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# Profile and prevalence of people with tinnitus: a health survey

## *Perfil e prevalência de pessoas com zumbido: inquérito em serviço de saúde*

### Keywords

Tinnitus  
Prevalence  
Health Survey  
Health Profile  
Primary Health Care

### Descritores

Zumbido  
Prevalência  
Inquérito de Saúde  
Perfil de Saúde  
Atenção Primária à Saúde

### ABSTRACT:

**Purpose:** To estimate the prevalence and characterize the health profile, and tinnitus complaint, of the adult population of a health district in Campinas, in the State of São Paulo. **Methods:** A in-service survey was conducted in all health centers in the district with a random approach to the adult population seeking care at the unit. The sample consisted of 1,720 people, including 1,569 subjects who agreed to participate in the survey and answered a questionnaire including questions on general health and tinnitus. Two regression models were performed according to the variables and a 5% significance level was adopted for the statistical analysis. **Results:** 496 people reported tinnitus, representing a prevalence of 31.6%. Most of the sample was female, had at least one chronic disease and made continuous use of some medication. Respondents reported hearing complaints and the most common type of tinnitus was reported as unilateral, intermittent and acute. The regression models performed showed a higher chance of tinnitus with advancing age and with the occurrence of diabetes and thyroid disorder. **Conclusion:** Tinnitus is related to the occurrence of chronic diseases and advancing age, may cause discomfort and is a reason for seeking treatment. Further population studies are required in different contexts in the Brazilian scenario.

### RESUMO

**Objetivo:** Estimar a prevalência e caracterizar o perfil de saúde, e a queixa de zumbido, da população adulta de um distrito de saúde do município de Campinas, no estado de São Paulo. **Método:** Foi realizado um inquérito em serviço em todos os centros de saúde do distrito com abordagem aleatória da população adulta que entrasse na unidade. A amostra contou com 1.720 pessoas, sendo que 1.569 concordaram em participar da pesquisa e responderam a um questionário contendo perguntas de saúde em geral e sobre zumbido. Para a análise estatística, foram realizados dois modelos de regressão de acordo com as variáveis e o nível de significância considerado foi igual a 5%. **Resultados:** 496 pessoas referiram queixa de zumbido, configurando uma prevalência de 31,6%. A maioria da amostra pertence ao gênero feminino, tem pelo menos uma doença crônica e faz uso contínuo de alguma medicação. Os entrevistados relataram queixa auditiva e o zumbido mais referido foi unilateral, intermitente e agudo. Nos modelos de regressão realizados, observou-se maior chance de zumbido com o avançar da idade e com a ocorrência de diabetes e alteração de tireoide. **Conclusão:** O zumbido apresenta relação com a ocorrência de doenças crônicas e o avançar da idade, tem potencial de gerar incômodo para o indivíduo e é motivo para a busca por tratamento nos serviços de saúde. São necessários mais estudos populacionais em diferentes contextos no cenário brasileiro.

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## INTRODUCTION

Tinnitus can be defined as the perception of sound in the absence of an external sound source. Its multifactorial etiology may be related to several health problems, such as cardiovascular diseases, hormonal changes and otological diseases, among others. Several studies have shown negative implications for the individual's overall quality of life, including proven relationships with difficulty in attention and concentration, insomnia, depression and suicidal ideation<sup>(1-4)</sup>.

The literature reports that tinnitus affects 10-15% of the adult population, and may affect more than 30% of the population over 60 years. Brazilian studies have reported a 22% prevalence of tinnitus in the general population, while studies with smaller samples reported a prevalence above 40% in elderly people<sup>(1-6)</sup>.

Given the high prevalence and the potential negative impact on people's lives, tinnitus can be considered as a Public Health issue and, as such, should be included in the planning design at all levels of care. However, hearing issues in general are rarely addressed in the context of primary care and the comprehensiveness recommended by the Unified Health System is not actually offered in the care provided<sup>(7-8)</sup>.

There are public policies that include tinnitus as a health issue related to the adult population, suggesting that it should be addressed from primary care and, in view of the development of a care network for people with disabilities with diversification of care strategies and articulation in the health network that are associated with hearing care<sup>(9-12)</sup>. However, there is still a lack of the necessary capillarity in the actions developed in the territory and in health centers (HC) and there is also a lack of specific data on this condition to allow the mapping of demand and the planning of management and assistance<sup>(7-8)</sup>.

