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Gender Differences Affecting Psychiatric Distress and Tinnitus Severity

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Objective: This study evaluated gender differences in the relationship between psychiatric distress and subjective tinnitus severity.
Methods: This cross-sectional study included 134 female and 114 male patients who visited the otology outpatient clinic at Seoul St. Mary's Hospital for tinnitus from February to July 2015. Patients completed a series of instruments, including the Tinnitus Handicap Inventory, Beck Depression Inventory, Korean version of Brief Encounter Psychosocial Instrument (BEPSI-K), and visual analogue scales assessing various tinnitus characteristics (loudness, awareness, annoyance, and effect on life).
Results: Tinnitus severity did not significantly differ between the gender groups (p=0.632), and it correlated significantly with tinnitus characteristics and psychiatric distress. Partial correlations between tinnitus severity and depressive symptoms were stronger in males (r=0.411, $p<0.01$) than in females (r=0.304, $p<0.01$) while controlling for duration of tinnitus and tinnitus characteristics. However, stress (BEPSI-K) was positively correlated with tinnitus severity in only males (r=0.463, $p<0.01$). A multiple regression analysis revealed that effect of tinnitus on life, depressive symptoms, and stress were significantly associated with tinnitus severity in males, whereas only tinnitus annoyance and depressive symptoms were associated with tinnitus severity in females.
Conclusion: Tinnitus severity was significantly correlated with depressive symptoms and stress, and there were gender differences in the relationship between tinnitus severity and psychiatric components. It is necessary to be vigilant of psychiatric symptoms among patients with tinnitus who visit the otology outpatient clinic, especially for male patients.

KEY WORDS: Tinnitus; Depression; Psychological stress; Sex.

INTRODUCTION

Tinnitus refers to a phantom auditory sensation—that is, an auditory phenomenon without the presence of external sound—described as sounds of peeping, chirping, blowing wind, etc.[1] While common among elderly adults, the exact prevalence rate has been shown to vary across studies and populations. In general population studies, the point prevalence of tinnitus was 19.7% in South Korea[2] and 25.3% in the United States.[3] In another study, about 80% of adults experience tinnitus symptoms at one point in their lifetime.[4] Although tinnitus is a primarily transient sensation, it remains unremitted in 6% of the general population.[5]

Tinnitus can have an adverse effect on individuals' work life and quality of life, and may be accompanied by additional symptoms such as stress, sleep disturbance, anxiety, agitation, and depression; it may even lead to suicide.[6] A large-scale interview study in the United States showed that out of about 21.4 million individuals, those with tinnitus tended to have higher anxiety or depressive symptoms (anxiety, 26.1%; depressive symp-

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toms, 25.6%) compared to individuals without tinnitus (anxiety, 9.2%; depressive symptoms, 9.1%).[7] These psychiatric problems also increase with the severity of tinnitus.[8] Conversely, tinnitus distress might be influenced by comorbid psychiatric symptoms such as depressed mood and anxiety.[9-14] Accordingly, there appears to be a reciprocal relationship between tinnitus severity and psychiatric symptoms, which needs to be investigated in more detail. While there are a number of studies examining the various forms of psychiatric distress that appear to result from tinnitus, few studies have attempted to explore the association between tinnitus severity and psychiatric distress.

Gender is recognized as one of the most important risk factors of psychiatric disease, particularly depression.[15] However, previous studies have had conflicting results about the relation between gender and tinnitus severity. Some studies have shown no difference in tinnitus distress by gender,[16-18] whereas other studies have reported significant gender differences.[19-21] Given the possible reciprocal relationship between tinnitus and psychiatric symptoms, it is conceivable that, like with psychiatric symptoms, there are gender differences in tinnitus. In fact, Gomaa *et al.*[22] found that depression, anxiety, and stress differed by gender among patients with tinnitus. However, they only compared the differences in depression, anxiety, and stress scores according to gender, and did not analyze the association between tinnitus severity and psychiatric distress in tinnitus patients separately for men and women, to see how this association differs by gender. Therefore, it seems meaningful to evaluate differences in the association between psychiatric symptoms and severity of tinnitus between males and females.

Stress is known to have a relationship with tinnitus severity and its relevant secondary symptoms.[19] A correlation between stress and tinnitus has been reported in numerous previous studies.[23-27] The ability to cope with stress varies according to numerous individual characteristics, including gender. For instance, one study reported that when exposed to repetitive stress, females showed significantly greater heart rate and negative affect than did males, indicating that females may be more vulnerable to the negative outcomes of repetitive stress than males.[28] Accordingly, we examined gender differences in the association of tinnitus severity with stress as well as psychiatric symptoms.

