

## Original articles

# Characterization of patients with tinnitus seen by the Hearing Health service

**Edna Lorena Lubo Carrera<sup>1</sup>**

<https://orcid.org/0000-0003-4349-5093>

**Marine Raquel Diniz da Rosa<sup>1</sup>**

<https://orcid.org/0000-0003-0920-2234>

**Jerusa Roberta Massola de Oliveira<sup>1</sup>**

<https://orcid.org/0000-0001-8771-3588>

**Andrea Cintra Lopes<sup>1</sup>**

<https://orcid.org/0000-0002-7680-8618>

**Maria Fernanda Capoani Garcia Mondelli<sup>1</sup>**

<https://orcid.org/0000-0001-7572-209X>

<sup>1</sup> Universidade de São Paulo, Faculdade de Odontologia de Bauru – FOB/USP, Clínica de Fonoaudiologia, Bauru, São Paulo, Brasil.

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## ABSTRACT

**Purpose:** to establish the profile of individuals with tinnitus treated at a Hearing Health service and to associate the symptom with gender, audiological profile, and presence of vertigo.

**Methods:** a descriptive, retrospective study with an analysis of 6,000 medical records of individuals treated at a hearing health service was carried out. The data collected from the medical records were: sociodemographic data, characteristics of hearing impairment, characteristics of tinnitus and vertigo, speech therapy interview, and otorhinolaryngological, audiological, otoneurological assessments, characteristics of life style and risk factors. An descriptive analysis was performed using the Chi-square test of association, adopting a statistical significance level of 5% ( $p < 0.05$ ) for the inferential analysis.

**Results:** there was a statistically significant association between the presence of tinnitus and gender, normal hearing, and vertigo, and a significant association was also found between tinnitus and unilateral and bilateral conductive hearing loss, and unilateral and bilateral sensorineural hearing loss.

**Conclusion:** there was a significant association, in the population evaluated, for the presence of tinnitus and female gender, normal hearing, unilateral and bilateral conductive hearing loss, unilateral and bilateral sensorineural hearing loss, and the presence of vertigo.

**Keywords:** Tinnitus; Vertigo; Hearing; Hearing Loss

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**Corresponding address:**

Edna Lorena Lubo Carrera  
Rua Francisco Alves Mendes Filho, 190  
CEP: 830500420 - Campo Largo,  
Paraná, Brasil  
E-mail: [lorenalubo.c@gmail.com](mailto:lorenalubo.c@gmail.com)

## INTRODUCTION

Tinnitus is an auditory sensation without external sound stimulation, which can be described by its perceptual characteristics: location, intensity, frequency, and timbre<sup>1</sup>. It indicates changes in the functioning of the auditory system and/or other structures that can interfere with the symptom, even in cognitive or emotional processes, which can impact the quality of life<sup>2</sup>.

Researchers report that tinnitus may have a multifactorial etiology, with an association being described with middle ear diseases, neurological, neurodegenerative, cardiovascular, metabolic, and psychological disorders or associated with sensorineural hearing loss (HL), but it can also be referred by individuals with normal hearing in about 5 to 10% of cases, being suggestive of a predictive sign of hearing loss or an existing alteration<sup>3</sup>.

HL can be considered one of the most disabling disabilities, affecting people's quality of life, and when acquired in adults, it can occur in several ways, such as gradually, interfering with interpersonal communication, language, and other activities of the child. everyday life, with psychological and developmental consequences<sup>4</sup>.

According to data from the World Health Organization (2021), by the year 2050, almost 2.5 billion people worldwide will live with some degree of hearing loss. In Brazil, studies have shown that 2.2 million people have this sensory deprivation.

Tinnitus is one of the main complaints in patients with hearing loss, especially in those who are frequently exposed to noise, significantly reducing attention and concentration, increasing the risk of falls and sleep disorders, and impairing the performance of different daily tasks and quality of life<sup>5</sup>.

