

Original Research

To evaluate the association between hearing loss and duration of the noise exposure

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ABSTRACT:

Aim: To evaluate the association between hearing loss and duration of the noise exposure. **Methods:** After taking the ethical permission this study was done in the department of community medicine. We included 50 male drivers who were exposed to high intensity noise for more than 7 hours a day over a period of 9 years and more of job. 35-55 age group people were included in this study. Family history and personal details regarding any ear problems and injury, neurological problems, use of ototoxic drugs etc. was noted. The individuals were also asked any use of ear protection component by them. **Result:** 50 male were included in this study, 44.55±10.55 mean age of the person. 62% of the individuals were observed to be having sensorineural hearing loss. They were further divided as low, average and high problem on the basis of recordings of BERA. Among the 50 participant 20% had low, 24% had average and 20% had high level of hearing loss.⁵ The intensity of hearing loss was more profound in participant serving for very long time. 66.67% of the participant who were exposed to loud noise for more than 18 years had high intensity of SNHL, while only 10% of them working for 10-14 years duration had high intensity of hearing loss. **Conclusion:** We concluded that the highly exposure of the noise has been correlated with the intensity of the hearing loss. So regular audiological checkup is very important for all the people who working in high intensity noise area.

Keywords: hearing loss, noise, neurological disorder

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INTRODUCTION

Noise is an important occupational health hazard, with a high prevalence in the construction industry. The noise exposure of construction workers varies greatly with the activities performed and the equipment used on the worksite (Hong 2005), frequently exceeding daily noise exposure levels of 80 dB(A), which the European Directive 2003/10/EC defines as lower action level. This directive also considers an upper action level of 85 dB(A), at which the use of hearing protection is mandatory, and an exposure limit of 87 dB(A) that takes the attenuation of individual hearing protectors into account.¹ The mammalian auditory system is susceptible to noise exposure injury resulting from damage to cells in the inner ear. Changes in function can be temporary or permanent.² The Occupational Safety and Health Administration (OSHA) federal noise regulations define an auditory "standard threshold shift" as a permanent change in hearing threshold, relative to

one's baseline audiogram, of an average of 10-dB or more at ^{2, 3}, and 4 kHz in either ear. A temporary threshold shift (TTS), by definition, does not meet this regulatory standard for a workplace-induced noise injury. However, recent findings suggest that large TTS may result in permanent synaptic loss, followed by slow, progressive neural degeneration. Thus, exposures that result in TTS may be more harmful than previously believed.³ NIHL is a preventable occupational health hazard. Regular use of ear protection devices have shown to offer good protection against damage to hair cells. Earplugs and earmuffs provide at least 5 to 10dB SPL of attenuation and this provides great protection.⁴ According to the US Department of Labors' Occupational Safety and Health Administration (OSHA), an employer must provide hearing conservation programs for all its employees working at a noise level of 85dB (A) or above for an average 8 hour time period.⁵ Unfortunately, not many

institutions provide hearing conservation devices to its employees. Moreover people avoid the use of ear protection devices due to different reasons like lack of comfort, reduced sound quality and embarrassment. Management programs for people with NIHL include counseling and the use of hearing aids.⁴

MATERIAL AND METHODS

After taking the ethical permission this study was done in the department of community medicine. We included 50 male drivers who were exposed to high intensity noise for more than 7 hours a day over a period of 9 years and more of job. 35-55 age group people were included in this study. Family history and personal details regarding any ear problems and

injury, neurological problems, use of ototoxic drugs etc. was noted. The individuals were also asked any use of ear protection component by them. Statistical analysis was done for all the individuals. The subjects' hearing capability was assessed using brainstem evoked response audiometry. The peak latencies and inter-peak latencies were used for analysis.

RESULT

50 male were included in this study, 44.55 ± 10.55 mean age of the person.

