



## CLINICAL STUDY

# INVESTIGATION OF FREQUENCY OF ANXIETY AND DEPRESSION IN PATIENTS WITH TINNITUS

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### SUMMARY

It was aimed to compare the levels of anxiety and depression of subjects in the control group with the levels of depression and anxiety in patients admitted because of tinnitus and diagnosed as subjective tinnitus. 51 patients with idiopathic tinnitus and 51 patients without tinnitus and volunteers were asked to fill out a sociodemographic information form. Then Tinnitus Disability Questionnaire (TEA), Beck Anxiety Inventory (BAI), and Beck Depression Inventory (BDI) were applied. The results were compared and statistically commented. For this purpose, BDI and BAI scores of the subjects in the idiopathic tinnitus group were found to be statistically significant compared to those in the control group ( $p = 0.000$ ,  $p = 0.006$ ). While 8 patients in the patient group had mild depression scores, 6 patients had moderate depression, 3 had severe depression scores. There were mild anxiety scores in 13, moderate in 7, and severe in 4. Whereas in the control group, mild depression scores in 3 people, moderate in 3 people, and severe in 2 people. Anxiety scores were mild in 9, moderate in 2, and severe in 2. It was found statistically significant between TEA scores and BDI and BAI ( $p = 0.000$ ;  $p = 0.000$ ). After all, Anxiety and depression may accompany patients with idiopathic tinnitus. The presence of emotional factors such as depression and anxiety can be accepted as a bad prognosis in patients with tinnitus. The application of a multidisciplinary approach in patients with tinnitus should be evaluated together with tinnitus and psychiatric problems.

*Keywords: Tinnitus, anxiety, depression, epidemiology*

### TİNNİTUSLU HASTALARDA ANKSİYETE VE DEPRESYON SIKLIĞININ ARAŞTIRILMASI ÖZET

Çalışmamızda kulak çınlaması nedeniyle başvuran ve subjektif tinnitus tanısı konan Hastaların anksiyete ve depresyon seviyeleri ile, kontrol hastaların depresyon ve anksiyete seviyelerinin karşılaştırılması amaçlanmıştır. Bu amaçla, İdiyopatik tinnitusu olan 51 hasta ile tinnitusu olmayan 51 hasta ve gönüllülere sosyodemografik bilgi formu doldurmaları istendi. Ardından Tinnitus Engellilik Anketi (TEA), Beck Anksiyete Ölçeği (BAÖ) ve Beck Depresyon Ölçeği (BDÖ) uygulandı. Sonuçları karşılaştırıldı ve istatistik olarak yorumları yapıldı. Sonuçta, İdiyopatik tinnituslu kişiler ile kontrol grubundakiler karşılaştırıldığında, BDÖ ile BAÖ arasında istatistiksel olarak anlamlılık saptandı ( $p=0.000$ ;  $p=0.006$ ). Hasta grubun 8 adetinde hafif depresyon skoru vardı. 6 hastada orta depresyon, 3 hastada şiddetli depresyon skorları vardı. 13 hastada hafif, 7 tanesinde orta, 4 tanesinde şiddetli anksiyete skoru vardı. Kontrol grubunda ise, 3 hafif depresyon, 3 orta depresyon, 2 şiddetli depresyon vardı. Anksiyete skorları: 9unda hafif, 2 sinde orta, 2 sinde şiddetli anksiyete vardı. TEA ile BDÖ ve BAÖ arasında istatistik anlamlılık vardı ( $p=0.000$ ;  $p=0.000$ ). İdiyopatik tinnitusu olan hastalara anksiyete ve depresyon eşlik edebilir. Depresyon ve anksiyete gibi emosyonel faktörlerin varlığı, tinnitusu olan hastalarda kötü prognoz göstergesi olarak kabul edilebilir. Tinnitusu olan hastalarda multidisipliner bir yaklaşımın uygulanması ile tinnitus ve psikiyatrik sorunların birlikte değerlendirilmelidir.

