

Original articles

Workers of the hospital maintenance sector: protection, hearing symptoms and noise exposure

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ABSTRACT

Purpose: to investigate the use of hearing protection and symptoms in hospital maintenance workers and evaluate the noise level of the machines.

Methods: a cross-sectional quantitative study held with workers from a public hospital maintenance service. A questionnaire related to personal, clinical and occupational history was used. Measurement of the noise level of the machines in the sector was carried out using a sound pressure level meter.

Results: 57 male workers participated, mean age of 43.28 years, among the workers, carpentry prevailed (10.53%), length of time at the job averaged 8.9 years and 9.3 daily work hours; 45.76% did not know what could be done to reduce maintenance noise; 59.65% wore hearing protectors at work, ear plug model (47.37%), and 82.45% thought that the noise was reduced when they wore the hearing protector correctly. Auditory and non-auditory signs and symptoms were denied by most workers. Noise perception in the maintenance service was medium (53%) and high (44%), evidenced noise levels of 62.0 to 101dB (A).

Conclusion: the hearing protector was worn by 59.7% of the workers, the plug model was the most used (47.4%) and 75.8% reported that occupational noise decreased with the use of hearing protectors. Most workers use hearing protection and have no hearing symptoms. However, the presence of symptoms such as otalgia (8.8%), otorrhea (5.3%), dizziness (14.0%), tinnitus (17.5%) and difficulty in speech comprehension (7, 0%) should be pointed out. Noise assessment showed high levels from some maintenance machinery, representing a risk for hearing. The sectors of the woodwork and metalwork were the noisiest.

Keywords: Noise Effects; Workers' Health; Hearing; Occupational Exposure

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INTRODUCTION

Hospital maintenance features as a service provider, responsible to supply service requests from the hospital complex in an efficient, effective and fast way, such as: fixing, repairing, restoration, conservation, reform and construction. Facilities in those settings must be kept in good conditions of conservation, safety, organization, comfort and cleanliness; water and electricity must continue being supplied in case of interruption. Thus, hospital maintenance makes sure that machinery and facilities are working properly, providing comfort and safety conditions for the development of several activities in the institution. In addition, preventive and corrective maintenance actions of the building facilities must be reassured in order to contribute to the ongoing enhancement of health care services¹.

However, to most hospitals, maintenance services are not viewed as essentially important². In hospital settings, attention is usually focused on the health care professionals, aiming at prevention from damages or occupational accidents. The other professionals, although they are exposed to hazards, they do not have the same attention, which may cause implications for workers' health, particularly the ones from hospital maintenance.

Work conditions at the hospital maintenance service are unhealthy, as there are environmental hazards to workers' health, mainly the physical risk, once noise is produced by the machines they use³.

Noise is an undesirable sound, and it is the commonest physical agent among the occupational hazards at workplace, which may cause deleterious effects to health and hearing⁴. That risk is present at several workplaces, among them, in hospital maintenance, where services, such as woodwork, metalwork, masonry work, boiler, electrical fixtures, hydraulics, gardening are concentrated, among others⁵. Nevertheless, studies related to workers' hearing health are still incipient in this sector, therefore, research in this area is required.

Noise may harm hearing and cause difficulty in speech understanding, tinnitus, cephalgia, aural fullness, dizziness, stress, nervousness, irritability, gastric disorders, circulatory dysfunctions of eyes, attention and memory, sleep and mood, among others^{6,7}.

Auditory and non-auditory effects will depend on noise frequency, intensity, duration and rhythm, as well as the time length of exposure to it and individual susceptibility^{4,8}.

Noise-Induced Hearing Loss (NIHL) features as a neurosensory hearing loss, notched audiometric configuration, usually symmetric, bilateral, irreversible and progressive. NIHL is considered one of the commonest occupational diseases in the industrial activity, and is totally preventable^{4,8}.

According to a study⁹, statistics on noise exposure is not available for most industrialized and non-industrialized countries. However, high levels of occupational noise exposure were reported in 17 studies held in 12 countries of South America, Africa and Asia. Such high levels of noise were verified at workplaces, and in many of those studies, hearing loss was reported in the exposed workers.

