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Occupational sensorineural hearing loss due to noise exposure

Hipoacusia neurosensorial laboral por exposición al ruido

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ABSTRACT

The general objective was to identify occupational sensorineural hearing loss due to noise exposure in workers of the Municipal Decentralized Autonomous Government of the province of Napo - Ecuador. The study was descriptive. The study population consisted of 55 employees. Based on the inclusion and exclusion criteria, the study population consisted of 52 workers of the road equipment. Although there is no statistically significant relationship between occupational sensorineural hearing loss due to noise exposure in workers of the Municipal Decentralized Autonomous Government of the province of Napo, it is evident that there are workers who do present audiometries with sensorineural hearing loss and acoustic trauma, most of them being asymptomatic, most of them exposed to high noise levels, with a seniority in their jobs of more than 10 years and daily exposure to noise of 5 to 8 hours.

Descriptors: noise pollution; noise control; preventive medicine. (Source: UNESCO Thesaurus).

RESUMEN

Se planteó como objetivo general identificar la hipoacusia neurosensorial laboral por exposición al ruido en los trabajadores del Gobierno Autónomo Descentralizado Municipal de la provincia de Napo – Ecuador. Fue de tipo descriptivo. La población de estudio está constituida por 55 empleados. En base a los criterios de inclusión y exclusión, la población de estudio fue de 52 trabajadores del equipo caminero. Pese a que no existe relación estadísticamente significativa entre la Hipoacusia Neurosensorial Laboral por exposición al ruido en los trabajadores del Gobierno Autónomo Descentralizado Municipal de la provincia de Napo, se evidencia que existen trabajadores que si presentan audiometrías con Hipoacusia Neurosensorial y Trauma Acústico, siendo la mayoría de ellos asintomáticos, los cuales están expuestos en su mayoría a niveles de ruido alto, con una antigüedad en los puestos de trabajo mayor a 10 años y exposición diaria a ruido de 5 a 8 horas.

Descriptores: contaminación sonora; lucha contra el ruido; medicina preventiva. (Fuente: Tesauro UNESCO).

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Research articles section

INTRODUCTION

Within the activities of the companies, there are various working conditions that may involve a risk to operational workers due to the use or exposure to machinery (Ruiz-Vargas & Gallegos-Torres, 2018); which cause noise and/or vibrations of different frequencies that directly affect the health of the mimes if their impact is not analyzed in a timely manner (Ntlhakana, *et al*. 2020), (Buqammaz, *et al*. 2021).

Prolonged exposure to these noises decreases the hearing capacity of workers, causing progressive hearing loss over the years (Sliwinska-Kowalska, 2020); hence the importance of this research, as it seeks to analyze the prevalence of Occupational Sensorineural Hearing Loss (HSNL) caused by exposure to noise in workers of the road team of a Municipal Government of the Amazon of Ecuador, who have been exposed to this type of occupational hazard for a long time.

Hearing loss affects 5.3% of the world population representing 360 million people, where 56% of the cases are men, who have been exposed for several years in their working hours to vibrations and noise at high levels, without having adequate safety equipment to reduce or avoid this type of risk (Diaz, *et al*., 2016). In Ecuador there are only generalized data on occupational accidents and diseases of incidents reported to the social security IESS, which show that in 2015 reported 20 thousand work accidents, with the provinces of highest incidence being Guayas with 47%, Pichincha 25% (Moreira-Macias, 2019), (Gómez-García & Suasnavas-Bermúdez, 2015).

In the Ecuadorian Amazon within the municipal GADs, there are operational personnel in charge of public works such as roads, sidewalks; which are exposed to noise emitted by the machinery used for the execution of the same; these entities have an established human resources department which complies with all established industrial safety standards such as medical and audiometric examinations; However, the risk of maintaining employees at the existing noise and vibration pollution levels for a prolonged period of time (years) has not been evaluated; therefore, this project seeks to determine the prevalence of Occupational Sensorineural Hearing Loss (OSAHL) due to this exposure in one of the GADs.

The general objective was to identify occupational sensorineural hearing loss due to noise exposure in workers of the Municipal Decentralized Autonomous Government of the province of Napo - Ecuador.