*Anahtar Sözcükler: Tinnitus, anksiyete, depresyon, epidemiyoloji*

## INTRODUCTION

Tinnitus is defined as the perception of sound without an external sound source. This sound, which is generally perceived as a ringing tone, was also perceived as humming, rumble, buzzing, hissing whistling and beeping. It is stated that tinnitus is one of the most common complaints in the Otorhinolaryngology outpatient clinic and is seen in 10% to 30% of the population<sup>1</sup>.

Tinnitus is divided into two as subjective and objective. Objective tinnitus can occur as a result of vascular anomalies or contractions in the palate muscles. The perceived voice can be heard by the patient and the doctor, an examination finding regarding the hearing or a radiological reason can be detected. On the other hand, the voice perceived in the subjective tinnitus without the underlying psychological pathology is heard only by the patient and is not detected<sup>2</sup>.

Although tinnitus itself is not a disease, it is an uncomfortable symptom caused by several underlying causes. The most common cause of tinnitus is seen as loud sound hearing loss. Other main causes are the plugs in the ear, ear infections, and foreign bodies in the ear. Also, it may occur as a result of extremely low serotonin levels and side effects of oral medications.

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Ototoxic drugs can also cause tinnitus. Besides, it has been observed that ototoxic drugs increase hearing damage, and even in doses that will not cause toxic effects, increase auditory damage<sup>3</sup>.

In many cases with tinnitus, it has been reported that psychological and psychosomatic problems occur with the addition of emotional and cognitive disorders to acoustic symptoms<sup>4</sup>. The most common psychiatric disorders in patients with chronic tinnitus are anxiety disorder and depressive disorder<sup>5</sup>. In a study conducted in 2012, 48% to 60% of patients with chronic tinnitus had a major depressive disorder, and 45% of anxiety disorder<sup>6</sup>. In another study on tinnitus patients, it was found that instead of turning to the severity of tinnitus, it was better to turn towards the treatment of anxiety and depression in these patients<sup>7</sup>. In our study, we aimed to compare the severity of anxiety and depression with the tinnitus severity in patients admitted with tinnitus and diagnosed with subjective tinnitus, and the patients with subjective tinnitus in terms of depression and anxiety, with a healthy control group.

## **MATERIAL and METHODS**

**Ethics Committee Approval:** The study was approved by the Beykoz State Hospital Ethics Committee on January 02, 2018. No: 42. 51 patients (16 females and 35 males) ; Mean age  $49.5 \pm 13.01$ ) who were admitted to our otolaryngology outpatient clinic between August 2018 and April 2020 with complaints of tinnitus were included in the study. The control group consisted of 51 healthy volunteers (15 females and 36 males ); Mean age  $42.21 \pm 10.76$ ) randomly selected from hospital staff and relatives without tinnitus and psychiatric disease.

A detailed history was taken by examining the otolaryngology of each patient who came with tinnitus. Audiometry was applied to each patient. Those with Meniere's disease, objective tinnitus, middle or outer ear problems, chronic otitis media, temporal bone trauma, acoustic neuroma, neurological and psychiatric diseases were not included in the study. Information about chronic diseases such as blood pressure, diabetes, cardiovascular diseases, and the drugs used by the patients included in the

study was obtained. These were recorded in the patient file.

The patient and control group who participated in the study were asked to fill out a sociodemographic information form first. Afterward, TEA was applied to the patients, and BAI and BDI tests were applied to the patient and control groups.

### **Sociodemographic Data Form**

The sociodemographic data form consists of questions that identify patients and determine their sociodemographic characteristics. Also, in the form, individuals' history of psychiatric and physical illness, history of tinnitus, clinical features of tinnitus, drug treatments, and co-diagnoses was investigated.

### **Tinnitus Disability Survey (TEA)**

It was developed in 1996 by Newman et al, validity and reliability of the survey was made in Turkey by Aksoy et al in 2007. It is a subjective questionnaire consisting of 25 questions and is scored from 0-100<sup>8-9</sup>. There are three answer options for each question: 'Yes', 'Sometimes', 'No'. Yes = 4, Sometimes = 2, No = 0 points. In tinnitus patients, distress and loss of function are evaluated at five different severities. (Table 1)

### **Beck Anxiety Inventory (BAI)**

It was developed by Beck et al. In 1988 and its validity and reliability study was performed by Ulusoy et al. In 1998<sup>10-11</sup>. It is a Likert type self-evaluation scale consisting of 21 items and scored between 0-3. It shows the height of the anxiety experienced by the individual. The score range is 0-63.

