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Hearing Problem and Its Causes in Workers of an Automobile Manufacturing Unit

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ABSTRACT: The hearing problem in workers is a common problem in the automobile industry is caused by the high levels of noise. This research aims to determine the prevalence of Noise Induced Hearing Loss (NIHL) among workers of a car manufacturing unit. Data is collected and analyzed based on a variety to factor like the age of workers, department of workers, the skill of workers, and so on. According to the finding, 24% of workers have a hearing problems who have more than 55 years, 2.8% of workers have severe hearing problems in the left ear, 20% of workers have a severe hearing problems in the right ear, the maximum number of workers have hearing lose problem who work in the primer shop and minimum numbers of workers have hearing loss problem who work in pretreatment electrolysis decomposition (PTED). From a future point of view this study will help to identify reasons of hearing lose in automobiles manufacturing units.

KEYWORDS: Automobiles, Ear, Hearing Problem, Noise, Workers.

1. INTRODUCTION

Hearing is critical to living a successful life. Hearing loss has an impact on a person's lifespan, as well as their career, schooling, and well-being, and is consequently a difficulty for them to overcome throughout their lifetime [1]. His/her social life is also on a regular basis [2]. Hearings in the workplace. Not only does a loss reduce efficiency, but it also raises questions on the safety of the person as well [3]. Hearing loss is a significant contributor to illness burden [4]. Hearing loss isn't only a problem that affects the elderly any more [5]. Hearing loss may affect people of any age group. Conductive, sensori-neural, and mixed hearing loss are the three forms of hearing loss [6]. These three forms of hearing loss impact the ear's anatomical components in distinct ways as shown in Figure 1 [7].

1.1. Categories of hearing losses:

- *Sensorineural loss:*

When the auditory neuron or the inner ear is injured, this type of hearing loss happens. When half of the sensory follicles in the cochlear are gone, this loss happens. The most frequent kind of hearing loss is sensor neuronal loss[8]. Age, loud sound contact, accident, illness, certain drugs, or a genetic disease are all possible causes. Even though this type of auditory loss is frequently not treatable clinically or physically, many people who suffer from it find that listening aids might assist[9].

- *Conductive hearing s loss:*

When vibrations from the exterior or middle ear are failed to penetrate to the eardrum, this kind of hearing loss occurs[10]. Gunk or an external item in the ear canals might block sound; fluid, sickness, or a bony abnormality may impede the mid-ear space; or the tympan might have gotten wounded. Hearing loss caused by transmission may be treated with medication or surgery in certain cases[11]. Propagation hearing loss is especially common in kids who have had chronic ear infections or who have introduced foreign objects into their inner ear[12].

- *Mixed hearing losses:*

People might suffer from both sensor neural and conductivity heat loss. Without acquiring a conductivity element, they may have a sensor neuronal hearing loss. Hearing tests are necessary to determine the kind of deafness you have and the

best hearing treatment choice for you[13]. Hearing aids are available in several sizes, styles, and technology, as well as a range of seeing aid options[14].

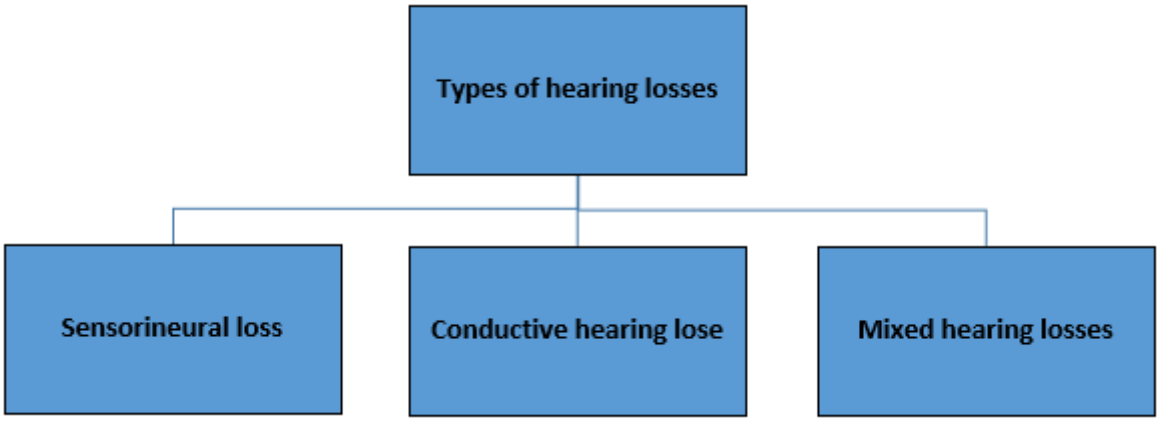

Figure 1: Illustrating the types of hearing losses

This study discusses the hearing problem and their causes in workers of an automobile manufacturing unit. Noise, age, sickness, and inheritance are all factors that contribute to a hearing loss[15]. Conversations with colleagues and relatives might be difficult for those with hearing loss. This paper consists of 5 sections out of which section 1 discusses the outline, section 2 discusses the review of literature, and section 3 discusses the methodology part which will be further divided into 5 parts which include the study design, sample, instrument, data collecting, and data processing, while section 4 presents the results and commentary and lastly section 5 consists of the conclusion.

