

# Comorbidity of chronic tinnitus and mental disorders

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## Abstract

**Objective:** Complaining of psychiatric symptoms is more common among individuals suffering from tinnitus. The aim of this study is to determine the psychiatric diagnosis and symptoms of patients with chronic tinnitus. **Materials and Methods:** Four hundred patients with chronic tinnitus from the registry of Otorhinolaryngology Research Center of Rasoul General Hospital, Tehran, Iran were enrolled. The study instruments were Structured Clinical Interview for DSM-III-R, axis I psychiatric disorders, Tinnitus Handicap Index (THI) and Symptom Check List-90-Revised. **Results:** The lifetime and current psychiatric disorders among patients with chronic tinnitus were 60% and 55% respectively. Depressive and anxiety disorders were the most common type. Females with severe THI were 75.6% versus 63.9% in men. **Discussion:** The comorbidity of chronic tinnitus with depressive and anxiety disorders is more common. This may have treatment implication to alleviate the stress and dysfunction resulted from chronic tinnitus.

**Keywords:** comorbidity, mental disorders, tinnitus.

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## INTRODUCTION

The word 'tinnitus' is a Latin word for 'ringing' and refers to the perception of noises in the absence of any external sound. It is the medical term for any kinds of sound that people hear in one or both ears, or come from the middle of their head<sup>1</sup>.

Tinnitus is a common symptom with a prevalence of 10-15% among adults, and 1-2% of severe type among general population<sup>2-4</sup>.

The exact physiological etiology of tinnitus is unknown. Tinnitus is a major difficulty for patients, physicians and researchers. Some underlying causes were defined for tinnitus including ear infections, foreign objects or wax in the ear, and damage from loud noises. Less than twenty percent of them usually required medical attention<sup>5</sup>. For some patients, this sensation does not interfere with daily activities and for others it is significant discomfort in daily life<sup>2</sup> and disabling and restricts social activities<sup>6-7</sup>. Tinnitus symptoms have been linked to various psychological and psychosomatic disorders<sup>8-10</sup>. It is shown that 48% to 60% of patients with chronic or disabling tinnitus have major depressive disorder (MDD)<sup>11-12</sup>. Asplund reported among subjects with chronic tinnitus poor sleep and frequent waking were more common in men and women<sup>13</sup>. The benefits of antidepressants for tinnitus patients were reported and indicating an interaction between tinnitus and mental disorders<sup>14</sup>. The nature of relationship between tinnitus and mental disorders is not clear. However, more studies need to identify the nature of psychiatric disorders among tinnitus patients. In order to access this objective, we have to know more about the prevalence and types of psychiatric disorders in patients with tinnitus.

The aim of this study was to determine the prevalence of psychiatric disorders among chronic tinnitus patients who referred to Ear, Nose, and Throat Center of Rasoul General Hospital Clinic in Tehran, Iran.

## METHODS

### Subjects and setting

The current study was carried out as a cross-sectional design between April 2008 and June 2009. From 2350 Patients with chronic tinnitus, which have been registered at the Research Center of Ear, Nose, and Throat of Rasoul General Hospital, 400 adult aged 18 years or older who were accessible and could participate were enrolled in this study. From the list of registry, among those who were living in Tehran were called and invited to participate in this study. This has been continued until the required subjects were enrolled.

Tinnitus patients with important medical or psychiatric disorders, illiterate subjects, patients who were taking psychotropics, and or Gabapentine were excluded. All study subjects had taken no medication for a long period before being included in the study.

## Measures and questionnaires

• Demographic variables included age, sex, educational level, marital status, occupation, were measured (Table 1).

**Table 1.** Frequency distribution of measured variables of the subjects by gender

Variable	Female n, (%)	Male n, (%)	p. value
<b>Age (years)</b>			
18-35	18 (15.7)	56 (19.6)	NS
36-45	24 (20.9)	52 (18.2)	
46-60	39 (33.9)	114 (40.0)	
+ 61	34 (29.6)	63 (22.1)	
<b>Marital status</b>			
Single	11 (9.6)	39 (13.7)	0.001
Married	91 (79.1)	242 (84.9)	
Other	13 (11.3)	4 (1.4)	
<b>Education</b>			
Ability of writing and reading	14 (12.2)	10 (3.5)	0.001
Pre-high school	36 (31.3)	62 (21.8)	
High school graduated	33 (28.7)	81 (28.4)	
University education	32 (27.8)	132 (46.3)	
<b>Occupation</b>			
Unemployed	0 (0)	16 (5.6)	0.001
Housewife	76 (66.1)	0 (0)	
Employed	26 (22.6)	181 (63.5)	
Retired	13 (11.3)	88 (30.9)	
<b>At least one axis-I psychiatric diagnosis</b>			
Yes	80 (69.6)	160 (56.1)	0.01
No	35 (30.4)	125 (43.9)	
<b>THI</b>			
< 38 (mild)	2 (1.7)	13 (4.6)	0.003
39-56 (moderate)	26 (22.6)	90 (31.6)	
57-100 (severe)	87 (75.6)	182 (63.9)	
<b>GSI</b>			
< 0.7	51 (44.3)	170 (59.6)	0.01
> 0.7	31 (27.0)	61 (21.4)	
Unknown	33 (28.7)	54 (18.9)	
Total	115	285	

