

Prevalence of tinnitus in elderly individuals with and without history of occupational noise exposure

Prevalência de zumbido, em idosos com e sem história de exposição ao ruído ocupacional

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SUMMARY

Introduction: The various metabolic and circulatory alterations that are related to noise exposure may cause the onset of several symptoms, including tinnitus.

Objective: The purpose of the study was to assess the prevalence of tinnitus complaints in elderly individuals with and without history of occupational noise exposure.

Method: This prospective study was conducted in a sample population consisting of 502 individuals aged over 60 years, by anamnesis and audiological evaluation. The variables that were studied were the frequency of tinnitus and the history of occupational noise. Logistic regression was used to control for potential confusion or modifications caused by the effects of the other variables on the associations of interest.

Results and Discussion: Tinnitus was reported in 50% of the cases, with tinnitus reported in 40% of the elderly individuals with history of occupational noise exposure, and in 43% of controls (elderly individuals without history of occupational noise exposure). A high frequency of tinnitus was detected in the population under investigation, but there were no statistically significant associations between the presence of tinnitus and history of occupational noise exposure.

Conclusion: The results of this study may have occurred due to other factors such as the age of the individuals without history of occupational noise exposure.

Keywords: tinnitus, noise, occupational, aged.

RESUMO

Introdução: A variedade de alterações metabólicas e circulatórias relacionadas com o ruído pode causar o aparecimento de inúmeros sintomas auditivos, incluindo, zumbido.

Objetivo: O objetivo do estudo foi avaliar a prevalência de queixa de zumbido, em idosos com e sem história de exposição ao ruído ocupacional.

Método: Forma de estudo prospectivo foi realizado em uma amostra populacional com 502 indivíduos com idade superior a 60 anos, através de questionário padronizado e avaliação audiológica. As variáveis estudadas foram frequência de queixa de zumbido e de história de ruído ocupacional. Foi usada regressão logística para controlar confusão ou modificação de efeito para as outras variáveis sobre as associações de interesse.

Resultado e Discussão: A queixa de zumbido foi verificada em 50% dos idosos com história de exposição ao ruído ocupacional e em 40,43% dos idosos sem história de exposição ao ruído ocupacional. Uma alta frequência de queixa de zumbido foi detectada na população sob investigação, porém não houve significativa diferença estatística entre a queixa de zumbido e história de ruído ocupacional.

Conclusão: O resultado desta pesquisa pode ter ocorrido devido à existência de outros fatores que podem ter contribuído para a presença de zumbido, como a própria idade, nos indivíduos sem história de exposição ao ruído ocupacional.

Palavras-chave: zumbido, ruído ocupacional, idoso.

INTRODUCTION

Patients with noise-induced hearing loss (NIHL) frequently have several symptoms such as tinnitus, vertigo, gradual decreases or distortions in hearing, and alterations in speech comprehension. NIHL is irreversible and permanent; however, it is preventable with the use of hearing protectors during noise exposure. The magnitude of hearing loss that results from excessive exposure to noise depends on factors that are associated with the exposure, including sound pressure level, duration, type of noise, and frequency, and the characteristics of the individual being exposed, including susceptibility to NIHL, age, and prior history of hearing damage (1-4).

DIAS et al. evaluated 284 workers and found an NIHL prevalence of approximately 63% and that of tinnitus was approximately 48%; this study reported an association between noise-induced hearing loss and occupational noise (5).

OGIDO et al. previously reported that tinnitus was present in 80.81% of the population, and concluded that auditory dysfunction is frequent and that research and evaluation of hearing disorders using surveys of workers that were exposed to occupational noise is critical, as symptoms such as tinnitus can cause distress and negatively affect the quality of life of workers (6). In addition to occupational exposure, hearing loss, tinnitus, and dizziness have been associated with smoking, hypertension, diabetes, aging, health history, and leisure activities, and the incidence of ear symptoms appears to be correlated with noise exposure throughout life (1-3,7-9).

Presbycusis, which the third most common chronic condition that is reported by the elderly, can be defined as hearing loss associated with aging, thus reflecting the loss of auditory sensitivity associated with advanced aging. The typical audiometric profile observed clinically in presbycusis is symmetrical bilateral sensorineural high-frequency hearing loss that progresses with age, and the associated buzzing sound is a highly prevalent symptom that has a high impact on the quality of life of the elder patient (10-12).

A study by FERREIRA et al. (12) observed that tinnitus was a cause of intense dissatisfaction in elderly patients, as it impaired their daily activities and resulted in emotional and sleep disorders. This study found a correlation between the presence of hypertension in patients and tinnitus; however, a correlation between the degree of hearing loss and the level of audiometric discomfort that is felt by the patient has not been established.

The purpose of the present study was to assess the prevalence of tinnitus in elderly individuals with and without history of occupational noise exposure.

METHOD

This cross-sectional study was carried out at Universidade Norte of Paraná (UNOPAR) in Londrina. The study protocol was approved by the bioethical committee of the UNOPAR University, with the approval number PP/0063/09. This was the first large, rigorous survey that examined 502 elderly individuals in this particular city. The subjects were sent by the Study on Aging and Longevity (EELO) project.

The anamnesis included questions about age, gender, hearing loss complaints, tinnitus, noise exposure history, and medical history. The audiological evaluation was performed individually in a soundproof booth with an interacoustics audiometer.

The variables that were studied included the frequency of tinnitus and the history of occupational noise.

