



Impact of Tinnitus on Quality of Life In Adults And Differences Between Genders

Galina S. Joković¹, Snežana S. Babac^{2,3}

¹ ENT hospital, Clinical Hospital centar „dr Dragiša Mišović-Dedinje”, Belgrade, Serbia

² ENT Clinic, Clinical Hospital Centar Zvezdara, Belgrade, Serbia

³ University of Belgrade, Faculty of special education and rehabilitation, Belgrade, Serbia

SUMMARY

Introduction: Tinnitus, or ringing in the ears, represents an abnormal perception of sound in the ears or head without an appropriate external sound source. Today, it is known that tinnitus is not a single disease but rather a group of different disorders with various underlying mechanisms, hence requiring different types of treatment. Tinnitus lacks visible signs of illness and does not endanger life, but in many ways affects the quality of life and causes suffering.

Aim: The aims of this study were: to use questionnaires to indicate the relationship between tinnitus and quality of life, to identify which areas of daily life are most affected by the presence of tinnitus, and to determine whether there is a significant difference between genders in terms of the impact of tinnitus on quality of life.

Material and Methods: The study included 80 adult patients aged 18 to 82 years. Inclusion criteria for patients in the study were: tinnitus in one or both ears or in the head, tinnitus persisting continuously for 6 months or longer, and older than 18 years. Exclusion criteria for the study are patients who experience auditory hallucinations in the form of music and speech. Otologic diagnostic methods were used, including ear, nose, and throat (ENT) examination, pure tone audiometry, and tympanometry with acoustic reflex testing. Patients completed two questionnaires: a specific questionnaire for tinnitus, the Tinnitus Handicap Inventory, and a general questionnaire for assessing quality of life, the Nottingham Health Profile.

Results: The prevalence of tinnitus increases with age, up to 65 years, and thereafter either remains independent of aging or decreases. The majority of participants had sensorineural hearing loss ranging from moderate to severe, predominantly affecting high frequencies, and descending. There are statistically significant positive correlations between audiometric parameters and THI scores for all frequencies except for 4000 Hz, both in the left and right ears.

Conclusion: By using questionnaires as instruments to assess quality of life and the severity of tinnitus, this study has shown a negative impact of tinnitus on quality of life. We found that the duration of tinnitus affects its severity.

Keywords: Tinnitus, Ringing in The Ears, Quality of Life

Corresponding author:

Associate Professor Snežana S. Babac, MD, PhD

Specialist in Otorhinolaryngology, Subspecialist in Audiology

Ear Nose Throat (ENT) Clinic, Clinical Hospital Centar Zvezdara, Belgrade, Serbia

E-mail: babac.snezana@gmail.com

INTRODUCTION

Tinnitus is the perception of sound in the ears or head without an external acoustic source [1]. It is often described as a phantom sound like ringing, whistling, or buzzing. Severe forms of tinnitus are often accompanied by a sensation or effect that can be termed as „suffering” [2]. Tinnitus can significantly impact the quality of life, causing issues with sleep, concentration, and emotional well-being.

In many ways, such a form of tinnitus is similar to neuropathic pain [3, 4]. Tinnitus is not a unique clinical or pathophysiological entity. There are many forms that differ in their pathophysiology [5].

There are two main types of tinnitus: subjective and objective. Subjective tinnitus, which is much more common, can only be heard by the patient, while objective tinnitus can be heard by a doctor using specific diagnostic methods [6, 7]. The causes of tinnitus vary, including hearing loss, noise exposure, middle and inner ear diseases, and cardiovascular conditions. There are indications that the way tinnitus is perceived is related to the perception of the „self” [8].

According to the Clinical Practice Guideline for Tinnitus from 2014, issued by the American Academy of Otolaryngology-Head and Neck Surgery [4], tinnitus is classified as follows:

1. Primary tinnitus, is idiopathic, it may or may not be associated with sensorineural hearing loss.
2. Secondary tinnitus is associated with a specific cause, which can be identified, and may have an organic cause that is not sensorineural hearing loss [4].

In terms of impact on quality of life, we categorize:

- Non-bothersome tinnitus – has no significant effect on quality of life, patients do not seek medical help.
- Bothersome tinnitus – significantly affects quality of life and functional health status. The patient seeks active medical assistance to alleviate or reduce symptoms [4].

The prevalence rate of tinnitus in adults varies from 8.2% to 20% [9, 10]. Additionally, the prevalence increases from 17.9% to 30.3% in individuals over the age of 50 [11, 12, 13]. One of the main variables tracked in prevalence studies of tinnitus is aging. The prevalence increases until the age of 70 and

then stabilizes or even shows a slight decline.

The relationship between the prevalence of tinnitus and gender is less clear, but it has been shown that tinnitus occurs more frequently in males than in females.

In addition to aging, risk factors for the onset of tinnitus include hearing loss, especially at 4 kHz, noise exposure, middle and inner ear diseases, cardiovascular diseases, and the use of ototoxic drugs [14, 15, 16, 17].

AIM

The aims of the study were to highlight the relationship between tinnitus and quality of life using questionnaires and to identify which areas of daily life are most affected by the presence of tinnitus. Also, to determine if there is a significant difference between genders in terms of the impact of tinnitus on quality of life.

MATERIAL AND METHODS

The study is academic (non-commercial) and observational. This study was approved by the Ethics Committee, approval number: 01-1432/50.

The study included 80 adult patients aged 18 to 82 years. Patients were examined at the Department of Otorhinolaryngology of the Clinical Center „Dr. Dragiša Mišović - Dedinje” in Belgrade. Patients were informed about the research being conducted and gave their informed consent and were included in the study on voluntary basis. The inclusion criteria for patients in the study were: tinnitus in one or both ears or in the head, tinnitus persisting continuously for 6 months or longer, and older than 18 years. Exclusion criteria for the study are patients who experience auditory hallucinations in the form of music and speech.