Millions of workers in Europe have been exposed to occupational noise and subject to hearing damage. About 7% of them suffer from occupational hearing disorders, and NIHL is allegedly one of the most prevalent occupational diseases in the European Union¹⁰.

An American study suggests that hearing loss is the third commonest chronic physical condition in the United States, more prevalent than diabetes or cancer, and occupational hearing loss, mostly caused by exposure to high noise levels is the commonest occupational disease in the United States¹¹.

In Brazil, there are no precise data on noise exposure among the economically active population, which hinders an estimation about the number of exposed workers, as well as the identification of the most hazardous lines of business, highly useful information for NIHL monitoring and prevention^{12,13}.

Considered a public health problem, NIHL is preventable by means of protection, prevention and health promotion actions, putting forth joint measures and the effective participation of workers in prevention programs, assessing social determinants and organizational factors^{12,13}.

Therefore, research on the hearing health of noise-exposed workers is valuable, including workers from the hospital maintenance sector, whose studies are scarce or non-existent. Thus, the current study aims at investigating the use of protection as well as the hearing symptoms of workers from the hospital maintenance sector, in addition to the assessment of the machinery noise levels.

METHODS

This research was approved by the Research Ethics Board of the Hospital de Clínicas, Federal University

of Paraná, register number 32003014.9.3001.0096. Workers from the hospital maintenance sector were invited to participate in the study and informed about its objective, and all of them signed the Free Informed Consent Form.

It is a cross-sectional quantitative study, developed at a large Federal Public Hospital Maintenance Service from June 2014 to April 2015, having hospital maintenance workers as participants in the research.

The inclusion criterium was to be a hospital maintenance worker in the areas of metalwork, mechanics, boiler, woodwork, medical gases, masonry work, electrical, hydraulic work and gardening, exposed or not to noise levels greater than 80 dB(A) or other ototoxic agents.

Initially, an adapted questionnaire was applied¹⁴ (Appendix 1), comprising open and closed questions, including personal data as well as workers' clinical and occupational history.

In the current study, the questions analyzed related to: sociodemographic data (gender, age and schooling); current position (1.1); employment relationship (1.2); length of time at the job (1.5); daily work hours (1.6); noise perception at the maintenance sector (1.7); knowledge on measures for noise reduction (1.10); use and type of hearing protector (1.11); guidance on hearing protection (1.12); perception on the use of hearing protection (1.13); exposure to chemicals at workplace (1.14); former occupational noise exposure (1.15); audiometric exam (2.1); history of morbidity (3); hearing symptoms (5.1 to 5.5); difficulty in speech understanding (5.10).

Subsequently, the assessment of environmental noise level was carried out by a certified professional, using a Bruel & Kjaer 2238 sound pressure meter, duly calibrated. The technical assessment procedures, recommended by the Occupational Hygiene Regulations 01 from Jorge Duprat Figueiredo Foundation for Occupational Safety and Medicine (FUNDACENTRO), were complied¹⁵. Measurement was performed in workers' hearing area (delimited by a radius of 150mm \pm 50mm, measured from the entrance of the ear canal).

The reference criterium adopted was 85 dB(A) for an 08-hour working day, dose duplication increase (q) = 5, integration threshold of 80 dB(A), Leq readings and minimum and maximum levels. Three-minute evaluations were performed for each equipment at work. All machines were turned on, one at a time, for the assessment (except for the router and dust collector

which were jointly evaluated). Evaluations were carried out during regular work hours and tasks. Despite the complex operational dynamic activity, it was opted for checking sound pressure level of each equipment as if it operated alone in the environment.

Statistical analysis was carried out by means of Descriptive Statistical Methods (frequency tables, mean/median, minimum, maximum, standard deviation). Sphinx for Windows software was used for the analyses.

RESULTS

Hospital maintenance team comprised 86 workers during the study. Twenty-nine (29 – 33.7%) workers were excluded from the study, as 20 of them did not work in the sector anymore, 2 were on sick leave, one was on vacation, and 6 refused to participate in the study.