• **The Structured Clinical Interview for DSM-III-R, axis I psychiatric disorders (SCID).** The Structured Interview for DSM-III-R (SCID-I) as a diagnostic instrument for DSM-III-R axis I psychiatric disorders was used to identify mental disorders.

The interview was conducted by trained psychiatric residents in the SCID procedure. Farsi version was provided with test-retest reliability (Yule's Y) for diagnosis

of all current and lifetime disorders of 0.61 to 0.63 and for inter-rater reliability (kappa statistics) for all current and lifetime disorders of 0.52 to 0.55 respectively. The feasibility was acceptable according to the interviewers and interviewees statements.<sup>15</sup>

- **Tinnitus Handicap Index (THI).** The THI measures the impact of tinnitus on daily life. It was developed by Newman et al. with a good reliability (Cronbach's Alpha= 0.93)<sup>16</sup>. Three of functional effects, the emotional response and the catastrophic response to tinnitus have been described. The cut-off point in THI score was defined as 38 for discriminating between slight/mild versus moderate or more tinnitus as a severity index<sup>17</sup>. In this study THI has been categorized as less than/equal 38 (mild handicap), 39-56 (moderate handicap), and 57-100 (severe handicap) according to Newman<sup>18</sup>.

- **Symptom Check List-90-Revised (SCL-90-R).** The SCL-90-R is a 90-item self-report system inventory developed in the 1980s by Derogatis<sup>19</sup> in which nine symptoms diminutions are being evaluated. The SCL-90-R is a simple questionnaire and was translated into the official language of Iran (Persian), which is comparable to almost every Iranian, and its validity and reliability were approved in an independent study<sup>20</sup>. Internal consistency for all dimensions of questionnaire was more than 0.70. Correlation coefficient of questionnaire based on pre-test and post-test was 0.97. The sensitivity and specificity of questionnaire comparing to DSM III-R were 0.94 and 0.98 respectively<sup>20</sup>. The global severity index (GSI) is one of the three-global-index which measures the extent or depth of the individual's psychiatric disturbances. Based on the study of Noorbala and his colleagues<sup>21</sup>, we used the cutoff point of 0.7 for GSI in which equal/above 0.7 were designated as possible cases of mental disorder.

### Statistical analyses

The data were analyzed using SPSS for windows, version 11.5 (SPSS Inc., Chicago, IL). Numeric variables were normally distributed in this study (Kolmogorov-Smirnov,  $P > 0.05$ ). The Student t-test was used to compare the mean of THI across two groups of with/without mental disorders and is presented as mean  $\pm$  SD. Chi-square and Fisher's Exact tests were used to compare categorical variables across gender groups. One way analysis of variance was used to perform between and within comparison of numeric data across more than two groups.

All subjects gave their informed consent to participate in the study. The Ethics Committee review board of Tehran Psychiatric Institute approved the study.

## RESULTS

On average, the patients had perceived their tinnitus for 10 years. Four hundred study subjects were

assessed with three scales of THI, SCL-90-R, and SCID-I. The frequency distribution of variables measured in this study is illustrated in Table 1. The sample was predominantly male. A majority of both male and female patients (40%) aged between 46-60 years-old. Most of them were married and percentage academic education was significantly more in men versus women (46.3% vs 27.8%;  $p=0.001$ ).

The mean score of psychological symptoms are seen in Table 2. According to GSI score, they are categorized to two groups of less than 0.7 (as cut off score) and more. 27.1% of women and 21.4% of men had GSI more than 0.7 and the difference was significant ( $p=0.01$ ). Table 2 illustrates SCL-90-R subscales scores by gender. All subscales but Hostility and psychoticism were significantly higher in females than males ( $p < 0.01$ ). The subscales of Hostility and Psychoticism were also higher in women than men but the difference was not significant.