In this context, this study aimed to estimate the prevalence; characterize the health profile and the complaint of tinnitus; and to qualify the degree of discomfort with the tinnitus on the population over 18 years of age in a health district in Campinas, in the State of São Paulo.

## METHODS

This study was approved by the Research Ethics Committee of the Faculty of Medical Sciences of the Universidade Estadual de Campinas under the no. 2.847.478/2018.

Health surveys are an important tool in order to understand the profile of a population and its risk factors, allowing a comparison in terms of temporality and geographic areas. Due to the direct relationship established with the prevalence, it allows the calculation of the occurrence of a specific health condition and the consequent evaluation of the implemented care policies and models<sup>(12)</sup>.

This study chose to conduct an in-service survey, which is defined as a health survey modality in order to obtain essential information for health planning and management actions. General health data for the population and the health service are obtained through a questionnaire, according to the objective of the study<sup>(12)</sup>.

There are few studies using the in-service survey methodology that address health problems such as tinnitus and fields of knowledge such as speech-language pathology, therefore, there is a lack of information regarding their specific demands for the organization of the health network<sup>(12)</sup>.

## Sample calculation

Campinas is located 98 km from the capital of the State of São Paulo and has a population of more than one million inhabitants. Due to the size and complexity of the population and territory, the city was divided into districts to provide health care and management, with five health districts including up to 200,000 inhabitants<sup>(13)</sup>.

Thus, the Life Conditions Index (LCI) survey of each health district was carried out in order to select the district. The ICV is a variation of the Municipal Human Development Index (mHDI) that assesses aspects such as education, basic sanitation and life expectancy, ranging from one to five, in which one represents the worst life condition<sup>(8)</sup>. Two districts of the investigated municipality had ICVs present in the city (from one to four) and, based on ease of access and the close relationship with management, one of these districts was selected as a research field, thus including 12 HCs.

As an inclusion criterion, the study selected subjects over 18 years of age, who were at the HC at the time of collection and who were able to respond to the questions.

Given that the literature reports a higher prevalence of tinnitus in the adult and elderly populations, and being a subjective complaint, the study selected a population over 18 years old because these individuals have greater ease of elaborating on the complaint.

The district has a total population over eighteen years of 178,541 inhabitants in the 12 health centers<sup>(13)</sup>. Four age groups were considered as domains (15-24 years old, 25-39 years old, 40-59 and 60 years of age or older), for which minimum sample sizes should be calculated and each HC was considered a stratum.

Then, the study carried out a flow mapping in the units. The study included two for-hour visits to each HC, with one visit in the morning and one in the afternoon, using the visit to count the subjects who entered the service and who seemed to be at least eighteen years old.

Based on the flow of each unit and the population of each domain by HC, the sample size was calculated considering a tinnitus rate of 22%, as observed in a specific study of the national context<sup>(6)</sup>, with a maximum coefficient of variation of 10%.

The study understood that the frequency would be the same for all age groups and, thus, the sample size calculated for each domain was 355, with a total of 1,420 subjects. The sample consisted of 1,680 users, with a refusal rate of 15%, in order to achieve the minimum number of interviews required for the sample. With the rounding of the conglomerate draw, a final sample of 1,720 subjects to be approached was obtained.

86 conglomerates were drawn, with each conglomerate corresponding to a period (morning or afternoon) in the health unit. The frequency of users in each HC was observed for two days in alternate periods in order to estimate the size of each conglomerate. Finally, the study defined that 20 users would be approached in each conglomerate.

## Data collection

Since any subject present at the unit at the time of data collection could be a potential participant, a sample draw would not be possible. Therefore, a selection procedure was adopted in order to avoid the choice of individuals, allowing to approach the process to a random draw.

Considering a four-hour period, five users were approached per hour, who was always the first person to enter the unit when the interviewer was available for the next interview. Refusals were also counted in the 20 interviews drawn by period.

The in-service survey was conducted through a questionnaire including questions about the profile of users (gender and age), perception and health habits (occurrence of chronic diseases, frequency in health services and use of medication), and the complaint of tinnitus (time of complaint, type and laterality, degree of discomfort and treatments performed). A Visual Analogue Scale (VAS) was used in the questionnaire to measure the degree of discomfort with tinnitus.

All subjects received and read the Informed Consent Form (ICF) for consent and signature according to the reading and writing skills of each individual.

## Statistical analysis

A multinomial logistic regression model was developed<sup>(14)</sup> including tinnitus as a dependent variable. The results show the estimates obtained from odds ratios, as well as their respective confidence intervals and p-values.