Therefore, 57 workers (66.3%) participated in the study, all males, ages ranging from 21 to 75 years (mean age of 43.3 years and standard deviation of 13.3 years). As for schooling, 31.6% had incomplete middle school (9 years), 29.8% complete high school, 21.1% complete middle school, 14% incomplete high school, and 3.5% complete Higher Education.

The maintenance service had three different employment relationships: the permanent employees (under an exclusive legal system) (5.3%); the ones hired by the foundation (17.5%) and the outsourced ones (77.2%) both under the Consolidation of Labor Laws (CLT). It should be pointed out that labor relations did not influence or had no relation to the sectors, job positions or risk agents in the maintenance sector, including the exposure to different noise levels.

Mean length of time at the job in the maintenance service was 8.9 years and mean hours of working day was 9.3 hours. The prevalent jobs were carpenter (10.5%), boiler operator, bricklayer and electrician with 8.8% for each job.

Workers reported exposure to chemicals at workplace (64.9%); noise exposure in the former job (66.7%); and non-occupational noise exposure (40.4%). (Table 1)

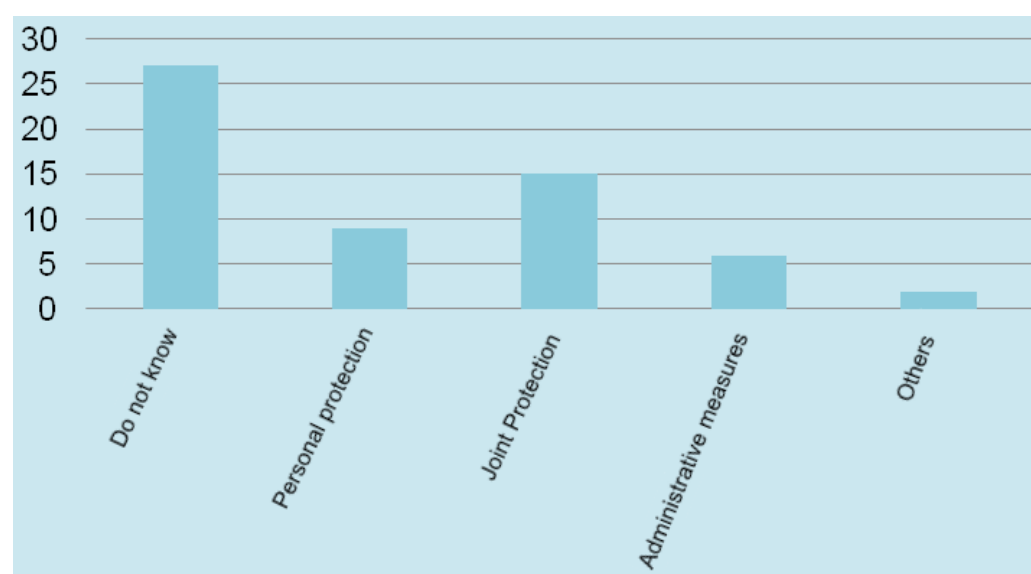
All of them underwent audiometric exam at work, and 31.6% mentioned history of morbidity. As for hearing complaints, 8.8% reported otalgia, 5.3% reported otorrhea, 14.0% complained about dizziness, and 17.5% reported tinnitus. Difficulty in speech understanding was mentioned by 7.0% of the participants (Table 1).

Table 1. Sample distribution according to maintenance workers' clinical and occupational history (n=57)

Variables	Absolute Frequency N	Relative Frequency %
Chemical exposure at workplace	37	64.9
Exposure to high noise levels at former job	38	66.7
Non-occupational noise exposure	23	40.4
Audiometric testing at the workplace	57	100
History of morbidities	18	31.6
Otalgia complaint	5	8.8
Otorrhea complaint	3	5.3
Dizziness complaint	8	14.0
Tinnitus complaint	10	17.5
Report of difficulty in speech understanding	4	7.0

When workers' opinions about what could be done to reduce noise in the maintenance were categorized, 45.8% did not know the solution, 25.4% mentioned joint

measures for protection, 15.3% mentioned individual protection, and 10.2% mentioned administrative measures (Figure 1).

