# AUDIOMETRIC FINDINGS IN PATIENTS WITH SUBJECTIVE TINNITUS

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***Abstract:*** *Tinnitus is the perception of sound in the absence of an external source. Most cases of tinnitus are associated with hearing loss expressed either in the audiogram or detected by more sensitive measures. The objective of this research was to determine the prevalence, type, and degree of hearing loss in patients with subjective tinnitus and to analyze the quality features and some tinnitus characteristics related to associated hearing loss. We analyzed audiometric, otoscopic findings, and the medical reports of 1,046 patients, 573 males (54.8%) and 473 females (45.2%), aged 19 to 89 years. The patients were examined at the Department of Otorhinolaryngology, City General Hospital "8-September", Skopje, Republic of Macedonia, during the period from January 2014 to October 2015. For statistical data analysis, we used a chi-square test with a significance level of $p<0.05$.*

*Most of the patients were males aged 60 to 69 years (13.4%), but there was no significant difference in age and gender distribution ($p=0.156$). The prevalence of hearing loss among these tinnitus patients was 91.9%. Most of the patients had bilateral sensorineural hearing loss (58.2%), predominantly at high frequencies ($p<0.00001$), and described their tinnitus as high-pitch whistling. Bilateral tinnitus was the most common manifestation (59.4%), followed by left-sided unilateral tinnitus (22.8%). Acoustic trauma and noise-induced hearing loss were present in 27.8% of all patients with otological conditions.*

*Most of the patients with subjective tinnitus have some degree of hearing loss. Bilateral, high-pitched tinnitus and bilateral sensorineural hearing loss, predominantly at high frequencies, were the most common findings. Acoustic trauma and noise-induced hearing loss were the most common otological conditions, and noise-induced tinnitus was the most common type of tinnitus.*

***Keywords:*** *subjective tinnitus, hearing loss, audiometry*

## INTRODUCTION

Tinnitus is the perception of sound in the absence of an external source (Adjamian et al., 2012). The term *tinnitus* is derived from the Latin word *tinnire*, meaning 'to ring' (Chan, 2009). Tinnitus is thought to result from abnormal neural activity at some point or points in the auditory pathway which is erroneously interpreted by the brain as sound (Hoare et al., 2014).

Tinnitus is generally divided into two categories: objective and subjective. Objective tinnitus is defined as tinnitus that is audible to another person as a sound emanating from the ear canal, whereas subjective tinnitus is audible only to the patient and is usually considered to be devoid of an acoustic etiology and associated movements in the cochlear partition or cochlear fluids (Han et al., 2009). Tinnitus aurium indicates a subjective experience of a noise, which seemingly originates in the inner ear of a patient. However, this noise cannot be heard by an external investigator. A subjective noise that the patient cannot localize in one or both ears but is somewhere in the head, though still not objectively measurable, is called tinnitus cranii sive cerebri (Claussen, 2005). Other than within the head, an individual may also localize the tinnitus external to the head (Baguley, 2002).

The quality of the perceived sound can vary enormously from simple sounds, such as whistling or humming, to complex sounds, such as music. The patient may hear a single sound or multiple sounds. The symptom may be continuous or intermittent. Most cases of tinnitus are described as subjective (Phillips and McFerran, 2010). Tinnitus

symptoms are referred to as a chronic condition when they last longer than six months (Zeman et al., 2012).

Most cases of tinnitus are associated with hearing loss expressed either in the audiogram or putatively detected by more sensitive measures (Roberts et al., 2013). Approximately 90 % of evaluated tinnitus patients have some degree of hearing loss (Folmer, 2002). Tinnitus may precede or follow the onset of a hearing loss, or the two may occur simultaneously (Singh, 2014). The overall prevalence of tinnitus among adults in the United States has been estimated to be 25.3% (Shargorodsky et al., 2010).

## OBJECTIVES

The objectives of this study were to determine the prevalence, type, and degree of hearing loss in patients with subjective tinnitus and to analyze the quality features and some tinnitus characteristics related to associated hearing loss.

## HYPOTHESES

According to the results from previous studies and the objectives of this research, we formulated the following hypotheses:

H1: Most of the patients with subjective tinnitus have some degree of hearing loss.
H2: Bilateral tinnitus and bilateral sensorineural hearing loss, predominantly at high frequencies are the most common.
H3: The most common type of tinnitus is noise-induced high-pitch tinnitus.