2. LITERATURE REVIEW

I. Yildirim et al [16] mention the effects of noise on textile workers' Antioxidant proteins, vision, and lipid peroxidation. The author perform research that comprised 30 textile employees exposed to high noise levels of 105 dB (A) in a textile industry, as well as a reference sample of 30 young men healthcare workers. Blood samples were taken from both groups after the audiometric examinations. Malondialdehyde (MDA), in those plasma samples, the activities of superoxide dismutase (SOD) and peroxidase (CAT) were tested. The SPSS edition 11.0 computer package was used to conduct the statistical analysis (SPSS Inc., Chicago 1L). Average single-tone audiogram at frequencies of 2,000, 4,000, and 6,000 Hz, employee sensitivities were considerably greater than control people. In the worker group, hearing loss was more noticeable at high frequencies (4–6 kHz) than at low frequencies. ($p<0.05$). Hearing thresholds were found to be weaker in textile workers with longer job periods, and hearing loss had begun in individuals who had worked for 5–8 years. Workers had considerably greater MDA levels than controls (p0.001), but significantly lower CAT activity (p0.005). Additionally, worker SOD activity was decreased, although the difference was not statistically significant. When comparing the textile workers' hearing threshold to that of the control group, the author found a substantial difference. Noise is a cause of oxidative, according to increased MDA levels and reduced CAT and SOD activities in textiles employees.

R. Deepthi and A. Kasthuri [17] stated that Hearing loss is a potentially debilitating condition that may lead to physical and social problems in the elderly. Although audiometric testing for the criterion is hearing loss, however, it is not practicable in communal contexts. Several questionnaires for assessing hearing impairment have been created. Because there is a lack of knowledge about the Relevance of these questions to the aged in remote areas, research was designed to compare in rural Indian elderly, a solitary question and the Shortened Hearing Impairment Assessment for Old (HHIE-S) was shown to be more effective than pure tone audiometry in assessing hearing loss. The sensitivity, selectivity, positive prognostic values (PPV), and negative prediction values (NPV) of both diagnostic devices' pristine tone average (PTAs) larger than 25, 40, and 55 dB was examined. The single inquiry exhibited poor sensitivity (30.9 percent) and a strong precision for mild hearing loss (93.9 percent). HHIE-S, on the other hand, had a sensitivity of 26.2 percent and a specificity of 95.9%. With significant hearing loss, sensitivity to single questions climbed to 76.2 percent and specificity to 83.1 percent. With significant hearing loss, HHIE-S sensitivity increased to 76.2 percent and specificity declined to 87.7%. These hearing screening questionnaires would aid in the identification of more debilitating hearing losses among the elderly in rural areas, which will aid in the design of rehabilitation programs.

T. W. Picton et al. [18] stated that if you can't hear what you're saying, you won't be able to understand it. As a result, for children and people with hearing loss, audibility is unquestionably a significant aim of amplification. It is often believed that the listener can extract speech cues over the whole range of voice frequencies when restoring audibility. This assumption holds true for those persons who have moderate to intermediate hearing damage, but not those who

have extreme hear loss at high frequencies. To see whether severely hearing-impaired children need more high-frequency audibility than adults with comparable hearing impairments, author looks at how audibility impacts speech intelligibility judgements and measured speech intelligibility in severely hearing-impaired adults and children. Second, author try to figure out what elements influence the utility of audibility for speech intelligibility. Finally, they talked about how the link between audibility and speech intelligibility affects gain-frequency response prescription for adults and children.

Research questions:

- How to improve hearing problem in automobiles industry?
- Which department in the automobile industry generates the maximum noise?

3. METHODOLOGY

3.1 Research design:

This research was carried out in India on workers and certain management staff in automobile manufacturing unit in step by step manner. Variables such as age, gender, skill, and worker job type is considered for this research. Some members of management as well as workers of various types were asked a question concerning hearing loss, tinnitus, and Noise-induced hearing loss (NIHL) knowledge to provide relevant details.

