

Tinnitus Complaint and Health Changes

Queixa de Zumbido e Alterações de Saúde

Queja del Acúfeno y Alteraciones de la Salud

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Abstract

Purpose: To verify the relation between tinnitus complaint, in patients with lower frequency thresholds from 3000 Hz, with gender and age group and association with health changes. **Methods:** The medical records of adults and the elderly were analyzed. They were treated in the period between September 2013 and June 2016, with complaints of tinnitus and audiological diagnosis of normal hearing, considering the means of frequencies of 500, 1000 and 2000 Hz, with lowering frequency of 3000 Hz in both ears. The analysis included the absence or presence of self-reported health disorders such as hypertension, diabetes, cholesterol, and psychosocial disorders such as depression and anxiety. **Results:** The study group consisted of 38 patients, 21 women and 17 men, 21 adults and 17 elderly people. From the total, 68.4% reported health changes, 50% reported hypertension, 18.4% presented psychosocial changes, and 13.2% had diabetes and cholesterol. There was a significant association between the presence of altered health in women, as well as variable hypertension in elderly women. **Conclusion:** A similar distribution was found in both gender and age variable, with a low prevalence in women compared to men, and in adults compared to the elderly people. Most of the patients (68,4%) presented some health change, with prevalence of changes in women. Among changes, Arterial Hypertension was the most referred (50%), with a significant association regarding elderly women.

Keywords: Tinnitus; Hearing; Disease; Self Report; Adult; Aged; Hearing Loss

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Authors' contributions:

GCF: study design, data collection, analysis and interpretation of research results, drafting and final review.

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Resumo

Objetivo: Verificar a relação entre a queixa de zumbido, em pacientes com rebaixamento dos limiares das frequências a partir de 3000 Hz, com o gênero e faixa etária e associação com alterações de saúde. **Métodos:** Foram analisados os prontuários de adultos e idosos, atendidos entre o período de setembro de 2013 a junho de 2016, com queixa de zumbido e diagnóstico audiológico de audição normal considerando a média das frequências de 500, 1000 e 2000 Hz, com rebaixamento nas frequências a partir de 3000 Hz em ambas as orelhas. Considerou-se na análise, a ausência ou presença de alteração de saúde autorrelatadas como hipertensão, diabetes, colesterol e alterações psicossociais como depressão e ansiedade. **Resultados:** O grupo estudado ficou constituído por 38 sujeitos, 21 mulheres e 17 homens, sendo 21 adultos e 17 idosos. Do total, 68,4% referiram alteração de saúde, desses, 50% relataram hipertensão arterial, 18,4% alteração psicossocial e 13,2% diabetes e colesterol. Existiu associação significativa entre a presença de alteração de saúde e as mulheres, bem como entre a variável hipertensão arterial e as mulheres idosas. **Conclusão:** Encontrou-se distribuição semelhante tanto na variável gênero como na idade, com discreta prevalência das mulheres em relação aos homens, e dos adultos com relação aos idosos. A maioria dos pacientes (68,4%) apresentou alguma alteração de saúde, havendo prevalência de alterações nas mulheres. Dentre as alterações, a Hipertensão Arterial foi a mais referida (50%), com associação significativa nas mulheres idosas.

Palavras-chave: Zumbido; Audição; Doença; Autorrelato; Adulto; Idoso; Perda Auditiva

Resumen

Objetivo: Verificar la relación entre la queja del acúfeno, en pacientes con reducción de los umbrales de frecuencias comprendidos entre 3000Hz, con el género y la edad y asociación con alteraciones de salud. **Métodos:** Fueron analizados los registros de adultos y ancianos, atendidos entre el período de septiembre de 2013 a junio de 2016, con queja de acúfeno y diagnóstico audiológico de audición normal considerando la Media Tritonal de 500, 1000 y 2000 Hz, con reducción en las frecuencias a partir de 3000 Hz en ambas orejas. Se Consideró en el análisis, la ausencia o presencia de alteraciones de salud autorrelatadas como hipertensión, diabetes, colesterol y alteraciones psicossociales como depresión, ansiedad. **Resultados:** El grupo estudiado quedó constituído por 38 individuos, 21 mujeres y 17 hombres, siendo 21 adultos y 17 ancianos. Del total 68,4% presentaron alteraciones de salud, de esos, 50% presentaron hipertensión arterial, 18,4% alteración psicossocial y 13,2% alteración de diabetes y de colesterol. Existió asociación significativa entre la presencia de alteración de salud de las mujeres, bien como entre a variable hipertensión arterial y las mujeres ancianas. **Conclusión:** Se encontro distribución semejante tanto en el variable género como edad, con discreta prevalencia de las mujeres en relación a los hombres y de los adultos con relación a los ancianos. La mayoría de los pacientes presentó alguna alteración de salud (68,4%), hubo prevalencia de alteraciones en las mujeres. Entre las alteraciones, la Hipertensión Arterial fue la más citada (50%), con asociación significativa en las mujeres ancianas.