**Figure 1.** Workers' knowledge on measures to reduce noise in the maintenance sector

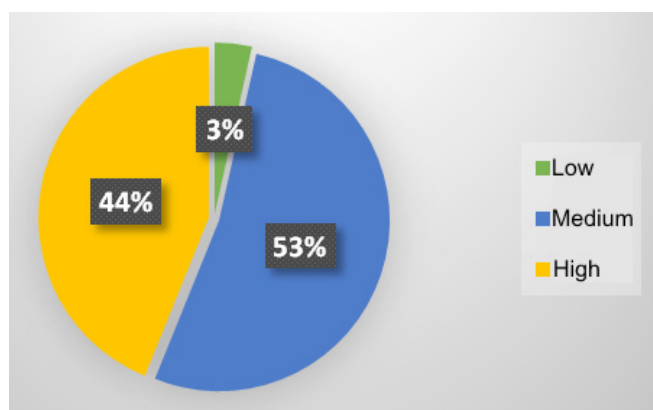
Regarding the guidance on hearing protection, 98.3% answered affirmatively. Hearing protection was used by 59.7% of the workers, ear-plug model was the best used (47.4%), hearing protectors were sometimes worn by 24.6%, and 12.3% did not wear any hearing

protectors. In relation to the considerations on the use of hearing protection, 75.8% claimed that the use of hearing protectors reduced occupational noise, 8.1% answered that it is hard to talk with them (Table 2).

Table 2. Workers' sample distribution on guidance, use, type and their considerations on the use of hearing protection (n=57)

Variables	Absolute Frequency n	Relative Frequency %
GUIDANCE		
Yes	56	98.3
No	1	1.8
USE		
Yes	34	59.7
No	7	12.3
Sometimes	16	28.1
TYPE OF PROTECTORS		
Did not wear	7	12.3
Ear muffs	9	15.8
Ear plugs	27	47.4
Ear muffs and plugs	14	24.6
CONSIDERATIONS ON THEIR USE		
Do not wear them	3	4.8
Occupational noise is reduced	47	75.8
They disturb talking	5	8.1
Protectors bother me	3	4.8
I wear them because it's mandatory	3	4.8
Makes no difference to wear them	1	1.6

Figure 2 shows workers' answers on noise levels in the hospital maintenance sector, with 52% of the workers considering them medium, 44% considered them high, and 4% considered them low.

**Figure 2.** Distribution of workers' answers on noise levels in the maintenance sector

According to the measurement results of the noise levels in the hospital maintenance machinery, handsaw for woodwork was the noisiest machine, featuring 101.0 dB(A) as the equivalent level of noise, followed by the marble saw cutting metal, which featured 99.9 dB(A) as the equivalent level of noise, and the same machine cutting tiles featured 98.2 dB(A), the multi-cutter saw for iron reached 98.7 dB(A), and the sander reached 98.2 dB(A) (Table 3).

Table 3. Machine distribution in the hospital maintenance sector, according to the result of noise level assessment