3.2 Sampling:

In this research samples are taken from automobiles manufacturing units of 200 respondents out of which 65% are males and 35 %are females. 30 respondents are 15-25 years old, 25 respondents are 25- 35 years old, 40 respondents are 35- 45 years old, 55 respondents are 45-55 years old, and 50 respondents are more than 55 years as shown in Figure 2.

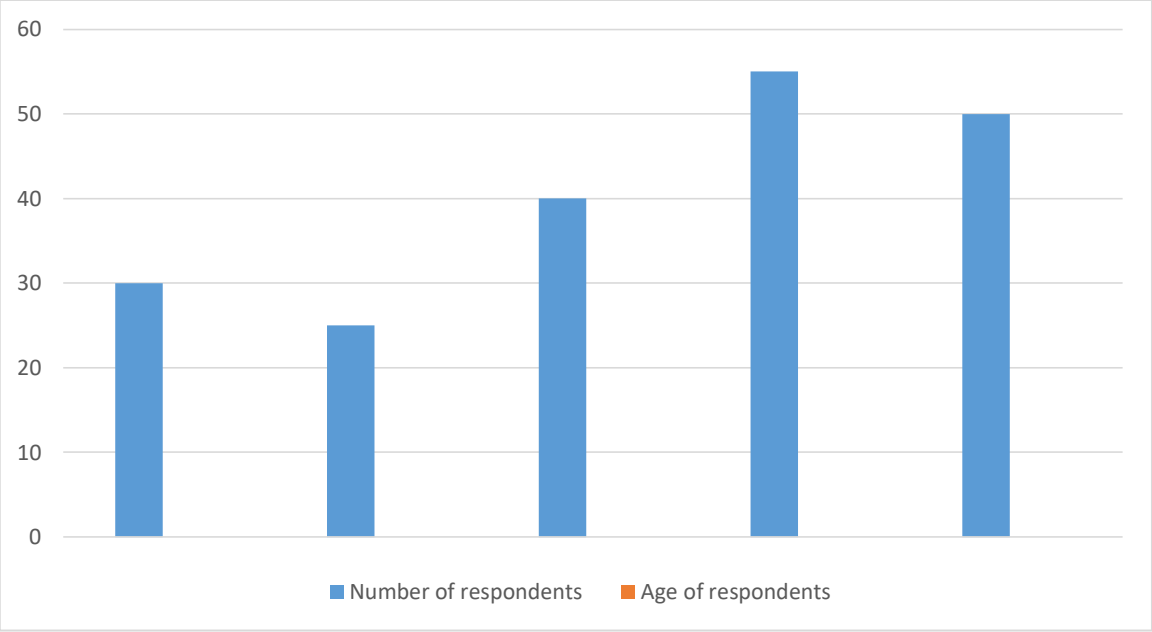

Figure 2: Illustrating the numbers of respondents concerning age group

3.3. Instrument used:

Statistical tools would be utilized by the researchers throughout the research process, depending on the accessibility of information and the study's requirements. Mean, percentage, correlation, chi-square test, and t-test are a few examples. The study's findings will be represented using graphs, charts, and tables. Several questions have been provided to assist in the explanation of the research and the mapping of the graph as shown in Table 1.

1. Does the company have sufficient PPE kit for all workers?
2. Do workers have a problem hearing over the telephone?
3. Do workers have problems has more than 50 years?
4. Do workers used PPE kit properly?

Table 1: Illustrating the list of questions asked during research

S.NO.	Questions asked	Yes	No	In the developing stage
1	Does company have sufficient PPE kit for all workers?	35%	50%	15%
2	Do workers have a problem to hearing over the telephone?	46%	34%	20%
3	Do workers have problems has more than 50 years?	55%	40%	5%
4	Do workers use PPE kit properly?	30%	60%	10%

3.4. Data collection:

During this research, 200 respondents are served out of which 65 % are male and 35 are female. About 30% of respondents were between ages 15-25, 25% of respondents were between ages 25-35, 45% of respondents were between ages 35-45, 55 % of respondents were between ages 45-55 and 50% of respondents were between ages more than 55 as shown in Table 2.

Table 2: Illustrating the age group of respondents

Age group	Percentage of respondents
15-25	30
25-35	25
35-45	45
45-55	55
More than 55	50

Table 3 show that 10 % of respondents have hearing problem between the age group 15 -25, 17 % of respondents have hearing problem between the age group 25-35, 27% of respondents have hearing problem between the age group 35-45, 22 % respondents have hearing problem between 45-55 and 24% of respondents have hearing problem more than 55.