The purpose of this study was to empirically investigate gender differences in the relationship between psychiatric distress and subjective tinnitus severity. We specifically investigated whether depressive symptoms—one of the most common psychiatric symptoms clinically observed in patients with tinnitus[29]—and stress intensity are independent factors related to tinnitus severity in both genders.

METHODS

Study Populations

This study included 248 patients who visited the otology outpatient clinic at Seoul St. Mary's Hospital with a complaint of tinnitus on their first visit between February and July 2015. We excluded all patients who had been previously diagnosed with a psychiatric disorder such as major depressive disorder, bipolar disorder, anxiety disorder, schizophrenia, or substance use disorder by psychiatrists (according to Diagnostic and Statistical Manual of Mental Disorders); who had severe and/or uncontrolled medical and neurological disease; and who were pregnant or breastfeeding (females only). Written informed consent was obtained from all participants before the survey, and approval was obtained from the institutional review board of Seoul St. Mary's Hospital (No, KC16RISI 0470).

Evaluation of Tinnitus Severity and Characteristics

The subjective severity of tinnitus-related distress was evaluated using the Tinnitus Handicap Inventory (THI), a self-report questionnaire created by Newman *et al.*[30] It contains 25 items, each with three answer options: "yes" (4 points), "sometimes" (2 points), and "no" (0 points). These scores are summed, and the total score ranges from 0 to 100. These scores can be used to classify participants as having normal (0-16), mild (18-36), moderate (38-56), and severe (58-100) tinnitus.[31] This classification has been used in previous studies in South Korea.[32,33] The scale contains 3 subscales: functional (11 items), emotional (9 items), and catastrophic (5 items). The original version of the scale has good internal consistency reliability (Cronbach's alpha=0.93),[31] as does the Korean translation (Cronbach's alpha=0.95).[34]

The visual analog scale (VAS) is a well-known method of assessing the subjective characteristics of chronic pain,

and has been used to measure subjective tinnitus characteristics. Using VASs along with the THI may be helpful for evaluating subjective levels of particular psychoacoustic characteristics of tinnitus (e.g., loudness) not covered by the THI as continuous variables (as opposed to yes or no responses). For this reason, several previous studies on tinnitus have applied both the THI and VASs together to examine tinnitus-related distress.[35-37] Patients are asked to indicate the level of certain tinnitus characteristics (loudness, awareness, annoyance, and effect on life) that they were experiencing at the point surveyed on a VAS from ranging from 0 to 10 (or 0 to 100 for awareness).

In addition, we checked the tinnitus location and associated subjective hearing loss for each patient.

Evaluation of Psychiatric Distress

Psychiatric distress was evaluated using two self-report questionnaires: the Beck Depression Inventory-I (BDI-I), which assesses depressive symptoms, and the Korean version of Brief Encounter Psychosocial Instrument (BEPSI-K), which assesses stress level. The BDI-I was created by Beck *et al.*[38] to evaluate depressive symptoms; it is a 21-item self-report questionnaire consisting of three subscales: negative attitude, performance difficulty, and somatic elements. Each item is rated on a scale of 0 to 3. The total scores are classified as no depression (0-9) and mild (10-15), moderate (16-23), and severe (24-63) depression. The internal consistency of the Korean version of the BDI-I in a previous study was 0.78 (Cronbach's alpha) in the general population and 0.85 among depressed individuals.[39]

The BEPSI-K is an self-administered instrument for measuring stress; it comprises five items, each rated on a scale of 1 to 5. We used the total score in our analysis, with higher scores indicating higher stress. Subjects are asked to indicate the severity of stress experienced in the past month. The instrument was created by Frank and Zyzanski[40] and later adapted into Korean and validated; the BEPSI-K has a test-retest reliability and Cronbach's alpha of 0.68 and 0.80, respectively.[41]

Statistical Analysis

We compared the demographic and clinical features of the gender groups using the chi-square test or independent t test. The relationships between age, duration of tinnitus, THI, VAS, BDI-I, and BEPSI-K scores were analyzed using Pearson's correlation coefficient separately for the gender groups. We also performed a partial correlation analysis between psychiatric distress (i.e., BDI-I and BEPSI-K) and tinnitus severity (THI) for both gender groups, controlling for duration of tinnitus and VAS scores (which were positively correlated with tinnitus severity in the Pearson's correlation analysis).