## RESEARCH METHODS

This retrospective study included 1,046 patients (573 males and 473 females), aged 19 to 89 years, examined at the Department of Otorhinolaryngology, Division of Audiology, City General Hospital "8 September", Skopje, Republic of Macedonia. Ear, nose and throat examination and pure-tone audiometry were performed during the period from January 2014 to October 2015. Inclusion criteria were the presence of subjective tinnitus in adults and audiological evaluation. Cases of both acute and chronic tinnitus were included, with tinnitus lasting at least five minutes. We analyzed the audiometric, otoscopic findings and medical reports of the patients. Pure-tone audiometry was performed with a Bell Plus (Inventis) audiometer and Telephonics TDH-39 supra-aural headphones in a sound-proof booth. The hearing threshold was determined at the following frequencies: 125, 250, 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz. Normal hearing was defined as thresholds ≤20 dB hearing level (HL) at audiometric frequencies from 125 to 8000 Hz, and a pathological audiogram was defined as an audiogram with a hearing threshold of >20 dB at any of the frequencies. For statistical data analysis, we used a chi-square test with a significance level of $p<0.05$.

Protocol number of ethical approval: 4300/2014.

## RESULTS AND DISCUSSION

The total number of patients in our study was 1,046, 573 males (54.8%) and 473 females (45.2%), with a wide age range, from 19 to 89 years. We displayed sample distribution according to age and gender (Table 1). Most of the patients were males aged between 60 and 69 years (13.4%), but there was no significant difference in age and gender distribution ($\chi^2=9.319$, df=6, p=0.156).

**Table 1.** *Sample distribution according to age and gender*

| Age | Males | % | Females | % | Total | % |
|---|---|---|---|---|---|---|
| 19-29 years | 41 | 3.9 | 40 | 3.8 | 81 | 7.7 |
| 30-39 years | 69 | 6.6 | 45 | 4.3 | 114 | 10.9 |
| 40-49 years | 99 | 9.5 | 63 | 6 | 162 | 15.5 |
| 50-59 years | 111 | 10.6 | 108 | 10.3 | 219 | 20.9 |
| 60-69 years | 140 | 13.4 | 118 | 11.3 | 258 | 24.7 |
| 70-79 years | 88 | 8.4 | 86 | 8.2 | 174 | 16.6 |
| 80-89 years | 25 | 2.4 | 13 | 1.2 | 38 | 3.6 |
| | | | | | | p=0.156* |
| Total | 573 | 54.8 | 473 | 45.2 | 1046 | 100 |

* chi-square test

Our results are similar to other authors' findings. Nondahl et al. (2010) reported a 10-year cumulative incidence of tinnitus that was higher for men than for women. Steinmetz et al. (2009), in workers exposed to excessive noise, also found more prevalent tinnitus in males than females. Patients

with posttraumatic noise-related tinnitus were more frequently male (Kreuzer et al., 2012). The higher prevalence of tinnitus in men than women can be explained by the fact that males are more exposed to excessive noise (in military service, workplaces, noisy hobbies) than females.

Most of the patients in our study were aged between 60 and 69 years. In a study conducted by Shargorodsky et al. (2010), the prevalence of tinnitus also increased with age until the age of 60-69 years, after which it decreased with increasing age. Prevalence of tinnitus clearly increases with age, and this does not seem to be influenced by noise exposure (Heller, 2003). Although it can occur at any age, chronic tinnitus is more common in the senior years, when hearing is often impaired at frequencies above 2-4 kHz (Roberts et al., 2010). The increase of tinnitus incidence among older people is explainable considering some aspects of elderly patients: the high prevalence of sensorineural hearing loss in this group, the presence of diseases accompanied by an increasing use of medications, and finally changes in life that may bring on changes in mood, depression, and anxiety (Salvago et al., 2012).

We displayed tinnitus localization in all patients (Table 2). Most of the patients had bilateral tinnitus (59.4%). Unilateral tinnitus was more common in the left ear (59.5% of all cases of unilateral tinnitus). Twenty-five patients (2.4%) described their tinnitus as non-lateralized, i.e. present in the head.

**Table 2.** *Tinnitus localization in all tinnitus patients*

| Localization | Males | % | Females | % | Total | % |
|---|---|---|---|---|---|---|
| Right ear | 80 | 7.6 | 82 | 7.8 | 162 | 15.5 |
| Left ear | 121 | 11.6 | 117 | 11.2 | 238 | 22.8 |
| Both ears | 361 | 34.5 | 260 | 24.9 | 621 | 59.4 |
| In the head | 11 | 1.1 | 14 | 1.3 | 25 | 2.4 |
| Total | 573 | 54.8 | 473 | 45.2 | 1046 | 100 |

A total of 400 patients had unilateral tinnitus (Figure 1). Most of them had hearing loss in both ears (25.2%), but there was a higher prevalence on the side with greater hearing loss. There were no cases of tinnitus in a normal hearing ear and hearing loss in the contralateral ear.

