

NOISE INDUCED HEARING LOSS AMONG STAFF IN A PUBLIC STATE UNIVERSITY

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ABSTRACT: This study aimed to analyze Noise Induced Hearing Loss among the staff of a public state university in the north of Paraná. The research is characterized as a descriptive transversal study, undertaken between June and July 2014. The data were obtained through documental analysis. A total of 131 workers participated in the research, with a mean age of 53 years old, each one undertaking an average of three audiometric examinations. It was observed that in the last audiometric examination undertaken, 30% of the sample group presented some form of hearing loss, representing an increase of 2.3 times, or 230%, of persons with this health problem, in comparison with the reference audiometric examination. These results indicate that it is not enough to undertake occasional audiometric examinations, but that actions for promoting health and preventing harm to health are also necessary, including the worker in the planning and control of her auditory health.

DESCRIPTORS: Audiometry; Hearing loss; Noise; Occupational health.

PERDA AUDITIVA INDUZIDA PELO RUÍDO EM SERVIDORES DE UMA UNIVERSIDADE ESTADUAL PÚBLICA

RESUMO: O objetivo desta pesquisa foi analisar a Perda Auditiva Induzida pelo Ruído em servidores de uma universidade estadual pública do norte do Paraná. A pesquisa se caracteriza como um estudo transversal descritivo, realizado entre junho e julho de 2014. Os dados foram obtidos através de análise documental. Participaram da pesquisa 131 trabalhadores com idade média de 53 anos e cada um realizou em média três exames audiométricos. Observou-se que na última audiometria realizada 30% do grupo amostral apresentou algum tipo de perda auditiva, o que representa um aumento 2,3 vezes ou 230% de portadores deste agravio, ao comparar com a audiometria de referência. Estes resultados indicam que não basta a realização de exames audiométricos pontuais, mas ações de prevenção e promoção à saúde, incluindo o trabalhador no planejamento e controle de sua saúde auditiva.

DESCRIPTORIOS: Audiometria; Perda auditiva; Ruído; Saúde do trabalhador.

PÉRDIDA AUDITIVA INDUCIDA POR EL RUIDO EN FUNCIONARIOS DE UNA UNIVERSIDAD ESTADUAL PÚBLICA

RESUMEN: El objetivo de esta investigación fue analizar la Pérdida Auditiva Inducida por el Ruido en funcionarios de una universidad estadual pública de norte de Paraná. La investigación se caracteriza como un estudio transversal descriptivo, realizado entre junio y julio de 2014. Los datos fueron obtenidos a través de análisis documental. Participaron de la investigación 131 trabajadores con edad media de 53 años y cada uno realizó en media tres exámenes audiométricos. Se observó que en la última audiometría realizada, 30% del grupo de la muestra presentó algún tipo de pérdida auditiva, lo que representa un aumento 2,3 veces o 230% de portadores de este agravio, haciéndose una comparación con la audiometría de referencia. Estes resultados apuntan que no basta solo la realización de exámenes audiométricos puntuales, pero acciones de prevención y promoción de salud, incluyendo el trabajador en el planeamiento y control de su salud auditiva.

DESCRIPTORIOS: Audiometría; Pérdida auditiva; Ruido; Salud del trabajador.

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INTRODUCTION

Noise Induced Hearing Loss (NIHL) is among the main health problems of the Brazilian worker, and is the second among the most frequent illnesses of the auditory system⁽¹⁾.

Noise is considered to be the most common physical risk among the workers in industry, and can lead to NIHL, an irreversible disorder, although completely preventable⁽²⁾. Exposure to noise, as a result of the frequency, and its multiple consequences for the human organism constitutes one of the main problems of occupational and environmental health at the current time⁽³⁾.

According to Annex I of Regulatory Standard NR-7, Ordinance SIT (Labor Inspection Secretariat) 223/2011, of May 6th 2011, by NIHL is understood alterations of the auditive threshold, of the neuro-sensory type, resulting from systematic occupational exposure to elevated levels of sound pressure. As its main characteristics, it has irreversibility and a gradual progression in accordance with the time of exposure to the risk⁽⁴⁾.