**Table 2.** Mean and standard deviation of SCL-90-R subscales between two groups of students.

Variable	Male	Female
Somatization	0.53 (0.49)	0.77 (0.61)
Obsessive-Compulsive	0.59 (0.58)	0.75 (0.59)
Interpersonal sensitivity	0.52 (0.59)	0.68 (0.66)
Depression	0.62 (0.62)	0.89 (0.70)
Anxiety	0.54 (0.03)	0.75 (0.64)
Hostility	0.54 (0.61)	0.62 (0.86)
Phobic Anxiety	0.26 (0.39)	0.43 (0.54)
Paranoid Ideation	0.70 (0.69)	0.90 (0.74)
Psychoticism	0.48 (0.54)	0.57 (0.58)

Regarding to lifetime and current clinical diagnosis, the results showed 60% (240 patients) and 55.2% (197 patients) of the study subjects were suffering from at least one mental disorder using SCID-I. Concerning to gender differences, the results revealed 56.1% of men compared to 69.1% of women reported at least one lifetime axis-I psychiatric diagnosis and the difference was significant ( $p= 0.01$ ). The frequency of lifetime mental disorders is shown in Table 3. The most prevalent disorders were anxiety and major depression respectively. Frequency of major depression, anxiety, and somatoform disorder was significantly more in females than males ( $p < 0.01$ ). Substance use and adjustment disorders were significantly more common in males than females ( $p < 0.01$ ).

There was a significant difference between male and female across THI score ( $p=0.003$ ). Females with severe THI were 75.6% versus 63.9% in men.

Patients with at least one axis-I psychiatric diagnosis were more females and younger than other group (tin-

**Table 3.** Lifetime frequency distribution of at least one axis-I psychiatric diagnosis by SCID-I

Variable	Male (n=285) n, (%)	Female (n=115) n, (%)	p. value
Bipolar	17 (6.0)	6 (5.2)	NS
Major depression	84 (29.5)	46 (40.0)	0.04
Anxiety disorders	116 (40.7)	67 (58.3)	0.001
Substance use	15 (5.3)	0 (0)	0.008
Psychotic disorders	4 (1.4)	1 (0.90)	NS
Somatoform disorders	7 (2.5)	11 (9.7)	0.002
Adjustment disorders	9 (3.2)	3 (2.6)	NS

nitus patients without mental disorders) with significant difference ( $p < 0.05$ ) (Table 4). Among tinnitus patients with mental disorders housewife women were more than other group with a significant difference ( $p = 0.01$ ).

**Table 4.** Distribution of mental disorders among patients with tinnitus by demographic variables.

Variable	With mental disorders (n=240)	Without mental disorders (n=160)	p. value
<b>Sex</b>			
Female	80 (33.3)	35 (21.9)	0.01
Male	160 (66.7)	125 (78.1)	
<b>Age</b>			
18-35	43 (17.9)	31 (19.4)	0.05
36-45	54 (22.5)	22 (13.8)	
46-60	94 (39.2)	59 (36.9)	
+ 61	49 (20.4)	48 (30.0)	
<b>Marital status</b>			
Single	27 (11.3)	23 (14.4)	NS
Married	200 (83.3)	133 (83.1)	
Other	13 (5.4)	4 (2.5)	
<b>Occupation</b>			
Unemployed	11 (4.6)	5 (3.1)	0.01
Housewife	57 (23.8)	19 (11.9)	
Employed	118 (49.2)	89 (55.6)	
Retired	54 (22.5)	47 (29.4)	
<b>Education</b>			
Ability of writing and reading	15 (6.3)	9 (5.6)	NS
Pre-high school	63 (26.3)	35 (21.9)	
High school graduated	73 (30.4)	41 (25.6)	
University education	89 (37.1)	75 (46.9)	
<b>THI</b>			
Mild	9 (3.8)	6 (3.8)	NS
Moderate	67 (27.9)	49 (30.6)	
Severe	164 (68.3)	105 (65.6)	

Regarding to psychiatric diagnosis or symptoms, there was not any significant association between THI and presence of mental disorders or the scores of GSI.

## DISCUSSION

This study was performed with approximately large sample and using structural interview by SCID-I to determine the psychiatric diagnosis of the study sample. Our study showed that more than 50% of study subjects were suffering from mental disorders for lifetime or currently in which depression and anxiety disorders were more common.