In terms of tinnitus localization, many authors reported similar results. According to Henry et al. (2010), tinnitus is bilateral in most cases. Newall et al. (2001) reported symptoms in both ears in 48% of tinnitus sufferers. Steinmetz et al. (2009) also found more prevalent bilateral tinnitus in their study. Axelsson and Prasher (2000) concluded that tinnitus was most often bilateral, but much more common in the left ear than in the right. Nicolas-Puel et al. (2006) also reported more frequent left-sided tinnitus. A small percentage of the patients in our study described their tinnitus as non-lateralized, present in the head. Tinnitus cranii may be confused with bilaterally symmetrical tinnitus aurium (Singh, 2014).

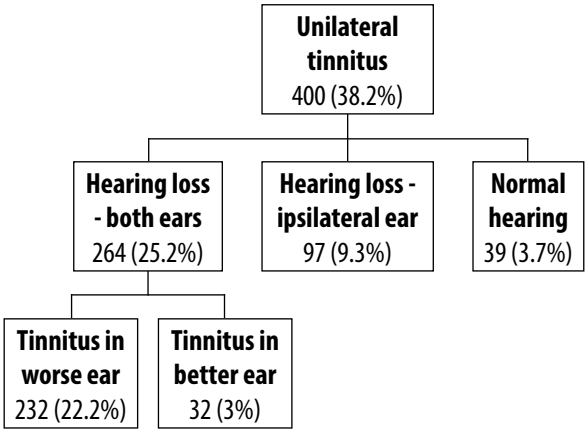


**Figure 1.** *Presence of hearing loss in patients with unilateral tinnitus*

In our study, a total of 961 patients (91.9%) had pathological audiograms and 85 (8.1%) had normal hearing. Fifty-four patients (5.6%) had pathological audiograms only in the right ear, 70 (7.3%) had pathological audiograms only in the left ear, and 837 patients (87.1%) had pathological audiograms in both ears. Out of a total of 2,092 audiograms, 1,798 (86%) were pathological, 891 (42.6%) in the right ear and 907 (43.4%) in the left ear. A total of 294 audiograms (14%) were not pathological, 155 (7.4%) in the right ear and 139 (6.6%) in the left ear.

The estimated prevalence of hearing loss among tinnitus patients in our study was similar to previously reported prevalence rates. The percentage of tinnitus patients without hearing impairment varies from 8% for individuals with pure-tone thresholds ≤20 dB HL for all standard audiometric frequencies up to 8 kHz, to about 30% for patients with

average thresholds at 1, 2, 4, and 6 kHz ≤25 dB HL (Vernon and Meikle, 2000, according to Fabijańska et al., 2012).

We determined hearing thresholds at frequencies from 125 to 8000 Hz. Normal hearing thresholds have long been regarded as an indicator of the absence of cochlear damage (Epp et al., 2012). Hearing loss at higher frequencies can contribute to manifestations of tinnitus. Even small changes in thresholds (<20 dB HL), at any audiometric frequencies, can have implications for the onset of tinnitus. Whether tinnitus without hearing loss exists is debatable, and it is more likely that all tinnitus sufferers have some degree of hearing loss at much higher frequencies (Adjamian et al., 2012, Lockwood et al., 2002). One can hypothesize that possible causes of tinnitus in patients with normal audiograms in the conventional region (up to 8 kHz) may be linked to cochlear impairment in the most basal region, which is routinely not tested by extended high-frequency audiometry, and/or to subclinical outer hair cells damage corresponding to the conventional frequency region (Fabijańska et al., 2012). Schaette and McAlpine (2011) provided direct physiological evidence of "hidden hearing loss". In the absence of elevated hearing thresholds, they demonstrated how activity-dependent neuronal plasticity in response to hidden hearing loss could lead to pathological activity patterns in the auditory brainstem that potentially trigger the development of tinnitus. A subtile cochlear problem may exist in tinnitus patients before it is definitively noticed on an audiogram (Ishak et al., 2013). Obviously, there is a need to perform extended high-frequency audiometry in tinnitus patients with normal hearing at standard pure-tone audiometry.