METHOD

The research was descriptive because it describes the facts as they are observed without any influence; it is also correlational because it establishes the relationships between the dependent and independent variables of the study. The study population is constituted by 55 employees of the road team of a Municipal Government of the Napo province as shown in Table 1.

Table 1. Study population.

Detalle	**N**
Choferes de Vehículos	17
Operadores de Maquinaria Pesada	19
Ayudantes de Operadores de Maquinaria Pesada	14
Mantenimiento	05
TOTAL	**55**

Source: Own elaboration.

The research did not work with a sample because the population is finite, but the research was carried out with the entire study population only by applying the inclusion, exclusion and elimination criteria.

Among the inclusion criteria were considered the workers of the equipment that are exposed to noise, in addition to the exposure time that is greater than 1 year. Among the exclusion criteria, the workers of the road equipment that are not exposed to noise and the non-compliance with the

exposure period of more than 1 year were considered. The elimination criterion applied is the acceptance of participation in the research, in the case of employees who did not want to participate in the study were eliminated from the study.

Based on the inclusion and exclusion criteria, the study population was 52 workers of the road equipment.

Regarding the instruments for the observation technique, the observation guide was used to record the history of previous audiometries and sonometries and the measurement of current audiometries and sonometries; while for the measurement particular methods or instruments are used in order to determine a numerical data according to established standards for the measurement of the study, tonal audiometries and sonometries were performed, a calibrated audiometer was used to determine the hearing capacity of workers and a calibrated sound level meter was used to determine the noise dose to which workers are exposed, considering the parameters presented in Table 2, to determine the level of risk exposed.

Table 2. Risk Levels.

Rango de ruido	Clasificación
<75 dB	Sin riesgo
75 – 81 dB	Riesgo bajo
82 – 85dB	Riesgo medio
>85 dB	Riesgo alto

Source: Reglamento de Seguridad y Salud de los trabajadores. Executive Decree 2393.

The data collected were processed using descriptive statistics and Chi-square with the support of the SPSS V 25 statistical package.

RESULTS

Among the sociodemographic data, 100% of the study population is male, where 41% of the employees are between 40 and 49 years old, 40% are over 50 years old and 19% are between 30 and 39 years old.

With respect to the dimension of current exposure to noise, the results show that 88% of the population studied is exposed to noise from 5 to 8 hours of work, 6% from 3 to 4 hours and 2% works more than 8 hours exposed to noise and between 1 to 2 hours exposed.

Seventy-seven percent of the employees have been exposed to noise for more than 10 years, 17% have been exposed for 6 to 10 years, and 6% have been exposed for 1 to 5 years.

Regarding work history, 46% of the employees have been exposed to noise in previous jobs, leaving 54% who have not been exposed to this type of work.

Regarding noise exposure outside of work, no person is exposed to this type of noise on a daily basis, but there is a percentage that is exposed weekly to 1.9% from discotheques and 3.8% from hunting and motorcycling, and 3.8% are exposed monthly to firearms.

Regarding occupational exposure to toxic materials, 88.5% of the study population is exposed to carbon monoxide and 40.4% is exposed to lead.

Within the dimension of the use of PPE safety equipment, 81% of the population confirms that the company provides PPE protective equipment, while 19% indicate the opposite.

Regarding the use of the equipment provided, 52% of the employees always use them, 40% use them sometimes and 8% do not use any type of PPE equipment.

Among the protective equipment assigned by the company, 88% receive ear muffs and 12% ear plugs.

Within the background dimension, specifically with respect to family history of deafness and/or other ENT infections, only 2% have a history of this type.

As a history of pre-existing diseases, 83% of the study population had no disease, 9% had arterial hypertension, 4% had other types of diseases and 2% had diabetes or facial paralysis.

An important result is the diagnosis of hypoacusis, which only corresponds to 2% of the study population; while 98% do not present it.

