







Objective tinnitus in geriatric patients

Geriatrik hastalarda objektif tinnitus

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ABSTRACT

Objectives: This study aimed to investigate the distribution and possible causes of objective tinnitus in geriatric patients.

Patients and Methods: A total of 242 patients (101 males, 141 females; mean age: 71.5±13.3 years) over 65 years who were admitted to our outpatient clinic with the complaint of tinnitus between March 2021 and October 2021 were included in the retrospective study. The clinical history and the etiology of tinnitus were investigated. The pure tone audiometry tests were evaluated to determine whether there was a loss in any frequency. The associations between the presence of objective tinnitus, age, sex, hearing loss, and comorbid diseases were analyzed.

Results: The prevalence of objective tinnitus was 13.6% in geriatric patients. The relation between objective tinnitus with the male sex and lower age was statistically significant ($p<0.001$ and $p<0.001$, respectively). No association was found between objective tinnitus and hearing loss or other comorbid diseases ($p=0.727$ and $p=0.658$, respectively).

Conclusion: Objective tinnitus may be less common than subjective tinnitus; however, a detailed medical history and physical examination is recommended, particularly in males and younger patients. The most common cause of objective tinnitus was vascular diseases.

Keywords: Geriatric, incidence, tinnitus, vascular diseases.

ÖZ

Amaç: Bu çalışmada, geriatrik hastalarda objektif tinnitusun dağılımı ve olası nedenleri araştırıldı.

Hastalar ve Yöntemler: Mart 2021 - Ekim 2021 tarihleri arasında tinnitus şikayeti ile polikliniğimize başvuran 65 yaş üstü 242 hasta (101 erkek, 141 kadın; ort yaş: 71.5±13.3 yıl) retrospektif çalışmaya dahil edildi. Tinnitusun klinik öyküsü ve etyolojisi araştırıldı. Herhangi bir frekansta kayıp olup olmadığını belirlemek için saf ses odyometri test sonuçları değerlendirildi. Objektif tinnitus varlığı, yaş, cinsiyet, işitme kaybı ve komorbid hastalıklar arasındaki ilişkiler analiz edildi.

Bulgular: Geriatrik hastalarda objektif tinnitus prevalansı %13.6 idi. Objektif tinnitus ile erkek cinsiyet ve daha düşük yaş arasındaki ilişki istatistiksel olarak anlamlıydı (sırasıyla, $p<0.001$ ve $p<0.001$). Objektif tinnitus ile işitme kaybı veya diğer komorbid hastalıklar arasında ilişki bulunmadı (sırasıyla, $p=0.727$ ve $p=0.658$).

Sonuç: Objektif tinnitus, subjektif tinnitustan daha az yaygın olabilir ancak özellikle erkek ve daha erken yaşta hastalarda ayrıntılı bir tıbbi öykü ve fizik muayene yapılması önerilir. Objektif tinnitusun en sık nedeni vasküler hastalıklar idi.

Anahtar sözcükler: Geriyatri, insidans, tinnitus, vasküler hastalıklar.

Tinnitus is defined as a sound perceived in the ears without any stimulus.^[1] It is often subjective and can only be defined by the patient. Patients may describe a unique tone or several different tones. The reported incidence is 17% in the general population and can reach up to 33% in the geriatric population.^[2]

The most common risk group for tinnitus varies between the ages of 40 and 70.^[3] High-frequency tinnitus is quite disturbing for the patients, and it is described as a ringing sound, grunt, radiofrequency sound, or buzz sound.

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Although the physiopathology of tinnitus is not fully understood yet, there are many theories regarding the etiology of this symptom. The disruption of cochlear neurotransmitter and ion balance, damage to inner or outer hair cells of the cochlea, and degeneration of vestibular-cochlear nerve fibers could be summarized as the valid theories.^[4] Several risk factors related to tinnitus have been evaluated, including hearing impairment, noise, advanced age, obesity, and emotional distress.^[5] However, the definite factors remain unclear.