As synonyms, NIHL has: hearing loss through exposure to noise at work, occupational hearing loss, professional deafness, occupational dysacusis, hearing loss induced by high levels of sound pressure, hearing loss induced by occupational noise, and neurosensory hearing loss through continuous exposure to high levels of sound pressure of occupational origin⁽⁵⁾.

This type of hearing loss has, as its main characteristics: always being of the neurosensory type, due to affecting the Corti cells; being irreversible and nearly always affecting both ears; being manifested as a result of intolerance to intense sounds and as tinnitus, compromising communication due to the difficulty in understanding speech. The progression of this health problem ceases when the exposure to noise is interrupted. Some factors are capable of directly influencing work-related NIHL, such as: the physical characteristics of the noise (type, spectrum and the level of sound pressure), individual susceptibility and time of exposure⁽⁵⁾.

Occupational illnesses are considered as those pathologies acquired during work activities. Ministerial Ordinance N. 777 of 28th of April 2004, of the Brazilian Ministry of Health, regulates the compulsory notification of NIHL⁽⁶⁾.

In Brazil, public policies directed towards workers' health began to be implemented from 2003 onward. Among the strategies for putting the Comprehensive Care for Workers' Health into effect, the National Network of Comprehensive Attention to Workers' Health stands out. Its objectives are to bring together the network of services of the Unified Health System (SUS) directed to the attendance provided to health surveillance and to notify health problems linked to work in sentinel service networks⁽⁵⁾. According to data from the National Notifiable Diseases Information System (SINAN), between 2007 and 2012, 1872 cases of NIHL were notified, with the highest level in the states of São Paulo – with 646 notifications, Minas Gerais – 296 notifications, and Rio de Janeiro, with 255 notifications⁽⁷⁾.

The data relating to NIHL, or regarding the population exposed to noise, remain rare and those which are available partially express the occurrence of the risk related to hearing loss. This information is highly relevant for estimating the number of vulnerable workers and identifying the areas of activity affected most, constituting support for surveillance actions related to, and prevention of, NIHL⁽⁸⁾.

NIHL compromises the worker's quality of life due to the functional and psychosocial changes⁽⁶⁾. It is therefore essential to undertake further actions of control and prevention of its risks and health problems. The World Health Organization (WHO)⁽⁹⁾ and the Brazilian Ministry of Health⁽⁵⁾ agree that NIHL and work accidents also result from individual practice which could also be eradicated, if there were actions of inspection, guidance and intervention in the work environment.

In the light of this scenario, this study's objective was to analyze noise induced hearing loss among the staff of a public state university.

METHOD

This is a descriptive transversal study with a quantitative approach. The study was undertaken in the Specialized Services in Occupational Health and Safety Engineering (SESMT), on the campus of a public state university in the Brazilian state of Paraná, in 2014. This service is made up of two technicians, one nurse, one engineer, and one

occupational physician, and its main responsibility is to promote and protect the safety of 5,353 workers in their workplace in accordance with Brazilian Regulatory Standard NR4⁽¹⁰⁾.

This study's population was made up from the medical records of workers, staff contracted under the Single Legal Regime for Civil Servants of the State of Paraná, who have a risk of NIHL due to the characteristics of their role, that is, they were working in an environment where the noise exceeded 85 dB; for this reason, an audiometric examination is included in their periodical occupational health examination. The following were included in this study: workers undertaking activities in environments where the levels of sound pressure exceeded the limits of tolerance established by the Brazilian Ministry of Labor, whether or not auditory equipment was used⁽⁴⁾; and to have a reference audiometric examination and a sequential one. The reference audiometric examination is the first audiometric evaluation undertaken following the admittance of the worker to the environment where the noise constitutes an occupational risk. The sequential audiometric examination is that which will be compared with the reference examination⁽⁴⁾. The exclusion criteria was related to the existence of hearing disorders known prior to the worker's entrance to the institution. This data was obtained through the medical examination undertaken on admission or in subsequent medical consultations documented in the occupational medical records available in the service.

