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Hearing Sensitivity Comparison between Industrial and Construction Site Workers

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Abstract: ***Objective: The study aimed to compare the hearing sensitivity of people who are working in industries and construction sectors. Method: A total of 40 individuals working in industries and construction sites were tested. The study was conducted on 20 individuals from industries and 20 individuals from construction sites. Pure tone Audiometry and Distortion Product Otoacoustic emission (DPOAE) screening was done for the workers working in industries and construction sites for 4 - 6 hours daily. Result: The results showed that construction site workers have a higher percentage of hearing loss than industrial site workers.57% of construction site workers are affected by hearing loss and 43% of industrial workers are affected by hearing - loss. Conclusion: Construction site workers have an increased possibility of having Noise Induced Hearing Loss associated with inner ear problems than industrial workers due to increased duration of noise exposure and lack of awareness. Therefore, it is essential to conduct an awareness program for the workers regarding hearing loss and the use of ear protection devices.***

Keywords: Hearing sensitivity, construction workers, industrial workers, Noise Induced Hearing Loss, Threshold, Noise Exposure

1. Introduction

The hearing has been called the most important of the human senses, it is the perception of sound. Hearing sensitivity is the number of decibels by which the hearing threshold of an individual exceeds the normal threshold. It is the capacity of the auditory system to detect a stimulus, most often described by an audiometric pure tone threshold (Stach, 2009). Normal hearing sensitivity has been defined as being able to hear a range of frequencies at a loudness between 0 - 25 decibels. The hearing threshold is the least audible sound pressure level (WIDEX 1995). It is the lowest level at which an individual can hear the sound almost 50% of the time.

Hearing loss is the most common form of hearing disorder. It is characterized by a reduction in the sensitivity in the auditory mechanism so that sounds need to be of higher intensity than normal before they are perceived by the listener (Stach, 2010). Hearing loss is a common problem caused by loud noise, ageing, disease, and genetic variations. About one - third of older adults have hearing loss and the chance of developing hearing loss increases with age. People with hearing loss may find it hard to have conversations with friends or family. They may also have trouble understanding a doctor's advice, responding to warnings and hearing doorbells and alarms. Some people may not want to admit that they have trouble hearing. Hearing problems that are ignored or untreated can get worse.

In Summar say "Ears never sleep". This emphasizes the fact that the ear is continually sending signals to the brain. I. e. It is in danger of exposure at any time of the day in any place. When over - exposure to noise or very loud noise reaches the ear, it produces destruction of the auditory sensory cells and hair cells in the cochlea, resulting in hearing loss. This type of hearing loss is called Noise Induced Hearing Loss (NIHL). NIHL is a slowly progressive inner ear hearing loss that results from exposure to continuous noise over a long period. Hearing loss caused by continuous noise exposure is called 'occupational hearing loss' and hearing loss due to the instantaneous impact of noise is called injury (Newell, 1987). Noise Induced hearing loss **(**NIHL) is the most common cause of acquired sensorineural hearing loss other than Presbycusis. NIHL can be temporary or permanent. Exposure to excessive sound results in a change in the threshold of hearing sensitivity or a threshold shift. If noise induced hearing loss is temporary, it is referred to as a temporary threshold shift or TTS. If the hearing loss is permanent, it is called a permanent threshold shift or PTS (Stach, 2010).

Exposure to excessive noise is the major avoidable cause of permanent hearing impairment worldwide. NIHL is an important public health priority because, as the population lives longer and industrialization spreads. In many countries, excessive noise is the biggest compensable occupational hazard. Worldwide 16% of disability hearing loss in adults is attributed to occupational noise, ranging from 7 to 21% in the various sub - regions.

Construction and industrial sites are very common sources of noise pollution. There is a wide range of hearing loss causes when working in construction, it often comes from the operation of various equipment on the job. Most of the equipment is loud and used for a long time. Exposure to this type of noise can gradually affect a person's hearing over time, with many not realizing the damaging effects until it's far too late. Construction noise is the noise that arises from an activity at a construction site that includes; work due to demolition, work related to strategy, and building renewal work. Noise is insidious of all industrial pollutants, involving every industry and causing severe hearing loss in every country in the world. A study done by Mithanga (2013) shows that the majority of the employees indicated that high occupational noise levels in the manufacturing industries affect work performance and communication among them.