There are two main types of tinnitus: "objective" tinnitus, caused by a sound source from the body, such as spontaneous muscle contractions in the middle ear or oropharynx, turbulence related to a vascular problem and spontaneous otoacoustic emissions, and "tinnitus" subjective", without an identifiable acoustic source, which is the most frequent<sup>2</sup>.

According to the World Health Organization (WHO), 278 million individuals have tinnitus, which corresponds to approximately 15% of the world population, and this prevalence increases to 35% among individuals over 60 years of age. In the Brazilian scenario, the prevalence is 31.6%, with a significant relationship with advancing age, the occurrence of diabetes mellitus, and thyroid changes<sup>6</sup>.

Considering the prevalence of tinnitus, its impact on the quality of life of individuals, and its close relationship with HL, it is important to map this scenario, establishing the profile of individuals with these conditions. Therefore, the present study aimed at establishing the profile of individuals with tinnitus, treated at a Hearing Health service, and associating the symptom with gender, audiological profile, and vertigo. This mapping provides evidence for current theoretical bases that allow the monitoring and adequate care of these individuals, in order to subsidize possible interventions and determine relevant referrals.

## METHODS

The study presented a descriptive, retrospective design, with a source of data from medical records, with approval by the Research Ethics Committee of the Faculdade de Odontologia de Bauru da Universidade de São Paulo (FOB/USP), Brazil, under opinion number: 4,393,731. The analysis encompassed 6,000 medical records of individuals treated at a hearing health service accredited to the Unified Health System, including the following eligibility criteria: having tinnitus; male or female, and all socioeconomic levels. Exclusion criteria were: children, having described severe emotional impairment, comorbidities, and neurovegetative alterations documented in the medical records by the medical team. The data collected from the medical records were sociodemographic data, such as the characteristics of hearing loss, the characteristics of tinnitus, and vertigo, as well as data from the speech-language pathology interview.

Data were stored and tabulated in the Excel program. To classify the type/degree of hearing loss, the classification from Silman to Silverman (1997) was used as a reference.

A descriptive analysis was performed, presenting absolute values and percentages and the Chi-square association test, adopting a statistical significance level of 5% ( $p < 0.05$ ) for the inferential analysis.

## RESULTS

Of the total number of records analyzed, that is, 6,000 records of individuals who were seen at the hearing health service in the period proposed for collection, only 3,332 met the eligibility criteria. Most (2,518) had comorbidities that could generate tinnitus, others (150) had exclusion criteria such as severe emotional impairments described and neurovegetative

alterations documented in the medical records by the medical team. Fifty medical records were from children.

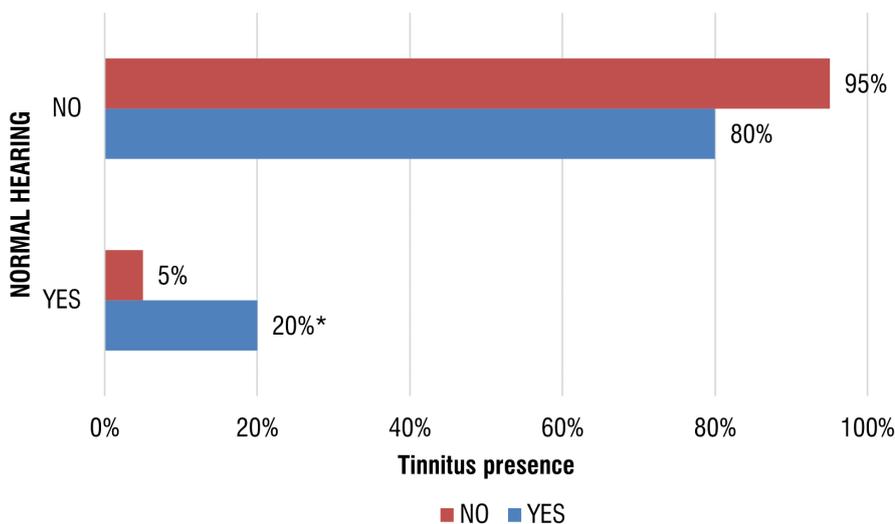
A descriptive analysis of data collected from 3,332 individuals revealed that 1,854 (56%) were females and 1,478 (44%) were males. The age ranged from 1 to 90 years, with a mean of 64 years and a standard deviation of 23.90. According to the audiological evaluation, 523 (16%) had normal hearing, 170 (5%) had unilateral sensorineural hearing loss, 1,935 (58%) had bilateral sensorineural hearing loss, 41 (1%) had unilateral conductive hearing loss, 54 (2%) had bilateral conductive hearing loss, 77 (2%) unilateral mixed hearing loss, 325 (10%) bilateral mixed hearing loss, 112 (3%) unspecified sensorineural hearing loss and 95 (3%) unspecified mixed hearing loss.