Palabras clave: Acúfeno; Audición; Enfermedad; Autoinforme; Adulto; Anciano; Pérdida Auditiva

Introduction

Tinnitus can be described as the perception of a sound in the absence of a corresponding external source¹, and it is a quite common auditory complaint in the speech-language clinic. According to international data, the prevalence of tinnitus in the general population rose from 15% to 25.3% in just 15 years, and these figures grow with increasing

age². On the basis of a national epidemiological study³, the prevalence of tinnitus corresponds to 22% in the adult population of the city of São Paulo.

Considered as a symptom that affects the auditory pathways, tinnitus may be caused by otologic diseases, such as acoustic trauma, exposure to noise, presbycusis, among others^{3,4}. It may also be due to disorders that collaterally affect the ear, such as metabolic, cardiovascular, neurological, pharmacological, psychiatric and dental disorders^{3,4}.

Arterial Hypertension (AH) is a circulatory disorder, considered chronic, asymptomatic and multifactorial in origin, characterized by the presence of high blood pressure levels⁵. In Brazil, it is estimated that more than 30% of the population suffers from hypertension, reaching more than 50% of the population aged over 60 years⁶. In this group, tinnitus is a commonly reported symptom^{7,8}.

Regarding metabolic alterations, the prevalence of Diabetes Mellitus (DM) has been increasing in recent years⁹. According to the authors, symptoms such as hypoacusis, tinnitus and dizziness are frequently reported by diabetic individuals. Complaints of tinnitus have also been observed in patients with altered cholesterol levels¹⁰.

Studies have shown that tinnitus can cause quality of life impairment, interfere with work routine, sleep and communication^{11,12}. Frequently, its perception exceeds the individual's capacity for adaptation and tolerance, thus causing physical, mental and/or emotional exhaustion¹¹.

Complaints of tinnitus are related to psychological aspects, which interfere in the way tinnitus is interpreted and approached by the individual¹³. Therefore, emotional reactions attributed to tinnitus are considered the key factors contributing to increase the discomfort caused by tinnitus¹⁴, which may be associated with depression, anxiety and other psychological and psychiatric disorders¹.

The presence of tinnitus is frequently reported by individuals with or without hearing loss^{2,15,16}.

In cases where tinnitus is associated with hearing loss, the use of hearing aids is recommended as a form of intervention, aiming at decreasing the effects of hearing impairment on quality of life, minimizing or eliminating tinnitus perception, as well as reducing speech recognition difficulties. However, in cases in which the lowering of thresholds is restricted to high frequencies, the indication of hearing aids is considered controversial according to the Ordinance GM 793 and 835 (2012)¹⁷. In private-sector clinics, this type of indication is also questioned, since the expected benefit derived from the use of hearing amplification devices is not always achieved.

Hence, as set out above, one can observe that possible interventions for tinnitus represent a challenge, especially among patients with auditory configurations that generate controversy regarding the hearing aids adaptation. In these cases, it becomes even more important to investigate which

factors may be associated with this symptom, in an attempt to ease the discomfort.

It is necessary to clarify some aspects related to the pathophysiology of tinnitus, in order to manage its treatment, thus, the present study aimed at investigating the relationship between tinnitus complaint in patients with low- frequency thresholds from 3000 Hz with gender and age group, as well as the association between tinnitus complaint and the aforementioned changes in the health status of individuals.

Method

This study was based on the extraction and analysis of retrospective database and files of patients with tinnitus who underwent audiological evaluation between September 2013 and June 2016. The research was developed in a Hearing Healthcare Center of a Higher Education Institution, previously approved by the Research Ethics Committee, under the protocol number 05765712.3.0000.5346.

The medical records of adult and elderly patients were analyzed, considering the following inclusion criteria: presence of tinnitus complaint and normal hearing diagnosed through audiological test, based on the tritonal average of the 500, 1000 and 2000 Hz frequencies, with a reduction (from 25 dB) in the high frequency thresholds in both ears (from 3000 Hz)^{18,19}.