In a Swedish study, the results showed that lifetime and current prevalence of major depression were 62% and 48% than the controls (21% and 7%, respectively)<sup>22</sup>. Using larger sample in 2006 by the same researchers, the study results revealed that 46% of the study sample had any current Axis I disorder; and 54%, no current Axis I disorder. The corresponding figures for the high-risk tinnitus patient were major depression (52%); any current anxiety disorder (49%) and any current Axis I disorder (81%)<sup>23</sup>.

In spite of the high rate coincidence between tinnitus and mental disorders, particularly anxiety and depressive disorders, the causation cannot be directly inferred. Severe tinnitus certainly has an impact on a patient's daily life and may cause psychological discomfort; on the other hand, the presence of depression and anxiety may reduce the patience of the individual to tolerate the chronic stress and overestimate the severity of tinnitus.

Depressive and anxiety disorders have been related to dysfunction of neurotransmitters such as the serotonergic system in the central nervous system. Serotonin is involved in modulation of sensory processing in the primary auditory cortex<sup>24-25</sup>.

It could be speculated that patients with depressive and anxiety disorders are neurobiological prone to suffering from tinnitus sound, or presence of chronic tinnitus may predispose the individuals to depressive and anxiety disorders and vice-versa. For better understanding, stress-diathesis model which assumed for the first time for the schizophrenia, and other psychosomatic disorder such as pain and depression<sup>26</sup> was applied for tinnitus and depressive disorders<sup>27</sup>. In this regard, considering tinnitus as a significant stressor, people react differently depending on their vulnerability to stress.

Regardless of etiology and biological similarities between anxiety/depression and tinnitus, they could have serious detrimental effect on the quality of life.

Among different variables, psychological variables included impaired concentration, feeling depressed and perceived negative attitudes were the strongest which had correlation with low quality of life<sup>28</sup>.

Data suggest that comorbid depressive disorders may worsen the prognosis for tinnitus disability<sup>29-30</sup>.

Mental disorders themselves are usually chronic diseases and could cause serious burden on the patient and the society. Depression will be the second most common disease in the community to impose burden and disability<sup>31</sup>. Comorbidities of mental disorders with tinnitus certainly will enhance the burden of disease and reduce remarkably the quality of life of the individuals. In this study, the score of THI did not showed any significant correlation with presence of psychiatric diagnosis and the Global Severity Index of SCL. This may be due to this reason that THI is not capable of measuring the burden caused by mental disorders, therefore another instrument should be used to evaluate the burden of cumulative effect of chronic tinnitus and mental disorders. On the other hand, depression and anxiety might not have direct effect on the severity of tinnitus and therefore, the comorbidity of psychiatric disorders did not have significant effect on the severity of THI in this study.

As a conclusion, the coincidence of tinnitus is more common with mental disorders specifically depressive and anxiety disorders. The psychological management of tinnitus has been extensively discussed elsewhere<sup>32</sup>. Vigorous attention to the mental health part of the tinnitus and choosing appropriate management may help the patients tolerate the stress caused by tinnitus and assist them to adjust in their daily activities.