Multiple linear regression analysis using the stepwise method was performed to examine the associations of psychiatric distress and tinnitus severity in the gender groups. We set THI score as the dependent variable, and BDI and BEPSI-K scores, duration of tinnitus, VAS scores, location of tinnitus, and presence of hearing loss as independent variables. There was no significant multicollinearity among the variables. All significance tests

Table 1. Comparison of demographic and clinical characteristics between the male and female groups

Variable	Male (n=114, 46.0%)	Female (n=134, 54.0%)	p value
Age (yr)	52.2±13.4	55.8±14.5	0.046*
Duration of tinnitus (mo)	42.1±81.2	29.1±64.5	0.162
VAS score			
Tinnitus loudness	4.6±2.3	4.7±2.4	0.761
Tinnitus awareness	62.3±31.4	63.2±34.4	0.840
Tinnitus annoyance	5.3±2.6	5.6±2.9	0.318
Effect of tinnitus on life	5.1±2.7	5.5±2.8	0.211
THI total score	38.3±25.9	43.0±25.9	0.169
THI grades			0.632
Normal	28 (24.6)	25 (18.7)	
Mild	34 (29.8)	40 (29.9)	
Moderate	24 (21.1)	33 (24.6)	
Severe	28 (24.6)	36 (26.9)	
With hearing loss	52 (45.6)	53 (39.0)	0.480
Location of tinnitus			0.564
Both	50 (43.9)	50 (37.3)	
One side	58 (50.9)	77 (57.5)	
Head	6 (5.3)	7 (5.2)	
BDI	8.7±9.8	11.6±9.3	0.022*
BEPSI-K total score	10.0±4.1	9.8±3.6	0.663
Comorbid medical disorder			0.100
Hypertension	20 (17.5)	22 (16.4)	
Diabetes	4 (3.5)	4 (3.0)	
Hypertension+diabetes	1 (0.9)	10 (7.5)	
None	89 (78.1)	98 (73.1)	

Values are presented as mean±standard deviation or number (%).
VAS, visual analog scale; THI, Tinnitus Handicap Inventory; BDI, Beck Depression Inventory; BEPSI-K, Korean version of Brief Encounter Psychosocial Instrument.
*$p<0.05$ for independent t test or chi-square test.

were 2-tailed and conducted with an alpha level of 5%. All statistical analyses were conducted using SPSS Statistics ver. 24.0 (IBM Co., Armonk, NY, USA).

RESULTS

Comparison of Demographic and Clinical Characteristics between Males and Females

The demographic and clinical features of subjects are presented in Table 1. There were 134 female (54.0%) and 114 male (46.0%) subjects, ranging in age from 20 to 82 years old. The mean age of the female group (55.8±14.5 years) was significantly higher than was that of the male group (52.2±13.4 years; p=0.046). For THI severity, the proportion of subjects with mild tinnitus was highest for both sexes (29.8% in male, 29.9% in female), and there was no significant difference between the gender groups (p=0.632). Clinical characteristics—including location of tinnitus, duration of tinnitus, accompanied hearing loss and comorbid medical disorder—did not differ significantly between the gender groups, nor did the VAS scores for subjective tinnitus characteristics (loudness, awareness, annoyance, and effect on life). The mean BDI-I score of the female group (11.6±9.3, classified as mild depression) was significantly higher than was that of the male group (8.7±9.8, classified as normal; p=0.022). The BEPSI-K scores of the male group were higher than were those of the female group, but not significantly (p=0.663).

Correlations and Partial Correlations between Tinnitus Severity, Characteristics, and Psychiatric Distress in Both Gender Groups

In the correlation analysis, THI scores were found to be positively correlated with VAS scores of loudness, awareness, annoyance, and effect on life, as well as with BDI-I and BEPSI-K scores, in both gender groups. However, age was not significantly correlated with THI in either gender group, and the duration of tinnitus was significantly and positively correlated with THI scores only in the female group (Tables 2, 3).

In the partial correlation analysis controlling for duration of tinnitus and VAS scores, the positive correlation between THI and BDI-I scores remained significant for both gender groups (male: r=0.411, $p<0.01$; female: r=0.304, $p<0.01$). The coefficient was stronger for the male group than for the female group. However, BEPSI-K scores were positively correlated with THI scores only in the male group (r=0.463, $p<0.01$) (Table 4).