The analysis took into account the absence or presence of health alterations such as hypertension, diabetes (the type was not specified), cholesterol, as well as psychosocial changes such as depression and anxiety, and these were self-reported by the individuals during the anamnesis, without medical confirmation of the diagnosis or diagnostic hypothesis. Psychosocial changes were considered present when the medical record indicated the use of medication. For the analysis of the age group, the patients were grouped according to age: adults, between 30 and 60 years old, and the elderly, aged over 60 years.

Individuals whose information related to tinnitus complaint and/or health problems were incomplete, or those presenting alterations in the middle ear and conductive and/or mixed hearing loss, and those who presented or reported neurological changes were excluded.

To define the study sample, a descriptive analysis of the variables was initially carried out. Data processing was performed using Microsoft Office Excel. Statistical Package for the Social Sciences (SPSS) software version 15.0 was used in the statistical analysis. In the bivariate analysis, Chi-square association tests and Fisher's exact test were performed when appropriate, due to the fact that the number of expected cells was inferior to 5%. To analyze the comparison between the presence or absence of alterations related to the age variable, the Kolmogorov-Smirnov normality test was applied and the distribution was considered normal when $p > 0.05$.

Results

The sample consisted of 38 patients complaining of tinnitus and lower thresholds from 3000 Hz, of which 26 patients had health impairment and 12 did not present any health changes. Of these, 21 were female and 17 male, between 34 to 70 years old. The overall mean age was 55.95 years (± 9.26), 53.71 (± 9.20) years for females and 58.71 (± 8.81) years for males. The elderly group consisted of 17 subjects, with a mean of 64.35 years (± 3.04), and the adult group comprised 21 subjects, with a mean age of 49.14 (± 6.52) years.

Table 1 shows the descriptive data of the sample group, considering the variables gender, age groups and health changes.

Table 1. Characteristics of individuals with tinnitus complaints and lower frequency thresholds from 3000 Hz

Variables	Frequency	Percentage
Gender		
Male	17	44,7%
Female	21	55,3%
Groups		
Adult	21	55,3%
Elderly	17	44,7%
Hipertension		
Present	19	50,0%
Absent	19	50,0%
Diabetes		
Present	5	13,2%
Absent	33	86,8%
Cholesterol		
Present	5	13,2%
Absent	33	86,8%
Psychosocial		
Present	7	18,4%
Absent	31	81,6%

Table 2. Evaluation of the relationship between gender and self-reported health alterations

Variables	Gender			p-value
	Total	Male n (%)	Female n (%)	
Hipertension				
Present	19 (50%)	5 (29,4%)	14 (66,7%)	0,022*
Absent	19 (50%)	12 (70,6%)	7 (33,3%)	
Diabetes				
Present	5 (13,2%)	1 (5,9%)	4 (19,0%)	0,243F
Absent	33 (86,8%)	16 (94,1%)	17 (81,0%)	
Cholesterol				
Present	5 (13,2%)	2 (11,8%)	3 (14,3%)	0,604F
Absent	33 (86,8%)	15 (88,2%)	18 (85,7%)	
Psychosocial				
Present	7 (18,4%)	1 (5,9%)	6 (28,6%)	0,082F
Absent	31 (81,6%)	16 (94,1%)	15 (71,4%)	
Alterations				
Present	26 (68,4%)	8 (47,1%)	18 (85,7%)	0,011*
Absent	12 (31,6%)	9 (52,9%)	3 (14,3%)	

Chi-Square Test and ^FFischer's Exact Test.*Values showing a significant association ($p \leq 0,05$)

A correlation between gender and hypertension was observed, and the female gender was associated with the presence of hypertension. Another variable significantly associated with gender was

the presence or absence of health changes, and a higher prevalence of health changes was observed among women.

Table 3. Evaluation of the relationship between age groups and health alterations

Variables	Group			p-value
	Total	Adult n (%)	Elderly n (%)	
Hipertension				
Present	19 (50%)	11 (52,4%)	8 (47,1%)	0,744
Absent	19 (50%)	10 (47,6%)	9 (52,9%)	
Diabetes				
Present	5 (13,2%)	4 (19,0%)	1 (5,9%)	0,243F
Absent	33 (86,8%)	17 (81,0%)	16 (94,1%)	
Cholesterol				
Present	5 (13,2%)	1 (4,8%)	4 (23,5%)	0,112F
Absent	33 (86,8%)	20 (95,2%)	13 (76,5%)	
Psychosocial				
Present	7 (18,4%)	5 (23,8%)	2 (11,8%)	0,302F
Absent	31 (81,6%)	16 (76,2%)	15 (88,2%)	
Alterations				
Present	26 (68,4%)	14 (66,7%)	12 (70,6%)	0,796
Absent	12 (31,6%)	7 (33,3%)	5 (29,4%)	

Chi-Square Test and ^FFischer's Exact Test.*Values showing a significant association ($p \leq 0,05$)

According to the results, there was no significant association between the health alterations analyzed with the variable age (adult or elderly).