In addition, a multiple Poisson regression model with robust variance<sup>(15)</sup> was adjusted considering the classification of tinnitus (“no” or “yes”) as dependent variable. The results show the estimates obtained from prevalence ratios, as well as their respective confidence intervals and p-values. The same models were applied only to subjects who have had or have tinnitus.

All 5% significance level was adopted for all analyses.

## RESULTS

### Profile and prevalence of tinnitus

In total, 1,569 interviews were conducted, reaching a number higher than the 1,420 planned interviews. As the percentage of users who declined interview (8.8%) was lower than the expected percentage (15%), this resulted in a larger sample than expected.

Of the 1569 interviews carried out, 496 people (31.6%) reported having tinnitus, 441 (28.11%) reported having had tinnitus and 632 users (40.28%) reported never having tinnitus, thus achieving a prevalence of 31.6% of tinnitus occurrence in the studied population.

Most of the subjects who had the complaint of tinnitus were female (58.27%), with a mean age of 59.24 years, a minimum age of 18 years and a maximum age of 91 years. Of these, 73.59% reported having some chronic disease, with high blood pressure being the most frequent, being reported by 265 (72.6%) participants. 77.92% of the people who reported tinnitus also reported the continuous use of some medication.

As an in-service survey, the interview also asked the user's frequency in the service and the most frequent answer was that the subjects had an appointment at the health unit in the previous month (33.47%).

On specific hearing health issues, people who have tinnitus reported hearing problems (56.25%). As for the duration of the complaint, most people reported experiencing tinnitus from one to ten years (64.11%). The tinnitus profile was reported as unilateral (52.22%), intermittent (68.55%) and acute (54.44%).

Participants also reported that tinnitus negatively affects their lives (76.82%), with an average degree of discomfort of 7.74 on a scale of one to ten (Figure 1). 109 people answered that their degree of discomfort was eight, which was the most reported degree.

Regarding the search for treatment, 261 people (52.62%) reported having sought some health service. Most respondents reported having sought a private professional (36.4%). The private professional was considered in this study as the otorhinolaryngologist, made available by a health insurance or private consultation.

An average improvement of 2.24 was reported after treatment, on a scale of zero to ten, with zero as the most reported degree, by 112 of the interviewees (Figure 2).

### Regression models

The age variable showed a significant association in the three models performed (OR=1.02 and PR=1.02), with a 2% increase in the probability of having tinnitus for each additional year and an 2% increase in chances of worsening the condition.

Among the chronic diseases reported, there was a significant association with diabetes in the first (OR=1.61) and in the second (PR=1.18) models (Table 1). Therefore, it can be noted that the individual with diabetes is 61% more likely to have worsening tinnitus than the non-diabetic individual, having a perception of greater intensity; and that those who have diabetes are 18% more likely to have tinnitus than those who do not have the disease.

In turn, thyroid changes also had a significant relationship (PR=1.22) in the second model, showing that people who have it are 22% more likely to have tinnitus (Table 2).

The third model showed that individuals who have tinnitus are 29% (PR=1.29) more likely to have some discomfort and 34% (PR=1.34) are more likely to seek treatment (Table 3).

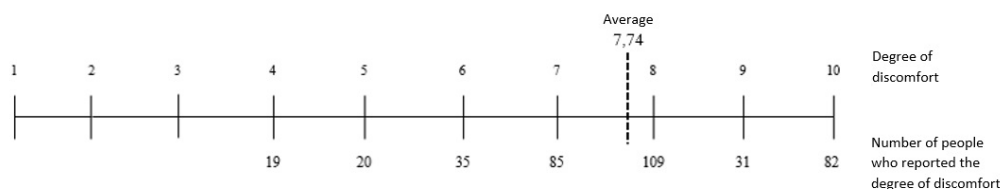
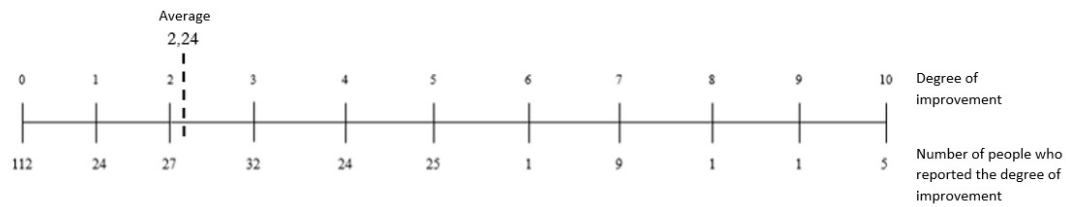