Association between Tinnitus Severity and Psychiatric Distress

Finally, we examined the possible influencing factors of THI using stepwise multiple regression analysis (Table 5). Among males, VAS scores of effect of tinnitus on life, BDI-I, and BEPSI-K scores were significantly associated with THI scores, whereas in females, only VAS scores of tinnitus annoyance and BDI-I were associated with THI scores. These results indicated that severe depressive symptoms were associated with tinnitus severity in both sexes, but stress intensity was associated with tinnitus se-

Table 2. Correlation between tinnitus severity/characteristics and psychiatric distress in the male group

Variable	Correlation								
	1	2	3	4	5	6	7	8	9
1. THI total score	1	−0.131	0.169	0.463**	0.415**	0.751**	0.782**	0.606**	0.598**
2. Age (yr)	−0.131	1	0.167	0.026	0.109	−0.080	−0.061	−0.020	−0.220*
3. Duration of tinnitus (mo)	0.169	0.167	1	0.330**	0.240*	0.244**	0.221*	0.091	0.024
4. VAS scores of tinnitus loudness	0.463**	0.026	0.330**	1	0.517**	0.681**	0.681**	0.315**	0.275**
5. VAS scores of tinnitus awareness	0.415**	0.109	0.240*	0.517**	1	0.590**	0.567**	0.306**	0.245**
6. VAS scores of tinnitus annoyance	0.751**	−0.080	0.244**	0.681**	0.590**	1	0.911**	0.449**	0.388**
7. VAS scores of effect of tinnitus on life	0.782**	−0.061	0.221*	0.681**	0.567**	0.911**	1	0.493**	0.426**
8. BDI	0.606**	−0.020	0.091	0.315**	0.306**	0.449**	0.493**	1	0.547**
9. BEPSI-K	0.598**	−0.220*	0.024**	0.275**	0.245	0.388**	0.426**	0.547**	1

THI, Tinnitus Handicap Inventory; VAS, visual analog scale; BDI, Beck Depression Inventory; BEPSI-K, Korean version of Brief Encounter Psychosocial Instrument.
*$p<0.05$, **$p<0.01$ for Pearson correlation.

Table 3. Correlation between tinnitus severity/characteristics and psychiatric distress in the female group

Variable	Correlation								
	1	2	3	4	5	6	7	8	9
1. THI total score	1	0.155	0.251**	0.388*	0.391**	0.618**	0.624**	0.395**	0.287**
2. Age (yr)	0.155	1	0.222**	0.196*	0.323**	0.147	0.145	0.121	−0.034
3. Duration of tinnitus (mo)	0.251**	0.222**	1	0.209*	0.147	0.144	0.152	0.118	0.304**
4. VAS scores of tinnitus loudness	0.388**	0.196*	0.209*	1	0.458**	0.645**	0.588**	0.190*	0.247**
5. VAS scores of tinnitus awareness	0.391**	0.323**	0.147	0.458**	1	0.505**	0.453**	0.175	0.167
6. VAS scores of tinnitus annoyance	0.618**	0.147	0.144	0.645**	0.505**	1	0.916**	0.257**	0.260**
7. VAS scores of effect of tinnitus on life	0.624**	0.145	0.152	0.588**	0.453**	0.916**	1	0.241**	0.247**
8. BDI	0.395**	0.121	0.118	0.190*	0.175	0.257**	0.241**	1	0.445**
9. BEPSI-K	0.287**	−0.034	0.304**	0.247**	0.167	0.260**	0.247**	0.445**	1

THI, Tinnitus Handicap Inventory; VAS, visual analog scale; BDI, Beck Depression Inventory; BEPSI-K, Korean version of Brief Encounter Psychosocial Instrument.
*$p<0.05$, **$p<0.01$ for Pearson correlation.

Table 4. Partial correlation between tinnitus severity and psychiatric distress

	Male (n=114)	Female (n=134)
BDI	0.411**	0.304**
BEPSI-K total score	0.463**	0.100

BDI, Beck Depression Inventory; BEPSI-K, Korean version of Brief Encounter Psychosocial Instrument.
**$p<0.01$ for partial correlation, controlling for duration of tinnitus and visual analog scale scores.

Table 5. Summary of multiple linear regression analysis for Tinnitus Handicap Inventory in both gender groups

Variable	B	SE	β	t	*p* value
Male					
VAS scores of effect of tinnitus on life	5.598	0.596	0.598	9.388	<0.001**
BEPSI-K	1.435	0.412	0.228	3.485	0.001**
BDI	0.486	0.180	0.187	2.703	0.008*
Female					
VAS scores of tinnitus annoyance	4.906	0.701	0.540	7.002	0.000**
BDI	0.660	0.200	0.255	3.307	0.001*

B, unstandardized beta coefficients; SE, standard error; β, standardized beta coefficients; t, t-score; *p*, significance value; VAS, visual analog scale; BEPSI-K, Korean version of Brief Encounter Psychosocial Instrument; BDI, Beck Depression Inventory.
*$p<0.05$, **$p<0.01$ for multiple regression analysis.

verity only in men.