Otologic diagnostic methods were used, including ear, nose, and throat (ENT) examination, pure-tone audiometry, and tympanometry with acoustic reflex testing.

The type and degree of hearing impairment were determined based on clinical examination, pure-tone threshold audiometry (audiometer: Ampaid A321), impedance audiometry, and ipsilateral 1000 Hz acoustic reflex (tympanometer: Interacustics AT 235). Pure-tone threshold audiometry was performed in an acoustically isolated room at precisely de-

fin frequencies, separately for each ear.

Patients completed two questionnaires: the Tinnitus Handicap Inventory (THI), a specific questionnaire for tinnitus, and the Nottingham Health Profile (NHP), a general questionnaire for assessing quality of life.

The NHP is intended for use in primary health care to obtain a quick overview of emotional, social, and physical health problems perceived by the patient. The questionnaire consists of two parts. The first part (NHP1) comprises 38 questions in 6 areas, with each question assigned a weighting value; the sum of all weighting values in a given area is 100. The areas are: Energy level (NE): 3; Pain (P): 8; Emotional reaction (ER): 9; Sleep (S): 5; Social isolation (SI): 5; Physical abilities (FS): 8.

The second part (NHP2) of the questionnaire assesses the impact on 7 aspects of life.

Interpretation of the questionnaire: The relative level of impairment is calculated by subtracting the sum of relative weighting factors from 100%, resulting in values from 0 to 1, where 0 indicates poor health and 1 indicates good health. The number of questions from each relevant area contributes to the sum. The specific questionnaire Tinnitus Handicap Inventory [18].

The questionnaire consists of 25 questions. Respondents answer with: YES - 4 points, NO - 0, SOMETIMES - 2 points. The maximum number of points is 100, and the minimum is 0. Based on the score, we determine the severity of the handicap experienced by patients with tinnitus. They are divided into 5 categories:

- 0-16: Tinnitus that does not interfere, is easily masked, does not affect daily activities and sleep, and is noticed only in absolute silence.
- 18-36: Mild tinnitus
- 38-56: Moderately severe tinnitus
- 58-76: Severe tinnitus
- 78-100: Catastrophic tinnitus

Both questionnaires have been validated in Serbian.

I have obtained permission from the author to use the Tinnitus Handicap Inventory questionnaire, Craig W. Newman, Ph.D.

The statistical analysis included the application of descriptive statistical methods and appropriate statistical tests. Normality testing of distributions was performed using

the Shapiro-Wilk and Kolmogorov-Smirnov tests. Non-parametric tests (Kruskal-Wallis test and Mann-Whitney U test) were used to assess the significance of differences between numerical parameters (THI SCORE, NHP 1, Weighting factors, Audiometry) by gender and THI SCORE grade. The significance of differences in the frequency of comorbidities, THI SCORE grade, type of buzzing, NHP 2, expertise, and reflexes by gender was assessed using the χ^2 (chi square) test and Fisher's exact test. The correlation between relevant parameters was determined using Spearman's correlation coefficient. All results are presented as absolute values, percentages, mean \pm standard deviation, or median with 25th and 75th percentiles in parentheses (this format is used wherever the Kruskal-Wallis Mann-Whitney test is used, as the data distribution is non-normal). Statistical analysis was performed using the IBM SPSS 20.0 computer program, and a difference was considered statistically significant if $p < 0.05$.

A multivariable linear regression was used to predict the quality of life from patients' gender, age, duration of tinnitus, and the presence of comorbidities (cardiovascular diseases, diabetes mellitus, and depression).

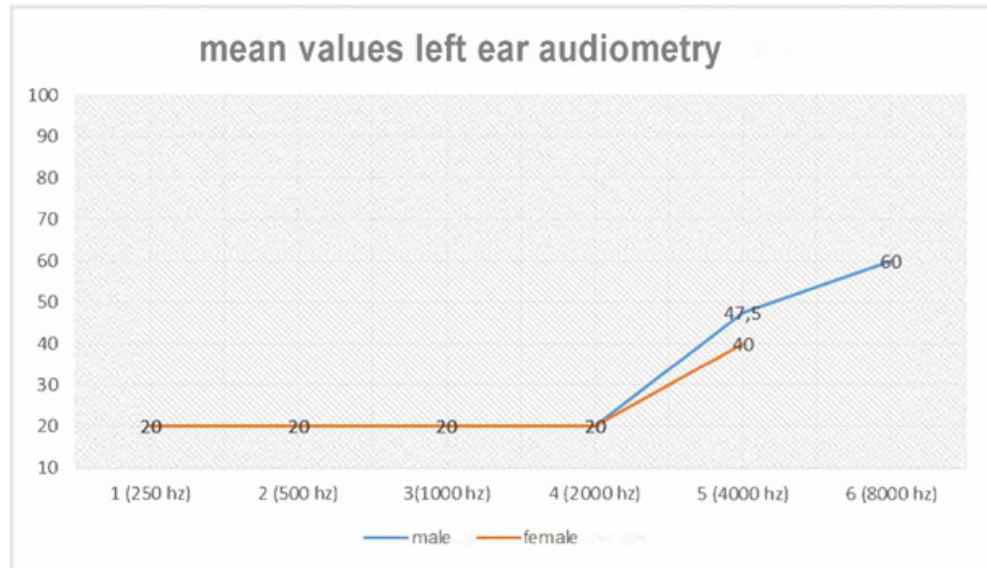
RESULTS

Of the 80 patients, 46 (57.5%) were male, and 34 (42.5%) were female. The patients ranged in age from 23 to 86 years old, with almost every other patient being over 50 years old. The mean age of male patients was 66.50 years, and of female patients was 59.50 years. The majority of participants reported bilateral ringing in the ears: 27 males (58.7%) and 21 females (61.8%). Tinnitus lasted on average about 4 years (ranging from 1.75 to 10 years) for males and 5 years (ranging from 2 to 10.5 years) for females.