### **Beck Depression Inventory (BDI)**

**It measures the physical, emotional, and cognitive symptoms seen in depression.** It is a self-evaluation scale consisting of 21 symptom categories scored between 0-3. The highest score received is 63. The height of the total score indicates the severity of depression. It was developed by Beck et al. In 1961 and its validity and reliability study was performed by Hisli in 1989<sup>11-12</sup>.



## Statistical Analysis

The data were analyzed with SPSS (Statistical Package for the Social Sciences) 15.00 program (SPSS Inc, Chicago, IL, USA). Frequency distribution, mean  $\pm$  standard deviation, and chi-square test were used in the

descriptive statistics of the data. The relationship between the variables was evaluated by Pearson correlation analysis.

**Table 1.** Interpretation of the Tinnitus Handicap Inventory

1	0-16	Slight	Only heard in quiet environment, very easily masked. No interference with sleep or daily activities.
2	18-36	Mild	Easily masked by environmental sounds and easily forgotten with activities. May occasionally interfere with sleep but not daily activities.
3	38-56	Moderate	May be noticed, even in the presence of background or environmental noise, although daily activities may still be performed.
4	58-76	Severe	Almost always heard, rarely, if ever, masked. Leads to disturbed sleep pattern and can interfere with ability to carry out normal daily activities. Quiet activities affected adversely.
5	78-100	Catastrophic	Always heard, disturbed sleep patterns, difficulty with any activity.

## RESULTS

51 patients participated in the study. Of these patients, 16 (31.37%) are women and 35 (68.63%) are men. The age range of the patient group is 17-73 ( $49.50 \pm 13.01$ ). The control group consists of 51 people. 15 of them (9.41%) are women and 36 of them (70.59%) are men. The age range in this group is 23-65 ( $42.21 \pm 10.76$ ). When the sociodemographic characteristics are compared, there is no statistically significant difference between the two groups in terms of gender, marital status, working status, income level, history of psychiatric illness in the past, antidepressant use in the past ( $p > 0.05$ ). There was a significant difference in terms of age, education level, number of children, medical history ( $p = 0.003$ ,  $p = 0.000$ ,  $p = 0.000$ ,  $p = 0.013$ , respectively). The sociodemographic characteristics of the patient and control groups are given in Table 2.

The mean BDI score in the patient group is 9.14; Mild depression was detected in 8 patients (15.69%), moderate in 6 patients (11.76%), and severe in 3 patients (5.88%). In the control group, the BDI mean score was 5.02, mild depression was found in 3 (5.88%), moderate depression in 3 (5.88%), and severe depression in 2 (3.92%). A statistically significant difference was found between the patient and control groups in terms of BDI scoring ( $p < 0.05$ ).

The mean BAI score in the patient group was 9.65. In this group, 13 patients (25.49%) had mild, 7 patients (13.73%) moderate, and 4 patients (7.84%) severe anxiety, while the control group's mean BAI score was 5.55; There was mild anxiety in 9 (17.65%), moderate in 2 (3.92%) and severe in 2 (3.92%). A statistically significant difference was found between the patient and control groups in terms of BAI scoring ( $p < 0.05$ ) (Table 3).

The mean TEA of the patients was found to be 28.94. According to the tinnitus disability questionnaire, 15 patients (29.41%) were inadequate, 15 patients (29.41%) were in the mild group, 16 patients (31.37%) were in the middle group and 5 patients (9.80%) were in the heavy group (Table 4).

When the relationship between TEA, BDI, and BAI was evaluated in the patient group, a statistically high level of correlation was found between TEA scores and BDI and BAI ( $p = 0.000$ ,  $p = 0.000$ ). Besides, a statistically strong relationship was found between patients' BDI and BAI ( $p = 0.000$ ) (Table 5).