The 100% of the studied population does not have surgical antecedents of ear surgery such as tympanoplasty, mastoidectomy, stapedectomy; as well as 100% have not consumed drugs such as cisplatin, aminoglycosides, salicylates, furosemide, antineoplastic drugs and drugs for the treatment of tuberculosis. On the other hand, there are traumatic antecedents of encephalic cranial trauma in 23.1% and direct ear trauma in 5.8%.

Regarding the current state of hearing, 86.5% indicated that noise bothers them, 21.2% indicated that they hear better when there is noise, 28.8% stated that they should increase the volume of the television, 30.8% indicated that they should repeat frequently in conversations and 71.2% indicated that they hear well.

Fifty-four percent of the study population has sensorineural hearing loss, 13% has acoustic trauma and 10% has conductive hearing loss, where 23% remains normal; highlighting that 44.23% of the study population has sensorineural hearing loss with a high level of exposure.

Table 3. Chi Square

Hipoacusia	NIVELES			Chi Cuadrado x^2
	Bajo	Medio	Alto	
Neurosensorial	0,05	0,2	0,4166667	0,29166667
Acústico	0,2	0,8	0,16666667	1.16666667
TOTAL	0,25	1	0,20833333	***1.45833333***

Source: Own elaboration.

In Table 3, the Chi-square test where audiometries with sensorineural hearing loss and acoustic trauma are associated with risk levels, obtaining a Chi-square of 1.45 of the study.

The Research Hypothesis raised were:

Null Hypothesis H_0 : Exposure to occupational noise in workers of the Municipal Decentralized Autonomous Government of the province of Napo is not related to Occupational Sensorineural Hypoacusis.

Alternative Hypothesis H_1: Exposure to occupational noise in workers of the Municipal Decentralized Autonomous Government of Napo province is related to occupational sensorineural hearing loss.

To test these hypotheses, the critical value of the research is calculated using the following formula:

x^2 (1-α)(r-1)(c-1)=5,99146455

Where the Chi square x^2= 1.45, the degrees of freedom gl=(r-i)(c-i)= 2, the rows r= 2 and the columns c= 3 and whose result is 5.99; considering that the critical value is greater than the Chi square, the null hypothesis that the exposure to occupational noise in the workers of the Municipal Government of the province of Napo is not related to occupational sensorineural hearing loss is

accepted, which indicates that there is no association between noise levels and sensorineural hearing loss.

DISCUSSION

Occupational Sensorineural Hearing Loss is a pathology that will affect those who present it for the rest of their lives (Chen, et al. 2020); therefore, its early detection, treatment and decisions by the company is essential for the quality of life of the employees of the Decentralized Autonomous Government of the Municipality of the Province of Napo.

The study had the limitation of not being able to relate to the gender variable since all the personnel, due to the type of job required, were only male.

It has as a precedent that in a wood company the prevalence of sensorineural hearing loss due to noise exposure was determined in 20% of operational workers, of which 15% corresponds to a low level and 5% to a moderate level (Sierra-Calderón, & Bedoya-Marrugo, 2016), values lower than those obtained in the study since sensorineural hearing loss amounts to 54% of workers, where 44.23% present a high risk level, 7.69% medium and 1.92% low.

On the other hand; exposure to noise was analyzed both at work and in habits or extralabor activities, where 30% present hypoacusis, due to the fact that 60% of the population affirms that they do not use adequate protective equipment, given the scarce information on occupational risks and their consequences (Llanos-Redondo, et al. 2020); results different from those obtained since 52% of the employees affirm that they always use protective equipment and 40% sometimes, also considering that in Ecuador the delivery and training in the use of PPEs is a requirement of the Ministry of Labor.

CONCLUSION

Although there is no statistically significant relationship between occupational sensorineural hearing loss due to noise exposure in workers of the Municipal Decentralized Autonomous Government of the province of Napo, it is evident that there are workers who do present audiometries with sensorineural hearing loss and acoustic trauma, Most of them are asymptomatic, most of them are exposed to high noise levels, with a seniority in their jobs of more than 10 years and daily exposure to noise of 5 to 8 hours, so it is important to perform an adequate follow-up of these workers.

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CONFLICT OF INTEREST

There is no conflict of interest with persons or institutions related to the research.

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