There was no statistically significant difference in the duration of ringing between male and female participants included in the study ($U = 753.0$, $p > 0.05$).

The majority of participants suffered from cardiovascular diseases, totalling 46 cases, with 28 (60.9%) being male and 18 (52.9%) female. Diabetes mellitus was reported by 5 participants, with 1 (2.2%) being male and 4 (11.8%) female. Three patients were diagnosed with depression: 2 males (4.3%) and one female (2.9%).

Figure 1. Mean values left ear audiometry



There is no statistically significant difference in the frequency of cardiovascular diseases between male and female participants ($\chi^2 = 0.503$; $df = 1$; $p > 0.05$). Similarly, there is no difference in the frequency of diabetes or depression between male and female individuals ($p > 0.05$).

Out of 80 participants, 13 (16.25%) patients did not have hearing impairment. We considered hearing impairment if there was even one frequency where the hearing threshold exceeded 20 dB. The majority of participants had sensorineural hearing loss ranging from moderate to severe, predominantly affecting high frequencies, and descending (Figure 1, Figure 2).

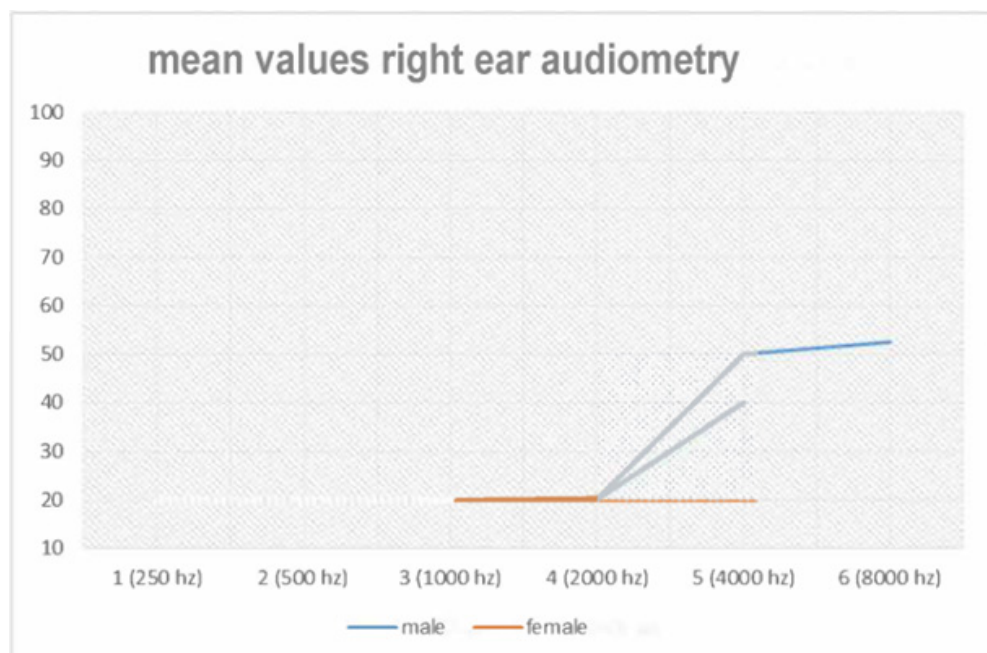
Tympanometry was normal in almost all participants, regardless of gender, with bilateral Type A. Additionally, there was no statistically significant difference in testing the acoustic reflex between both genders.

According to the THI questionnaire score, patients are classified into five groups or grades.

Out of the total of 80 patients:

- Group I consisted of 30 patients (37.5%) with mild tinnitus that does not cause any discomfort.
- Group II included 18 patients (22.5%) with mild disturbances.
- Group III comprised 10 patients (12.5%) with moderately severe symptoms.

Figure 2. Mean values right ear audiometry



- Group IV consisted of 15 patients (18.8%) with severe tinnitus.
- Group V included 7 patients (8.8%) with catastrophic tinnitus.

For questions: 3, 4, 5, 6, 7, 14, 16, 17, 22, 23, 24 there is a statistically significant difference in the frequency of responses.

There is a statistically significant difference in how males and females respond to whether the ringing in their ears confuses them. A much higher proportion of females report feeling angry, confused, desperate, difficulty falling asleep, irritable, disturb by the ringing, cause tension in relationships with family members and friends, frightened and worried, no longer cope with tinnitus, and worsening under stress. A much higher proportion of females report these feelings. This suggests that confusion due to tinnitus might be experienced differently across genders.

There are statistically significant positive correlations between audiometric parameters and THI scores for all frequencies except for 4000 Hz, both in the left and right ears. However, there is no statistically significant difference between THI scores and patients with and without hearing impairment.

If we test gender-related differences for THI score grades we find out that there is a statistically significant difference in THI score grade values between male and female study participants ($p < 0.05$).

If we correlate the THI score with the duration of the tinnitus, we find that there is a statistically weak positive correlation ($r = 0.27$, $p < 0.05$) between the duration of the tinnitus in the subjects included in the study and their THI score values. The longer the duration of the tinnitus, the higher the THI score. but this is not always the case because this statistical association is weak.

But if we compare the different degrees of the THI score with the duration of tinnitus, there is no statistically significant difference in the value of the median duration of tinnitus between the different THISKOR degrees ($p > 0.05$).

By correlating the total score of the first part of the NHP1 by gender: There is a statistically significant difference in the total score between male and female participants included in the study ($U = 515.0$, $p < 0.01$).