We recorded the degree of hearing loss in the worse ear in all tinnitus patients. We calculated the pure tone average at low-mid frequencies, speech frequencies, and high frequencies (Table 3). The hearing thresholds were ≤20 dB hearing level in 477 patients (45.6%) at low-mid frequencies (pure tone average at 500, 1000, or 2000 Hz), 236 patients (22.6%) at speech frequencies (pure tone average at 500, 1000, 2000, and 4000 Hz), and 133 patients (12.7%) at high frequencies (pure tone average at 3000, 4000, and 6000, or 8000 Hz). A total of 569 patients (54.4%) had hearing thresholds >20 dB at low-mid frequencies, 810 patients (77.4%) at speech frequencies, and 913 patients (87.3%) had hearing loss at high frequencies.

Most of the patients had hearing loss at high frequencies. There was a significant difference in the number of patients with hearing loss at high frequencies, low-mid frequencies, and speech frequencies ($\chi^2$=302.6704, df=2, p<0.00001).

Low-mid and high frequency hearing impairment was defined similarly to Shargorodsky et al. (2010).

Most of the patients in our study had some degree of hearing loss. The primary cause of tinnitus is thought to be hearing loss (Hoare et al., 2012). The most common otological conditions were acoustic trauma, NIHL, and presbycusis. Our results are similar to the results of other studies. The most common causes of tinnitus include noise exposure, aging (presbycusis), medications,

**Table 3.** *Degree of hearing loss in tinnitus patients*

| Degree of hearing loss | Low-mid frequencies | Speech frequencies | High frequencies |
|---|---|---|---|
| | No. (%) | No. (%) | No. (%) |
| 0-20 dB HL | 477 (45.6) | 236 (22.6) | 133 (12.7) |
| 21-40 dB HL | 373 (35.7) | 456 (43.6) | 286 (27.3) |
| 41-60 dB HL | 128 (12.2) | 219 (20.9) | 275 (26.3) |
| 61-95 dB HL | 64 (6.1) | 128 (12.2) | 314 (30) |
| >95 dB HL | 4 (0.4) | 7 (0.7) | 38 (3.6) |
| Total | 1046 (100) | 1046 (100) | 1046 (100) |
| Total (0-20 dB HL) | 477 (45.6) | 236 (22.6) | 133 (12.7) |
| Total (>20 dB HL) | 569 (54.4) | 810 (77.4) | 913 (87.3) |
| | | | p<0.00001* |
| Total | 1046 (100) | 1046 (100) | 1046 (100) |

* chi-square test

head injury, middle-ear disease (such as otosclerosis) and Ménière's disease (Preece et al., 2003, Brozoski et al., 2002). Chronic noise exposure is the main cause of tinnitus (Salvago et al., 2012, Axelsson and Prasher, 2000, Nicolas-Puel et al., 2002). In a sample with exposure to impulse noise during shooting practice, Rezaee et al. (2012) reported post-exposure tinnitus in more than 60% of military personnel. Most clinical cases of noise-induced tinnitus are chronic in nature, lasting months to years (Kaltenbach, 2000).

Taking into account that tinnitus can significantly affect the quality of life and the complexity of tinnitus management, we would like to emphasize the fact that the most common type of tinnitus was noise-induced tinnitus in patients with histories of excessive noise exposure, particularly in occupational settings, and to highlight the importance of prevention of noise-induced hearing loss either in occupational, or non-occupational settings.

With the intention of finding a correlation between tinnitus quality and type of hearing loss, we displayed the otological conditions present in tinnitus patients (Table 4). In some cases, there was no single otological condition, or there were different causes of hearing loss, so we classified them according to type of hearing loss. Some patients reported hearing more than one type of sound, tonal tinnitus, atonal tinnitus, insect noise, etc. We displayed the quality of the dominant tinnitus sound, the sound most frequently heard. The most common otological conditions were acoustic trauma and noise-induced hearing loss (NIHL).

In the group with otological conditions, we included one patient with ototoxicity, hearing loss, and tinnitus after aminoglycozide antibiotic therapy. We cannot separately display cases of drug-related tinnitus because more patients classified in other groups used drugs such as salicylates, nonsteroidal anti-inflamatory medications, loop diuretics, etc.

In terms of the tinnitus quality, most of the patients described their tinnitus as high-pitch whistling. They experienced stable, nonpulsatile tinnitus.

