

EVALUATION OF HEARING LOSS IN BUS DRIVERS IN CURITIBA (BRAZIL)

Avaliação da perda auditiva em motoristas de ônibus de Curitiba

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ABSTRACT

Purpose: to investigate the prevalence of hearing loss and audiometric characteristics of urban bus drivers. **Methods:** the sample was comprised of 122 bus drivers from the city of Curitiba (PR, Brazil), with an age mean of 36.1 years. The audiometric tests were performed during one year, between 2010 and 2011, according to the Resolution number 19 of the Ministry of Labour (1998). **Results:** 31.15% of the drivers had hearing problems detected by the method used, and 24.59% of the participants had results suggestive of noise-induced hearing loss. The most affected frequency was 6000 Hz without being one ear more affected than the other one. **Conclusion:** the results of this study were compared with results of previous studies carried out in the same city, and it was observed that the preventive measures for hearing health had shown favorable results.

KEY WORDS: Hearing Loss; Noise, Occupational Noise exposure, Transportation; Audiometry

■ INTRODUCTION

The hearing loss induced by high sound pressure levels or Noise-Induced Hearing Loss (NIHL) is the loss caused by prolonged exposure to noise. It is characteristically sensorineural, usually bilateral, irreversible and progressive along with the time of exposure to noise (code M83.3 in the International Statistical Classification of Diseases and Related Health Problems / ICD), and is one of the most prevalent findings among occupational diseases, considering that the exposure to noise affects a large amount of the working population worldwide ¹. Professional drivers are among the most affected people by this illness, due to the noise of traffic, the urban noise pollution in general, and the peculiar difficulty in performing the sound protection in that group. Among other sources of noise to which drivers are exposed, one can cite: the poor maintenance of vehicles, lack of soundproofing of the engine and

exhaust, tire friction with the asphalt, poor conservation of the paving of roads, and finally the horns. It should also be noted that there are other causative agents of occupational hearing loss that, regardless of noise exposure or interaction with this, potentiate its effects on the hearing: in the case of bus drivers it can be cited the exposures to carbon monoxide and whole-body vibrations ^{2,3}.

Studies with bus drivers in several Brazilian cities demonstrate the occurrence of NIHL with the bus drivers ranging between 19% ⁴ and 70% ⁵. Whereas Curitiba is, historically, a pioneer city in the national urban public transport in some aspects, such as express buses on own channels, bi-articulated buses, direct route buses, tube stations, etc, this study aims to investigate the prevalence of hearing loss – and their audiometric characteristics – in passenger bus drivers.

■ METHODS

The audiometric tests were selected from a occupational medicine clinic, among urban bus drivers who underwent periodic examinations during the period 1 May 2010 to 30 April 2011, ie 1 year. The sample computed 122 individuals, with a mean age of 36.13 ± 7.31 years (minimum 23 years old, and maximum 59 years old), and 119 were male.

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Conflict of interest: non-existent

Table 1 – Distribution by age of the examined drivers

Age	20-25 y/o	26-30 y/o	31-35 y/o	36-40 y/o	41-45 y/o	46-50 y/o	≥ 51	TOTAL
Individuals	6	23	34	23	22	12	2	122
%	4,92	18,85	27,87	18,85	18,03	9,84	1,64	100,00

This sample represents approximately 5% of the bus drivers in the metropolitan region of Curitiba. See Table 1.

The tests were conducted in a proper acoustic room, and by the same speech language pathologist. The equipment used was the audiometer *Interacustics AD 27*, properly calibrated according to ISO 8253-1 Brazilian standard. From the drivers who had made more than one audiometry in this period, was selected only the last exam. The audiometric tests were performed and classified according to the determination of NR-7, Annex I, updated by the Regulation nº 3.214/78 of the Ministry of Labour, which standardizes in Brazil the occupational examinations. The subjects were evaluated by air through the frequencies 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz. In case of change detection, or according to the evaluation of the professional responsible for implementing the exam, the same was done also by bone conduction at frequencies of 500, 1000, 2000, 3000 and 4000 Hz. The tests were classified as normal when the auditory thresholds were equal to or less than 25 dB (NA), and abnormal if above 25 dB (HL). The selection criteria for examinations as suggesting of NIHL was indicated by the cited standard, 4.1.2 item, ie cases whose audiograms for frequencies of 3000 and/or 4000 and/or 6000 Hz presented hearing thresholds above 25 dB (NA) and higher than the other frequencies tested, whether altered or not, either the tests were done by air or bone conduction, on one or both sides. And the tests not suggestive of NIHL were those which did not fit the above description.