According to the speech therapy interview, of the total sample of patients who had normal hearing or

some degree of hearing loss, the exclusive presence of tinnitus was found in 1,264 (55%), with different types, intensities, and impairments. In another 274 (27%), an isolated episode of vertigo was found. However, it is noteworthy that many individuals had tinnitus and vertigo simultaneously, in a total of 1,056 (46%), while in 738 (73%) these two symptoms were not present.

The inferential analysis verified the association with significance between the gender variables and the presence of tinnitus ( $p=0.011$ ).

Additionally, the relationship between the diagnosis according to the 2014 World Health Organization (WHO) classification of normal hearing and the presence of tinnitus was verified. The results of this association are shown in Figure 1, so that significance was verified ( $p<0.001$ ).



YES= individuals with normal hearing and tinnitus.

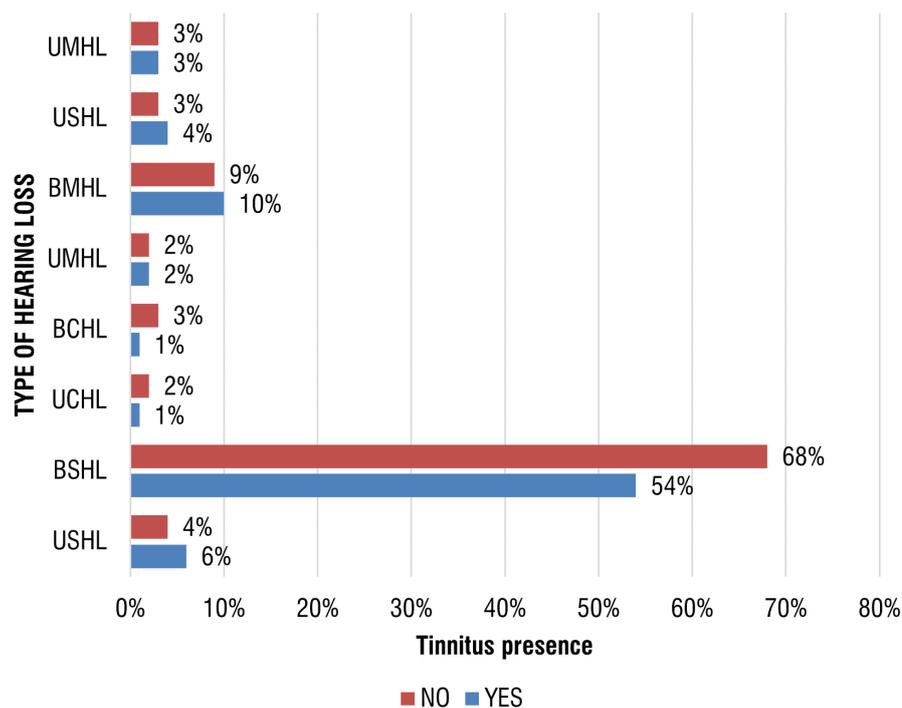
NO= individuals without normal hearing and without tinnitus.

\*=Statistically significant relationship between normal hearing and presence of tinnitus obtained through statistical analysis by the Chi-square Test.