The earlier use of terms like boilermaker's disease to describe deafness among industrial workers highlights the fact that occupational noise exposure has been recognized as a major cause of hearing loss for a very long time. Numerous studies have reported the noise induced hearing loss experienced by workers in many countries. Noise - induced hearing loss continues to afflict workers in many occupational settings despite the long - standing recognition of the problem and well - known methods of prevention and

regulations. Although many industries have noise exposures, construction workers are at particularly high risk. Noise levels associated with heavy construction equipment range from 80 to 120 dB and power tools commonly used in construction produce exposures of up to 115 dB. These exposure levels are high enough to necessitate hearing conservation efforts, as noise exposure above 85 dB is considered hazardous. However, complete and effective hearing conservation programs are rare in the industry for some reasons, including the transience of the workforce, extremely variable work conditions and environment, lack of resources, and worker reluctance. The absence of hearing conservation efforts has resulted in very high rates of hearing loss, also called noise - induced permanent threshold shift or NIPTS, among construction workers.

2. Method

Aim:
The study aimed to compare the hearing sensitivity of people who are working in industries and construction sectors.

Participants:
A total of 40 individuals working in industries and construction sites were further divided into two groups; Group A and Group B. Group A includes 20 individuals from industries and Group B includes 20 individuals from construction sites.

Inclusive:
- The subjects must be exposed to noise for a minimum time of 4 - 6 hrs daily
- Individuals in the age range of 20 to 60 years.
- Subjects who are working part - time or full - time in an industry or any other sectors under study.

Exclusive:
- Individuals less than 20 years of age and greater than 70 years of age.
- Participants with congenital anomalies.
- Individuals with neurological and visual problems.
- Subjects with any history of ear discharge & ototoxic drug exposure.
- Subjects who do not belong to the participant category.

Procedure:
A detailed case history has been taken followed by an otoscope evaluation. Using 'GLOBAL FEEL' and 'GSI Corti' instruments, hearing sensitivity and otoacoustic emission screenings were conducted.

Hearing sensitivity evaluation by pure tone audiometry -
The client was asked to sit straight on a chair comfortably and he/she was seated in such a way that the audiometer's controls cannot be seen. The test was conducted in a well - illuminated environment & well - ventilated area, which was free of ambient noise and other distractions. After that, the clinician provided an outline of the test procedure, the clinician presented the tone through the headphones and the individual indicated whether the sound was being heard or not, by raising their hands. The clinician recorded their responses for each frequency and the results were evaluated later.

Otoacoustic emission screening test -
OAE screening was carried out using the GSI Corti instrument. An ideal ambient noise environment has been taken for conduct this test. Here we have measured the Distortion Product Otoacoustic Emission (DPOAE) and it was obtained at 32 seconds. A probe has been selected according to the size and shape of the ear canal of the individual. The probe was placed in the ear canal by pulling the upper helix upward and backwards. Proper instruction was given for obtain better emissions. The subject was asked to sit straight comfortably on a chair without any body movements and not to swallow. The client was also instructed to keep quiet till the test is completed.

3. Results and Discussions

The study aimed to screen a sample of the target population (construction & industrial site workers) for the presence of hearing loss and inner ear problems.

A. Constructional Site Workers

a) Hearing evaluation of construction site workers by Pure Tone Audiometry test

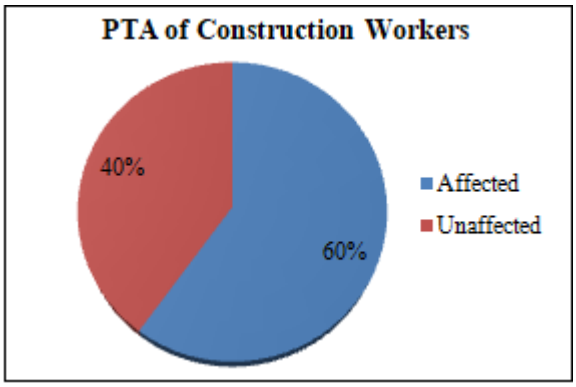

Figure 1.1: Shows the PTA average of the construction site workers.