There is a statistically significant difference in the score for Physical Functioning from NHP1 between male and female participants included in the study ($U = 520.0$, $p < 0.01$). where women show a higher score for physical functioning compared to men (the median for men is 0, and for women, it's 11.2). On the other hand, if you look at the total score for all 38 questions, you get a statistically significant difference between male and female participants ($U = 515.0$, $p < 0.01$), where the total score in women is higher than in men (median for men: 52.3; median for women: 125.8). Pain and Sleep are two weighted factors that correlate most strongly with audiometric parameters on the right and left sides. Therefore, the higher the audiometric values, the higher the scores for these weighted factors.

In comparison to the total score of NHP1, there is a statistically moderate positive correlation ($r = 0.418$, $p < 0.001$) between the duration of ringing in the ears among the participants included in the study and their total score values.

There is a statistically moderate positive correlation ($r = 0.572$, $p < 0.001$) between the THI score and the total score for the NHP1 among participants included in the study.

When correlating responses to 7 questions NHP2 between male and female genders, the results indicate that the influence of current health status does not show statistically significant differences between male and female individuals ($\chi^2 = 0.001$; $df = 1$; $p > 0.05$).

Multivariable linear regression showed that age and gender were independent predictors of quality of life in patients with tinnitus (Table 1).

Variable	Standardized coefficient (95%CI)	p
Gender	0.333 (6.357-29.921)	0.003
Age	0.248 (0.040-0.901)	0.033
Presence of CVD	-0.060 (-15.827 to 9.321)	0.608
Presence of DM	0.025 (-21.979 to 27.510)	0.824
Presence of depression	0.029 (-25.825 to 34.034)	0.785

Table 1. Predictor of quality of life in patients with tinnitus.

CVD - cardiovascular diseases, DM - diabetes mellitus

DISCUSSION

Tinnitus, the perception of sound in the ears or head in the absence of an external sound source, is a common disorder, with a prevalence ranging from 2.4% to 20.1%. Such a wide prevalence range can be attributed to variations in how tinnitus is defined in different epidemiological studies [19]. The impact of tinnitus on quality of life is a variable phenomenon. While many individuals with tinnitus may not experience any discomfort, others may suffer from it, ranging from severe depression to suicidal thoughts and attempts [20].

Various types of questionnaires have been developed to assess the severity of tinnitus or the impairment it causes. Although these questionnaires have been cross-validated, there is limited information about their relationship with quality of life. Therefore, the use of nonspecific tinnitus questionnaires, i.e., general quality of life questionnaires, is recommended [21].

Regarding the prevalence of tinnitus in different age groups, all published studies agree that the risk of tinnitus increases with age up to 65 years, after which the prevalence either stabilizes or slightly decreases. The relationship between tinnitus and gender is less clear, but studies indicate that tinnitus is slightly more common in males. However, results among published studies are not consistent in this regard. Some studies report a higher prevalence in females [22, 23]. One possible explanation is that the higher prevalence in males may be due to greater occupational noise exposure. Studies suggesting a higher prevalence in females attribute this to the fact that women may have more time to seek medical help.

Most studies show an increased prevalence of tinnitus in the age group of 65-74 years, with a similar prevalence for both males and females. The prevalence is slightly higher in males aged 75 years and older. This pattern is similar to that observed for cardiovascular diseases. In our study, the mean age of male participants was 66.50 years, and that of female participants was 59.50 years, with a relatively balanced distribution between genders. Out of 80 patients, 46 (57.5%) were male, and 34 (42.5%) were female.

We monitored the localization of tinnitus, i.e., the presence of tinnitus in the right ear, left ear, bilaterally, or somewhere in the

head. The majority of participants complained of bilateral ringing in the ears: 27 males (58.7%) and 21 females (61.8%). There was no statistically significant difference between males and females. Several studies have addressed the frequency of tinnitus localization, with the consensus being that tinnitus is most commonly perceived in both ears or centrally in the head [24]. In some other studies, tinnitus is more frequent in the left ear [25]. The cause of this is unknown and may only be explained by asymmetric hearing loss. Chronic tinnitus was defined as tinnitus persisting for 6 months or longer, consistently. In our study, the average duration of tinnitus was approximately 4 years in males (ranging from 1.75 to 10) and 5 years in females (ranging from 2 to 10.5). We did not find a statistically significant difference in the duration of ringing between males and females.

We found that there is a statistically weak correlation ($r = 0.27$, $p < 0.05$) between THI score and the duration of tinnitus. This means that as the duration of ringing increases, the THI score also increases. When correlating the THI score grades with the duration of tinnitus, we did not find a statistical correlation.

In comparing the total NHP1 score with the duration of ringing, there is a statistically moderate positive correlation ($r = 0.418$, $p < 0.001$) between the duration of tinnitus in the participants included in the study and their total score values NHP1. This statistical correlation explains that the longer the duration of tinnitus, the more negatively it affects the quality of life.

The result of a large international multicentre study that investigated which aspect of tinnitus most affects the quality of life, based on THI questionnaire analysis, showed that the average duration of tinnitus is 5 years and that the duration of tinnitus negatively affects the quality of life. This study included 1274 patients from the Tinnitus Research Initiative database [26].

In our study, participants were asked if they suffered from any other diseases. Arterial hypertension, diabetes mellitus, and depression emerged as the most common conditions. The majority of participants suffered from cardiovascular diseases, totalling 46, with 28 (60.9%) males and 18 (52.9%) females. Diabetes mellitus was reported by 5 participants, 1 (2.2%) male and 4 (11.8%) females. Three pa-

tients were diagnosed with depression: 2 males (4.3%) and one female (2.9%).

Hypertension emerged as the most common comorbidity among patients with tinnitus. There was no statistically significant difference between males and females; hypertension was equally prevalent in both genders.

Tinnitus has a multifactorial etiology, and arterial hypertension is observed in studies as an etiological factor. A systematic review of PubMed, ISI Web, Lilacs, and SciELO scientific databases showed an association between hypertension and tinnitus, although this correlation is not entirely clear. The explanation lies in hypertension affecting cochlear microcirculation, leading to hearing impairment, which is an important factor in tinnitus onset. There is an association between tinnitus and arterial hypertension, especially in older individuals treated with ACE inhibitors, calcium channel blockers, and diuretics. It is suggested that the ototoxicity of these drugs could play a role in the pathophysiology of tinnitus in these individuals [27].