62% of the individuals were observed to be having sensorineural hearing loss. They were further divided as low, average and high problem on the basis of recordings of BERA.⁵

Table 1: Distribution of participant on the basis of job time

Time of job	Number of Participant	%
Below 10 years	-	-
10-14	22	44
14-18	25	50
Above 18	3	6

50 of the participant had service duration of 14-18 years. 44% of them had service duration of 10-14 years, and 6% worked for above 18 years

Table 2: BERA in right and left ears

	Mean Absolute Latencies(ms)			Mean Intrapeak Latencies (ms)		
	1	2	3	1-3	3-5	1-5
Right ear	1.88 ± 0.29	3.81 ± 0.36	5.69 ± 0.52	1.89 ± 0.29	2.11 ± 0.31	3.99 ± 0.25
Left ear	1.69 ± 0.27	3.77 ± 0.31	5.65 ± 0.53	1.88 ± 0.28	2.13 ± 0.30	3.89 ± 0.26

Both the peak latencies and the inter-peak latencies of right and left ears were found to be prolonged suggesting prolongation of the conduction time all through the pathway.

Table 3: Distribution of participant on the basis of loss of hearing

Loss of hearing	Number of Participant	%
Low	10	20
Average	12	24
High	10	20
No loss	18	36

Among the 50 participant 20% had low, 24% had average and 20% had high level of hearing loss.⁵

Table 4: Shows the distribution of severity of hearing loss with relation to duration of noise exposure

SNHL (No. of cases)	Service (years)			Total	
	10-14	14-18	Above 18		
Low	8	1	1	10	20
Average	4	8	0	12	24
High	2	6	2	10	20
No loss	8	10	0	18	36

The intensity of hearing loss was more profound in participant serving for very long time. 66.67% of the participant who were exposed to loud noise for more than 18 years had high intensity of SNHL, while only 10% of them working for 10-14 years duration had high intensity of hearing loss.

Table 5: intensity of hearing loss and mean exposure

SNHL	Number	Job in years
Low	10	15.99 ± 3.66
Average	12	16.88 ± 3.68
High	10	20.21 ± 2.45
No loss	18	15.58 ± 2.55

As the duration of exposure to loud noise increased the degree of severity of hearing loss also increased ($p < 0.001$).

DISCUSSION

Hearing loss due to noise is a preventable disease. The use of ear protection devices and hearing conservation programs can greatly reduce the incidence of noise induced hearing loss. It has been proved that earplugs and earmuffs can provide protection of at least 5 to 10 dB, but use of these devices is not routinely practiced. The BERA recording showed prolongation of peak latencies and inter-peak latencies. 62% of the individuals were observed to be having sensorineural hearing loss. They were further divided as low, average and high problem on the basis of recordings of BERA.^{5 2} Among the 50 participants 20% had low, 24% had average and 20% had high level of hearing loss. But 36% of the participants were observed without hearing loss in our study. This is possible due to 18 participants had lesser duration of exposure, mean 15.58 ± 2.55 yrs. The capability of hearing and resistance to damage from noise varies from person to person.

But the duration of exposure was observed to have a great impact on the intensity of hearing loss, intensity of noise being the same. We observed a significant correlation between duration of exposure to loud noise and severity of hearing loss ($p < 0.0001$). As the duration of exposure to loud noise increased the level of hearing loss also increased ($p < 0.001$). The longer the participant was exposed to loud noise higher the severity of the hearing loss which was reflected by prolongation of absolute latencies and inter-peak latencies. This is due to the fact that continuous exposure to high intensity noise for long duration causes profound damage to inner hair cells, leading to changes in the BERA recordings.⁶⁻⁸

We also observed that none of the participants was using any kind of ear protection component. Most of the participants were not aware about these devices. Some who were aware of the devices were not using them for different reasons like embarrassment and not comfortable. It has been observed that although the response rate for their use is 80%, only 2% of the exposed individuals agree to use personal protection devices.⁹

Therefore it is highly suggested that the use of such personal defense devices should be inspired and made obligatory. In fact these should be provided positively by the institution itself. In addition, the

institution should inspire and arrange for regular audiological evaluations using BERA technique. With these simple steps early detection of hearing loss and early intervention to halt its progression can be done.

CONCLUSION

We concluded that the highly exposure of the noise has been correlated with the intensity of the hearing loss. So regular audiological checkup is very important for all the people who are working in high intensity noise area.

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