## REFERENCES

1. British Tinnitus Association. Tinnitus. [www.tinnitus.org.uk/](http://www.tinnitus.org.uk/)
2. Axelsson A, Ringdahl A. Tinnitus: a study of its prevalence and characteristics. *Br J Audiol.* 1989;23:53-62.
3. Coles RRA, David AC, Haggard MP. Epidemiology of tinnitus. In: Evered D, Lauresson G, eds. *Tinnitus CIBA Foundation Symposium* 85. London: Pitman Books Ltd, 1981:16-34.
4. Davis AC. The prevalence of hearing impairment and reported hearing disability among adults in Great Britain. *Int J Epidemiol.* 1989;18:911-7.
5. Heller AJ. Classification and epidemiology of tinnitus. *Otolaryngol Clin N Am.* 2003;36:239-48.
6. Belli S, Belli H, Bahcebasi T, Ozcetin A, Alpaly E, Ertem U. Assessment of psychopathological aspects and psychiatric comorbidities in patients affected by tinnitus. *Eur Arch Otorhinolaryngol.* 2008;265:279-85.
7. Bayar N, Oguzturk O, Koc C. Minnesota multiphasic personality inventory profile of patients with subjective tinnitus. *J Otolaryngol.* 2002;31:317-22.
8. Lynn SG, Bauch CD, Williams DE et al. Psychologic profile of tinnitus patients using the SCL-90-R and tinnitus handicap inventory. *Otol Neurotol.* 2003;24:878-81.
9. Unterrainer J, Greimel KV, Leibetsedar M et al. Experiencing tinnitus: which factors are important for perceived severity of the symptom? *Int Tinnitus J.* 2003;9:130-3.
10. Scott B, Lindberg P. Psychological profile and somatic complaints between help-seeking and non-help-seeking tinnitus subjects. *Psychosomatics.* 2000;41:347-52.
11. Harrop-Griffiths J, Katon W, Dobie R et al. Chronic tinnitus: association with psychiatric diagnosis. *J Psychosom Res.* 1987;31:613-21.
12. Sullivan MD, Katon W, Dobie R et al. Disabling tinnitus: association with affective disorder. *Gen Hosp Psychiatry.* 1988;10:285-291.
13. Asplund R. Sleepiness and sleep in elderly persons with tinnitus. *Arch Gerontol Geriatr.* 2003;37:139-45.
14. Dobie RA. Depression and tinnitus. *Otolaryngol Clin N Am.* 2003;36:383-8.
15. Vandad SH, Asadi SM, Mohammadi MR, Amini H, Kaviani H, Semnani Y, Shabani A, Shahriver Z, Davari Ashtiani R, Hakim Shooshtar M, Sadigh A, Roodsari Jalali M. (2004). The reliability and feasibility of the Farsi version of SCID (DSM-IV). *Cognitive Sciences (in Farsi language)* 6:1,10-22.
16. Newman CW, Jacobson GP, Spitzer JB. Development of the tinnitus handicap inventory. *Arch Otolaryngol Head Neck Surg.* 1996;122:143-8.
17. Andersson G, Kaldo-Sandstrom V, Storm L. Internet administration of the Hospital Anxiety and Depression Scale in a sample of tinnitus patients. *J Psychosom Res.* 2003;55:259-62.
18. Newman CW, Sandridge SA, Jacobson GP. Psychometric adequacy of the Tinnitus Handicap Inventory (THI) for evaluating treatment outcome. *J Am Acad Audiol.* 1998;9:153-60.
19. Derogatis LR. Symptom checklist -90-R: Administrative scoring and procedures manual, NCS Pearson, Minneapolis (1994).
20. Hosseini SH, Mosavi SA. The study of mental health of medical student of Mazandaran University of Medical Sciences in 2000. *Journal of Mazandaran University of Medical Sciences* 2000;28:23-32.
21. Noorbala AA, Mohammad K, Bagheri Yazdi SA. A survey of psychiatric disorders in Tehran city. *Hakim Magazine* 1998;4:212-23.
22. Zoger S, Svedlund J, Kajsa-Mia Holgers. Psychiatric disorders in tinnitus patients without severe hearing impairment: 24 month follow-up of patients at an audiological clinic. *Audiology.* 2001 May-Jun;40(3):133-40.
23. Zoger S, Svedlund J, Kajsa-Mia Holgers. Relationship Between Tinnitus Severity and Psychiatric Disorders. *Psychosomatics.* 2006;47:282-8.
24. Juckel G, Mortar M, Hergerl U, Csepe V, Karmos G. Auditory evoked potentials as indicator of brain serotonergic activity-first evidence in behaving cats. *Biol Psychiatry.* 1997;41(12):1181-95.
25. Hegerl U, Juckel G. Intensity dependence of auditory evoked potentials as indicators of central serotonergic neurotransmission-new hypothesis. *Biol Psychiatry.* 1993;33:173-87.
26. Banks SM, Kerns RD. Explaining high rates of depression in chronic pain: a diathesis-stress framework. *Psychol Bull* 1996;119:95-110.
27. Andersson G, McKenna L. Tinnitus masking and depression. *Audiology.* 1998;37(3):174-82.
28. Erlandsson SI, Hallberg LR. Prediction of quality of life in patients with tinnitus. *Br J Audiol.* 2000;34(1):11-20.
29. Dobie RA. Depression and tinnitus. *Otolaryngol Clin N Am.* 2003;36:383-8.
30. Katon WJ, Sullivan MD, Russo J et al. Depressive symptoms and measures of disability: a prospective study. *J Affect Disord.* 1993;27:245-54.
31. Henry JA, Dennis KC, Schechter MA. General Review of Tinnitus: Prevalence, Mechanisms, Effects, and Management. *JSLHR* 2005;48(5):1204-32.
32. Christopher JL Murray, Alan D. Lopez (2000). *Global Burden of Disease (summary)*. World Health Organization, Harvard University, World Bank.