RISK ANALYSIS OF NOISE IN INDUSTRY MAKING CLOTHES

Análise do risco ruído em indústria de confecção de roupa

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ABSTRACT

Purpose: to get into an underexplored work environment and to identify if this environment might bring hearing losses to the workers. **Methods:** the environment chosen is a garment factory located in Colatina, Espírito Santo/Brazil. The two noisiest areas of the factory were selected to be analyzed, as well as six employees that have been working there for five years or so. The employees were asked to fill in a questionnaire on the hearing symptoms and then the audiometric tests taken for the last five years were compared. The analyzed areas produce noise from 83,5 to 97,8 dB. **Results:** from the audiometric tests we could conclude that 83% of the workers did not have any hearing loss, although 16% had occupational loss, but this was classified as stable. From the questionnaire we can conclude that 33% of the workers feel some kind of fatigue when exposed to high level sound for some time, 50% feel themselves stressed after their work shift, but none of them stated to hear any buzz nor insomnia, nor difficulty hearing other people. **Conclusion:** this work environment presents some risks to the hearing, once the employees are exposed to sound pressure levels during their work shifts, and the occupational hearing loss is evident although to a lesser extent – considering that the sample employees have been working there for at least five years. Therefore, it is plain to understand the importance of studying a good variety of work environments to identify where prevention programs, like the HLPP (Hearing Loss Prevention Program) should be applied.

KEYWORDS: Hearing Loss; Hearing Loss, Noise-Induced; Occupational Risks; Clothing

INTRODUCTION

Hearing is one of the noblest senses; its main function is linked to the acquisition and development of oral, essential language in interpersonal relations and the environment [1]. Due to this importance, is that scholars increasingly seek ways to prevent the occurrence of hearing loss, especially those caused by noise.

"Noise threatens hearing, health, learning and behavior," says Nancy Nadler, spokesman for the Center for Hearing and Communication (CHC), responsible for the institution of the International Day of Awareness about Noise, affecting humans in physical, psychological and social level [2]. At high intensity and with continued exposure, noise can cause structural changes in the inner ear, which determine the occurrence of Noise Induced Hearing Loss (NIHL), and is the most frequent cause of injury to the health of workers [3], present in many [4] lines of business, such as in industries, textiles, construction works, metallurgy, printing, sewing workshops, among other work environments [5].

The garment industry in the country has emerged from the process of national industrialization with textile production. Brazilian Association of Clothing [6] – With the evolution of the textile industry, the modernization of the manufacturing sector, which currently has twenty-one different articles of clothing and accessories segments, according to the classification of Abravest occurred. This is one of the sectors that soon developed in the country by requiring little technological level and small capital investment, in many regions, as occurred in the early industrialization of Brazil, this industry is the precursor of the industrialization process.

With efforts to increase the amount of production and maintain the products competitiveness in the market, companies invest and modernize faster and faster their machines. The great need of skilled

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manpower in diverse industry, due to the variety of productive stages in the industry, such as: warehouse of fabrics and trims, creating, modeling, enfesto, cutting, sewing, crafts, laundry, ironing, finishing, labeling , packaging, final inspection and shipment [6]; attracts people who search for a paid service.

This niche market that has been growing steadily, it is underexplored in scientific research as working conditions and occupational health. There is little explanation about this environment in the speech, and he presents some risk, especially hearing the employee.

Because of this question, the aim of this study is to verify the presence of noise in garment manufacturing industry, since this risk is not widespread in research related to this work environment.

METHODS

The research, retrospective and documental study conducted in a company Tailoring located in Colatina-ES/Brazil.

The chosen industry has a total population of 368 employees. Through the Program of Environmental Risk Prevention supplied by them, noise measurements were analyzed in each sector, and thus raised the two sectors of higher risk noise, identified as Ironing (six employees) and area USED (with four employees), totaling ten workers. After applying the exclusion criteria, only six workers were selected to participate in the study (four are workers Ironing and two workers are Used).

Exclusion criteria were: employees with less than five years of service to the participating undertaking; workers in other sectors with less intensity noise or no risk and workers who declined to participate voluntarily in the study. With selected subjects, we analyzed the audiometric tests performed since the entrance exam to the current exam (2011) and can not therefore have fewer than five tests for each worker (at least one test for each year), available at medical records filed in the sector responsible for this function. Audiograms were analyzed for normality and hearing loss, which are subdivided into occupational and non-occupational. Occupational hearing loss found were analyzed for stability, worsening or triggering.