Logistic regression was used to control for confusion or modification of the effects of other variables on the associations of interest. Confounding variables that had values of up to a 20% association with a history of occupational noise (in a univariate model) were included in the adjusted logistic regression model. The procedures were performed using Bio Stat software, version 5.0, while adopting a significance level of 5%.

RESULTS

In the present study, calculations of the sample results of 382 individuals were necessary to extrapolate the results found in the study population.

Considering possible losses of data during its collection, 519 patients were evaluated, of which 502 patients were included in the study and 17 patients were excluded from the study due to a lack of evaluation days.

Of the 502 patients that were included in this study, 366 (72.90%) had no history of occupational noise exposure, and 136 (27.09%) had history of exposure to occupational noise.

Of the 502 subjects, 286 (56.97%) did not have tinnitus and 216 (43.02%) had tinnitus.

Among the 366 who were not exposed to occupational noise, 148 had tinnitus (40.43%) and 218 did not have tinnitus (59.56%).

Of the 136 subjects who were exposed to occupational noise, 68 (50%) had tinnitus and 68 (50%) had no tinnitus (Table 1).

Sixty-eight subjects (13.54%) had tinnitus and were exposed to occupational noise, 68 subjects (13.54%) did not have tinnitus and were exposed to occupational noise, 148 (29.48%) had tinnitus and were not exposed to occupational noise, and 218 (43.42%) had neither tinnitus nor exposure to occupational noise.

By using the chi-square test, we obtained a chi-square value of 3.699 ($p = 0.0544$), which indicated that there was not a significant difference between the subjects that were exposed to occupational noise and those that were not exposed with regard to tinnitus, when measured in subjects older than 60 years of age.

Multiple logistic regression analysis was also performed from the data of 498 subjects, which excluded patients who had not been assessed in the selected variables; tinnitus was the dependent variable (y) and noise exposure, age, gender, hypertension, and diabetes were the independent variables (x).

The results indicated that there were no significant differences between the independent variables (exposure to noise, $p = 0.0580$; age, $p = 0.8560$; gender, $p = 0.7544$; hypertension, $p = 0.3006$; and diabetes, $p = 0.4425$; Table 2).

DISCUSSION

Data from a gerontological and geriatric study population in Sweden (13) indicated that the age-related

deterioration of hearing is more pronounced in older men (between 70 and 75 years of age) that were exposed to noise compared with those that were not exposed to noise. However, a limiting factor to the differential diagnosis of hearing disorders in the elderly is that the hearing loss that is normally associated with aging tends to be confounded by the previous effects of noise exposure in individuals who worked in a noisy environment (11). In this study, the presence of tinnitus regardless of history of occupational noise exposure may be due to the accumulated noise exposure over time and other comorbidities in the elderly.

A lifetime of noise exposure increases the likelihood of negative effects on hearing, but it is difficult to determine the specific interactions between noise, alterations in hearing, and presbycusis, as presbycusis has a complex etiology that includes both intrinsic and extrinsic factors. The influence of noise on presbycusis has been postulated in numerous reports for nearly a century; however, is difficult to identify the noise exposure as a single factor for hearing impairment in elderly (4-14).

The possible correlations between hearing loss and history of occupational noise exposure in the elderly reveals a complex picture due to the variety of factors that are associated with aging.

It is difficult to determine whether hearing loss in the elderly is caused by general degeneration that is associated with aging.

Tinnitus, in which an individual perceives sounds that do not correspond with an external sound, is a symptom that is often reported in individuals that are exposed to high sound pressure levels, and several studies have reported that prolonged exposure to occupational noise can not only lead to a decrease in hearing, but also to tinnitus and hyperacusis. In addition, excessive exposure to noise is the most important risk factor for hearing impairment and the onset of tinnitus, followed by age and gender, and it has been recommended that tinnitus prevention should be included in hearing loss prevention programs to promote hearing health in potentially affected workers (16).

Table 1. Tinnitus and history of occupational noise exposure.

		History of occupational noise exposure			
		Yes	%	No	%
Tinnitus	Yes	68	13,54%	148	29,48%
	No	68	13,54%	218	43,42%
		136		366	

Table 2. Logistic regression analysis of tinnitus and related variables.

VARIABLES	MULTIPLE LOGISTIC REGRESSION ANALYSIS			
	Standard error	p-value	Odds ratio	95% Confidence Interval (CI)
Intercept				
X1 (Noise exposure)	0.9855	0.058	1.5168	0.99 to 2.33
X2 (Age)	0.014	0.856	1.0025	0.98 to 1.03
X3 (Gender)	0.2101	0.7544	9.364	0.62 to 1.41
X4 (Hypertension)	0.1958	0.3006	1.2247	0.83 to 1.80
X5 (Diabetes)	0.2048	0.4425	1.1703	0.78 to 1.75

Given the high prevalence of hearing impairment in the elderly population and the differences between the groups, there is a clear need to understand its nature and causes in various populations to improve prevention and to develop intervention strategies (4-9,17).

CONCLUSION

This study aimed to determine whether noise exposure was a potential causal factor for tinnitus in the elderly; however due to the aforementioned difficulty in defining the causes of hearing impairment in the elderly, the numerous comorbidities present in this population, and the degenerative nature of the aging process, there was no significant association between elderly individuals with a history of occupational noise and tinnitus. However, the similar high-frequency tinnitus that occurred in both populations regardless of history of occupational noise exposure shows the need to be aware of the prevalence of tinnitus among elderly individuals.

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