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Research Article

VESTIBULAR SYMPTOMS IN WORKERS EXPOSED TO OCCUPATIONAL NOISE IN A MATCHES COMPANY

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ABSTRACT

Objective: To determine vestibular disorders in workers of a matches company, and identify the main risks associated with the development of these symptoms.

Methods: The work included two groups: The experimental constituting the workers who were exposed to chronic occupational noise, and the control group corresponding to the administrative staff, which was not exposed to occupational noise. The Irvine questionnaire developed by the Department of Otolaryngology at the University of California and the Dizziness Questionnaire developed by the Center for Audio and Balance from the University of Maryland were used to evaluate the prevalence of vestibular symptoms. Tone audiometric evaluations were performed to all individuals in the population.

Results: In the experimental group, 9.7% of the employees showed hearing loss or acoustic trauma in both ears. In the control group, 5.5% of the employees showed mild hearing loss. 60% of the employees have any symptoms associated with a vestibular disorder either by noise or exposure (experimental group) to ergonomic risk factors (administrative staff).

Conclusions: The prevalence of vestibular symptoms in individuals of the experimental group could be associated with exposure to occupational noise ≥85 dBA. The questionnaires are important tools because they could prevent occupational hearing loss and it does not involve an onerous economic cost for the company. The questionnaires could be used in any type of business from craftwork to industrial plants.

Keywords: Vestibular symptoms, Noise, Safety and occupational health.

INTRODUCTION

Noise is considered as any harsh, tiring, or unpleasant sound and its intensity is measured in decibels [1]. Loud noises as such as the exposure to them for a long period of time can cause a permanent reduction in hearing sensitivity, due to the damage that its produces in the sensory organs of the inner ear. In addition, prolonged exposure to noise causes fatigue, headaches, irritability, and depression [2].

Noise at work reduces the concentration, decreases the precision of movements and efficiency, diverts the attention, and increases the amount of energy that a worker required to meet a specific task. It, furthermore, generates additional fatigue, not only by the effort needed to understand instructions in a noisy environment but also by the overload of the cerebral cortex when receiving information heralded by a certain amount of noise [2].

Noise is one of the most common pollutants at the work environment, not only in manufacturing of industrial plants but also in the offices, in this one rarely the risk of hearing loss is present; however, noise even at distant levels can lead to other physiological alterations such as distractions, stress, communication interference, vestibular disorders, or psychological disorders [3].

Noise at levels above 85 dBA is prejudicial and can cause hearing impairment, loss of sleep, irritability, indigestion, ulcers, elevated blood pressure, and finally heart disease [4,5]. The noise affects both hearing and balance. It is estimated that 1.1 million people are exposed to excessive noise at work. Of this group, 0.17 million are predicted may suffer hearing damage [6].

The most significant physiological effect of exposure to noise is deafness which may be temporary or permanent. Unfortunately, noise is a part of everyday life of workers in the industrial plants. There is documented evidence of vestibular dysfunction in people with noise -induced hearing loss [7].

Company workers, due to exposure to very high noise levels (higher than 85 dBA), have begun to suffer a degenerative hearing process leading to sensorineural hearing loss. Noise generated by the machinery of the company has triggered vestibular disorders in the employees, which diminish their quality of life and constitute a serious risk to occupational health. Hence, it is necessary to evaluate the vestibular disorders caused by exposure to high levels of occupational noise in the industrial plant. This study seeks to identify early hearing loss related to noise exposure in the workplace according to the vestibular symptoms that may present the employees.

METHODS

A cross-sectional study was conducted to determine the vestibular symptoms in workers exposed to chronic noise in the matches company. Data were collected through questionnaires that allowed to infer the presence of vestibular disorders in the employees who formed the population under study. Tone audiometry was taken using a clinical audiometer (Maico, model MA 42) calibrated according to ANSI S3.6-1996, IEC 645; to identify auditory thresholds at frequencies 125, 250, 500, 750, 1000, 2000, 3000, 4000, 5000, 6000, and 8000 Hz with gradual intensity of 5 dB in the left and right ears.

The study included two groups. The experimental group formed by the workers who are exposed to chronic occupational noise, and the control group corresponding to administrative staff, which is not exposed to occupational noise caused by the machinery of the company. Both groups maintained a normal working day of 8 hrs for 5 days a week, with an hour for lunch. The work routine of the experimental group

involves physical activities in a standing position with occupational exposure to noise above 85 dBA. The subjects in the control group conduct their activities in sitting position most of the time and are not exposed to occupational noise.