There was no significant association between the variable gender and the health changes evaluated in the adult group.

Table 4. Evaluation of the relationship between gender and health alterations in the adult group

Variables	Gender			p-value
	Total	Male n (%)	Female n (%)	
Hipertension				
Present	11 (52,4%)	2 (33,3%)	9 (60,0%)	0,268F
Absent	10 (47,6%)	4 (66,7%)	6 (40,0%)	
Diabetes				
Present	4 (19,0%)	0 (0,0%)	4 (26,7%)	0,228F
Absent	17 (81,0%)	6 (100,0%)	11 (73,3%)	
Cholesterol				
Present	1 (4,8%)	0 (0,0%)	1 (6,7%)	0,714F
Absent	20 (95,2%)	6 (100,0%)	14 (93,3%)	
Psychosocial				
Present	5 (23,8%)	0 (0,0%)	5 (23,8%)	0,148F
Absent	16 (76,2%)	6 (100,0%)	10 (76,2%)	
Alterations				
Present	14 (66,7%)	2 (33,3%)	12 (80,0%)	0,064F
Absent	7 (33,3%)	4 (66,7%)	3 (20,0%)	

Chi-Square Test and †Fischer's Exact Test.
*Values showing a significant association (p≤0,05)

Table 5. Evaluation of the relationship between gender and health alterations in the elderly group

Variables	Gender			p-value
	Total	Male n (%)	Female n (%)	
Hipertension				
Present	8 (47,1%)	3 (27,3%)	5 (83,3%)	0,043F*
Absent	9 (52,9%)	8 (72,7%)	1 (16,7%)	
Diabetes				
Present	1 (5,9%)	1 (9,1%)	0 (0,0%)	0,647F
Absent	16 (94,1%)	10 (90,9%)	6 (100,0%)	
Cholesterol				
Present	4 (23,5%)	2 (18,2%)	2 (33,3%)	0,445F
Absent	13 (76,5%)	9 (81,8%)	4 (66,7%)	
Psychosocial				
Present	2 (11,8%)	1 (9,1%)	1 (16,7%)	0,596F
Absent	15 (88,2%)	10 (90,0%)	5 (83,3%)	
Alterations				
Present	12 (70,6%)	6 (54,5%)	6 (100,0%)	0,075F
Absent	5 (29,4%)	5 (45,5%)	0,0 (0,0%)	

Chi-Square Test and †Fischer's Exact Test.
*Values showing a significant association (p≤0,05)

It was found a significant association between gender and hypertension, as women showed a higher prevalence of this health alteration in comparison with men in the elderly group.

Discussion

In the study sample, it was observed that 55.5% of the patients were female, similar to the findings of other studies^{3,7,15,20} (Table 1). Regarding the influence of gender on the predominance of the tinnitus complaint, the findings in literature are controversial, as some studies found a prevalence of tinnitus among male individuals²¹ while others found this prevalence among women^{7,22}. However, differences between genders are hardly statistically significant.

The prevalence of tinnitus had a significant increase in the last 15 years, ranging from 15% to 25.3% in the general population², and its occurrence is observed in all age groups³. The literature also points out that the increase in the prevalence of tinnitus occurs with increasing age^{1,3,15}.

Regarding the particular age groups, the present research found that the adult group prevailed over the elderly (Table 1). This fact may be associated to the audiological profile of the sample, which displayed a hearing threshold reduction only in high frequencies, indicating the early stages of hearing loss. Thus, it is believed that there were fewer elderly people in this analysis, because, with increasing age, medium and/or low frequencies tend to be compromised^{23,24}.

In consonance with this finding, a study conducted with diabetic and non-diabetic patients aged 33 to 84 years old, when considering hearing loss related to age, found a prevalence of hearing thresholds within normality patterns and an impairment limited to high frequencies, while in older age groups, the authors observed sensorineural changes in other frequencies²³.