Table 3: Illustrating the percentage of respondents who have a hearing problem

Age group	Percentage of respondents who has a hearing problem
15-25	10%
25-35	17%
35-45	27%
45-55	22%
More than 55	24%

3.5. Data analysis:

Table 4 shows the noise level at the different department of workplace which show that in the wire harness department noise level is minimum and maximum in product support division department.

Table 4: Illustrating the noise level in different area in work place

Department	Average(DBA)	Minimum(DBA)	Maximum(DBA)
Wire harness	66.8	61	77
Product support division (PSD 2)	72	52	106
Quality inspection department(QID)	68.6	60	81
Vehicles inspection department 1(VID)	75.6	66	101
Quality audit department (QAD)	74.9	71	83
Rectification	77.7	69	88
Vendorized parts store (VPS)	78.6	75	80
Vehicle inspection department 2 (VID)	78	70	88
Paint shop	78.8	75	83
Primer shop	78.4	75	81
Complete knockdown (CKD)	81.5	75	86
Pre delivery inspection (PDI)	79.7	75	83
Tool and dye	81.1	71	89
Body shop	85.5	75	97
Main shop	81.7	64	111
Pipe shop	83.5	75	96
Pretreatment electrolysis decomposition (PTED)	85	75	95
Interial material handling	87.6	82	96
Axle shop	91	98	97
Engine shop	91.7	74	111

4. RESULTS AND DISCUSSION

We conducted a company-wide walk-through survey. There was a health and safety department present, which was staffed by certified employees. Safety engineers and health and safety coordinators were present. The corporation offered PPE to all employees, but only a small percentage of them used it. The fire suppression system was satisfactory. We discovered excessive noise in several industrial sections. Because the various stores were not separated, noise from one shop were additional to sound from various shops, resulting in an additive effect of noise. We saw employees at the body shop bolting while lying in an uncomfortable posture, causing a lot of noise and vibration. There was inadequate housekeeping, considerable paint dust, and a high temperature in the paint shop. The loader's hooter was making an excessive amount of noise. Table 5 show that in right ear 19 % of workers had mild, 15.5% workers had moderate, 20% had workers severe and 14. 5% had profound hearing loss and in left ear 56% workers had mild, 15.5 workers had moderate, 2.8% workers had severe and 1% workers had profound hearing lose.

Table 5: Illustrating the degree of hearing lose in left and right ear

Degree of hearing lose	Left ear	Right ear
No deficit	24.7%	31%
Mild	56%	19%
Moderate	15.5%	15.5%
severe	2.8%	20%
Profound	1%	14.5%

Table 6: Illustrating the number of worker with hearing lose in every department.

Department	Numbers of Workers
Wire harness	10
Product support division (PSD 2)	6
Quality inspection department(QID)	22
Vehicles inspection department 1(VID)	10
Quality audit department (QAD)	12
Rectification	7
Vendorized parts store (VPS)	14
Vehicle inspection department 2 (VID)	6
Paint shop	16
Primer shop	28
Complete knock down (CKD)	8
Pre delivery inspection (PDI)	11
Tool and dye	9
Body shop	12
Main shop	10
Pipe shop	5
Pretreatment electrolysis decomposition (PTED)	2
Interial material handling	9
Axle shop	10
Engine shop	5

Table 6 show that maximum number of workers have hearing lose problem who work in primer shop and minimum numbers of workers have hearing loss problem who work in pretreatment electrolysis decomposition (PTED). From the survey we found that 22 percent of the 200 employees said they couldn't hear in a noisy environment, 11 percent had trouble hearing on the phone, 7.7% of people listened more with one ear than the another, 5.9% turned up the TV too loudly, and 9.6% got their hearing examined. Tinnitus in the ears affected 9.6% of persons.

5. CONCLUSION

This research was carried out by taking into account several factors to provide a comprehensive image of hearing lose among workers in automobiles manufacturing units. A car manufacturing unit uses rotors, gears, turbulent fluid flow, impact operations, electric equipment, internal combustion engines, pneumatic gear, drills, crusher, blasted, pumps, and compressors. These devices emit extreme noise, which damages ears and causes hearing loss; if exposure continues,

complete hearing loss will result. Throughout our research, we discovered that the majority of employees (78.7%) was exposed to sound levels that are above the 85dBA safe limit. The danger of NIHL in sectors where employees are exposed to constant high stages of sound is well known. Hearing loss may occur as a consequence of a single high-noise exposure or a continual high-noise level. When a person is subjected to excessive noise, his hearing threshold changes temporarily; His auditory range increases when he is away from those surroundings; but, if the experience is incessant, the hearing threshold changes permanently, resulting in permanent hearing loss.

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