The experimental group consisted of 34 workers, and the control group consisted of 16 employees. Subjects in both groups had normal hearing sensitivity, according to the database of clinical histories, and also reported no history of relevant disorders of neurological functions.

The questionnaires used in this study were the Irvine questionnaire for dizziness developed by the University of California - Department of Otolaryngology/Head and Neck Surgery, and the scale of vertigo symptoms developed by the University of Maryland Medical Center - Hearing and Balance Center. These questionnaires were used to assess the presence of vestibular symptoms in workers. Questionnaires allowed to define the appearance of vestibular symptoms, and the relationships with posture, history of hearing loss, vestibular symptoms, treatments, and habits.

Table 1: Incidence of symptoms associated with vestibular disorders in the experimental and control groups of the matches company Quito-Ecuador

Symptoms	Frequency (%)	
	Control group	Experimental group
Dizziness	15.00 (44.10)	10.00 (55.60)
Loss of perception	2.00 (5.90)	0.00 (0.00)
Sensation of turning	1.00 (2.90)	0.00 (0.00)
Visual changes	4.00 (11.80)	5.00 (27.80)
Nausea or vomiting	2.00 (5.90)	0.00 (0.00)
Ringing in the ears	7.00 (19.40)	2.00 (11.10)
Ears covered	4.00 (11.80)	3.00 (16.70)
Headache	14.00 (41.20)	8.00 (44.40)
Spinning sensation	3.00 (8.80)	2.00 (11.10)
Head pressure	2.00 (5.90)	1.00 (5.60)
Sensation that falling sideways	2.00 (5.90)	0.00 (0.00)
p value (two-tails)	0.4371	

To compare the prevalence of peripheral vestibular symptoms among the control group and the experimental group, two-tail-paired *t*-test was used. The frequency of major vestibular symptoms was reported according to the number of individuals who responded positively to the presence of the condition. The symptoms were divided into two severe and mild groups to be analyzed as binary variables; the prevalence and standard deviation in each group were calculated to detect statistical differences using *t*-test for two independent samples. INFOSTAT Version 2014 (Cordoba, Argentina) was used to analyze the data obtained from the study.

RESULTS AND DISCUSSION

Demographic characteristics of the population were gender distribution of 8% women and 92 % men. 63% of individuals included in the study were in a range of age between 30 and 39 years. The 34% of individuals included in the study were 40-59 years old, and 3% were older than 60 years. There were no women in the experimental group. The 85% and 78% of individuals showed symptoms associated to vestibular disorders either by exposure to noise or ergonomic risk factors in the experimental and control groups, respectively. The main symptoms associated with a vestibular disorder were headache (41.2%; 44%) and dizziness (44.1%; 55.6%) in the experimental group and the control group, respectively. Although a higher incidence of vestibular symptoms was detected in the experimental group, no significant differences between the two groups were detected in this study (p=0.4371) (Table 1).

The results of the tone audiometry are summarized in Table 2. The incidence of hearing disorders in the experimental and control groups was mild bilateral sensorineural hearing loss (2.9% and 5.5%) and bilateral acoustic trauma with the frequency of 9.7% in the experimental group. In a similar study conducted by Jibaja [8], conductive hearing loss problems were detected in 7.8% of the population and sensorineural hearing loss in 32.8% of the employees.

Among the results of the tone audiometry tests conducted in the experimental group, two individuals had acoustic trauma due to the vestibular damage from chronic exposure to work noise (Fig. 1).

Table 2: Distribution of vestibular disorders and hearing disorders in the experimental and control groups in the matches company

Group	Total	Vestibular disorders				Hearing disorder (%)		
		Noise (dBA)	Mean	Standard deviation	% total	Normal	Mild hearing loss	Acoustic trauma bilateral
Control	16	35	1.19^{ns}	2.01	78^{ns}	97.1	2.9	0.0
Experimental	34	88	1.81^{ns}	1.83	85^{ns}	84.8	5.5	9.7

ns: Not significant differences t-test independent groups (p<0.05)

