	Female	35.76	12.39
IDS-SR <sub>30</sub>	Male	24.03	12.01
	Female	22.12	14.48

n=100

\*THI = Tinnitus Handicap Inventory, STAI-S= State Trait Anxiety Inventory- State, STAI-T= State Trait Anxiety Inventory- Trait, Depressive Symptomatology-Self Report-30.

### ***Influence of nature of tinnitus***

In the present study, 30 individuals perceived intermittent tinnitus and the remaining 70 reported continues tinnitus. An independent sample T-test was carried out to see if the nature of tinnitus influenced the psychological profile of the sufferer. The results indicted no significant difference in the scores of the THI [t (100) = 6.15,  $p > 0.05$ ], STAI-S [t (100) = -0.28,  $p > 0.05$ ], STAI-T [t (100) = 0.11,  $p > 0.05$ ], and IDS-SR<sub>30</sub> [t (100) = 0.14,  $p > 0.05$ ] between the two groups.

***Relationship between of individuals’ pure tone audiometry thresholds and psychological profile***

In order to see if the pure tone audiometry thresholds influenced the scores of THI, STAI and IDS-SR<sub>30</sub> bivariate correlation analysis was carried out. The results of correlation analysis are tabulated in Table 5. The analysis showed no significant correlation between the audiometric thresholds and the scores on THI, STAI and IDS-SR<sub>30</sub>.

Table 5. *Correlation analysis (r values) of pure tone average and THI, STAI and IDS-SR<sub>30</sub>.*

	<b>THI</b>	<b>STAI-S</b>	<b>STAI-T</b>	<b>IDS-SR<sub>30</sub></b>
<b>PTA- Right ear</b>	0.082	-0.073	-0.162	-0.047
<b>PTA- Left ear</b>	0.003	-0.118	-0.121	-0.056

\*PTA= Pure Tone Average, THI = Tinnitus Handicap Inventory, STAI-S= State Trait Anxiety Inventory- State, STAI-T= State Trait Anxiety Inventory- Trait, Depressive Symptomatology-Self Report-30.

\*\* Correlation is significant at the 0.01 level (2-tailed).

***Influence of age and duration of tinnitus perception on the psychological profile***

Both age and duration of tinnitus perception were found to have no influence neither on the THI scores nor the psychological measures. The ‘r’ value of the bivariate correlation analysis is displayed in the Table 6.

Table 6. *Correlation analysis (r values) of age and duration of tinnitus perception and THI, STAI and IDS-SR<sub>30</sub>.*

	<b>THI</b>	<b>STAI-S</b>	<b>STAI-T</b>	<b>IDS-SR<sub>30</sub></b>
<b>Age</b>	-0.083	-0.017	0.140	-0.042
<b>Duration on tinnitus onset</b>	-0.034	0.025	0.016	-0.035

\*THI = Tinnitus Handicap Inventory, STAI-S= State Trait Anxiety Inventory- State, STAI-T= State Trait Anxiety Inventory- Trait, Depressive Symptomatology-Self Report-30.

\*\* . Correlation is significant at the 0.01 level (2-tailed).

***Findings from 16Personality Factor questionnaire***

Table 7. *Mean and SD of the participants across four global traits on the 16PF.*

<b>Trait</b>	<b>Mean</b>	<b>SD</b>
<b>Extraversion</b>	6.27	3.36
<b>Anxiety</b>	5.89	1.99
<b>Tough poise</b>	4.51	2.06
<b>Independence</b>	4.63	1.69

The results of the 16PF were analyzed under four global scales/traits (extraversion, anxiety, tough poise and independence). The mean and SD for the participants (N=25) for the four traits is tabulated in Table 7. These mean values indicate that the individuals with tinnitus did not exhibit any dominant personality trait. However, scores on the tough poise and independence traits show a low score direction indicating

that the individuals with tinnitus are emotionally sensitive, more concerned regarding their tinnitus and generally group dependent.

## DISCUSSION

In recent years, an increasing amount of attention has been placed on the role of psychological and cognitive factors in the perception of tinnitus. While tinnitus is a common otological condition, only a small percentage of individuals report it to be extremely disturbing and disruptive. There are also a large number of individuals who have tinnitus but are apparently not sufficiently troubled to complain or seek relief from it (Tyler & Baker, 1983). The findings of the present study are in agreement with the earlier studies in terms of the percentage of participants with tinnitus as their primary complaint. Among the 87 participants studied by Hallberg and Erlansson (1993) 43 patients' availed professional help and 44 patients did not seek any help for their tinnitus.

The difference between right and left sides no longer remains clear, as some studies have found the right to be more affected, and others have shown no difference from right to left (Chung, Gannon & Mason, 1984). However, the present study found that 34 per cent reported it on the left side.

There are a slight increased number of male participants in the study. Men are described to experience the sensation more often than women, possibly related to the more impaired hearing thresholds in male population (Lockwood et al., 2002). Also, they are generally exposed more than females to industrial noise and it is well known that chronic noise exposure is one of the main causes of tinnitus (Savastano, 2008). The analysis of the epidemiological data indicates that exposure to noise is widespread and it is one of the most common causes of tinnitus, estimated at about 28% according to

Axelsson, 20.7% according to Kowalska and 42% according to Palmer (Axelsson & Ringdahl, 1989; Kowalska & Sulkowski, 2001; Palmer et al., 2002).