From the above Figure 1.1, it can be seen that the construction site workers with a percentage of 60% in the better range and 40% in the poorer range. Out of 20 workers, 12 workers showed normal hearing sensitivity and 8 of them showed mild to moderate degree of hearing loss (Goodman's classification).

b) Hearing evaluation of construction site workers based on DPOAE.

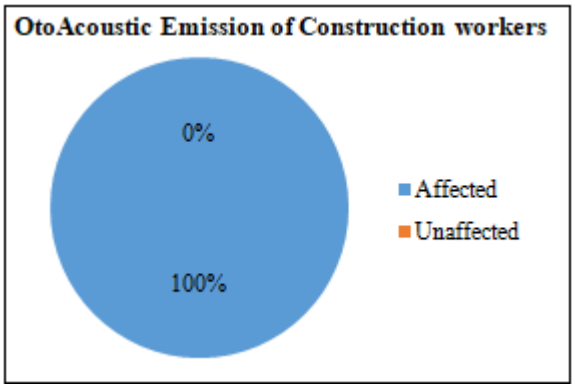

Figure 1.3: Shows the result of DPOAE of the construction site workers

Figure 1.3: shows the DPOAE with the percentage of Refer 100% and Pass percentage as 0%. Refer percentage in the Right ear was 90% and in the Left ear was 10%. This indicates an increased refer percentage than the pass percentage.

B. Industrial Site Workers

a) Hearing evaluation of industrial site workers by the Pure Tone Audiometry test

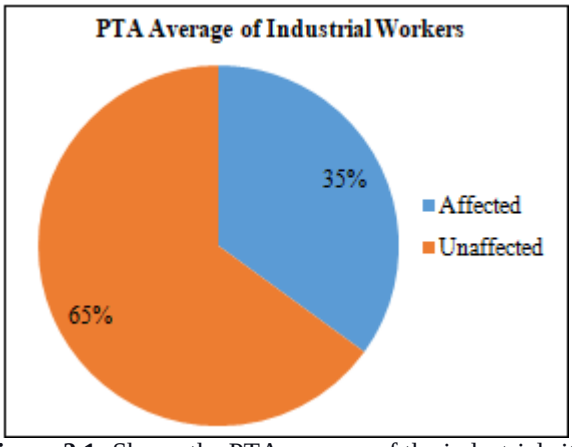

Figure 2.1: Shows the PTA average of the industrial site workers

From the above Figure 2.1; it can be seen that the industrial site workers with a percentage of 65% in the better range and 35% in the poorer range. Out of 20 workers, 13 workers showed normal hearing sensitivity and 7 of them showed a mild to moderate degree of hearing loss (Goodman's classification).

b) Hearing evaluation of industrial site workers based on DPOAE.

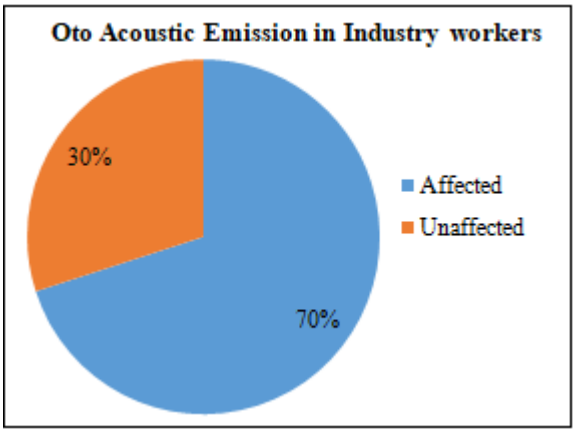

Figure 2.2: Shows the result of DPOAE of industrial workers

Figure 2.2; shows that DPOAE with a percentage of 70% refer and a pass percentage of 30%. The above figure shows an increase in refer percentage as compared to the Pass percentage.

c) Hearing Sensitivity comparison between construction and industrial site workers

