

OCCUPATIONAL HEARING LOSS: A CROSS-SECTIONAL SURVEY IN A MANUFACTURING INDUSTRY AT BAHAWALPUR

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ABSTRACT

Objective: To assess occupational hearing loss among the workers of a manufacturing industry at Bahawalpur.

Methodology: This cross sectional study was carried out in a manufacturing industry in Bahawalpur. The study was carried out from August to October 2015. There were 448 individuals working in that industry. All those individuals who were subject to daily noise in the industry and who consented for inclusion in the study were included. Information including age, gender, use of protective ear plugs, and history of any chronic disease or chronic drugs/medications use was also gathered. A qualified audiologist carried out pure tone audiometry (PTA) of all the workers in standard settings.

Results: Pure tone audiometry (PTA) of 448 industry workers showed that 39(8.71%) had sensorineural hearing loss and 8(1.78%) had conductive hearing loss. Among 39 patients of sensorineural hearing loss, 29 had mild (from 26 to 40 dB), 7 had moderate (from 41 to 55dB) and 3 had moderately severe (56 to 70dB) hearing loss. When enquired about use of hearing protection devices during noise exposure, 30 of these 39 did not use hearing protection devices while 9 used hearing protection measures, showing significant association between use of hearing protection device and healthy hearing ($p=0.000$). Out of 448 workers, 367(81.92%) used the hearing protection devices and rest 811(8.08%) denied their use.

Conclusion: Occupational noise can lead to hearing loss. Use of hearing protection measures are significantly associated with healthy hearing.

Key Words: Hearing loss, Pure tone audiometry, Hearing protection devices, Ear Muffs, Ear Plugs

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INTRODUCTION

Ramazzini was the first to recognize hearing loss caused by noise exposure, as shown in his classic occupational medicine treatise *De Morbis Artificum* 1713 (disease of workers)¹. Noise induced hearing loss is defined as hearing impairment caused by exposure to excessive noise at work. Hearing loss caused by occupational noise can be totally prevented, but after it sets in it becomes irreversible. There are other factors which cause hearing impairment e.g. age related hearing loss, ototoxic drug use, certain infections like mumps etc. Age related hearing loss is most common and it is difficult to differentiate occupational hearing loss from that caused by aging but thorough history and previous audiograms can help.

The workers who are exposed to noise louder than 85db suffered from noise induced hearing loss^{1,2}. Degree of hearing loss depends upon the intensity of noise exposed and duration of exposure to noise. Noise induced hearing loss is of sensorineural type, is usually bilateral, symmetrical and initially involves high frequencies including 3000, 4000 and 6000 hertz. 16% of disabling hearing loss in adults is owing to the occupational noise which varies from 7% to 21% in different sub-regions³.

Hearing loss not only affects quality of life but also increases risk of injury for instance inability to hear approaching vehicle and warning signal which can lead to accidents. Noise induced hearing loss is a major preventable cause of permanent hearing loss. Occupational hearing loss can be prevented by decreasing the

noise of machines through proper maintenance etc and by using hearing protection devices which include ear plugs and ear muffs etc.

In our country much less data about occupational noise induced hearing loss is available. We have gathered information from an industry where workers are exposed to noise, assessed their hearing status (over a period of two years) and also enquired about trend of use of hearing protectors. It will help in understanding the occupational hearing loss in Pakistan.

METHODOLOGY

It was a cross sectional study, community based and has public health significance. The study was carried out in Bahawalpur in a manufacturing industry where workers were exposed to occupational noise of intensity around 90 dB. There were 448 individuals working in that industry. All those individuals who were subject to daily noise in the industry and who consented for inclusion in the study were included. Those who did not consent for study and others who were diagnosed as cases of presbycusis were not included in the study. Drugs induced sensorineural hearing loss was also included in the list of exclusion criteria. Pure tone audiometry of each individual was carried out and information was gathered through personal interaction and this information was written on separate individual data sheet. Information including age, gender, use of protective ear plugs, and history of any chronic disease or chronic drugs/medications use was also gathered. A qualified audiologist carried out pure tone audiometry (PTA) in standard settings. Audiometry is a standard test to diagnose hearing loss. Air conduction is measured with help of ear phones and bone conduction is checked with a probe placed on skull behind the ear. Each ear was tested separately. All the data gathered was entered on SPSS version 21 and analyzed. Chi square test was used to analyze qualitative variables and t-test was used for quantitative variables.