The selected officials responded in a single day and individually questionnaire approved by the ethics committee – Protocol 071/11 (Figure 1) of the closed type of information and auditory symptoms containing four questions, developed by the researcher based on descriptions of symptoms in cases NIHL in the literature.

With the questionnaires, they were collected and discharged workers. The responses obtained through the questionnaire and analysis of audiometry were transformed into percentages and presented in this work by means of graphs.

RESULTS

1. Description Field of research: Synthesis of the infrastructure of the selected company

The analyzed company is located in the town of Colac in the state of Espírito Santo, and acts for clothes in the jeans, shirts, knitwear and social segment. It employs 368 staff, with workday of 9 hours / day (7am entry ace out ace 17:15 pm with 1 hour 20 minute stop for lunch). The measurements of each sector were provided by the company resulting from PPRA conducted by a Technical Work Safety, the company contracted to carry out the reviews: Cutting Sector I – 80.8 to 89.7 dB (A) ; Sector Cut II – 80.8 to 82.2 dB (A) ; Sector Sewing I – 79.9 to 89.2 dB (A) , Sector Sewing II – 79.8 to 88.4 dB (a) ; Sewing Sector III – 80.5 to 84.4 dB (a) ; Sewing Sector IV – 79.8 to 84.1 dB (A) ; Sector Sewing Pilot – 81.1 to 86.4 dB (a) ; Salon Embroidery – 86.4 to 90.3 dB (a) ; Limpadeiras industry – from 80.1 to 82.7 dB (a) , Maintenance Sector I – 82.0 to 89.1 dB (a) ; industry Corrosion / sanding – 81.9 to 86.1 dB (a) ; Sector Boiler – 81.4 to 82.7 dB (A) ; Finishing Sector I – 76.8 to 79.7 dB (a), Sector II Finish – 80.4 to 89.4 dB (a) ; industry Washing / Drying – 80.4 to 87.7 dB (a) ; Sector Montage / Collage – 79.7 to 82.3 dB (a) ; Sector area USED – from 88.4 to 98.2 dB (a) ; Sector Ironing – 83.5 to 93.5 dB (a) ; Sector General Administrative Services – 84.2 to 86.1 dB (a) . The other sectors as Snap , Modeling , Styling, Effluent Treatment , Storage of Chemicals , Warehouse , Shipping , Chair , Human Resources , Billing , Purchasing , Accounts payable / receivable , Sales , Production Planning and Control , Guaritas , Canteen , Interfacing and Accounting , show measurements below 80 dB (A) with no risk noise , however the PPRA other risks is described as gifts , heat, dust and solvents in their respective sectors , which were not listed because they are not subject of this study.

The company makes mandatory the use of individual protective shield sound, performing and training vouchers for their use, however, it can be observed that most workers do not use or even know the basic instructions on individual protectors. The company has an occupational physician who acts in certain on company time, and archiving in place of audiometric tests performed by specialized clinics, chosen for each contract.

QUESTIONNAIRE

1. Personal data:
1.1 Age : _____ years
1.2 You are exposed to noise outside the work environment? ( ) YES ( ) NO
1.2.1 Name the places: _____
_____
2. Professional data:
2.1 How long have you worked at this company? _____
2.2 Have you worked in another company, you was exposed to noise? ( ) YES ( ) NO
2.2.1 If yes: How long? _____
2.2 Current Work Day:
2.2.1 Entry: _____ hours
2.2.2: Output _____ hours
2.2.3 Lunch: _____ hours
3. In your current job, you have contact with chemicals (solvents) ( ) YES ( ) NO
3.1 Make use of Personal Protective Equipment? ( ) YES ( ) NO _____
3.2 If yes: Is there training to use? ( ) YES ( ) NO
3.3 Do you think that effective training? ( ) YES ( ) NO
4. Have any of the symptoms below:
4.1 Tinnitus? ( ) YES ( ) NO
4.2 Difficulty in understanding what people say? ( ) YES ( ) NO
4.3 Insomnia? ( ) YES ( ) NO
4.4 Sense of hearing loss? ( ) YES ( ) NO
4.4.1 If yes: How long have you been noticing this change? _____
4.5 Stress or irritation at the end of the workday? ( ) YES ( ) NO
4.5.1 If yes: What do you attribute this stress ? _____
4.6 Do you feel uncomfortable when exposed to loud sounds? ( ) YES ( ) NO