Figure 1. Degree of discomfort reported with tinnitus



**Figure 2.** Degree of improvement after tinnitus treatment

**Table 1.** Odds ratio (OR) after multinomial regression with tinnitus as a dependent variable

Independent variable	Odds ratio <sup>*</sup>	p-value
<b>Age</b>	1.02	<b>&lt;0.0001</b>
<b>Continuous use of medication</b>	1.20	0.1641
<b>Diabetes mellitus</b>	1.61	<b>0.0004</b>
<b>High blood pressure</b>	1.28	0.0527
<b>High cholesterol levels</b>	0.91	0.4856
<b>Thyroid disorders</b>	1.34	0.0614
<b>Other</b>	0.93	0.7481

\*The chance of having higher levels of tinnitus was estimated

**Table 2.** Prevalence ratio (PR) after Poisson regression with tinnitus as a dependent variable ("yes" and "no")

Independent variable	Prevalence ratio <sup>*</sup>	p-value
<b>Age</b>	1.02	<b>&lt;0.0001</b>
<b>Continuous use of medication</b>	1.19	0.1581
<b>Diabetes mellitus</b>	1.18	<b>0.0239</b>
<b>High blood pressure</b>	1.15	0.0976
<b>High cholesterol levels</b>	0.95	0.5461
<b>Thyroid disorders</b>	1.22	<b>0.0258</b>
<b>Other</b>	0.76	0.3032

\*The probability of having tinnitus was estimated ("yes" result)

**Table 3.** Prevalence ratio (PR) after Poisson regression with tinnitus as a dependent variable ("I have" or "I already had")

Independent variable	Prevalence ratio <sup>*</sup>	p-value
<b>Age</b>	1.02	<b>&lt;0.0001</b>
<b>Continuous use of medication</b>	1.05	0.5628
<b>Diabetes mellitus</b>	0.95	0.4012
<b>High blood pressure</b>	1.09	0.1542
<b>High cholesterol levels</b>	0.96	0.5250
<b>Thyroid disorders</b>	1.04	0.6241
<b>Other</b>	0.72	0.1773
<b>Tinnitus negatively affects life</b>	1.29	<b>0.0002</b>
<b>Search for treatment</b>	1.34	<b>&lt;0.0001</b>

\*The probability of having tinnitus was estimated ("I have" result)

## DISCUSSION

### Prevalence

The study found a tinnitus prevalence of 31.6%, which is higher than other similar studies<sup>(3-6)</sup>. This result may be related to the in-service survey methodology, which has the possibility of a greater occurrence of the health problem due to the population with a higher probability of risk factors attending the health service.

It is worth highlighting the methodological differential adopted when approaching subjects that represent the population in general and not an intentional sample. The methodology not only allows the approximation of the representativeness of the population, but also of reproducibility when dealing with health services and, in particular, the context of primary care.

In addition, as the study addresses a health issue associated with specialized care, but not occurring in this scenario, it promotes the reflection of users in relation to the occurrence of this problem in their lives, and of the service in relation to the care offered.

Oiticica and Bittar carried out the only population-based study related to tinnitus to date in Brazil, in which a questionnaire was applied to the population over 18 years of age in São Paulo, including a sample of 1,960 respondents and obtaining a prevalence 22% of tinnitus complaint<sup>(6)</sup>. In a survey of 502 elderly people, 43.03% reported tinnitus<sup>(5)</sup>.

The largest study carried out on this subject in England, with 48,313 respondents, reported a prevalence of tinnitus of 10.1%<sup>(1,4)</sup>.

Researchers in the United States have calculated an estimated 25.3% occurrence of any type of tinnitus in the adult population, which can reach 31.4% in people over 60 years old<sup>(3)</sup>.

In China, a study including 19,290 people between 20 and 98 years old found a prevalence of tinnitus of 20.7%<sup>(16)</sup>.

Studies addressing the prevalence have difficulties in defining tinnitus and there is a significant variation in sample sizes, which explains the differences in the values found. As tinnitus has different manifestations and its prevalence varies according to the multiplicity of factors involved, such as age, gender, comorbidities, work history, eating habits, among others; its prevalence will hardly be expressed in a single number<sup>(17)</sup>.

### Gender and age

Most of the population studied was female (58.27%), thus allowing a relationship between the gender and the frequency in health services to be established.