In accordance with the criteria, 231 medical records were appropriate for analysis, although 131 were selected, as 30 medical records had no audiometry; 53 received only the reference audiometric examination; five had a diagnosis of acoustic trauma; and six had audiometric examinations with inconclusive or queried medical reports, in which it was not possible to identify the result of the examination.

For data collection, a spreadsheet was developed using Microsoft Excel 2010, containing the following variables: number of medical record, sex, age, time of work in the institution, job, results of the reference and sequential audiometric examinations, conduct in the periodical occupational examination, and results and conducts in previous audiometric examinations, if there were any.

All the audiometric examinations were undertaken by the speech therapy service of the institution itself, respecting the specifications established under Ministerial Ordinance N. 19 of NR-7, such as: use of an acoustic cabin, appropriately calibrated equipment, guidance for 14 hours of acoustic rest and the undertaking of the examination by a qualified professional – in this case, the speech therapist⁽⁵⁾.

The analysis of the data was undertaken using the Statistical Package for the Social Sciences (SPSS), version 20.0. This study was submitted to and approved by the Ethics Committee for Research with Human Beings, under CAAE: 21405214.7.0000.5231.

RESULTS

In this study, among the 131 workers, 63% were male; and, in accordance with distribution by age range, there was greater concentration between 52 and 61 years old (49%), as well as between 42 and 51 years old (37%); the mean age was 52 years old, and the median was 53 years old.

Regarding where the workers worked, 52.6% were from the House of Culture, with predominance of the category of musicians, who represented 36% of the total of the sample. The place with the second greatest density of workers exposed to NIHL was the university restaurant (18.3%) and the category of workers with the greatest quantity of workers in this department was the cooks (7%) (Table 1). The professionals' time of work in the institution varied between five and 42 years, with a mean equal to 22 years, and a median of 21 years.

The results of the reference audiometric examination identified that 13 individuals had a diagnosis of bilateral NIHL (10%), four had unilateral NIHL (3%) and 36 (27%) presented lowering of auditory threshold. The other 78 workers (60%) had examination results within the normal standards (Table 2). The House of Culture was the department which had staff with the most compromised initial audiometric examinations (8.7%).

The results of the sequential audiometric examination showed that 31 individuals (24%) presented bilateral NIHL, eight (6%) presented unilateral NIHL, and that 35 (26%) had threshold shift (Table 3).

On average, each worker undertook three audiometric examinations over the period in which they worked in the institution; this study analyzed the reference audiometric examination and the last sequential audiometric examination. The median interval between them was 10 years.

In the comparison of the results of the audiometric examinations, it was identified that in the reference audiometric examination, 17 workers (13%) had a diagnosis of NIHL (unilateral and bilateral), and that in the sequential audiometric examination, there was an increase of professionals affected by the pathology, with this number coming to be 39 staff members (30%). This being the case, an increase of 2.3 times (230%) was ascertained in the number of workers affected by NIHL in the institution studied, in the period between the reference audiometric examination and the last sequential audiometric examination.

It was also possible to evaluate, in the record of the periodical occupational examinations, the main guidance and conducts undertaken for these staff; it was observed that in 59% of the medical records, there were no annotations regarding guidance or clarifications related to prevention or treatment of NIHL.

In relation to the guidance, only in 26% were records of information relating to the use of Personal Protective Equipment (PPE) identified, in this case the use of ear protectors; 10% were referred to the E.N.T specialist and 7% were advised to use otological solution for removing plugs of earwax, followed by 5% who were advised to avoid places with intense noises, to use ear protection, to practice ear irrigation whenever necessary and to request revision of the Environmental Risk Prevention Program (PPRA) of the service in which the worker was allocated.