Figure 1 – Questionnaire for company employees participating in the research

1.1. Description of the sectors analyzed:

The sector identified with higher noise level was the Sector Area USED, where it performs the operation through the dyeing process that describes Used by putting the garment in place to be dyed, apply the dye through the air pistol compressed, remove clothes once dyed, deposit it in a pre-determined location, and other related services. The consequences outlined in the Prevention of Environmental Risks for this sector were: fatigue, irritability, headaches, decreased hearing, and so on. The equipment used in this industry as well as the noise generated by them, are listed in Table 1.

The second area examined was the Ironing industry, identified as the second sector presents the greatest risk noise. The function of this sector is performing crossing clothing services, using the process of the steam press, noting the temperature and pressure of steam used and other related services. The consequences outlined in the Program for Prevention of Environmental Risks were: fatigue, irritability, headaches and decreased hearing. Table 2 lists the equipment used in this industry and their measurements.

The data found in measurements of the equipment used in sectors surveyed (Table 1 and 2) were analyzed and compared with the limits established by Norm 15 (NR15) and are available in Table 3.

Table 1 – Description of the equipment used in industry and their measurements Used

Machinery	Spot noise average / dB(A)	Spot noise maximum / dB(A)	Dosimetry real dose %
Used (cabin) Set Hood	96,5	97,8	353,08
Used (external) Hoods and Compressed Air - 1st job	96,1	98,2	
2nd job	93,2	94,1	
3rd job	88,4	92,7	

Table 2 – Description of the equipment used in industry and Ironing your measurements

Machinery	Spot noise average / dB(A)	Spot noise maximum / dB(A)	Dosimetry real dose %
Steam press I	88,1	91,2	143,40
Steam Presses II	88,9	92,7	
Press (turn pants / dummy)	87,8	90,5	
Ironing	84,5	86,3	

Table 3 – Noise Limits of Tolerance (NR-15)

Noise Level dB(A)	Maximum Permitted Daily Exposure
85	8 hours
86	7 hours
87	6 hours
88	5 hours
89	4 hours e 30 minutes
90	4 hours
91	3 hours e 30 minutes
92	3 hours
93	2 hours e 40 minutes
94	2 hours e 15 minutes
95	2 hours
96	1 hours e 45 minutes
98	1 hours e 15 minutes
100	1 hours
102	45 minutes
104	35 minutes
105	30 minutes
106	25 minutes
108	20 minutes
110	15 minutes
112	10 minutes
114	8 minutes
115	7 minutes

Of the six workers interviewed three complained of stress or irritation at the end of the workday, attributing the noise as the main factor. Two people reported discomfort when exposed to loud sounds and none of the respondents reported having tinnitus, insomnia or feeling of hearing loss / difficulty in understanding what people say (Figure 2).

The sample analyzed, five workers have a history of normality and has hearing loss. Hearing loss was found lodged in the chart above, specified as occupational hearing loss, this loss is stable (Figure 3).

The age range of respondents was 28-51 years old, and this item was not used as a criterion for participation in research. The analyzed group has 5-24 years of service to the company, in general, the same industry. Only 16% of subjects reported exposure to noise outside the work environment, as justifying another job, the waiter service at parties at least three times a week. Two subjects make use of ear and reported that training for the same is efficient, an employee reports using the shield, but thinks ineffective training, while three officials do not make use of ear training and complain.