Tinnitus can be defined as objective or subjective tinnitus. The objective tinnitus is identified after confirmation of any tinnitus through examinations. In contrast, subjective tinnitus is described as tinnitus that only the patient perceives.^[6] A further classification can also be made according to the dysfunction in audiometric tests as central and peripheral tinnitus.^[7] Apart from the definitions, there is still a lack of evidence regarding the type of tinnitus and its relation to risk factors.

This study aimed to analyze the association of objective tinnitus with age, sex, hearing loss, comorbid diseases, and possible reasons for objective tinnitus.

PATIENTS AND METHODS

This single-center, retrospective observational study was conducted in Ankara Bilkent City Hospital, Ear-Nose-Throat (ENT) Outpatient Clinic. The patients over 65 years admitted between March 2021

and October 2021 with tinnitus complaints examined by an ENT specialist and audiometric tests were enrolled in the study. A total of 265 patient records were evaluated, and 242 of these patients (101 males, 141 females; mean age: 71.5±13.3 years) with complete records were enrolled. Tinnitus symptom was classified according to the objective or subjective symptom types, considering the medical history and otolaryngologic examinations, including the tympanic membrane examination. The audiometric tests (pure tone audiometry) were conducted with the Interacoustics AC40 device (Interacoustics A/S, Middelfart, Denmark) according to the observation of dysfunction at one or more of the following frequencies: 250, 500, 1000, 2000, 4000, 8000 Hz. The patients were divided into two groups as the objective tinnitus group and the subjective tinnitus group. The same observer carried out the examinations and audiometry tests. The study was approved by the Ankara Bilkent City Hospital Ethics Committee (approval no: 2021/E2-21-897). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical analysis

All data were analyzed with IBM SPSS version 25.0 software (IBM Corp., Armonk, NY, USA). The categorical variables are presented as percentages and frequency. A one-sample Kolmogorov-Smirnov test was performed to analyze the distribution of the clinical variables. The continuous variable (age) with homogenous distribution was presented as mean ± standard deviation. Independent samples t-test was used to determine any significant difference of

Table 1
The characteristics of objective and subjective tinnitus groups in geriatric patients

	Objective tinnitus group (n=33)			Subjective tinnitus group (n=209)			p
	n	%	Mean±SD	n	%	Mean±SD	
Age (year)			68.8±11.4			72.3±13.1	<0.001
Sex							<0.001
Male	21	63.6		80	39.3		
Female	12	36.3		129	61.7		
Systemic disease							0.658
None	1	3		8	3.8		
Hypertension	22	66.6		134	64.1		
Diabetes mellitus	7	21.2		42	20.0		
Hypertension + diabetes mellitus	4	12.1		25	11.9		
Pulmonary disease	2	6.06		13	6.2		
Other	1	3		12	5.7		
Hearing loss (n=158)	21	63.6		137	65.5		0.727

SD: Standard deviation.

Table 2
The possible reasons for objective tinnitus in geriatric patients

	Objective tinnitus group (n=33)
	n
Nasopharynx cancer	8
Radiotherapy to the head neck region	5
Patent eustachian tube	2
Temporomandibular joint disorder	3
Vascular anomalies	
Artery venous malformation	6
Venous hum	5
Aneurysm	1
High jugular bulb	2
Jugular glomus	1

age between the study groups. The association of categorical data was assessed using the chi-square test. The significance level was set at 0.05, with a 95% confidence interval.

RESULTS

The majority of the patients were female (55.7%). The most common comorbidities in the total population were hypertension, pulmonary disease, and diabetes, with 63.2%, 31.4%, and 20.2%, respectively. The mean age was significantly higher in the subjective tinnitus group than the objective tinnitus group (72.3 ± 13.1 vs. 68.8 ± 11.4 , $p < 0.001$). The most common observed comorbidity was hypertension in both study groups, and no significant difference was observed between the study groups considering systemic comorbidities ($p = 0.658$). Thirty-three (13.6%) of the patients had objective tinnitus, and 209 (86.4%) of them had subjective tinnitus (Table 1).