Patients with high THI questionnaire scores are more likely to suffer from psychiatric disorders than those with lower THI scores. Tinnitus is most commonly associated with depression and anxiety [28, 29, 30, 31, 32]. Less commonly, there is an association with post-traumatic stress disorder [33, 40], somatoform disorders [35], and psychosis [36]. The strongest correlation is between severe tinnitus and symptoms of depression and anxiety.

Regarding the correlation between hearing loss and tinnitus in our study, the following data were obtained. Out of 80 participants, 13 (16.25%) patients did not have hearing loss. Hearing loss was considered present if there was only one frequency where the hearing threshold was greater than 20 dB. The majority of participants had sensorineural hearing loss from moderate to severe, predominantly affecting high frequencies, in a descending manner.

Previously published studies indicate a strong association between hearing impairment and tinnitus [37, 38]. The strong association between the presence of tinnitus and hearing loss supports the hypothesis that the most likely common cause lies in the peripheral auditory system. However, tinnitus also occurs in individuals who have undergone cochlear ablation or auditory nerve section [39].

Comparing the severity of tinnitus

in participants with and without hearing loss, it has been reported that patients with hearing loss and tinnitus have more severe tinnitus and higher scores on THI questionnaires [40]. It has also been reported that age, gender, and hearing loss do not affect the severity of tinnitus, which was measured using the THI questionnaire [41]. Tinnitus is often associated with hearing impairment caused by noise or ototoxic drugs.

In our study, we correlated the THI scores with hearing impairment for each frequency individually. We found statistically significant positive correlations between audiometric parameters and THI scores for all frequencies except for 4000 Hz, both in the left and right ears. However, there was no statistically significant difference between THI scores and patients with or without hearing impairment.

The same correlation was conducted with the NHP1. Looking at the results, it can be observed that Pain and Sleep positively correlate with all frequencies in both the right and left ears, while Physical Fitness (D 500, 2000, and 8000 Hz) and Energy Level (D 2000 and 8000 Hz) only correlate with three and two frequencies, respectively. Although this alone does not indicate much, Pain and Sleep are the two significant factors that correlate best with audiometric parameters in both ears. Thus, as audiometric values increase, so do the scores for these weighty factors. The greater the hearing impairment, the greater its negative impact on quality of life, according to the NHP1.

Tympanometry was normal in almost all participants, regardless of gender, with a bilateral Type A. There was also no statistically significant difference in the examination of the acoustic reflex between both genders.

The relationship between the acoustic reflex and tinnitus has not yet been established, as there is insufficient published data. It is known that measuring the acoustic reflex can induce acoustic trauma and trigger the onset of tinnitus [42, 43].

Analyzing all 25 questions of the THI questionnaire separately, as well as the gradation of tinnitus severity and correlating the responses with gender, the following results were obtained:

Out of a total of 25 questions, two questions stand out in terms of the number of positive responses:

Question No. 16: Does your tinnitus

bother you?

Question No. 19: Do you feel you have no control over your tinnitus?

For questions 3, 4, 5, 6, 7, 14, 16, 17, 22, and 23, there is a statistically significant difference in the frequency of responses between males and females. Women have a higher number of positive responses to all these questions.

A large multicenter study that conducted a meta-analysis of questionnaires related to tinnitus severity and quality of life reported similar results. There were significantly more positive responses to questions 4, 5, 6, 7, 11, 12, 13, 15, 16, 20, 21, 22, 23, 24, and 25. These questions relate to distress caused by tinnitus, its impact on sleep, depression, anger, inability to cope with tinnitus, and frequent complaints to others about tinnitus [44].

Out of a total of 80 patients: Group I consisted of 30 (37.5%) patients with mild tinnitus that caused no discomfort, 18 (22.5%) patients were in Group II with mild disturbances, 15 (18.8%) patients belonged to Group IV with severe tinnitus, 10 (12.5%) patients were in Group III with moderately severe symptoms, and 7 (8.8%) patients had catastrophic tinnitus, Group V.

When testing differences by gender for THI score grades, we found a statistically significant difference in the values of THI score grades between male and female participants in the study. Men were more numerous in Groups I and II of THI grades related to mild tinnitus, while women were more numerous in Groups III, IV, and V. The higher the THI score, the higher the frequency of depression, especially for IV and V THI grades, which should immediately be an indicator for evaluating possible psychiatric disorders.

By analysing the NHP1, we obtained the following results. In our study, there was a statistically significant difference in the total score for the NHP1 between male and female participants in the study. Women had a higher score. The six areas in NHP 1 are: Energy Level (NE): 3; Pain (P): 8; Emotional Reaction (ER): 9; Sleep (S): 5; Social Isolation (SI): 5; Physical Fitness (PF): 8. The frequency of weighty factors by areas and genders gave us the following results: There is a statistically significant difference in the score for Physical Fitness in the NHP1 between male and female participants in the study. Women again have a higher score for physical fitness, i.e., they are less physically

fit.

The NHP2, comprises the impact of current health status on 7 aspects of life: work, household maintenance, social life, family life, sexual life, interests and hobbies, and rest. We did not find statistically significant differences between men and women. The NHP questionnaire has been proposed for investigating the impact of tinnitus on quality of life [45]. This questionnaire was used in a large study related to quality of life and hearing impairments [46]. There are statistically significant differences in three out of six dimensions: lack of energy, emotional reaction, and social isolation. Women have a higher score compared to control groups [47].