**Table 2.** Comparison of sociodemographic characteristics of the patients with tinnitus and control groups

<b>Gender</b>			$\chi^2= 0.046$	<b>0.830</b>
Female	16(31.37)	15(9.41)		
Male	35(68.63)	36(70.59)		
<b>Educationstatus</b>			$\chi^2=18.701$	<b>0.000**</b>
No education	15(29.41)	2(3.92)		
Primaryeducation	16(31.37)	9(17.65)		
High school	14(27.45)	26(50.98)		
Undergraduategraduate	6(11.76)	14(27.45)		
<b>Maritalstatus</b>			$\chi^2=5.795$	<b>0.016*</b>
Married	45(88.24)	35(68.63)		
Single	6(11.76)	16(31.37)		
<b>Profession</b>			$\chi^2=18.977$	<b>0.000**</b>
Working	35(68.63)	51(100.00)		
Inoperative	14(27.45)	0(0.00)		
Student	2(3.92)	0(0.00)		
<b>Number of children</b>			$\chi^2=17.038$	<b>0.001**</b>
No	5(9.80)	13(25.49)		
1-2 children	20(39.22)	31(0.78)		
3-4 children	20(39.22)	6(1.76)		
5 andabove	6(11.76)	1(1.96)		
<b>Income rate</b>			$\chi^2=4.272$	<b>0.118</b>
Low	10(19.61)	8(15.69)		
Middle	41(80.39)	39(76.47)		
High	0(0.00)	4(7.84)		
<b>History of psychiatricillness</b>			$\chi^2=3.830$	<b>0.05*</b>
+	11(21.57)	4(7.84)		
-	40(78.43)	47(92.16)		
<b>Antidepressantuse inthepast</b>			$\chi^2=0.065$	<b>0.799</b>
+	10(19.61)	9(17.65)		
-	41(80.39)	42(82.35)		
<b>Familyhistory of psychiatricillness</b>			$\chi^2=0.060$	<b>0.807</b>
+	11(21.57)	10(19.61)		
-	40(78.43)	41(80.39)		
<b>Medicaldiseasehistory</b>			$\chi^2=6.182$	<b>0.013*</b>
+	24(47.06)	12(23.53)		
-	27(52.94)	39(76.47)		

\* $p < 0.05$ , \*\* $p < 0.001$ . Chi square test was used.



**Table 3.** Comparison of patient and control groups in terms of BDI and BAI scores

<b>BDI</b>	<b>9.14±8.93</b>	<b>5.02±9.34</b>	<b>0.000**</b>
<b>BAI</b>	<b>9.65±9.26</b>	<b>5.55±6.92</b>	<b>0.006*</b>

BDI: Beck Depression Inventory, BAI: Beck Anxiety Inventory, M: Mean, SD: Standard Deviation  
\*p<0.05, \*\*p<0.001. Mann Whitney U test was used.

**Table 4.** Distribution of patients according to Tinnitus Handicap Inventory scores frequency distribution

1	15	29.41
2	15	29.41
3	16	31.37
4	5	9.80
5	0	0.00

**Table 5.** Relationship between THI, BDI, and BAI in the patientsgroup

<b>THI</b>	<b>r</b>	<b>1.000</b>	<b>0.471</b>	<b>0.532</b>
	<b>p</b>	<b>-</b>	<b>0.000*</b>	<b>0.000*</b>
<b>BDI</b>	<b>r</b>	<b>0.471</b>	<b>1.000</b>	<b>0.643</b>
	<b>p</b>	<b>0.000*</b>	<b>-</b>	<b>0.000*</b>
<b>BAI</b>	<b>r</b>	<b>0.532</b>	<b>0.643</b>	<b>1.000</b>
	<b>P</b>	<b>0.000*</b>	<b>0.000*</b>	<b>-</b>

THI: Tinnitus HandicapInventory, BDI: Beck DepressionInventory, BAI: Beck AnxietyInventory. \*p<0.05, \*\*p<0.001. Pearson correlation analysis was used.