As life situations and gender roles played by men and women are different, there is a variation in how each gender deals with illness and in the relationship with health professionals.

The subjectivity of tinnitus still hinders its association with gender, since some studies show that women tend to report a greater variety of types of tinnitus, which may be related to the greater attention and sensitivity of women about health and care processes - their own and with others, as a characteristic of the historical-social process of the populations<sup>(16-19)</sup>.



Seydel et al.<sup>(18)</sup> show that women have greater discomfort and stress related to tinnitus, and men have a higher rate of hearing loss and tinnitus intensity.

In turn, some studies report that younger and middle-aged women showed more negative signs of health in terms of lack of energy, pain, social isolation, emotional reactions and sleep, when compared to the general population. In contrast, sleep and emotional state were reported as the two aspects that had a significant difference in men in relation to the rest of the population<sup>(17-19)</sup>.

As for age, the average age of the interviewees was 59.24 years and there was a significant relationship between the variable age and the occurrence of tinnitus in all regression models.

Results show that people over 40 are more commonly affected by tinnitus in more severe degrees. Elderly people with chronic tinnitus report greater intensity, discomfort and stress related to tinnitus than younger adults<sup>(18)</sup>.

In general, middle-aged individuals have greater discomfort with tinnitus, which decreases for men with advancing age, but worsens for women. Only women had greater discomfort in relation to tinnitus with advancing age and older women had more sleep impairment than men in the same age group<sup>(19)</sup>.

### Comorbidities

Although arterial hypertension and diabetes mellitus have been reported as possible cardiovascular risk factors for tinnitus, there are variations in the associations obtained in studies<sup>(16-20)</sup>.

Both the presence of diabetes mellitus and arterial hypertension are evidenced as independent risk factors for the occurrence of tinnitus. Individuals with tinnitus had higher systolic and diastolic blood pressure than in the control group, thus showing the importance of blood pressure monitoring in these patients<sup>(20)</sup>. However, this study found no significant relationship between arterial hypertension and tinnitus, as other previous studies<sup>(16)</sup>.

In turn, this study found significant results between the occurrence of diabetes mellitus and tinnitus in the regression models.

According to the literature, 80% of individuals with diabetes have hearing loss and/or tinnitus, suggesting a higher prevalence and probability of developing some hearing disorder from an earlier stage of the disease, since the metabolism of the inner ear depends directly on the oxygen and glucose in the blood, and therefore, disorders, such as diabetes mellitus and hyperinsulinemia, may lead to hearing disorders<sup>(5,16,21)</sup>.

In addition, this study also found a significant association between thyroid disorder and the occurrence of tinnitus. Given the possibilities of thyroid-related diseases, the relationship with thyroid changes may vary, but most studies have reported a significant association with the occurrence of tinnitus<sup>(16)</sup>.

### Audiological characteristics

Most of the respondents (56.25%) reported hearing difficulties, which is in line with the literature that shows the frequent relationship between tinnitus and hearing loss. In fact, the prevalence of tinnitus is higher in populations with a higher occurrence of hearing loss. There is a variation in the percentage of individuals with hearing loss and also tinnitus, but studies show a prevalence above 80%<sup>(19-22)</sup>.

Subjects who have hearing loss have a higher degree of discomfort with tinnitus than people with hearing within normal standards. In addition, tinnitus is more common in people with sensorineural hearing loss, in which tinnitus is progressively greater according to age<sup>(19-22)</sup>.

Given the great variation in the studied populations, there are differences in studies<sup>(16,22)</sup> in relation to the type, laterality and duration of tinnitus.

In this study, the tinnitus reported by the subjects was acute (54.44%), unilateral (52.22%) and intermittent (68.55%). In turn, Oiticica and Bittar found complaints of intermittent tinnitus in the adult population in São Paulo<sup>(6)</sup> and Gibrin, Melo and Marchiori show that individuals exposed to noise in the workplace had bilateral, severe, intermittent tinnitus with medium intensity<sup>(5)</sup>.

### Discomfort

This study used a VAS to measure the degree of discomfort with tinnitus, due to the ease of access and greater speed of application. Although there is no systematic validation of its use in relation to tinnitus, there is a positive correlation between VAS and other instruments that have already been validated, such as the Tinnitus Handicap Inventory (THI) and acuphenometry<sup>(22-23)</sup>.