RESULTS

A total of 448 industry workers were included in the study. Out of 448 workers, 367(81.92%) used the hearing protection devices and rest 81(8.08%) did not use

them.

PTA of all 448 industry workers were done and out of them 39(8.71%) had sensorineural hearing loss and 8(1.78%) had conductive hearing loss. Patients with conductive hearing loss were found to be having ear wax on ear examination. Among 39 patients of sensorineural hearing loss, 29 had mild (from 26 to 40 dB), 7 had moderate (from 41 to 55dB) and 3 had moderately severe (56 to 70dB) hearing loss. When enquired about use of hearing protection devices during noise exposure, 30 of these 39 did not use hearing protection devices while 9 used hearing protection measures, showing significant association between use of hearing protection device and healthy hearing ($p=0.000$), as shown in table 1.

DISCUSSION

Noise is a pollutant which involves every industry and causes hearing loss worldwide in all countries. In our country, very less data is available pertaining to occupational hearing loss. The industry where the study was carried out had heavy machines which produced noise of intensity around and more than 90 dB. The mechanism of noise induced hearing loss involves damage to cochlear hair cells and also vasoconstriction of capillaries causing hypoxic insult^{4,5}. Audiometry (PTA) detects early hearing loss even before clinical hearing impairment⁶. Recently extended high frequency audiometry and otoacoustic emissions have been devised which detect noise induced hearing loss even earlier^{7,8}.

In this study, there were 47 (10.49%) workers who had hearing loss diagnosed upon audiometry. Out of these 8(1.78%) were of conductive variety which were because of ear wax. The rest 39(8.71%) workers had sensorineural hearing loss, had a prominent notch at 4000 kHz on audiogram, confirming it to be noise induced. More over among these 39 patients of sensorineural hearing loss, 9 were in age range 51-60 and 3 were in age range 41-50, rest all were in their thirties and twenties. Different subregions in world show different prevalence of occupational noise induced hearing loss i.e 7-21%³. In his work, Hong has showed even a higher prevalence of hearing loss of 60% among construction workers⁹. Similar studies in India have showed significant association of noise and hearing loss and

Table 1: Association between hearing protection and hearing loss

Degree of hearing loss	Workers who used hearing protection	Workers who did not use hearing protection	P value
Sensorineural hearing loss present	9	30	0.000
No hearing loss	358	51	
Total	367	81	

P= 0.000

increased prevalence of noise induced hearing loss in different industries^{10,11}.

In our present study, there came out to be significant association between hearing protection usage and healthy hearing among workers. Out of 448 workers, 81 did not use hearing protection devices and 30 of these 81 had sensorineural hearing loss. Only 9 workers out of 367 who used hearing protection had sensorineural hearing loss ($p=0.000$).

Workers should be encouraged to practice hearing protection in daily routine. Use of hearing protective measures by the workers is influenced by various factors including education, experience, various beliefs and perceived hearing loss⁶. Integrating and imparting the hearing protection device use training to the workers has significantly improved the use of these protective measures^{12,13}.

CONCLUSION

Occupational noise can lead to hearing loss. Use of hearing protection measures are significantly associated with healthy hearing.

RECOMMENDATIONS

The industrial workers should be educated to understand the association of noise and hearing loss and should be encouraged to use hearing protection devices to prevent noise induced hearing loss. Audiometry detects noise induced hearing loss earlier so all industrial workers subjected to noise should have yearly audiometric analysis.

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CONTRIBUTORS

MAK conceived the idea, planned the study, and drafted the manuscript. SA helped acquisition of data and in manuscript writing. SM and HBU did statistical analysis and references citation. All authors contributed significantly to the submitted manuscript.