Three dimensions or weighty factors: Emotion, Sleep, and Pain have been shown as statistically significant predictors for the severity of tinnitus [47]. It is also interesting that women have higher scores for energy, physical fitness, pain, and sleep, while emotional reactions are similar between men and women [47]. This is explained by the fact that women's life situations and gender roles make them cope with illness differently than men, depending on how they use and receive healthcare [48].

Comparing the total THI score with the NHP1, we find a statistically moderate association between Energy Level and Emotional Reaction. We obtain a weak statistical association with sleep, social isolation, and physical fitness.

When comparing THI grades, we find a statistical association with all 6 dimensions of the NHP1, and for the NHP2, we find a statistical association with all dimensions and all questions except for the first question: "Does your current health condition cause problems at work?" One possible explanation is that the majority of respondents are either unemployed or retired. There is no literature data on the correlation between these two questionnaires.

CONCLUSION

The use of questionnaires as tools for assessing the quality of life and severity of tinnitus has shown that tinnitus has a negative impact on quality of life. The prevalence of tinnitus increases with age, but after the age of 65, it either stabilizes or decreases. We have found that the duration of tinnitus affects its sever-

ity, with patients experiencing longer duration of tinnitus having more difficulty coping with symptoms, resulting in poorer quality of life. Arterial hypertension has been identified as the most common comorbidity.

The relationship between hearing loss and tinnitus is clear and confirmed. Hearing loss also significantly affects the quality of life, and this association is so pronounced that the presence of hearing loss can be inferred based on a general quality of life questionnaire. Patients with both hearing loss and tinnitus report poorer quality of life compared to those with tinnitus alone.

Our study also demonstrates that tinnitus primarily affects the distress it causes and the inability to control the condition. There is a negative impact on emotions, acceptance of the condition, and sleep.

Quality of life is more compromised in women, who appear to have more difficulty coping with tinnitus. The impact on physical fitness is particularly pronounced in women compared to men.

Based on the results of this research, we conclude that tinnitus treatment should focus on auditory amplification in individuals with hearing loss, as well as psychological therapy aimed at accepting tinnitus and changing emotional reactions to this condition. In this context, cognitive-behavioural therapy and mindfulness-based cognitive-behavioural therapy can be beneficial.

CONFLICT OF INTEREST

All authors declare no conflict of interest.

REFERENCES

1. Tunkel DE, Bauer CA, Sun GH, Rosenfeld RM, Chandrasekhar SS, Cunningham ER Jr, Archer SM, Blakley BW, Carter JM, Granieri EC, Henry JA, Hollingsworth D, Khan FA, Mitchell S, Monfared A, Newman CW, Omole FS, Phillips CD, Robinson SK, Taw MB, Tyler RS, Waguespack R, Whamond EJ. Clinical practice guideline: tinnitus. *Otolaryngol Head Neck Surg*. 2014 Oct;151(2 Suppl):S1-S40. doi: 10.1177/0194599814545325. PMID: 25273878.
2. Møller AR. Sensorineural Tinnitus: Its Pathology and Probable Therapies. *Int J Otolaryngol*. 2016;2016:2830157. doi: 10.1155/2016/2830157. Epub 2016 Feb 8. PMID: 26977153; PMCID: PMC4761664.
3. Møller AR. Similarities between tinnitus and pain. In: *Textbook of Tinnitus*. New York: Springer; 2011.
4. Møller AR. Pain: Its anatomy, physiology and treatment. Aage R. Moller, Publishing; 2012.
5. Møller AR. *Textbook of tinnitus*. New York: Springer;2010.
6. Langguth B, Kreuzer PM, Kleinjung T, De Ridder D. Tinnitus: causes and clinical management. *The Lancet Neurology*. 2013 Sep 1;12(9):920-30.
7. Jastreboff PJ. Phantom auditory perception (tinnitus): mechanisms of generation and perception. *Neuroscience research*. 1990 Aug 1;8(4):221-54.
8. Levine RA. Somatic modulation appears to be a fundamental attribute of tinnitus. In *Proceedings of the Sixth International Tinnitus Seminar 1999 Sep 5* (pp. 193-197). London: The Tinnitus and Hyperacusis Center.
9. Fabijanska A, Rogowski M, Bartnik G, Skarzynski H. Epidemiology of tinnitus and hyperacusis in Poland. In *Proceedings of the sixth international tinnitus seminar 1999 Sep 5* (pp. 569-571). Cambridge, UK: The Tinnitus and Hyperacusis Centre.
10. Nondahl DM, Cruickshanks KJ, Wiley TL, Klein R, Klein BE, Tweed TS. Prevalence and 5-year incidence of tinnitus among older adults: the epidemiology of hearing loss study. *Journal of the American Academy of Audiology*. 2002 Jun;13(06):323-31.
11. Sindhusake D, Mitchell P, Newall P, Golding M, Rochtchina E, Rubin G. Prevalence and characteristics of tinnitus in older adults: the Blue Mountains Hearing Study: Prevalencia y características del acúfeno en adultos mayores: el Estudio de Audición Blue Mountains. *International journal of audiology*. 2003 Jan 1;42(5):289-94.
12. Nondahl DM, Cruickshanks KJ, Wiley TL, Klein R, Klein BE, Tweed TS. Comment on tinnitus in older adults from the Blue Mountains Study by Sindhusake et al and comparison with tinnitus data from the Epidemiology of Hearing Loss Study. *International Journal of Audiology*. 2004 Jan 1;43(1):60-.
13. Shargorodsky J, Curhan GC, Farwell WR. Prevalence and characteristics of tinnitus among US adults. *The American journal of medicine*. 2010 Aug 1;123(8):711-8.
14. Tambs K, Hoffman HJ, Borchgrevink HM, Holmen J, Samuelsen SO. Hearing loss induced by noise, ear infections, and head injuries: results from the Nord-Trøndelag Hearing Loss Study: Hipoacusia inducida por ruido, infecciones de oído y lesiones cefálicas: resultados del estudio Nord-Trøndelag sobre pérdidas auditivas. *International journal of audiology*. 2003 Jan 1;42(2):89-105.
15. Borg E. Noise, Hearing, and Hypertension. *Journal of Occupational and Environmental Medicine*. 1982 Feb 1;24(2):150.
16. Coles R. Medicolegal issues. In: *Tinnitus handbook*. R Tyler, Editor. Singular Publishing: San Diego;2000.p. 399-417.