**Figure 1.** Results of the association between the variables normal hearing and the presence of tinnitus

The type of hearing loss was analyzed in this sample, in order to verify its association with the presence of tinnitus. The analysis showed significance between unilateral sensorineural hearing loss ( $p=0.014$ ),

bilateral sensorineural hearing loss ( $p=0.000$ ), and unilateral ( $p=0.018$ ) or bilateral ( $p=0.000$ ) conductive hearing loss, and the presence of tinnitus, as shown in Figure 2.

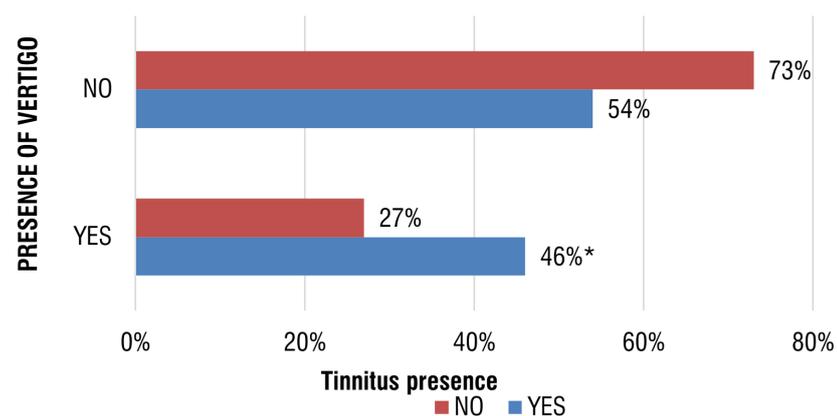


PAMNE=Unspecified mixed hearing loss; PASNE=Unspecified sensorineural hearing loss; BPBP=Bilateral mixed hearing loss; PAMU=Unilateral mixed hearing loss; PACB=Bilateral conductive hearing loss; PACU=Unilateral conductive hearing loss; PASB=Bilateral sensorineural hearing loss; PASU=Unilateral sensorineural hearing loss

\*=Statistically significant relationship between hearing loss and presence of tinnitus obtained through statistical analysis by the Chi-squareTest.

**Figure 2.** Association between types of hearing loss and the presence of tinnitus

The association between the presence of vertigo and the presence of tinnitus was verified so that there was significance ( $p=0.000$ ) between these variables (Figure 3).



YES= subjects with vertigo and tinnitus.

NO= subjects without vertigo and without tinnitus.

\*=Statistically significant relationship between the presence of vertigo and the presence of tinnitus obtained through statistical analysis using the Chi-square Test.

**Figure 3.** Association between the presence of vertigo and the presence of tinnitus

## DISCUSSION

It was evidenced that tinnitus affects individuals of both genders and is present at all ages, with a higher rate in the age group from 66 to 67 years, and may not present with the same characteristics at different stages of life. Thus, the impact, of the individual's management of tinnitus, as well as their awareness, can be specific, considering age.

The presence of tinnitus and concomitant vertigo was observed in the results, where 46% of the individuals presented these symptoms, allowing us to infer that the quality of life of individuals becomes impaired and health care intensified. Therefore, it is important to carry out research in hearing health services that alert the medical community about the proposals for the management of vertigo and the importance of the symptom<sup>7</sup>.

As tinnitus is often perceived in the ear, this leads clinicians and individuals to believe that tinnitus has its origin in this organ, but tinnitus may have another etiological site. Thus, although there is a close relationship between tinnitus and hearing loss, this study showed that, in the association made between tinnitus and normal hearing, there is significance. The result of this study indicates that in the audiological assessment according to the 2014 World Health Organization (WHO) classification, 16% of individuals with tinnitus had normal hearing agrees with the literature since the study by Vieira et al., (2010)<sup>8</sup> the same percentage was found.

On the other hand, when diagnosing normal hearing, assessment with conventional audiometry was used exclusively (frequencies from 250 to 8KHz), with no high-frequency audiometry data and/or complementary tests that could suggest the beginning of a hearing loss in this population; as is the case of the study carried out by Maggi et al. (2018)<sup>9</sup> where tinnitus and auditory thresholds in the conventional and high-frequency ranges were analyzed in adolescents, determining that the differences between the auditory thresholds were mainly greater in the high-frequency range.