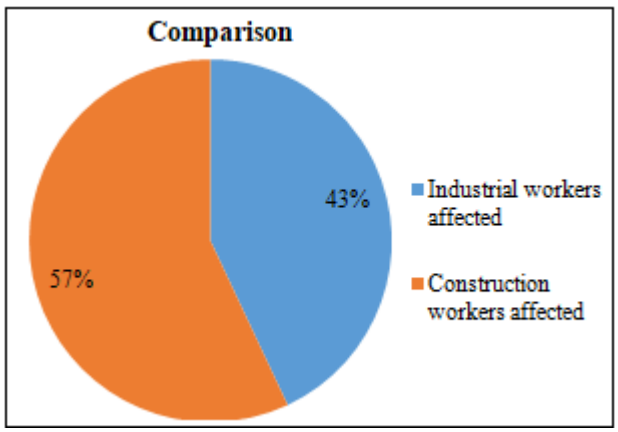

Figure 3.1: Shows a comparison between industrial and construction site workers' hearing loss.

The above figure 3.1; shows that 43% of industrial workers are affected by hearing loss and 57% of construction site workers are affected by hearing loss. The above figure shows that high percentage of hearing loss in construction site workers.

4. Conclusion

The present study aimed to screen a sample of the target population (construction & industrial site workers) for the presence of hearing loss and inner ear problems. A total of 40 individuals working in industries and construction sites were tested. The study was conducted on 20 individuals from industries and construction sites.

The crucial contributions of noise from construction sites are mainly from the vehicles, equipment, breakers etc. Construction operations are arranged by different equipment contrast in noise levels. The noise level data of a construction site consideration depends on ambient scale levels. Each construction noise computation is carried out by

forecasting noise levels established for the particular site. The OSHA sets legal limits on noise exposure in the workplace. These limits are based on a worker's time - weighted average of over 8 hours per day. With the noise, OSHA's permissible exposure limit (PEL) is 90 dBA for all workers for 8 hours per day. The OSHA standard uses a 5 dBA exchange rate. The PTA results of construction site workers showed that 60% were in the better range and 40% in the poorer range. Out of 20 workers, 12 workers showed normal hearing sensitivity and 8 of them showed mild to moderate degree of hearing loss (Goodman's classification).

Industrial noise is due to big machines, cutting, grinding, packaging and transportation of materials. The noise level data of an industrial site depends on the ambient scale level. In many industries, workers have shifts within minimum hours of 4 to 6 hours. The PTA results of industrial site workers showed a percentage of 65% in the better range and 35% in the poorer range. Out of 20 workers, 13 workers showed normal hearing sensitivity and 7 of them showed a mild to moderate degree of hearing loss (Goodman's classification). The OAE results showed a DPOAE refer percentage of 70% in industrial site workers and construction site workers with a refer percentage of 100%. As per the studies, 43% of industrial workers are affected by hearing loss and at the same time, 57% of construction site workers are affected by hearing loss. This indicates that construction site workers show an increased percentage of people having inner ear problems than industrial site workers. All these details show that construction site workers have an increased possibility of getting Noise Induced Hearing Loss associated with inner ear problems.

Hearing protectors should be used when engineering controls and work practices are not feasible for reducing noise exposure to safe levels. Earmuffs, earplugs and ear canal caps are the main types of hearing protectors. Awareness should be created among workers about the harmful effects of noise. As per the severity of the hearing loss, suitable implantable hearing devices can be adopted (hearing aids, cochlear implants etc.).

References

[1] Frederick, N. M., (2012). Test environment of pure tone audiometry, *Introduction to Audiology;* 7, 72 - 74
[2] Geetha, M., & Ambika. D. (2015). Study on noise pollution at construction site, *International Journal of Research in Engineering and Technology; 4 (2) 420 - 421*
[3] Hearing sensitivity, retrieved from *https: //www.thehearingsolution. com/hearing - blog/raising - the - bar - what - is - normal - hearing*
[4] Occupational noise exposure, retrieved from *https: //www.osha. gov /noise*
[5] Sataloff., (1993). Occupational Hearing Loss, *Hearing Loss, 3; 371 - 388.*
[6] Stach, B. A., (2010). Hearing loss, *Clinical Audiology: Introduction;* 2, 102.
[7] Stanley A. G., (2007). Pure tone audiometry, *Essentials of Audiology; 4, 108 - 110.*
[8] Subroto, S. N., & Sarang, V. D., (2008). Occupational noise induced hearing loss in India, *International journal of occupational and environmental medicine;* 12 (2), 53 - 56.