17. Pan T, Tyler RS, Ji H, Coelho C, Gehringer AK, Gogel SA. The relationship between tinnitus pitch and the audiogram. *International journal of audiology*. 2009 Jan 1;48(5):277-94.
18. Newman CW, Jacobson GP, Spitzer JB. Development of the tinnitus handicap inventory. *Archives of Otolaryngology-Head & Neck Surgery*. 1996 Feb 1;122(2):143-8.
19. Heller AJ. Classification and epidemiology of tinnitus. *Otolaryngologic Clinics of North America*. 2003 Apr 1;36(2):239-48.
20. Turner O, Windfuhr K, Kapur N. Suicide in deaf populations: a literature review. *Annals of General Psychiatry*. 2007 Dec;6:1-9.
21. Langguth B, Goodey R, Azevedo A, Bjorne A, Cacace A, Crocetti A, Del Bo L, De Ridder D, Diges I, Elbert T, Flor H. Consensus for tinnitus patient assessment and treatment outcome measurement: Tinnitus Research Initiative meeting, Regensburg, July 2006. *Progress in brain research*. 2007 Jan 1;166:525-36.
22. Axelsson A, Ringdahl A. Tinnitus—a study of its prevalence and characteristics. *British journal of audiology*. 1989 Jan 1;23(1):53-62.
23. Sanchez TG. Reabilitação do paciente com zumbido. Em: Campos CAH, Costa HOO, editores. *Tratado de Otorrinolaringologia*. 1 ed. São Paulo: Roca; 2003. p. 311-24.
24. Coles RR. Epidemiology of tinnitus:(2) Demographic and clinical features. *The Journal of Laryngology & Otology*. 1984 Jun;98(59):195-202.
25. Meikle MB, Griest SE. Asymmetry in tinnitus perceptions. Factors that may account for the higher prevalence of left-sided tinnitus. In: Aran JM, Dauman R, eds. *Tinnitus 91. Proceedings of the Fourth International Tinnitus Seminar*. Amsterdam/New York: Kugler Publications; 1992. p. 231-37.
26. Zeman F, Koller M, Langguth B, Landgrebe M, Tinnitus Research Initiative Database Study Group. Which tinnitus-related aspects are relevant for quality of life and depression: results from a large international multicentre sample. *Health and quality of life outcomes*. 2014 Dec;12:1-0.
27. Figueiredo RR, Azevedo AA, Penido ND. Positive association between tinnitus and arterial hypertension. *Frontiers in neurology*. 2016 Oct 5;7:216058.
28. Henry JL, Wilson PH. Coping with Tinnitus: Two Studies of Psychological and Audiological Characteristics of Patients with High and Low Tinnitus-Related Distress. *The international tinnitus journal*. 1995 Jan 1;1(2):85-92.
29. Crocetti A, Forti S, Ambrosetti U, Bo LD. Questionnaires to evaluate anxiety and depressive levels in tinnitus patients. *Otolaryngology—Head and Neck Surgery*. 2009 Mar;140(3):403-5.
30. Marciano E, Carrabba L, Giannini P, Sementina C, Verde P, Bruno C, Pietro GD, Ponsillo NG. Psychiatric comorbidity in a population of outpatients affected by tinnitus: Comorbilidad psiquiátrica en una población de pacientes de consulta externa afectados por tinnitus. *International journal of audiology*. 2003 Jan 1;42(1):4-9.
31. Sullivan MD, Katon W, Dobie R, Sakai C, Russo J, Harrop-Griffiths J. Disabling tinnitus: association with affective disorder. *General hospital psychiatry*. 1988 Jul 1;10(4):285-91.
32. Zöger S, Svedlund J, Holgers KM. Relationship between tinnitus severity and psychiatric disorders. *Psychosomatics*. 2006 Jul-Aug;47(4):282-8. doi: 10.1176/appi.psy.47.4.282. PMID: 16844885.
33. Fagelson MA. The association between tinnitus and posttraumatic stress disorder. *Am J Audiol*. 2007 Dec;16(2):107-17. doi: 10.1044/1059-0889(2007/015). PMID: 18056879.
34. Hinton DE, Chhean D, Pich V, Hofmann SG, Barlow DH. Tinnitus among Cambodian refugees: relationship to PTSD severity. *J Trauma Stress*. 2006 Aug;19(4):541-6. doi: 10.1002/jts.20138. PMID: 16929509.
35. Hiller W, Janca A, Burke KC. Association between tinnitus and somatoform disorders. *J Psychosom Res*. 1997 Dec;43(6):613-24. doi: 10.1016/s0022-3999(97)00188-8. PMID: 9430074.
36. D'Amelio R, Delb W. Komorbidität schizophrene Psychose und Tinnitus. Ein bislang vernachlässigtes Thema in Forschung und Therapie [Comorbidity of schizophrenic psychosis and tinnitus. A hitherto neglected theme in research and therapy]. *HNO*. 2008 Jul;56(7):670-2. German. doi: 10.1007/s00106-008-1790-2. PMID: 18566784.
37. Tan CM, Lecluyse W, McFerran D, Meddis R. Tinnitus and patterns of hearing loss. *J Assoc Res Otolaryngol*. 2013 Apr;14(2):275-82. doi: 10.1007/s10162-013-0371-6. Epub 2013 Jan 18. PMID: 23328862; PMCID: PMC3660910.
38. Davis A, El Refaie A. Epidemiology of tinnitus. In: Tyler RS, editor. *Tinnitus handbook*. San Diego: Singular; 2000.
39. Sasaki CT, Babitz L, Kauer JS. Tinnitus: development of a neurophysiologic correlate. *The Laryngoscope*. 1981 Dec;91(12):2018-24.
40. Yenigün A, Doğan R, Aksoy F, Akyüz S, Dabak H. Assessment of tinnitus with tinnitus severity index, tinnitus handicap inventory and distortion product otoacoustic emissions in patients with normal hearing and hearing loss. *The Turkish Journal of Ear Nose and Throat*. 2014 Jan 1;24(1):11-6.
41. Pinto PC, Sanchez TG, Tomita S. The impact of gender, age and hearing loss on tinnitus severity. *Braz J Otorhinolaryngol*. 2010 Jan-Feb;76(1):18-24. doi: 10.1590/S1808-86942010000100004. PMID: 20339684; PMCID: PMC9446027.
42. Fernandes FL, Guimarães AC, de Carvalho GM,