Table 1 – Distribution of workers at risk of developing NIHL related to the work, by departments and role in a state public university. Londrina-PR, 2014.

Departments / Role of workers	N (131)	%
House of culture	69	52,6
Orchestra archivist	01	0,8
Operational assistant/ general helper	07	5,3
Orchestra inspector	01	0,8
Musicians	47	36
Sound and image operator	02	1,5
Administrative technician	07	5,3
Technician in setting up events	04	3
University restaurant	23	18,3
Operational assistant/ general helper	06	5,3
Kitchen assistant	05	4
Chef	09	7
Nutritionist	01	0,8
Porter/cleaner	01	0,8
Prefecture of the university campus	19	14,5
Operational assistant/ general helper	01	0,8
Gardener	08	6
Woodworker	02	1,5
Driver – heavy machinery	01	0,8
Maintenance Officer	02	1,5
Builder	01	0,8
Metalworker	01	0,8
Telephone operator	03	2,3
University radio	13	10
Head of department	01	0,8
Social communicator/ journalist	04	3
Administrative technician	01	0,8
Studio and multimedia technician	07	5,3
Printing services	07	4,6
Administrative assistant	01	0,8
Head of department	01	0,8
Printing operator	04	3

Table 2 – Results of the reference audiometric examinations of staff at risk of developing NIHL, according to the occupational departments of a public state university. Londrina-PR, 2014

Departaments	Results of audiometric examinations									
	NIHL bilateral		NIHL unilateral		Threshold shift		Normal		Total	
	N	%	N	%	N	%	N	%	N	%
House of Culture	05	7,2	01	1,5	17	24,6	46	66,7	69	52,6
Campus Prefecture	03	15,7	00	0	07	37	09	47,3	19	18,3
University radio	02	15,4	01	7,8	03	23	07	53,8	13	10
University restaurant	02	8,7	02	8,7	06	26,1	13	56,5	23	18,3
Printing services	01	14,4	00	0	03	42,8	03	42,8	07	4,6
Total	13	10	04	3	36	27	78	60	131	100

Table 3 – Results of the last sequential audiometric examination of staff at risk of developing NIHL, according to departments of a public state university. Londrina-PR, 2014

Departaments	Results of the last sequential audiometric examination									
	NIHL bilateral		NIHL unilateral		Threshold shift		Normal		Total	
	N	%	N	%	N	%	N	%	N	%
House of Culture	15	21,7	03	4,3	20	29	31	45	69	52,6
Campus Prefecture	06	31,6	03	15,8	02	10,5	08	42,1	19	18,3
University radio	02	15,4	01	7,7	04	30,8	06	46,1	13	10
University restaurant	07	30,4	01	4,4	08	34,8	07	30,4	23	18,3
Printing services	01	14,3	0	0	01	14,3	05	71,4	07	4,6
Total	31	24	08	06	35	26	57	44	131	100

DISCUSSION

Occupational noise is the main cause of NIHL, tinnitus and change in the auditory threshold, resulting in problems in communication and difficulty in social interactions. This phenomenon also provokes secondary effects such as stress and difficulty establishing efficacious communication at work, leading to accidents⁽¹¹⁾.

In this study it was possible to observe an increase in the number of cases of NIHL among workers with a mean age of 52 years old and who had been working in the institution for a mean of 22 years, possibly suggesting there to be a relationship between these variables. Corroborating this finding, one study emphasizes the increase in prevalence of hearing loss as age advances, coming to be 11.45 times higher in the age range over 50 years old, when compared with those aged under 30 years old. The same study also observed a relationship of NIHL with time of activity in the company, observing an increase of prevalence of cases suggestive of hearing loss,

after six years of work activity⁽¹²⁾.

It was possible to make this inference as the subjects were state employees, admitted through open public examination, and who had the characteristic of stability of their employment link.