Machine	Sector	Leq* dB(A)**	Max dB(A)	Min dB(A)
Handsaw	Marcenaria	101.0	108.4	65.5
Marble Saw:				
Cutting metal		99.9	109.3	77.0
Cutting tiles		98.2	109.3	70.8
Iron multi-cutter saw	Metalwork	98.7	103.6	71.3
Sander	Metalwork	98.2	105.5	86.7
Aluminum multi-cutter saw	Metalwork	97.7	107.7	60.6
Grinding wheel	Metalwork	96.9	103.1	88.7
Coping saw	Woodwork	95.0	106.7	82.2
Hand Electric Planer	Woodwork	95.0	103.3	88.1
Brush cutter	Gardening	94.9	102.4	78.2
Power Hand Drill	Woodwork	94.4	97.9	87.1
Compressed air nozzle	Woodwork	93.8	100.0	90.7
Router + Exhaust (together)	Woodwork	93.1	99.8	78.7
Circular saw B:				
Cutting solid wood	Woodwork	91.7	106.8	79.4
Cutting leaked wood		89.5	99.6	83.4
		80.5	90.0	73.7
Woodwork grinding wheel (sharpening drill)	Woodwork	87.5	93.4	77.4
		83.3	94.4	76.2
Circular saw A (cutting wood)	Woodwork	87.1	94.5	82.6
Boiler	Boiler	84.6	90.7	80.2
		83.5	94.5	79.0
Woodwork sander (sanding wood)	Woodwork	84.1	94.5	79.0
Bench Drill	Woodwork	83.1	88.8	81.0
Dust collector	Woodwork	81.3	92.6	81.0
Paint spray gun	Painting	67.8	92.0 (background noise – disregard)	72.8
Exhaust (on - alone)	Woodwork	62.0	87.2	67.2
Welding (red)	Metalwork	-	84.5	82.0

NOTA: Leq* - equivalent continuous sound level; Max - Maximum; Min - Minimum
dB(A)** - sound pressure level in decibels, A-weighting filter, which is similar to the response of the human ear.

DISCUSSION

The current study aimed to investigate the use of hearing protection and symptoms in workers from the hospital maintenance sector, in addition to the assessment of noise levels of the machinery.

Due to the scarcity of studies on workers' hearing health in the hospital maintenance sector, also called building maintenance, studies related to similar services performed by the workers from hospital maintenance were searched, such as repairs, restorations, conservation, reforms and construction, including the jobs performed by electricians, bricklayers, carpenters, among other jobs required in the hospital maintenance service.

Building maintenance service rendered in Health Care Facilities is indispensable to ensure users' safety within health care facilities¹. If that is supposed to occur, it is understood that health promotion and quality of life enhancement of workers in those services are paramount, by means of educational interventions which contribute to preventive actions at their workplace, prevailing the occupations of carpenters (10.5%), electricians, boiler operators and bricklayers (8.8% each).

Other studies with maintenance workers describe similar jobs^{2,3}. Study within a Federal Educational Institution assessed the risks which maintenance workers are exposed to, and concluded that the main

maintenance jobs were plumbers, welders, electricians, bricklayers, gardeners and upholsterers, and their major risks were noise, outdated equipment, work at heights and exposure to chemicals³.

Another study evidenced the existence of maintenance services in a private, medium-sized, high complexity hospital in the interior of São Paulo State, and concluded that, within hospital settings, maintenance contributes to improve the environment, and may influence health care safety, health care team's productivity, hospital infection indicators, decrease of work accidents, in addition to potentialize humanized care².

Thus, it is essential to ensure the satisfactory functioning of that sector, by valuing its workers, detecting hazards they are exposed to, adopting preventive measures, aiming at health promotion and quality of life.

Other studies still report that some workers are vulnerable to noise, such as welders, carpenters, electricians, mechanics and bricklayers, and may be included among the professionals at greater risk for NIHL, with age, time length of exposure to occupational noise as contributing factors to hearing disorders¹⁶⁻¹⁸.

In this study, time length of occupational noise exposure averaged 8.9 years for 9.3 hours of working day. Another study evidences that the risk for developing occupational NIHL increases according to the time length of exposure in years¹⁹.

Maintenance workers' occupational history unveils former noise exposure (66.7%). In their current job, in addition to noise exposure, they were also exposed to chemicals (64.9%). Studies show that exposure to chemicals (solvent, among them) is potentially ototoxic, and added to noise, may contribute to the development or aggravation of hearing loss²⁰⁻²².

As for their medical records, results report former morbidities (31.6%), in addition to hearing complaints, among them, dizziness (14.0%) and tinnitus (17.5%) stood out. It should be pointed that non-auditory symptoms were not broadly analyzed in the current study, however, they should be investigated in the anamnesis^{4,23,24}.