The results were presented in a descriptive way by means of absolute numbers and percentages, and analyzed using arithmetic mean and standard deviation.

This study was approved by the Ethics Committee in Research of the Community Health Department of UFPR, Record CEP / SD: 1217.142.11.09, CAAE: 0147.0.091.000-11.

■ RESULTS

Among the 122 tests, 84 (68.85%) had hearing thresholds within normal limits, and 38 (31.15%) had some form of hearing loss. Among the abnormal tests, 30 were suggestive of NIHL, and 8 were compatible with other forms of hearing loss.

In Figure 1 we note that, except for the younger population (20-25 years), the percentage of individuals with altered exams became progressively greater with age, with a predominance of NIHL.

Regarding laterality of hearing loss in the abnormal audiometries (Table 2), it was found that the cases suggestive of NIHL with bilateral changes predominated in relation to those with only one side altered, unlike what was found in the others abnormal audiometric curves.

In Table 3 it was observed that in the 30 individuals suggestive of NIHL, the frequency most commonly affected was 6000Hz, regardless of side.

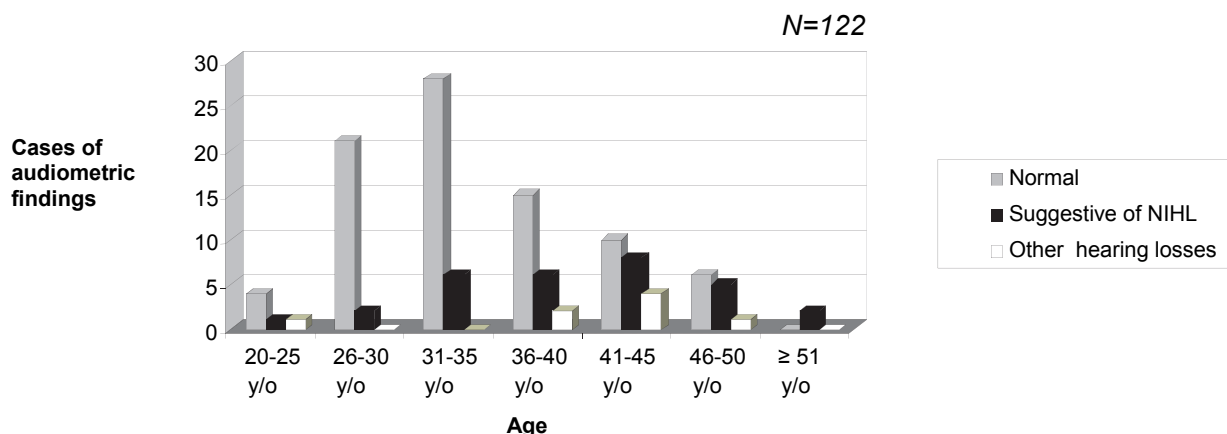


Figure 1 – Distribution of audiometric findings according to age of evaluated drivers

Table 2 – Distribution of drivers with hearing loss in absolute numbers and percentage, according to the location of audiometric change

Location of hearing loss	Right ear		Left ear		Bilateral		Total	
	N	%	N	%	N	%	N	%
Suggestive of NIHL	5	16,67	6	20,00	19	63,33	30	100
Other hearing losses	4	50,00	2	25,00	2	25,50	8	100

Table 3 – Distribution of changed frequencies in the audiometries suggestive of NIHL (n = 30), according to the laterality of the ear, in absolute numbers and percentages

Frequency (Hz)	Right ear		Left ear	
	Number of findings	%	Number of findings	%
2000	2	6,67	1	3,33
3000	8	26,67	9	30,00
4000	10	33,33	14	46,67
6000	20	66,67	21	70,00
8000	11	36,67	11	36,67

■ DISCUSSION

Regarding age, it is observed that the majority of the evaluated drivers were individuals aged 30-40 years, with a mean age of 36.13 years. The age profile of the subjects was similar to that found in other studies involving bus drivers^{4,6}.