Tinnitus has been investigated by different research fields due to its wide association with different pathologies. In relation to the health alterations analyzed, it was verified that 68.4% of the sample presented some of the alterations assessed (Table 1).

Among health changes, arterial hypertension was the main alteration reported by study participants, followed by psychosocial changes (Table 1). It can be observed a significant association between

women and the presence of health alterations (Table 2). This finding corroborates other studies^{10,20,25}.

It has been pointed out in the literature that the perception of tinnitus is one of the symptoms reported by hypertensive individuals of different age groups^{2,7,8}. As a result of impairment of the circulatory system, the inner ear function may be jeopardized due to the decrease in capillary blood flow and oxygen transport caused by increased blood viscosity²⁵.

Considering hypertension as a factor responsible for tinnitus generation is still a source of controversy. Several studies have sought to analyze the relationship between alterations in hearing aids and arterial hypertension in populations from different age groups, and some authors observed this association²⁶ while others did not find it^{1,7,25}.

A correlation between the female gender and arterial hypertension was found (66.7%) (Table 2), a result similar to that observed in a previous study²⁵ which also found a higher proportion of hypertensive women complaining of tinnitus. This association is in agreement with data reported in the literature, which shows that the prevalence of hypertension in women is higher after the fifth decade of life²⁷, and the mean age of female participants in this study was 53.71 years. The prevalence of hypertension among women was verified in both groups of the sample, where there was a significant association between the elderly women group and AH (Tables 4 and 5).

This trend may be related to the various hormonal changes derived from the climacteric period and menopause, which may weaken the cardiovascular system²⁷.

On the other hand, psychosocial disorders have also been observed in patients with tinnitus perception^{1,2,12} corroborating the findings of this study, which observed that this was the second most frequent health alteration reported by the participants (Table 1). A review study¹² found a high prevalence of depressive symptoms in individuals complaining of tinnitus.

Tinnitus, when classified as an important fact by the individual, leads to a greater attentional focus, making its perception more evident. Thus, its association with unpleasant situations, or even danger, contributes to the activation of perception centers²⁸. When such an association occurs, the limbic system is activated. By activating the limbic system, which is responsible for emotions,

memory, mood states and motivation, the individual begins to perceive it for a longer time and sometimes even with an increase in intensity, which can result in attention and concentration problems²⁹. The activation of the Autonomic Nervous System may also occur, leading to a significant increase in discomfort, stress and anxiety levels²⁹.

No significant association was found between the complaint of tinnitus and psychosocial health changes in the sample (Table 2). This finding disagrees with results of another study conducted with adult patients in order to ascertain the prevalence and risk factors associated with tinnitus, in which they found several factors associated with tinnitus, including those of psychological nature, stress and depression¹.

Although there was no association between diabetes mellitus and cholesterol with the complaint of tinnitus in this study, it is known that the metabolism of the ear depends directly on the supply of oxygen and glucose, so changes in blood flow or metabolism may impair inner ear function¹⁰.

Alterations in cholesterol levels, in turn, reduce the release of vasodilator nitric oxide, which can impair cochlear microcirculation, resulting in a decreased mobility by increasing the stiffness of the outer hair cell walls, thus jeopardizing inner ear function³⁰. A study found that 56.91% of the individuals complaining of tinnitus had hypercholesterolemia¹⁰.

In a study carried out to verify the subjective sensation of tinnitus before and after nutritional intervention in patients with tinnitus and metabolic alterations, it was observed that the degree of discomfort introduced by tinnitus fell significantly after nutritional control, thus one can infer that tinnitus appears to be influenced by dietary intake¹⁰.

One of the limitations of the research lies in the fact that health alterations were not investigated through clinical examinations, as they were only considered by the patient self-report, and the group studied was small. However, based on the results found, it is believed that this study will certainly aid future researches. In addition, these findings will help both the professionals who prescribe the use of hearing aids, and those responsible for the process of adaptation in patients with such audiological characteristics.

The present study emphasizes the importance of research and intervention on health aspects, aiming to minimize the effects of alterations that

secondarily affect the auditory system, and to reduce further degeneration of the system, attenuating the symptoms associated.

Conclusion

A similar distribution was found in both gender and age groups, with prevalence slightly higher among women in relation to men and among adults in relation to the elderly. The majority of the patients presented some health alterations, with higher prevalence among females. Among the alterations, arterial hypertension was the most frequent, and it also displayed a significant association with elderly women.

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