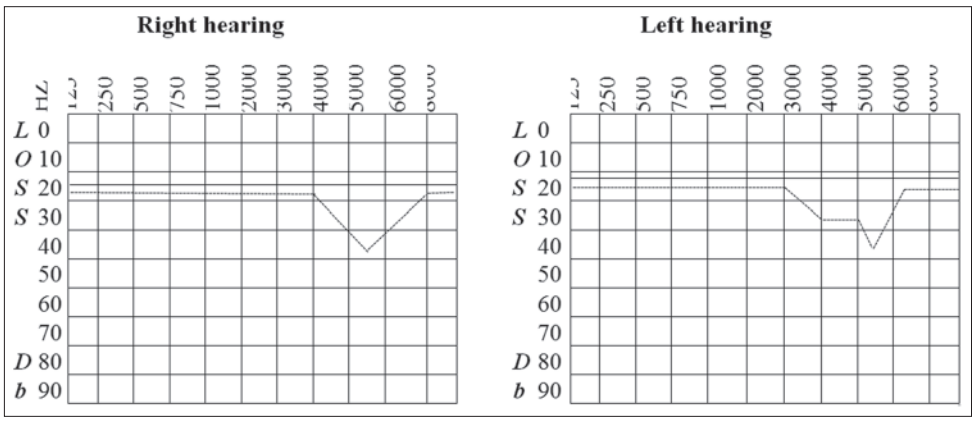

Fig. 1: Tone audiometry conducted in a worker of the matches company with hearing loss due to chronic occupational noise (dotted line) versus normal audiometry (continuous line)

When permanent hearing loss is given at high noise exposure, in sound intensity and time, or a prolonged fatigue that does not allow recovery, it begins to settle at frequencies from 4000 to 6000 Hz. If exposure is continuous, loss extends to even conversational frequencies [9].

The coexistence of vestibular disorders and otological symptoms indicates a waste of cochlear and vestibular structure due to the occupational exposure to chronic noise in the experimental group. These results are similar to those found by Raghunath *et al*. [7] who found significant differences in vestibular symptoms in workers subjected to chronic noise in India.

The questionnaires were effective in determining vestibular symptoms since these could be detected with a high prevalence in patients with hearing loss. Questionnaires for dizziness and balance are important tools because they prevent occupational hearing loss, obtaining specific and conclusive results regarding symptoms associated with vestibular disorders. In addition, both questionnaires are easy to the use in any industrial plant that has noise as part of the risk for workers.

REFERENCES

1. Sellapan E, Janakiraman K. Environmental noise from construction site power systems and its mitigation. Noise Vibration Worldwide 2014;45(3):14-20.
2. Stoia M. Evaluation of the nonspecific effects induced in workers by occupational noise. Acta Med Trans 2012;17(3):169-72.
3. Ruiz A, Floría G, Maestre P. Manual Para La Prevención De Riesgos Laborales En Las Oficinas. Madrid: Fundación Confemetal; 2003.
4. Suggs C. Noise problems of hand and power tools. Noise-con 1981;81:339-42.
5. Singh P. Noise pollution. Every Man's Sci 1984;25(1-2):231-5.
6. Kumar K, Vivarthini CJ, Bhat JS. Vestibular evoked myogenic potential in noise-induced hearing loss. Noise Health 2010;12(48):191-4.
7. Raghunath G, Suting LB, Maruthy S. Vestibular symptoms in factory workers subjected to noise for a long period. Int J Occup Environ Med 2012;3(3):136-44.
8. Jibaja J. Evaluation of metabolic changes and their influence in the hearing loss. Thesis to Fulfill the Requirements of Master in Occupational and Health Safety. International University SEK, Faculty of Occupational and Health Safety; 2012. p. 91.
9. Gilles A, Van Hal G, De Ridder D, Wouters K, Van de Heyning P. Epidemiology of noise-induced tinnitus and the attitudes and beliefs towards noise and hearing protection in adolescents. PLoS One 2013;8(7):e70297.
10. Azizi MH. Occupational noise-induced hearing loss. Int J Occup Environ Med 2010;1(3):116-23.
11. Maryland Hearing and Balance Center. Dizziness Questionnaire. Baltimore, MD: University of Maryland Medical Center.
12. University of California. UC Irvine. Dizziness Questionnaire Developed in the Department of Otolaryngology/Head and Neck Surgery. Irvine, CA. Available from: http://www.ent.uci.edu/Forms.html.