The prevalence of NIHL observed in this study was 30%, corresponding to the unilateral and bilateral loss of hearing found in the last audiometric examination undertaken by the staff member, and slightly higher than that estimated by the Brazilian Ministry of Health⁽⁵⁾, which is 25% of the population exposed to occupational noise. In one study undertaken with workers in various industrial roles, 46% presented some type of unilateral or bilateral NIHL⁽¹³⁾.

In a separate study with a similar population, however, the prevalence found was 35.7% among those with activities in the area of civil engineering, woodworking and gardening⁽¹⁴⁾. It is noteworthy that there is a greater risk of NIHL among workers in civil engineering, as – contrary to what happens in the industrial sector – noise has not diminished over the passing years. Investment

is lacking in modernizing the machinery and in caring for occupational health⁽¹⁵⁾.

It was also identified that there is a high prevalence of NIHL among musicians. In one study comparing military musicians and a control group, the prevalence of NIHL found in these professionals was 32%, meaning that this category presented a risk 14.54 times greater of developing some sort of auditory alteration compared with individuals without a history of exposure to music⁽¹⁶⁾. In a similar study, a prevalence rate of 17% of NIHL was found, also demonstrating a positive correlation between time of professional activity and a worsening of the auditory thresholds⁽¹⁷⁾.

In the case of the professional musicians in this study, the prevalence of NIHL was close to that found in the studies described above. The high rates of hearing loss in this professional category seem to be determined by extrinsic and intrinsic factors. The following are considered to be external factors: the time of exposure to noise in years, the position occupied by the musician on the stage: whether orchestra pit or close to the speakers, as well as the type of instrument which he or she plays. The intrinsic factors, on the other hand, are related to the individual and psychophysiological differences⁽¹⁸⁾.

In relation to the workers of the university restaurant, in this study, a high percentage was observed of workers affected by NIHL. One study undertaken with workers of a hospital kitchen revealed that the risk of auditory harm seems to be associated with the noise produced in the food preparation area (principally from blenders and utensils), and from the metal-metal contact between stainless steel pans and metal shelves. The cooks are exposed to many sources of noise involving intermittent impact, such as the metal-metal contact between utensils and the use of industrial-size blenders⁽¹⁹⁾.

Nevertheless, in this documental analysis, it was not possible to identify institutional actions related to prevention and control of NIHL, but the data presented revealed the growth of the number of workers affected in the interval between the reference audiometric examination and the last one undertaken by the staff member. It was evidenced, therefore, that it is not enough to undertake the audiometric examination in accordance with what is established; it is

urgently necessary to establish efficacious plans capable of transforming the worker into an active participant, co-responsible for his health, in the work environment.

The report on the state of occupational health of the European Union notes the importance of implementing institutional measures for reducing noise, such as the modernization of machinery and the automation of the work process; these actions are more directed towards the industrial sector, while in the sector of civil engineering, the introduction of new tools and work equipment was identified as having contributed to the increase in noise levels. Lack of information, supervision and control of the risks in the work environment leave the worker more vulnerable to NIHL⁽¹¹⁾.

CONCLUSION

The prevalence of NIHL among the workers was 30%, summing the bilateral and unilateral hearing loss found in the last audiometric examination of the sample studied. It was possible to observe an increase of 2.3 times, or 230%, of this prevalence when compared to the result of the reference audiometric examination.

It was observed that, in some occupational sectors, there were professions which were more affected by this condition – such as musicians and kitchen workers. The time of exposure to the noise, and age, may contribute to the auditory compromise. As a result, from the high prevalence of NIHL in the various sectors analyzed evidenced in this study, it is possible to infer that there is a need for a program for the effective prevention and control of NIHL in the institution.

Finally, through the compliance with the norms stipulated by the Brazilian Ministry of Health, such as the mandatory notification of this health problem, it will be possible to investigate the prevalence and to obtain support for the construction of indicators guiding the planning of efficacious actions for controlling and preventing NIHL.

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