Nonpulsatile tinnitus is almost always subjective (Weissman and Hirsch, 2000). Martines et al. (2010) reported high-pitched tinnitus in most cases, associated with high-frequency hearing loss. Many authors reported that noise-induced tinnitus was most often tonal and high pitched (Axelsson and Prasher, 2000, Nicolas-Puel et al., 2006, Ristovska et al., 2015). It is accepted that there is a statistically significant association between high-pitched tinnitus and high-frequency sensorineural hearing loss. When subjects match their tinnitus pitch to a pure tone, most of the matches are at frequencies at which hearing is impaired (Salvago et al., 2012). Low-tone tinnitus (at and below 750 Hz) is more frequently found in Ménière's disease and

**Table 4.** *Otological conditions and tinnitus quality*

| Otological condition/ type of hearing loss | whistling | buzzing | hissing | cricket-like | water running | Total |
|---|---|---|---|---|---|---|
| | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) |
| Acoustic trauma/NIHL | 224 (21.4) | 43 (4.1) | 16 (1.5) | 7 (0.7) | 1 (0.1) | 291 (27.8) |
| Presbycusis | 135 (12.9) | 47 (4.5) | 14 (1.3) | 13 (1.2) | 10 (1) | 219 (20.9) |
| Otitis media | 17 (1.6) | 14 (1.3) | 2 (0.2) | / | / | 33 (3.2) |
| Sudden sensorineural hearing loss | 3 (0.3) | 10 (1) | 1 (0.1) | / | / | 14 (1.3) |
| Tympanic membrane perforation | 1 (0.1) | 3 (0.3) | 2 (0.2) | / | 2 (0.2) | 8 (0.8) |
| Otosclerosis | / | 5 (0.5) | / | / | / | 5 (0.5) |
| Ménière's disease | / | 2 (0.2) | / | / | / | 2 (0.2) |
| Ototoxicity | 1 (0.1) | / | / | / | / | 1 (0.1) |
| Cerumen impaction | / | / | / | 1 (0.1) | / | 1 (0.1) |
| Mixed hearing loss (different etiology) | 82 (7.8) | 110 (10.5) | 3 (0.3) | 1 (0.1) | 4 (0.4) | 200 (19.1) |
| Sensorineural hearing loss (different etiology) | 133 (12.7) | 37 (3.5) | 5 (0.5) | 1 (0.1) | 1 (0.1) | 177 (16.9) |
| Conductive hearing loss (different etiology) | 1 (0.1) | 7 (0.7) | / | / | 2 (0.2) | 10 (1) |
| Normal hearing | 53 (5.1) | 23 (2.2) | 4 (0.4) | 4 (0.4) | 1 (0.1) | 85 (8.1) |
| Total | 650 (62.1) | 301 (28.8) | 47 (4.5) | 27 (2.6) | 21 (2) | 1046 (100) |

**Table 5.** *Type of hearing loss and tinnitus localization*

| Type of hearing loss | Right ear | Left ear | Both ears | In the head | Total |
|---|---|---|---|---|---|
| | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) |
| Conductive (ipsilateral ear) | 13 (1.2) | 10 (1) | / | / | 23 (2.2) |
| Conductive (both ears) | 1 (0.1) | 1 (0.1) | 18 (1.7) | / | 20 (1.9) |
| Sensorineural (ipsilateral ear) | 25 (2.4) | 43 (4.1) | / | / | 68 (6.5) |
| Sensorineural (both ears) | 69 (6.6) | 95 (9.1) | 433 (41.4) | 12 (1.1) | 609 (58.2) |
| Mixed (ipsilateral ear) | 30 (2.9) | 31 (3) | / | / | 61 (5.8) |
| Mixed (both ears) | 6 (0.6) | 29 (2.8) | 84 (8) | 4 (0.4) | 123 (11.8) |
| Conductive/Sensorineural | / | / | 2 (0.2) | / | 2 (0.2) |
| Conductive/Normal hearing | / | / | 9 (0.9) | / | 9 (0.9) |
| Sensorineural/Mixed | / | / | 30 (2.9) | 1 (0.1) | 31 (3) |
| Sensorineural/Normal hearing | / | / | 13 (1.2) | 1 (0.1) | 14 (1.3) |
| Mixed/Normal hearing | / | / | 1 (0.1) | / | 1 (0.1) |
| Normal hearing | 18 (1.6) | 29 (2.8) | 31 (3) | 7 (0.7) | 85 (8.1) |
| Total | 162 (15.5) | 238 (22.8) | 621 (59.4) | 25 (2.4) | 1046 (100) |

some other cochleoapical disorders, and middle-tone tinnitus (1-2 kHz) more often is demonstrated in such diseases as otosclerosis (Claussen, 2005). Tinnitus generated in the middle ear is relatively rare, but it does occur. Sensorineural tinnitus is thought to be the most common form of tinnitus, mainly because noise exposure is so commonly associated with tinnitus onset, and the damage caused by noise is cochlear (Henry et al., 2005). All patients with sudden sensorineural hearing loss examined at our department experienced tinnitus. Some authors reported 80% prevalence of tinnitus in sudden deafness cases (Barreto et al., 2012).