Respondents report discomfort with tinnitus (76.82%) with an average of 7.74, with 4 being the lowest reported value and 10 being the highest, this being the maximum value of the scale. Studies also show a higher occurrence of degree of discomfort of 6-7 for patients with tinnitus, with variation in relation to the frequency of treatment<sup>(22-23)</sup>. In addition, this study found a significant relationship between the presence of tinnitus and the occurrence of discomfort with the condition.

There is a direct impact on attention and silence on discomfort with tinnitus. The greater degree of discomfort is associated with the worsening of hearing loss, which may occur due to the greater deterioration of the inner hair cells and the consequent greater difficulty in perceiving external sounds, which may cause a greater perception of tinnitus<sup>(22-24)</sup>.

Probably due to the greater impairment of the auditory system and the lower frequency of laborious activity, remaining in quiet environments more often, the elderly population may have a greater perception of tinnitus. The same association can be established due to the greater complaint about tinnitus at night and when sleeping<sup>(5,23)</sup>.

As a subjective health problem with a multifactorial etiology, there is a variation in perception and discomfort for each individual and methodologically and, therefore, it is challenging to obtain a sample that represents the necessary heterogeneity to represent the population that has the complaint. It should be noted that this multiplicity has a direct impact on the reported degree of discomfort, since the different aggravating factors that each subject may have must be investigated, such as health problems and/or comorbidities, food triggers and noise as a worsening factor<sup>(1,4,24)</sup>.

In addition, the discomfort with tinnitus is also a determining factor in the search for treatment. A study including 51,898 patients aged 18 to 80 years in hospitals in the United States, found that 20% of individuals had tinnitus as the main reason for going to

the health service. The highest probability of seeking treatment for discomfort with tinnitus was in male subjects, middle aged and with hearing loss at high frequencies<sup>(25)</sup>.

## Treatment

Among the interviewees, 52.62% reported having sought some type of treatment. Private professionals were the most sought option (38.31%), followed by the specialist professional (36.4%) and the health center (25.29%). The results also showed a significant relationship between having tinnitus and a greater likelihood of seeking treatment.

Studies<sup>(1-6)</sup> report few data regarding the type of service sought by people living with tinnitus and each scenario has particularities regarding the treatment possibilities offered.

In Brazil's national context, 170 primary care professionals (doctors, nurses and nursing technicians or assistants) were interviewed about tinnitus management and the existing care possibilities. The answers showed that there is still a doctor-centered treatment, based on referral to the specialist and with resistance to the insertion of practices related to tinnitus in the activities that are already developed in the units<sup>(8)</sup>.

In a study in primary care in England, 368 general practitioners answered a questionnaire on tinnitus care. The results show the inequality in terms of care according to the health unit, thus reinforcing the need for specific training for these professionals<sup>(26)</sup>.

In Ireland, 43 family doctors reported that there is a huge variation in the care offered, and that it is necessary to train professionals, develop specific guidelines and develop a flow of care from primary care<sup>(27)</sup>.

In South Africa, a survey was carried out with 243 audiologists, of which 122 were in the public sector and 121 in the private sector. Professionals reported that there is a lack of resources and equipment in the public sector for appropriate monitoring, and many subjects in both sectors reported feeling a fear to care for patients with tinnitus and that they need more training in the area<sup>(28)</sup>.

In England, 138 audiologists were asked about the flow and model of care and reported that there is a lack of standardization of care and measurement instruments, showing unequal access to care and difficulty in implementing the recommendation of national guidelines<sup>(29)</sup>.

Access to activities developed in the private sector is more restricted, as shown in an Australian study in a private clinic specialized in tinnitus, in which 552 patients underwent personalized dynamic acoustic neuromodulation, with a significant reduction in the intensity and degree of discomfort with tinnitus<sup>(30)</sup>, showing a potential treatment.

The inequalities found in training, resources and equipment in the different services sought by the subjects are in line with the result showing an average improvement of 2.24 after the treatment performed, with 112 respondents reporting no improvement.

## CONCLUSION

A prevalence of 31.6% of people with tinnitus complaints was found, with a significant relationship with advancing

age, the occurrence of diabetes mellitus and thyroid disorder. In addition, there was a greater likelihood of discomfort with tinnitus, having a negative impact on the subject's quality of life, and search for treatment in the available health services.

Given the multiplicity of tinnitus, health care and human beings, further population-based studies on tinnitus are required, including different contexts and health services. In addition, it is necessary to develop public policies and strategic actions from basic care aimed at the comprehensive care of people living with tinnitus.