In a study to verify the occurrence of auditory and non-auditory symptoms in workers from a glass processing plant, exposed to noise levels greater than 85.0 dBA, in Salvador (Bahia State, Brazil) in 2010, it was evidenced that the most reported hearing symptoms were tinnitus and loudness discomfort, while the most reported non-auditory symptoms were anxiety,

cephalea, gastric disorders and insomnia²⁴. Symptoms, such as loudness discomfort (30.1%); tinnitus (24%), aural fullness (22.9%); hearing loss (21.6%); and otalgia (13.2%) were also identified after exposure to high noise levels by workers from a tile manufacturing plant in João Pessoa (Paraíba State, Brazil)²⁵.

Being questioned about audiometric assessment, all of the hospital maintenance workers confirmed that they undergo audiometric testing in their current job, evidencing the compliance to the current regulations in the country. Audiometric testing is recommended to assess and follow up hearing of workers exposed to high sound pressure levels, according to Ordinance 19, Labor Ministry²⁶.

In order to verify workers' knowledge on preventive measures, it was asked them what could be done to reduce noise within the hospital maintenance sector. Results showed that 45.8% of the workers did not know about the subject. The other workers suggested joint preventive measures for noise control (25.4%). That evidences workers' knowledge on the need to prioritize the adoption of joint measures for noise control.

It is known that joint measures to reduce and control noise exposure to machinery and equipment are priority. However, it is still observed noisy machines and equipment, without proper maintenance, nor the adoption of preventive measures²⁷.

Still about that issue, personal protection was mentioned by 15.3% of the workers, and administrative measures by 10.2% of them. There has been common agreement that occupational hearing disorders can be prevented by means of a control hierarchy, putting the use of engineering control over administrative control and personal protection equipment⁸. However, the use of personal protection equipment (PPE) has been the only preventive measure adopted by workers in many jobs^{12,28}, including in the current study.

As for the use of PPE, it was analyzed the guidance provided on the use of hearing protection, and most of them (98.3%) reported that they had been guided on its use, with 59.7% reporting its use. Ear-plug model was worn by 47.4% of workers. In this aspect, training programs strengthened the importance of hearing health prevention and promotion, and may positively influence the use of hearing protectors in noisy workplaces²⁹.

In a study carried out to investigate NIHL in 60 woodworkers from the construction field, 63% of those workers reported to wear hearing protectors regularly, mostly ear-plug model¹⁶. Another study with 15 workers

from a food company in Curitiba, Paraná State – Brazil, where the efficiency of hearing health workshops as a proposal of educational intervention for noise-exposed workers was analyzed, it was evidenced that 73.3% of the workers also wore that type of hearing protector³⁰, similarly to the current study. Nevertheless, it is essential knowledge on noise and its health outcomes for workers to get involved in the adoption of preventive measures.

Regarding the use of hearing protection, 75.8% of the workers answered that occupational noise was reduced by using protection. A similar result was found by the authors when they evaluated and compared the perception of 440 workers from a logging company in municipalities from the interior of Paraná State, Brazil. They concluded that the most relevant aspects considered for the use of the equipment were noise reduction by the protector and verbal communication³¹.

As for the noise levels of the machines in the hospital maintenance, 52% of the workers considered them medium level, 44% considered them high, and 4% of the workers considered them low. Noise produced by machines in a tool manufacturing plant in Espírito Santo State, Brazil, was also considered excessively high by 76% of the workers³².

The incorporation of workers' risk perception and the ways to include workers' knowledge, as they experience risk situations and events, is an important step for risk identification and transformation¹². Study shows that workers questioned about their knowledge on noise risks for health, 76% reported that they knew about those risks, not only for general health, but also for hearing health²⁵.

The assessment results for the noise levels of the machines from the hospital maintenance sector corroborate workers' reports that noise levels in the maintenance is high, and the studied population is exposed to the risk of developing hearing loss, evidencing noise levels ranging from 67.2 dB(A) to 109.3 dB(A). It should be pointed out that the sound pressure level of most equipment was measured as if they operated individually in the environment, although maintenance has a complex and variable dynamic operational activity, depending on the job demand. With several machines working at the same time, the final sound pressure level could be higher than the one evaluated in this study, aggravating the risk for the exposed workers.