## DISCUSSION

Tinnitus is an increasingly common finding, an important health problem affecting the quality of life. Today it is seen in 10-30% of the population. Generally, the incidence increases between the ages of 40-80, and this rate rises to 33% over the age of 60<sup>13-14</sup>. The effect of tinnitus on sex is not quantified. For this reason, different results are obtained regarding the effect of tinnitus on gender in studies.

In some publications, it is stated that tinnitus is more common in women, while in others it is more common in men<sup>15-16</sup>. In our study, the number of male patients with tinnitus was twice the number of female patients. In our

study, although no statistically significant relationship was found between gender and TEA, BDI and BAI (p> 0.05), the mean scores of TEA, BDI and BAI of female patients with tinnitus for approximately 1 year (1.23 ± 0.0; 0.68 ± 0, respectively), 95; 0.70 ± 0.94) was higher than male patients (1.08 ± 1.39; 0.40 ± 0.70; 0.40 ± 0.63, respectively). Similarly, the mean scores of BDI and BAI in female patients with increasingly severe tinnitus (0.81 ± 0.96; 0.78 ± 0.94, respectively) compared to male patients (0.32 ± 0.59, 0.46 ± 0, 72 respectively) was higher.

Although anxiety does not cause tinnitus, it triggers tinnitus perception and intensity. For



this reason, it is thought to be an important factor in the treatment of tinnitus<sup>17</sup>. In our study, the mean values of BDI and BAI of female patients who started tinnitus after a stressful event were found higher than other events.

Increases in tinnitus levels also cause an increase in anxiety levels. Also, anxiety reduces the tolerance of tinnitus. This mutual interaction causes a vicious circle<sup>18</sup>. Besides, the presence of emotional factors such as depression and anxiety is considered as an indicator of poor prognosis in patients with tinnitus<sup>19</sup>.

Gomaa et al. in a study they found that tinnitus duration increased the severity of depression<sup>20</sup>. However, in our study, it was found that tinnitus duration was not effective in anxiety and depression severity. In a study conducted by patients with chronic tinnitus, Belli and colleagues found that patients' BDI and BAI scores were higher than the normal population<sup>21</sup>. Similarly, in our study, the BDI and BAI scores of the patients in the patient group were found to be statistically higher than those in the control group ( $p = 0.000$ ,  $p = 0.006$ ). While 8 patients in the patient group had mild depression scores, 6 patients had moderate depression, 3 had severe depression scores; There were mild anxiety scores in 13, moderate in 7, and severe in 4. Whereas in the control group, mild depression scores in 3 people, moderate in 3 people, and severe in 2 people; Anxiety scores were mild in 9, moderate in 2, and severe in 2.

In many studies, a positive relationship was found between tinnitus severity and anxiety and depression scales. Unterrainer et al. The presence of depression in predicting the severity of tinnitus; They stated that it was more effective than loudness, frequency, and ringing localization<sup>22</sup>. In a study conducted by Crocetti et al. On 108 tinnitus patients, the relationship between tinnitus, depression, and anxiety was examined and a significant relationship was found<sup>23</sup>.

Similarly, Zöger et al. Found that severe anxiety and depression were associated with more severe tinnitus transmission<sup>24</sup>. In a study in which Zeman et al. Used TEA, similar findings were found and the effectiveness of using TEA to detect comorbid depression and anxiety was

emphasized<sup>25</sup>. In our study, following the results of this literature, a statistically significant relationship was found between TEA and BDI and BAI in patients with subjective tinnitus. Besides, patients with subjective tinnitus had a statistically high level of significance between BDI and BAI.

## CONCLUSION

When the results of our study were examined, it was seen that depression and anxiety levels were higher in the patient group with subjective tinnitus than in the control group. In addition to the higher scores of BDI and BAI in the patient group compared to the control group, a high correlation was found between THI and BDI and BDA as well as between the BDI and BAI themselves. This situation shows once again that the coexistence of tinnitus and psychiatric diseases should not be ignored. These two groups can accompany both primary and secondary disease 26.

It suggests that applying a multidisciplinary approach in patients with tinnitus, evaluating tinnitus and psychiatric problems together can help increase the success rate in treatment.

**Informed consent:** Informed consent was obtained from each participant included in the study.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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