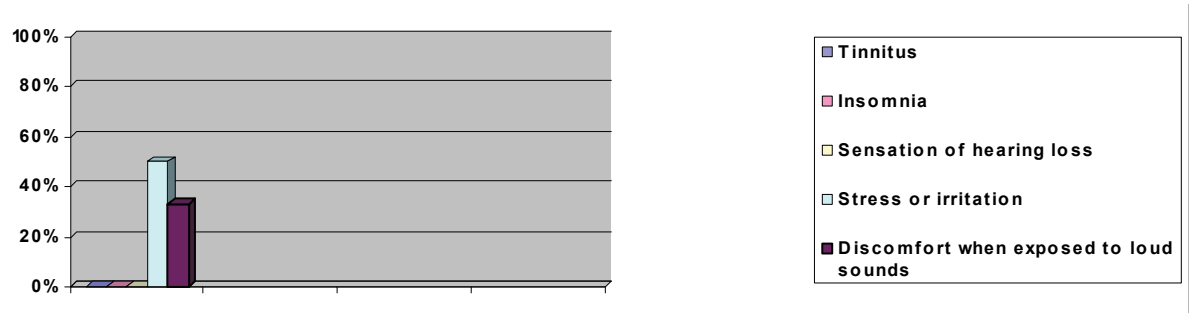

Figure 2 – with responses obtained through the questionnaire

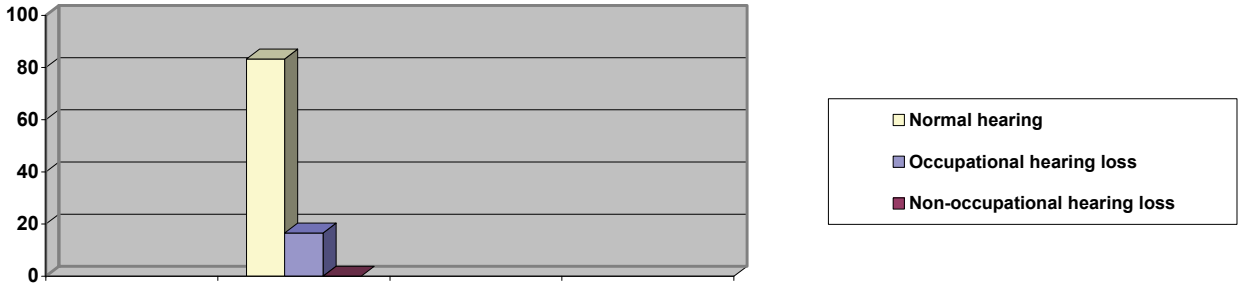

Figure 3 – Chart showing the results of analysis of Audiometries

DISCUSSION

During the 1980s, the noise was the main disease among metalworkers and affected more than 60% of category [7], and today is still rated as the most frequent agent of occupational exposure [8-11], being described as a major cause of sensorineural hearing loss in adults [12,13], usually bilateral, irreversible [4,8,11,14-16], affecting the inner ear and / or auditory nerve [17], insidiously, slowly progressive changes and producing symptoms only after several years [18].

This exposure can be very harmful, totally harmless or a measure of limits. The key issue is the duration of exposure, ie, the level of exposure determines the extent of the auditory effects of noise. All those working exposed to noise exceeding 85dBNPS and prolonged exposure should be monitored, which can be accomplished through pure tone audiometry [8,19].

The higher noise level of the equipment found in the analyzed sectors, generates noise of 98.2 dB (A) and considering the range of intensity to which employees are exposed (84.5 to 98.2 dB (A)), there that the exposure time, in a daily working hours exceeds the thresholds described in NR15 allowed.

Statistically, it is estimated that 15% of the exposed population constant noise of 90dB, eight hours per day, five days per week, 50 weeks a year develop hearing damage after ten years [20]. This fact becomes even more important to analyze the various work sectors, often exceeding the exposure time allowed or do without proper protection.

Exposure during working hours to noise above permissible limits entitlement to punitive damages. Understanding is the Regional Labor Court of the 15th Region (Campinas, Brazil) [21], as in the case of the seamstress who won damages from garment factory that operated in the laundry industry [22].

When the noise stops being just a causative agent of discomfort in the workplace to become a potentially harmful agent to the worker's health, he will take a more specific approach within the field of occupational hygiene. Stands out in Annex 1 of NR 15 (Table 3), which describes the noise levels present in the work environment considered harmful to workers.

Auditory cause a major impact on people's lives, which can lead them to social isolation [23], by difficulties in participating in conversations, making frustrating any family gathering or social event [24,25].