In the present study, we found NIHL suggestive hearing loss in 24.59% of the individuals, unlike 45.2% found by Talamini⁷ in 1994, which evaluated 62 drivers in the same region. This disparity can be explained, among other reasons: for a current and growing concern with the occupational noise

in the considered region, as evidenced by the routine checking of noise emission by the buses, as verified in the edict of bidding for public mass transportation in the metropolitan region of Curitiba⁸; by the acoustic evidence that the bus fleet is meeting NR-15-01 and NHO standards regarding noise emissions from vehicles, according to Portela⁹; the peculiarities of the vehicles currently used in the fleet, like articulated buses and direct route buses, which are less noisy for the drivers, as the previous study⁹. The prevalence of hearing loss in bus drivers of some other Brazilian cities, as described in the literature, is as follows: 34% in Bauru, 2001¹¹;

19% in Campinas, 2004⁴; 62.8% in São Paulo, 2004¹²; 28% in Maringá, 2005¹⁰; and 70% in Francisco Beltrão, 2010⁵.

In Table 3, we observe a positive association, already known in the literature, between age and the occurrence of NIHL, depending on the time of exposure to noise and the insidious and progressive nature of this disease. Worth also remembering that the presence of NIHL in the younger population could have been co-produced in other places with loud noises, typically frequented by this population.

In this study it was found that the most affected frequency is 6 kHz, and such data have been found in other previous studies, according to which the acoustic notch at 6000 Hz is as or more frequent than at 4000 Hz^{5,6,13}. The authors believe that this is currently being verified because of both the characteristics of the modern audiometers, and the requirement of compliance with the determination of labor legislation.

Regarding laterality, 63.3% of individuals with audiometric tracings suggestive of NIHL had bilateral changes, and the others unilateral without predominance of side. Lacerda⁵ found, among drivers audiograms suggestive of NIHL, 83.3% bilaterally affected, and 16.6% with unilateral right predominance of loss. Correa Filho⁶ observed 44.1% of bilateral loss, and unilateral loss remaining without predominance. Freitas⁴ studied 104 drivers, 19% of them with data suggesting NIHL, half of

them showed bilateral lesions, and half presented unilateral lesions without predominance. Therefore, the high noise level of the urban environment, which mainly affects the left side of the driver through the window, must be considered as harmful as the internal noise of the vehicle.

■ CONCLUSION

The analysis of audiometric findings of bus drivers in Curitiba, during the period of 2010 to 2011, suggests that the actions already taken towards the prevention of damage by noise in this city has been effective, with a reduction from 45.2% to 24.6% of drivers affected by NIHL.

Regarding audiometric findings, the most affected frequency in audiograms suggestive of NIHL is 6 kHz. Furthermore, the hearing damage by noise in this group after decades mainly affecting the right side, currently tend to present with no predominance of laterality.

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RESUMO

Objetivo: investigar a prevalência da perda auditiva e as características audiométricas em motoristas de ônibus de passageiros. **Métodos:** a amostra foi constituída de 122 motoristas de ônibus de passageiros da região metropolitana de Curitiba de uma clínica de medicina ocupacional, com média de idade de 36,13 anos. Foram selecionados os exames audiométricos realizados no período de um ano entre 2010 e 2011, realizados conforme a Portaria 19 do Ministério do Trabalho/1998. **Resultados:** 31,15% dos motoristas apresentaram problemas auditivos detectados pelo método, sendo 24,59% sugestivos de perda auditiva induzida por níveis de pressão sonora elevados. A frequência mais acometida foi 6000kHz sem predominância de lateralidade. **Conclusão:** comparando-se com resultados anteriores nesta mesma cidade, observa-se que as medidas preventivas para saúde auditiva tem mostrado resultados positivos.

DESCRITORES: Perda Auditiva; Ruído Ocupacional; Ruído dos Transportes; Audiometria

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