Mezzalana R, Stoler G, Paschoal JR. Stapedial reflex and recruitment: what is the relationship with tinnitus? *Noise Health*. 2014 Nov-Dec;16(73):422-6. doi: 10.4103/1463-1741.144427. PMID: 25387539.

43. Fernandes Lda C, Momensohn-Santos TM, Carvalho JS, Carvalho FL. Tinnitus and normal hearing: a study on contralateral acoustic reflex. *Am J Audiol*. 2013 Dec;22(2):291-6. doi: 10.1044/1059-0889(2013/13-0005). PMID: 23824442.

44. Zeman F, Koller M, Langguth B, Landgrebe M; Tinnitus Research Initiative database study group. Which tinnitus-related aspects are relevant for quality of life and depression: results from a large international multicentre sample. *Health Qual Life Outcomes*. 2014 Jan 14;12:7. doi: 10.1186/1477-7525-12-7. PMID: 24422941; PMCID: PMC3896823.

45. Holgers KM, Erlandsson SI, Barrenäs ML. Predictive factors for the severity of tinnitus. *Audiology*. 2000 Sep-Oct;39(5):284-91. doi: 10.3109/00206090009073093. PMID: 11093613.

46. Grimby A, Ringdahl A. Does having a job improve the quality of life among post-lingually deafened Swedish adults with severe-profound hearing impairment? *Br J Audiol*. 2000 Jun;34(3):187-95. doi: 10.3109/03005364000000128. PMID: 10905452.

47. Erlandsson SI, Holgers KM. The impact of perceived tinnitus severity on health-related quality of life with aspects of gender. *Noise Health*. 2001;3(10):39-51. PMID: 12689455.

48. Erlandsson SI. Tinnitus: sounds carrying psychological pain. *Psykologiska perspektiv*. 2000b; 105.

Uticaj tinitusa na kvalitet života kod odraslih i razlike među polovima

Galina S. Joković¹, Snežana S. Babac^{2,3}

¹ Kliničko bolnički centar „dr Dragiša Mišović – Dedinje“, Beograd, Srbija

² Klinika za otorinolaringologiju Kliničko Bolničkog centra „Zvezdara“, Beograd, Srbija

³ Univerzitet u Beogradu, Fakultet za specijalnu edukaciju i rehabilitaciju, Beograd, Srbija

KRATAK SADRŽAJ

Uvod: Tinitus, ili zvonjenje u ušima, predstavlja abnormalnu percepciju zvuka u ušima ili glavi bez prisustva odgovarajućeg spoljašnjeg zvučnog izvora. Danas je poznato da tinitus nije jedinstvena bolest, već grupa različitih poremećaja sa različitim osnovnim mehanizmima, zbog čega zahteva različite tipove lečenja. Tinitus nema vidljive znake bolesti i ne ugrožava život, ali na mnogo načina utiče na kvalitet života i izaziva patnju.

Cilj: Ciljevi ove studije su bili: upotrebom upitnika ukazati na vezu između tinitusa i kvaliteta života, identifikovati koja su područja svakodnevnog života najviše pogođena prisustvom tinitusa i utvrditi da li postoji značajna razlika između polova u pogledu uticaja tinitusa na kvalitet života.

Materijali i metode: Studija je obuhvatila 80 odraslih pacijenata uzrasta od 18 do 82 godine. Kriterijumi za uključivanje pacijenata u studiju su bili: tinitus u jednom ili oba uva ili u glavi, tinitus koji traje neprekidno 6 meseci ili duže, i starost preko 18 godina. Kriterijumi za isključivanje iz studije su pacijenti koji doživljavaju slušne halucinacije u obliku muzike i govora. Korišćene su otološke dijagnostičke metode, uključujući pregled ušiju, nosa i grla (ENT), audiometriju čistih tonova i timpanometriju sa testiranjem akustičnog refleksa. Pacijenti su popunjavali dva upitnika: specifičan upitnik za tinitus, Inventar za procenu hendikepa od tinitusa (THI), i opšti upitnik za procenu kvaliteta života, Notingemski zdravstveni profil.

Rezultati: Prevalencija tinitusa raste sa godinama, do 65 godina, nakon čega ostaje nezavisna od starenja ili opada. Većina učesnika imala je sensorineuralni gubitak sluha od umerenog do teškog, pretežno na visokim frekvencijama, i opadajući. Postoje statistički značajne pozitivne korelacije između audiometrijskih parametara i THI skorova za sve frekvencije osim za 4000 Hz, i za levo i za desno uvo.

Zaključak: Korišćenjem upitnika kao instrumenata za procenu kvaliteta života i težine tinitusa, ova studija je pokazala negativan uticaj tinitusa na kvalitet života. Utvrđeno je da trajanje tinitusa utiče na njegovu težinu.

Ključne reči: tinitus, zvonjenje u ušima, kvalitet života

Received: March 18, 2024

Accepted: July 23, 2024