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## REFERENCES

1. Watts EJ, Fackrell K, Smith S, Sheldrake J, Haider H, Hoare DJ. Why is tinnitus a problem? A qualitative analysis of problems reported by tinnitus patients. *Trends Hear*. 2018;22:2331216518812250. <http://dx.doi.org/10.1177/2331216518812250>. PMID:30482102.
2. Lugo A, Trpchevska N, Liu X, Biswas R, Magnusson C, Gallus S, et al. Sex-specific association of tinnitus with suicide attempts. *JAMA Otolaryngol Head Neck Surg*. 2019;145(7):685-7. <http://dx.doi.org/10.1001/jamaoto.2019.0566>. PMID:31046059.
3. Shargorodsky J, Curhan GC, Farwell WR. Prevalence and characteristics of tinnitus among US adults. *Am J Med*. 2010;123(8):711-8. <http://dx.doi.org/10.1016/j.amjmed.2010.02.015>. PMID:20670725.
4. McFerran D, Hoare DJ, Carr S, Ray J, Stockdale D. Tinnitus services in the United Kingdom: a survey of patient experiences. *BMC Health Serv Res*. 2018;18(1):110. <http://dx.doi.org/10.1186/s12913-018-2914-3>. PMID:29433479.
5. Gibrin PCD, Melo JJ, Marchiori LLM. Prevalência de queixa de zumbido e prováveis associações com perda auditiva, diabetes mellitus e hipertensão arterial em pessoas idosas. *CoDAS*. 2013;25(2):176-80. <http://dx.doi.org/10.1590/S2317-17822013000200014>. PMID:24408248.
6. Oiticica J, Bittar RSM. Tinnitus prevalence in the city of São Paulo. *Braz J Otorhinolaryngol*. 2015;81(2):167-76. <http://dx.doi.org/10.1016/j.bjorl.2014.12.004>. PMID:25631578.
7. Chamouton CS, Nakamura HY. Zumbido e atenção básica: uma revisão de literatura. *Distúrb Comun*. 2017;29(4):720-6. <http://dx.doi.org/10.23925/2176-2724.2017v29i4p720-726>.
8. Chamouton CS. Cuidado com o portador de zumbido na atenção básica: perspectiva dos profissionais de saúde [dissertation]. Campinas: Universidade Estadual de Campinas; 2017.
9. Brasil. Ministério da Saúde. Portaria GM/MS nº 2.073, de 28 de setembro de 2004. Institui a Política Nacional de Atenção à Saúde Auditiva. *Diário Oficial da União*; Brasília; 28 set. 2004.
10. Brasil. Casa Civil. Subchefia para Assuntos Jurídicos. Decreto nº 7.612, de 17 de novembro de 2011. Institui o Plano Nacional dos Direitos da Pessoa com Deficiência - Plano viver sem limite. *Diário Oficial da União*; Brasília; 2011.
11. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Política Nacional de Atenção Básica. Ministério da Saúde; Brasília; 2012.
12. Goulart BNG, Martins-Reis VO, Chiari BM. Inquérito domiciliar de distúrbios fonoaudiológicos autodeclarados: desenho e protocolo de pesquisa. *Audiol Commun Res*. 2015;20(4):336-48. <http://dx.doi.org/10.1590/2317-6431-2015-1586>.