DISCUSSION

The purpose of this study was to determine whether there are gender differences in the relationship between psychiatric distress and tinnitus severity. We found that tinnitus characteristics, depressive symptoms, and stress were positively correlated with tinnitus severity in both genders. The duration of tinnitus showed a positive correlation with tinnitus severity only in women, which is consistent with the results of a previous study[19] showing a correlation between tinnitus duration and severity in middle-aged and elderly patients. However, this previous study reported gender differences in this correlation (whereby the correlation was stronger for females than for males) only in younger patients with tinnitus (<45 age of years). In the present study, the male group was significantly younger than was the female group, which might have led to the observed gender differences.

We also found gender differences in the associations of depressive symptoms and stress with the severity of tinnitus in the multiple regression analysis. While depressive symptoms were significantly associated with tinnitus severity in both males and females, stress was associated with tinnitus severity only in males. Additionally, the correlation of tinnitus severity with depressive symptoms and stress was more pronounced in males than in females when controlling for tinnitus duration and characteristics.

Previous studies have shown that tinnitus questionnaire scores, including THI scores, were significantly correlated with self-report tools for measuring depressive symptoms, including the BDI-I.[36,42-45] Furthermore, many studies have reported that females show a greater prevalence of depression[16] and are more affected by stress than are males.[20,27,46]

However, in the present study, stress was significantly associated with tinnitus severity only in males, whereas

depressive symptoms were associated with it in both males and females. Similar to these findings, Gomaa *et al.*[22] found that males were more commonly affected than were females by depression, anxiety, and stress. In the correlation results, stress had a stronger positive correlation with depressive symptoms than with tinnitus severity in females, whereas stress had a stronger positive correlation with tinnitus severity than with depressive symptoms. These findings might suggest that women experience stress as feelings of depression or negative mood, while men might experience it in some other way. There are also differences in stress coping style between males and females,[47] as well as cultural differences in males' expression of a depressed mood.[48] Studies of the gender differences in stress coping strategies found that women tend to use an emotion-focused method, whereas men are more likely to deal with stress via problem-focused methods.[47] Previous studies also acknowledge that there are gender differences in emotional expressiveness, likely related to social processes such as differing gender roles, status and power imbalances between males and females, differing socialization histories between males and females, and cultural factors in the Asian population.[49]

With regard to stress, our findings accord with the biological model of tinnitus. This model explains that tinnitus symptoms might be activated or worsen as a result of activation of the hypothalamic pituitary adrenal axis, which is associated with the stress response, and may be affected by genetic/epigenetic predispositions to stress.[50]

Considering our results, assessing the depressive symptoms and stress intensity using a screening tool such as the Patient Health Questionnaire-9[51] or Clinically Useful Depression Outcome Scale[52] in all tinnitus patients, especially men, might help them get better help. Particularly, these results might help in formulating guidelines on the psychological evaluation and management of patients with tinnitus, which not only can lead to earlier diagnosis and intervention for psychiatric symptoms, but may also help improve tinnitus severity.

Nevertheless, this study had several limitations. First, this study is difficult to generalize to all patients because of the small sample size and the fact that we recruited all subjects from the otorhinolaryngology department of a single university hospital. Multicenter studies with a large sample are needed to confirm our findings. Second, assessing depressive symptoms and stress relied on self-report questionnaires. In the future, standardized structured clinical interviews by psychiatrists should be used to assess psychiatric distress. Third, we did not evaluate anxiety symptoms. Although depressive symptoms are the most common psychiatric symptoms among patients with tinnitus,[29] anxiety symptoms have also been found to relate to the severity of tinnitus.[9,13,53,54] Finally, we cannot make conclusions on the causal relations between psychiatric distress and tinnitus severity. Although multiple regression analysis was used to infer the causal relationships between psychiatric distress and tinnitus severity, these inferences can be further supported through a prospective longitudinal case control study.

Despite these limitations, this study was able to confirm gender differences in the relationship between psychiatric distress and tinnitus severity among patients with tinnitus. It is necessary to be alert to the psychiatric symptoms of patients with tinnitus who visit clinicians. Furthermore, considering the gender differences, administering self-report scales for psychological symptoms such as depressed mood and stress to male patients is strongly recommended at otology outpatient clinics. This could help reduce tinnitus symptoms successfully, thereby contributing to improved psychological well-being.

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