Tinnitus is a symptom that often accompanies occupational hearing loss [26], difficulties in being able to provide out of work contexts and negative influence on the quality of life of workers and the people who surround [27,28]. While none of the candidates analyzed have complained of tinnitus, this symptom should not be disregarded because to discard it, one should first examine the complaints of a larger population of workers exposed to noise and with more than five years of exposure.

Besides the frequent auditory symptoms – namely hearing loss, difficulty understanding speech, tinnitus [29,30] and intolerance to loud sounds – the worker carries PAIR also has complaints such as headache, dizziness and vertigo – because of the important changes that may occur in the labyrinthine structures, making the use of ear not only important to protect your hearing, but also for preservation of vestibular function [31] – irritability and digestive problems [4]. Are also listed in the literature, symptoms such as hearing loss, ear fullness, earache, transient changes in blood pressure, stress [32], disturbances of vision, memory, sleep and mood directly related to the exposure time, with sound pressure levels (SPL) and individual susceptibility [33,34], besides the reduction of speech perception in noisy environments, television, radio, film, theater, sound warning signs, music and environmental sounds [35] and inability to relax [36].

Stress was reported by participants in this study who reported feeling irritation / stress at the end of the workday, showing parity with the symptoms presented in other research that also still reported insomnia and lack of attention to consequences of noise exposure [15].

The volunteers showed another symptom, which is also described in the literature as a consequence of Noise Induced Hearing Loss: nuisance when exposed to loud sounds. None of the respondents complained of hearing loss / difficulty understanding what people say. The age of the participants was not taken into account in this study, although it is relevant to correlate with complaints and investigate whether the absence of symptoms on exposure, is not beyond the short time working (most with only five years of service in this industry), the playfulness of the individual as well as the entire auditory system.

The diagnosis of noise-induced hearing loss of occupational origin depends on the audiogram and the proof of the existence of noise exposure in the workplace, considering the intensity and characteristics of the agent, and the manner and time of exposure, the general conditions health, age of the worker [37], and the type of noise (continuous or intermittent) [11].

The causes and consequences of NIHL are already quite widespread general knowledge, although many do not follow guidelines for preventing this loss. However, some work environments still present dearth of information, because the current concern is facing the risk of grade 3 or 4, where the presence of noise is notorious companies, not taking into account other sectors, which even if not noticeable feature risks to workers' health.

Although only one of the six analyzed workers present Noise Induced Hearing Loss, is adamant the literature the effects and consequences of hearing people exposed to noise. Therefore, considering that the site poses risks to hearing, for better measurement of health problems, new research may be carried out using as target workers with ten or more years of services with noise exposure. Even though this study has shown low levels of claims or losses , described and analyzed in the participating workers would not rule out preventive workers presented here with normal hearing , and that may present a possible trigger NIHL is only visible after a few more years of continuous exposure . The environment selected for analysis (two sectors of clothing firm) exposes workers to thresholds above the tolerance limit. Considering this fact, the company should seek to prevent and resolve problems relevant to excessive exposure to the worker of this site is not affected.

According to the regulations of the Ministry of Labour, companies must maintain a Program Environmental Risk Prevention (NR9), in which the various risks involved in the work must be identified and quantified, from that information, direct the actions of the the Medical Control of Occupational Health (NR7), which shall carry out reviews of health workers [4].

Regarding the noise risk, there is a specific program for its management , which consist of steps

as Assessment , Risk Management and Control , Management Audiometric ; Training and Educational Programs , among others . The objectives of this program are : To improve the quality of life of workers avoiding deafness and reducing extra– auditory effects caused by exposure to high noise levels and other risk agents for the hearing ; Early diagnosis for cases of occupational hearing loss , establishing effective measures , preserving the health of the worker; adapt the company to the requirements of the law (Regulatory Standards Nos. 7 and 9.) to be in compliance with occupational programs : Professional Profile for Social Security , the Medical Control of occupational health ; Prevention Program Environmental Risk ; Hearing Conservation Program [38]. The Hearing Conservation Program also considerably reduces the risk of accidents, since the risk of accidents is about twice as high among workers exposed to noise [35].

The reflecting the implementation of the Hearing Conservation Program goes far beyond compliance. Develop educational programs is an act of intelligence, because it develops awareness, resulting in direct benefits for both the company and for the employee [3]. For the viability of this program the involvement of professionals in health and safety, industrial management and human resources of the company and the health of workers is necessary [39].