13. Campinas. Secretaria Municipal de Saúde [Internet]. Estrutura do SUS-Campinas. Campinas: Prefeitura Municipal de Campinas; 2006. [cited em 2019 Mar 22]. Available from: [www.campinas.sp.gov.br/saude](http://www.campinas.sp.gov.br/saude).
14. Agresti A. An introduction to categorical data analysis. 2nd ed. Hoboken: John Wiley & Sons; 2007. <http://dx.doi.org/10.1002/0470114754>.
15. Zou G. A modified poisson regression approach to prospective studies with binary data. *Am J Epidemiol*. 2004;159(7):702-6. <http://dx.doi.org/10.1093/aje/kwh090>. PMID:15033648.
16. Kim HJ, Lee HJ, An SY, Sim S, Park B, Kim SW, et al. Analysis of the prevalence and associated risk factors of tinnitus in adults. *PLoS One*. 2015;10(5):e0127578. <http://dx.doi.org/10.1371/journal.pone.0127578>. PMID:26020239.
17. Møller AR. Epidemiology of tinnitus in adults. In: Møller AR, Langguth B, De Ridder D, Kleinjung T, editors. *Textbook of Tinnitus*. New York: Springer; 2011. 29-37. [http://dx.doi.org/10.1007/978-1-60761-145-5\\_5](http://dx.doi.org/10.1007/978-1-60761-145-5_5).
18. Seydel C, Haupt H, Olze H, Szczepek AJ, Mazurek B. Gender and chronic tinnitus: differences in tinnitus-related distress depend on age and duration of tinnitus. *Ear Hear*. 2013;34(5):661-72. <http://dx.doi.org/10.1097/AUD.0b013e31828149f2>. PMID:23439056.
19. Al-Swiahb J, Park SN. Characterization of tinnitus in different age groups: a retrospective review. *Noise Health*. 2016;18(83):214-9. <http://dx.doi.org/10.4103/1463-1741.189240>. PMID:27569409.
20. Değirmenci H, Bakırcı EM, Salcan İ, Demirelli S, Duman H, Ceyhan G, et al. Determination of correlation among heart rate variability, left atrium global strain, and nighttime blood pressure among patients with tinnitus. *Med Sci Monit*. 2014;20:1714-9. <http://dx.doi.org/10.12659/MSM.890949>. PMID:25249354.
21. Somogyi A, Rosta K, Vaszi T. Hearing impairment and tinnitus in patients with type 2 diabetes. *Orv Hetil*. 2013;154(10):363-8. <http://dx.doi.org/10.1556/OH.2013.29562>. PMID:23461976.
22. Mondelli MFCG, Rocha AB. Correlação entre os achados audiológicos e incômodo com zumbido. *Int Arch Otorhinolaryngol*. 2011;15:172-80.
23. Nascimento IP, Almeida AA, Diniz J Jr, Martins ML, Freitas TMMWC, Rosa MRD. Tinnitus evaluation: relationship between pitch matching and loudness, visual analog scale and tinnitus handicap inventory. *Braz J Otorhinolaryngol*. 2019;85(5):611-6. <http://dx.doi.org/10.1016/j.bjorl.2018.05.006>. PMID:29983341.
24. Thabit MN, Fouad N, Shahat B, Youssif M. Combined central and peripheral stimulation for treatment of chronic tinnitus: a randomized pilot study. *Neurorehabil Neural Repair*. 2015;29(3):224-33. <http://dx.doi.org/10.1177/1545968314542616>. PMID:25030898.
25. Lewis RM, Jahn KN, Parthasarathy A, Goedicke WB, Polley DB. Audiometric predictors of bothersome tinnitus in a large clinical cohort of adults with sensorineural hearing loss. *Otol Neurotol*. 2020;41(4):e414-21. <http://dx.doi.org/10.1097/MAO.0000000000002568>. PMID:32176119.
26. El-Shunnar SK, Hoare DJ, Smith S, Gander PE, Kang S, Fackrell K, et al. Primary care for tinnitus: practice and opinion among GPs in England. *J Eval Clin Pract*. 2011;17(4):684-92. <http://dx.doi.org/10.1111/j.1365-2753.2011.01696.x>. PMID:21707872.
27. Kilroy N, El Refaie A. Tinnitus management in Ireland: a pilot study of general practitioners. *Ir J Med Sci*. 2020;189(4):1391-401. <http://dx.doi.org/10.1007/s11845-020-02222-6>. PMID:32266580.
28. Dawood F, Khan NB, Bagwandin V. Management of adult patients with tinnitus: preparedness, perspectives and practices of audiologists. *S Afr J Commun Disord*. 2019;66(1):e1-10. <http://dx.doi.org/10.4102/sajcd.v66i1.621>. PMID:31793315.
29. Hoare DJ, Gander PE, Collins L, Smith S, Hall DA. Management of tinnitus in English NHS audiology departments: an evaluation of current practice. *J Eval Clin Pract*. 2012;18(2):326-34. <http://dx.doi.org/10.1111/j.1365-2753.2010.01566.x>. PMID:21087449.
30. Hanley PJ, Davis PB. Treatment of tinnitus with a customized, dynamic acoustic neural stimulus: underlying principles and clinical efficacy. *Trends Amplif*. 2008;12(3):210-22. <http://dx.doi.org/10.1177/1084713808319942>. PMID:18614554.

#### Author contributions

*CSC* was responsible for the study conception, data collection, analysis and interpretation and article writing; *HYN*: was responsible for the study conception, data analysis and interpretation and article writing as professor adviser.