Twenty-one (63.9%) of the patients with objective tinnitus were male, and 12 (36.1%) were female. Although the number of female patients was higher in the study group, the number of male patients was higher in the objective tinnitus group. Thus, the male sex was significantly higher in the objective tinnitus group than the subjective tinnitus group ($p < 0.001$).

Hearing loss at one or more frequencies was observed in 158 (65.2%) patients in the pure tone audiometry test. Twenty-one patients had hearing loss at one or more frequencies in the group with objective tinnitus. No statistically significant difference was observed between groups regarding the hearing loss at any frequencies

($p = 0.727$). Eight patients in the objective tinnitus group had mixed hearing loss, seven of them had an increased sensorineural hearing loss after 2 kHz, and six patients had sensorineural hearing loss in all frequencies.

The evaluation of the cause of objective tinnitus revealed that 15 (45%) patients had a vascular anomaly, eight (24%) patients had a history of nasopharyngeal cancer, five (15%) patients had been exposed to radiotherapy in the head and neck region, three (9%) patients had a temporomandibular joint disorder, and two (6%) patients had a patent eustachian tube in the objective tinnitus group. Vascular anomalies constituted the majority of the underlying disease. The patients were referred to the cardiovascular department after their initial examination. Six patients had an arteriovenous malformation, five patients had a venous hum, two patients had a high jugular bulb, one patient had a jugular glomus, and one patient had an aneurysm (Table 2).

DISCUSSION

Our study revealed that objective tinnitus is observed in 13.6% of geriatric patients. Male and younger patients were at a significantly higher risk for objective tinnitus. The most common possible cause of objective tinnitus was vascular diseases.

Tinnitus can reduce the quality of life in individuals and causes depression, particularly in the geriatric population. Even suicide cases have been reported due to tinnitus in these patients.^[8] The prevalence of tinnitus in geriatric patients varies in different countries, from 13.5 to 32%.^[9-11] However, there is a lack of information

regarding objective and subjective tinnitus in the elderly population. In our study, a slightly higher age was observed in patients with subjective tinnitus. We may speculate that older patients may exacerbate their complaints compared to younger patients. In addition, the causes of subjective tinnitus may be due to external ear, middle ear, cochlear, and retrocochlear pathologies and may be due to neurodegenerative disorders, metabolic diseases, psychological and temporomandibular joint disorders. The detection of objective tinnitus at a younger age may be due to the earlier diagnosis of the underlying organic pathology.

Objective tinnitus may occur due to arteriovenous malformations, venous disorders, tumors, aneurysms, and neuromuscular anomalies. The cause of tinnitus can be isolated and treated successfully in only 5% of patients.^[12] In our study, most of the possible reasons for objective tinnitus were vascular diseases, with a rate of 45%. The higher rate could be associated with a distorted vascular system that could affect the structure of the hearing system and increased neurodegeneration.

The relation between tinnitus and sex was also evaluated in the literature. Pinto et al.^[13] assessed the severity of tinnitus and sex in patients varying between 24 to 83 years of age. They reported no significant correlation between age, sex, and tinnitus severity. In our study, the number of males was significantly higher in the objective tinnitus group. On the contrary to the study by Pinto et al.,^[13] we evaluated the elderly populations, and different results could be associated with the difference of the study population. We may postulate that since males are more prone to have cardiovascular diseases than females, the higher objective tinnitus rates could be associated with impairment in the circular system.

The limitation of our study is that it is single-center and retrospective in design, which could increase the bias risk. However, our center is a referral hospital, and our patients represent our population. Further population-based studies could be designed with larger samples of geriatric patients. In addition, subgroups analysis considering the tinnitus severity with objective questionnaires may provide more accurate results. However, to our knowledge, this is the first study evaluating the characterization of objective tinnitus in geriatric patients.

In conclusion, tinnitus is a common disorder in the elderly population. Objective tinnitus is observed in slightly younger patients compared to patients with subjective tinnitus. Male sex and increased number of vascular diseases could also be associated with objective tinnitus. Further studies are required to generalize our results in geriatric patients.

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