One way to make room for employees exposed themselves participate in programs, is through the Internal Accident Prevention Commission, which was created with the intention of staff to use as a tool for organization and better conditions of work and health as the risk analysis must rely on the experience, knowledge and participation of those undertaking the daily work and suffer its effects [7]. Therefore knowing the difficulties of individuals towards noise can be able to deploy an educational process within a Program Hearing Loss Prevention [23].

The Hearing Conservation Program is a coordinated set of actions that aims to prevent or stabilize occupational hearing loss. These, featuring a continuous and dynamic process of implementation of routines in companies seeking to reduce or eliminate risks to hearing in the present processes, described as one of the goals actions: improving the quality of life of workers avoiding deafness and reducing extra-auditory effects caused by exposure to high levels of sound pressure and other risk agents for the hearing, which probably decreases discrimination against them with varying degrees of hearing loss, that when unemployed, face the difficulty of achieving new employment [40], thus initiating a process of social and psychological devaluation generated by unemployment.

Audiometric evaluation of workers is still the most effective way to determine the success of a Hearing Conservation Program. Compared with the annual audiometric results can detect changes or reinforcements in the proposed interventions, finding areas in which the hearing (collective and / or individual) protection has flaws [38]. The speech therapist is a trained professional that making use of the knowledge that agents have about risk, the affected organ and audiological tests it performs, can develop or enhance important preventers' practices in promoting hearing health of the population[13].

One of the most talked about topics and worked by professional speech therapy and training is the use of Personal Protective Equipment that must be carefully considered, because most workers do not like to use them and end up creating some resistance . Most people exposed to noisy environments, do not know the risks that noise brings health , either for lack of information or as a result of the unpreparedness of the company or in bad faith when it intends to gain something from the company. In this study specifically , we note that of the six subjects selected for study , only three are used ear plugs , one of which relates find ineffective training , which leads us to think that the shield may be being used incorrectly and it disable its effect . However , even if this data is analyzed without questions still must be taken of the fact that three employees – half of the sample – not a daily use of the shield.

The hearing conservation programs in industry are an important way to prevent hearing loss. Hearing loss caused by noise is totally incurable today, but it is also absolutely avoidable [26,40].

CONCLUSION

This workplace noise risk has since recorded the sound pressure levels at which workers are exposed during the workday, and the presence of occupational hearing loss, even on a smaller scale – awarded to the minimum of five years of services and the limited number of participants in research.

RESUMO

Objetivo: verificar a presença do ruído em indústria de confecção de roupas, visto que este risco é pouco difundido nas pesquisas relacionadas a este ambiente de trabalho. **Métodos:** a empresa escolhida foi uma fábrica de confecção de roupa localizada em Colatina no Espírito Santo/Brasil. Foram analisados os dois setores com maior risco ruído na empresa, após a exclusão dos funcionários com menos de cinco anos de trabalho neste local, totalizamos uma amostra de seis funcionários. Os trabalhadores selecionados responderam questionário sobre informações e sintomas auditivos e posteriormente, foram analisadas as audiometrias realizadas nos últimos cinco anos. **Resultados:** por meio de medições realizadas nos setores analisados, constatou-se produção de ruído de 83,5 a 97,8 dB(A). Após observar o histórico das audiometrias, obteve-se 83% dos trabalhadores, destes setores, sem perda auditiva, 16% com perda ocupacional, sendo classificada como estável. Os dados levantados no questionário revelaram que 33% dos trabalhadores sentem-se irritados quando expostos a sons elevados, 50% sentem-se estressados após a jornada de trabalho, e nenhum trabalhador relatou queixa de zumbido, insônia ou dificuldade em entender as pessoas. **Conclusão:** este ambiente de trabalho apresenta risco ruído, uma vez constatados os níveis de pressão sonora no qual os trabalhadores são expostos durante a jornada de trabalho, bem como a presença de perda auditiva ocupacional, mesmo em menor escala – atribuído ao tempo mínimo de cinco anos de serviços prestados utilizado na pesquisa.

DESCRITORES: Perda Auditiva; Perda Auditiva Provocada por Ruído; Riscos Ocupacionais; Vestuário

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