The percentage of individuals with normal hearing in this study is also similar to the result of the study carried out by McCormack et al. (2016)<sup>10</sup>, which showed an incidence in about 5 to 10% of cases. This could indicate that, despite being a less frequent condition, it may be a sign suggestive of future hearing loss, of hearing loss above the frequency of 8,000 Hz or alterations in the functioning of the central auditory pathways; or it simply allows us to think that, probably, tinnitus

does not always determine alterations in the auditory pathways, but it may also be related to the perception of spontaneous activity.

Another finding of this study was that 60% of the cases of participants with tinnitus had hearing loss, mainly bilateral sensorineural hearing loss. This information is also present in the study carried out by Manche et al. (2016)<sup>11</sup>, with 96.9% of patients with tinnitus having hearing loss, as well as, by Rodriguez et al., (2019)<sup>12</sup> who, in an investigative study, concluded that, in 48.3% of the population, the association between tinnitus and audiograms with altered high frequencies and sensorineural type predominated. However, in research developed by Manche et al. (2016)<sup>11</sup>, the results differ from those of this study, as these authors observed that conductive hearing loss is the most common cause of the association between hearing loss and tinnitus, compared to sensorineural hearing loss. In the case of this study, specifically, the relationship between the presence of tinnitus and unilateral and bilateral conductive hearing loss was 1%. This result could be determined by a possible relationship with infectious processes, the rigidity of the ossicular chain, or also with nasopharyngeal factors involved in Eustachian tube dysfunction, generating infections in the middle ear and, later, affecting the sound transmission system.

Finally, the association between tinnitus and vertigo was verified, which are closely related to the symptoms of common diseases that affect the inner ear, such as benign paroxysmal postural vertigo (BPPV), Vestibular Migraine (VM) and Ménière's Disease. (MD). In this research, 46% of the participants reported these two symptoms simultaneously during the otorhinolaryngological and speech-language pathology evaluation, which allows us to indicate that anatomical, pathological and psychological factors may contribute to the appearance of these two otologic symptoms, taking into account the hypotheses involved in the origin of the symptoms. previously mentioned diseases such as BPPV, in which tinnitus can accompany vestibular symptoms due to the anatomical connections between the vestibular and cochlear systems, as mentioned in the work developed by Kocabaş et al., (2021)<sup>13</sup>

Based on the results found, it was observed that tinnitus may have different etiological bases, evidencing the need for a global otorhinolaryngological assessment of the individual so that it becomes possible to treat the underlying disease of the symptom generation. Thus, in the face of this symptom, it is necessary for

the clinician to always be attentive and careful, carrying out an assessment of the individual's general health as early as possible with greater efficiency to establish an accurate diagnosis.

Another important aspect is the need to work with a multidisciplinary team, with neurologists, psychiatrists, endocrinologists, nutritionists, physiotherapists, psychologists, dentists, and others, which allows a global assessment, as it includes, in addition to auditory aspects, general aspects of health, as well as in the treatment, considering that each one must intervene in the causal factor that is their responsibility, in order to determine the best conduct to be adopted for the patient, and reduce the impacts on the quality of life<sup>14</sup>.

In this study, it was possible to measure the occurrence of tinnitus in a service accredited to the Unified Health System, which can be extended to other services, given the relevance of the number of participants. In this way, two important points are highlighted: the need for the multidisciplinary team to include professionals from Otorhinolaryngology, Audiology, and related areas, to help in the effective understanding to address the issue of tinnitus with the user of the hearing health service and the need for public policies that move between awareness, prevention, and management of tinnitus.

## CONCLUSION

There was a significant association, in the population evaluated, between the presence of tinnitus and female gender, normal hearing, unilateral and bilateral conductive hearing loss, unilateral and bilateral sensorineural hearing loss, and the presence of vertigo.

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