Besides otological disorders, there are other conditions contributing to subjective tinnitus onset. Various metabolic abnormalities may be associated with tinnitus: hypothyroidism, hyperthyroidism, hyperlipidemia, anemia, and vitamin $B_{12}$ or zinc deficiency; neurologic disorders such as multiple sclerosis and head injury (Crummer and Hassan, 2004). Tinnitus may arise as a result of a number of infectious sources, such as Lyme disease, meningitis, or syphilis (Chan, 2009).

Because some patients had bilateral hearing loss and unilateral tinnitus, we analyzed the types of hearing loss and tinnitus localization (Table 5). The most common type of tinnitus was bilateral tinnitus. It was present in 621 patients (59.4%). A total of 609 patients (58.2%) had bilateral sensorineural hearing loss. In cases with unilateral tinnitus, we displayed only the type of hearing loss in the ipsilateral ear, and in cases with bilateral tinnitus or tinnitus in the head, we recorded the type of hearing loss in both ears, either the same type, or a different type in each ear.

In terms of the tinnitus localization, most of the patients had bilateral tinnitus and bilateral sensorineural hearing loss (41.4%). Andersson et al. (2001) also reported sensorineural hearing loss in most tinnitus patients.

## CONCLUSION

Most of the patients with subjective tinnitus have some degree of hearing loss. Bilateral, high-pitched tinnitus and bilateral sensorineural hearing loss, predominantly at high frequencies, were the most common. Acoustic trauma and noise-induced hearing loss, particularly in occupational settings, were the most common otological conditions, and noise-induced tinnitus was the most common type of tinnitus.

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# AUDIOMETRIJSKI NALAZI PACIJENATA SA SUBJEKTIVNIM TINITUSOM

***Sažetak:*** *Tinitus je percepcija zvuka u odsutnosti vanjskog izvora zvuka. U većini slučajeva tinitus je prisutan uz istovremeno oštećenje sluha. Cilj istraživanja bio je utvrditi učestalost, vrstu i stupanj oštećenja sluha u pacijenata sa subjektivnim tinitusom te analizirati karakteristike tinitusa u odnosu na oštećenje sluha. Analizirali smo audiometrijske, otoskopske nalaze i medicinske izveštaje 1046 pacijenata, 573 muškaraca (54.8%) i 473 žena (45.2%), u dobi od 19 do 89 godina. Pacijenti su pregledani na Odjelu za otorinolaringologiju Gradske opće bolnice "8-mi Septemvri", Skoplje, Republika Makedonija, u razdoblju od siječnja 2014. do listopada 2015. Statistička analiza podataka provedena je hi-kvadrat testom uz razinu značajnosti $p<0.05$.*

*Većina pacijenata bili su muškarci u dobi od 60 do 69 godina (13.4%), ali nije bilo značajne razlike u distribuciji po dobi i spolu ($p=0.156$). Prevalencija gubitka sluha kod pacijenata s tinitusom bila je 91.9%. Većina pacijenata imala je bilateralni zamjedbeni gubitak sluha (58.2%), uglavnom na visokim frekvencijama ($p<0.00001$), te su opisivali svoj tinitus kao piskavi zvuk. Bilateralni tinitus bio je najčešće prisutan (59.4%), nakon čega slijedi lijevi jednostrani tinitus (22.8%). Akustična trauma i gubitak sluha izazvan bukom bili su prisutni u 27.8% svih otoloških stanja.*

*Kod većine pacijenata sa subjektivnim tinitusom bio je prisutan neki stupanj gubitka sluha. Bilateralni, visoko-frekventni tinitus i bilateralni zamjedbeni gubitak sluha, uglavnom na visokim frekvencijama, bili si najčešći nalazi. Akustična trauma i gubitak sluha izazvan bukom bili su najčešća otološka stanja, a tinitus izazvan bukom bio je najčešći tip tinitusa.*

***Ključne riječi:*** *subjektivni tinitus, gubitak sluha, audiometrija*