It was verified that 15 out of the 22 machines analyzed at the equivalent continuous sound level (Leq) featured sound pressure level greater than 85 dB(A),

only 2 machines had levels lower than 85 dB(A), which may hinder general and hearing health of the exposed workers, unless preventive measures are not effectively adopted. During the measurement of noise levels in furniture manufacturing plants in Minas Gerais State, Brazil, it was also verified that most analyzed machines evidenced equivalent continuous sound level greater than the tolerance threshold of 85 dB(A)³³.

Noise assessment of the machines shows that the handheld circular saw, the marble saw, multi-cutter saw, sander, grinding wheel, coping saw and electric planer are the noisiest. Assessment results corroborate a study which suggests that planers and electric saws are among industrial machinery able to produce noise of approximately 100 dB(A) and cause NIHL³⁴.

A literature review, which assessed noise in hospital settings, pointed that 38.1% of the analyzed studies recommended the implementation of educational interventions to reduce environmental noise; 19.0% recommended noise surveillance, in addition to sound adaptation of equipment and architectural adaptations with managers' involvement³⁵.

Based on the results of the current study, it is recommended the implementation of preventive measures to eliminate or reduce hearing hazards among hospital maintenance workers. It can be understood that once the risks of the occupational noise are known, as well as its impact on general and hearing health of exposed workers, it is advisable to adopt individual and joint preventive measures which favor the reduction or elimination of the risk at workplaces; to make employers aware of the importance of a Prevention Program on Hearing Loss; and to guide workers, aiming at fostering those individuals' quality of life²⁴.

As a limitation in this study, noise assessment of the machines did not consider the regular work in the sector, where all machines could work at the same time, and also it did not have access to the quantitative analysis of other noise-related risk factors. The questionnaire used is long, which contributed to the refusal in participating of some workers. Further studies should consider those factors so that noise and its auditory and non-auditory effects be better profiled.

CONCLUSION

The results obtained enabled to investigate the use of hearing protection and symptoms in workers from the hospital maintenance sector, in addition to the noise level assessment of the machines in this sector, scarcely found in the literature.

Hearing protector was worn by 59.7% of the workers, ear-plug model was the most worn (47.4%), and 75.8% of them reported that occupation noise was reduced with the use of hearing protectors.

Most workers did not report hearing disorders, although the presence of symptoms, such as otalgia (8.8%), otorrhea (5.3%), dizziness (14.0%), tinnitus (17.5%) and difficulty in speech understanding (7.0%) should be pointed out. Noise levels were considered medium or high by most workers from the sector.

Noise assessment corroborates workers' report on the occupational noise levels and evidenced high levels from the machinery in the maintenance, posing risk to hearing. Woodwork and metalwork sectors were the noisiest.

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APPENDIX 1 - Questionnaire

Name: _____

Date: ____/____/____ Age: _____ Gender: Male () Female ()

Schooling: Middle School (9 years) () High School ()

Complete () Incomplete ()

Complete Higher Education () Incomplete Higher Education ()

1 DATA

1.1 Current Job: _____

1.2 Category: Funpar () Dean's office () Outsourced ()

1.3 Work area in the maintenance sector:

() metalwork and mechanics () boiler () transport

() clinical engineering () gardening

() building and reform design and supervision () medical gases

() masonry work, electrical fixtures and hydraulics () administration of the unit

() engineering and hospital maintenance () woodwork

1.4 Length of time in the job at the hospital: _____

1.5 Length of time in the job in the maintenance sector: _____

1.6 Hours of working day: _____

1.7 Impressions on the maintenance noise levels: Low () Medium () High ()

1.8 What maintenance machine is the noisiest? _____

1.9 Did you get any guidance about the noise effects on hearing at your workplace?

Yes () No () If so, by whom: _____

1.10 In your opinion, what could be done to reduce noise in the maintenance sector? _____

1.11 Use of ear protector: Yes () No () Sometimes ()

If so, what type: Ear muffs and plugs () Ear muffs () Ear plugs ()