Sensorineural hearing loss accounted for the greater percentage of hearing impairment (48.39%) in the present study. The findings are in agreement with that of Savastano (2008) who found that among the 520 participants, 28 subjects (5.4%) had a conductive hearing loss, 445 subjects (85.6%) had a sensorineural hearing loss, 46 subjects (9%) had hearing loss of mixed type. Moller (2006a) opines that several layers of complexity are involved in the pathophysiology and the cause of tinnitus and it is rarely known what causes an individual's tinnitus (idiopathic tinnitus). Sensory neural hearing loss can be caused by noise exposure, presbycusis, administration of ototoxic, disorders that affect the CNS, traumatic brain injury, herpes infections, surgically induced injuries, etc and these are often accompanied by tinnitus (Moller, 2006a). Kaas (1991); Kral, Hartmann, Tillrin, Heid and Klinke (2000) found that deprivation of auditory input can cause topographic map re-organization in cerebral cortices. The fact that tinnitus often is associated with hearing loss, especially high frequency hearing loss, supports the hypothesis that loss or reduction of input from the periphery can promote or initiate tinnitus (Moller, 2006b).

The author (Savastano, 2008) also reported that tinnitus was referred as unilateral in 54 % of cases, bilateral in 35% of cases, and in the head in the remaining cases which is also in voice with the present study.

Hearing status of the individual was found to have no influence on the severity of perceived tinnitus in the present study. In contrast, Savastano (2008) found that the

subjective discomfort was higher in the presence of hearing loss than in a case of normal hearing. But visual analogue scale was used as a measure of subjective discomfort in Savastano's study. Hence a direct comparison cannot be made between the findings of the two studies.

70% of the participants reported continuous tinnitus. Review of literature also supports this finding. Alam et al. (2012) found tinnitus was continuous for the majority (80%) of participants and intermittent for a small proportion of (20%) participants.

The mean THI scores indicated a mild grade of handicap due to tinnitus. This finding shows that the tinnitus may be easily masked by environmental sounds and easily forgotten with activities. It might occasionally interfere with sleep but not daily activities (McCombe et al., 2001). The observed wide range of scores shows that the sample was heterogeneous with respect to self-perceived tinnitus handicap.

The large standard deviations associated with all the measures (THI, STAI, IDS) show that the reaction to tinnitus varied among individuals. Approximately, only 1 to 5% of the population is severely affected by their tinnitus (Heller, 2003). The findings of the present study are in correlation with the Heller's results. Small percentages (7-8%) of participants were found to be severely affected by tinnitus.

A strong correlation was found between THI scores and presence of anxiety/depression symptoms. This finding is in agreement with earlier studies reported in literature (Zoger, Svedlund & Holgers, 2001; Crocetti, Forti, Ambrosetti & Bo, 2009). 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 (1983) 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., states influence more directly internal processing activities and have a more direct effect on behavior than do traits.

The IDS-SR<sub>30</sub> 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 (Seligman, 1975). 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., 2009). 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.

We found no correlation between the hearing status of the individual and the degree of annoyance experienced by tinnitus. Baskill and Coles (1999) 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 (2008) using THI found that more severe hearing loss did not correlate with the severity of bothersome tinnitus. Diverging from our findings, Coles (1984) found that individuals

with mild hearing loss were mildly bothered and severe to profound hearing loss individuals severely bothered by tinnitus. Weisz, Voss, Berg and Elbert (2004) suggested that increasing hearing loss was associated with absence from work due to tinnitus. Hallam, Rachman and Hinchcliff (1984) opined that adjustment to tinnitus does not closely relate to the severity of the condition. Budd and Pugh (1996) 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 to tinnitus and hearing status of the sufferer.

The results of the study also showed that there was no significant relationship of perceived tinnitus severity with age, gender and duration of tinnitus perception. Pinto, Sanchez and Tomita (2010) also found similar results in a group of 68 individuals with tinnitus in the age range of 24 to 83 years using the THI. Dineen, Doyle and Bench (1997) found that female subjects tended to report a greater level of reaction to the presence of the tinnitus than the male subjects. They also found that female subjects reported a similar level of anxiety, but reported more depression than the male subjects. No correlation between age and gender with the annoyance of tinnitus has also been reported by Meric, Gartner, Collet and Chery-Croze (1998). Various studies (Davis, 1983; Hiller & Goebel, 2006) have also shown controversial results regarding the effect of age and gender on tinnitus annoyance. Tyler and Baker (1983) found that respondents who had experienced tinnitus for only a short duration tend to report a larger range in the number of "tinnitus related" problems. However, a direct comparison of the results of

these studies cannot be made as the assessment tools used differ from one study to another.

Though, based on the small sample analysis of personality traits, it was evident that subjects with tinnitus did not exhibit any dominant personality trait. This may be attributed to the small sample size. However, it may be reiterated that tinnitus makes the individual emotionally more sensitive influencing their personality characteristics.

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