1.12 Have you ever got any guidance on the use of ear protectors?

Yes () No ()

By whom: _____

1.13 By wearing ear protectors, you can notice that:

Noise is reduced at workplace () It is bad to talk ()

The ear protectors disturb () Makes no difference to wear them ()

I cannot wear ear protectors () I only wear them because they are mandatory ()

1.14 At workplace, do you have any contact with chemicals? Yes () No ()

Which ones : _____

1.15 Have you ever worked in other jobs with high sound levels?

Yes () No ()

Which one: _____

1.16 Former job: Line of business: _____

Function: _____ Length of time in the job: _____

Noise exposure at the former job: Yes () No () sometimes ()

Use of ear protectors in the former job: Yes () No () sometimes ()

If so, what type: Ear muffs and plugs () Ear muffs () Ear plugs ()

1.17 Are you noise-exposed out of the hospital settings? Yes () No ()

Which ones: Shows () Frequent parties () Ear phones () Religious services ()

Others () Which ones? _____ Amount of daily hours: _____

2 FORMER AUDIOMETRIC TESTING

2.1 Did you undergo any audiometric testing in your current job? Yes () No ()

2.2 Did you undergo any audiometric testing in your former job? Yes () No ()

Reason for the exam: Professional () Hearing disorder ()

Did you know about the diagnosis? Yes () No ()

3 FORMER MORBIDITIES

Meningitis: Yes () No ()
 Chemotherapy: Yes () No ()
 Renal Failure: Yes () No ()
 Hypothyroidism: Yes () No ()
 Family history of deafness: Yes () No ()
 High blood pressure: Yes () No ()
 Diabetes: Yes () No ()
 Heart Condition: Yes () No ()
 High Cholesterol: Yes () No ()
 Head trauma: Yes () No () Don't know ()

4 PERSONAL HISTORY

4.1 Do you undergo any health treatment? yes () no ()
 Which one? _____
 How long for? _____
 4.2 Do you take any medication? Yes () No ()
 Which one? _____ How long for? _____
 4.3 Do you drink any alcoholic drinks: Yes () No () sometimes ()
 How many glasses? _____
 4.4 Do you smoke? Yes () No () sometimes ()
 How many cigarettes a day? _____

5 AUDITORY SYMPTOMS

5.1 Earache (otalgia): Yes () No ()
 Which ear? Right ear () Left ear () Bilateral ()
 5.2 Presence of ear secretion (otorrhea): Yes () No ()
 Which ear? Right ear () Left ear () Bilateral ()
 5.3 If so, how often are those symptoms?
 Daily () Weekly () Every fortnight ()
 Hardly ever () Don't know ()
 5.4 Dizziness: Yes () No ()
 5.5 Tinnitus: Yes () No ()
 Which ear? Right ear () Left ear () Bilateral () Don't know ()
 5.6 Frequency of the tinnitus: Daily () Weekly ()
 Every fortnight () Monthly () Hardly ever () Don't know ()
 5.7 What period is tinnitus more intense: After work () All day ()
 Morning () Afternoon () Evening or Night () Don't know ()
 5.8 Ear surgery: Yes () No ()
 Which ear? Left ear () Right ear () Bilateral ()
 5.9 Hearing trauma: Yes () No () Don't know ()
 5.10 Difficulty in speech understanding: Yes () No () Sometimes ()
 In which situation? _____

6 NON-AUDITORY SYMPTOMS

6.1 Irritability: Yes () No () Sometimes ()
 6.2 Tiredness: Yes () No () Sometimes ()
 6.3 Difficulty in concentrating: Yes () No () Sometimes ()
 6.4 Balance disorders: Yes () No () Sometimes ()
 6.5 Sea Sickness: Yes () No () Sometimes ()
 6.6 Vomiting: Yes () No () Sometimes ()
 6.7 Stomachache: Yes () No () Sometimes ()
 6.8 Depression: Yes () No () Sometimes ()
 6.9 Stress: Yes () No () Sometimes ()
 6.10 Headache: Yes () No () Sometimes ()