

OCCUPATIONAL HAZARDS IN LOCO-PILOTS OF CENTRAL INDIA

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Abstract:

Background: Occupational noise induced hearing loss is an increasingly prevalent disorder. Approximately 30 million workers are exposed to loud noise due to their occupation. Apart from hearing loss, other effects of loud noise exposure include headache, hypertension, tinnitus, insomnia, irritation and lack of concentration. These extra auditory effects cause deterioration in the work quality as well as affect the quality of life. **Aim:** To find out extra auditory effects of noise induced hearing loss like headache, tinnitus, vertigo, hypertension, irritation, insomnia, lack of concentration in persons exposed to heavy occupational noise environment and to correlate them with duration of exposure and degree of hearing loss. **Materials and Methods:** 60 male railway engine drivers, age 40-50 years were taken as subjects. They were all subjected to brainstem auditory evoked potential test (BAEP) to determine the degree of hearing loss. Their subjective complaints, duration of exposure to noise and other relevant details were recorded. Same number of subjects was taken as controls. **Results:** 36/60 (60%) subjects were found as having hearing loss. 16.7% complained of tinnitus and strong association was established. Strong association was also found between degree of hearing loss, duration of exposure and age. **Conclusion:** Strong association between tinnitus and noise has been established. The severity is directly associated with duration of exposure and degree of hearing loss.

KEY WORDS: BAEP, tinnitus, hypertension, duration of exposure, degree of hearing loss

1. INTRODUCTION

Occupational noise induced hearing loss is an increasingly prevalent disorder. Approximately 30 million workers are exposed to loud noise due to their occupation. Noise-induced hearing loss is the second most common form of sensorineural deafness after presbycusis.¹ When the ear is exposed to excessive sound levels or loud sounds over a period of time, the overstimulation of hair cells leads to heavy production of reactive oxygen species. The detoxifying capacity of endogenous antioxidants may prove insufficient and resulting oxidative stress can lead to necrotic or apoptotic cell death.²

It has been recommended by the Ministry of Labour, Government of India that a noise level of 90 dB(A), for 8 hours a day, for a period of 5 days a week, should be the maximum limit for workplaces.³ It is also highly recommended that an employer must implement hearing conservation programs for employees if the noise level is equal to or above 85dB(A) for an average 8 hour time period per day.⁴

There have been a lot of studies focussing on the effect of noise on the hearing threshold, and it has been proved that long-term exposure to loud noise definitely has a deleterious effect on the hearing capacity. But the part that has been missed is the effect of noise on problems other than hearing impairment, which are equally important as they are affecting the quality of life of individuals. These problems like headache, irritation, insomnia, hypertension, tinnitus etc., which are the extra-auditory effects of noise exposure, also need attention. This present study focuses on these extra-auditory effects of noise.

Hypertension has been found to be present in maximum number of subjects and it has been proposed to be due to stress induced by long-term exposure to noise. It is a well known fact that stress causes hyper-secretion of adrenal hormones which lead to hypertension. Talbot E et al in 1985 found a significant relationship between noise-induced hearing loss and high blood pressure among metal workers.⁵ Similar results were found by Bell S et al in 1984 and Moscow JI et al in 1977.⁶ Another study carried out among bus drivers revealed significant relationship between prolonged noise exposure and increase in blood pressure.⁷ Long-term exposure to noise has also been found to increase the level of catecholamines and corticoids in the body.⁸

Tinnitus is ringing sound in the ear, described variously as roaring, rustling, or clicking type. It is more annoying in quiet surroundings.³ A study among textile workers revealed that there is a significant correlation between tinnitus and the duration of exposure to noise.⁹ A similar study on shipyard workers in US also reported tinnitus to be more annoying than the hearing loss.¹⁰

The technique used in this study is Brainstem Auditory Evoked Potentials (BAEPs). Brainstem auditory evoked potentials (BAEPs) are the potentials recorded from the ear and vertex in response to a brief auditory stimulation via electrodes placed at fixed locations on the scalp. The potential changes are recorded in wave form and assess the conduction through the auditory pathway up to midbrain. BAEPs comprise of five or more peaks within 10 ms of the stimulus. The critical parameters utilized for assessment are absolute latency, inter-peak latency and peak-to-peak amplitude.¹¹

2. MATERIALS AND METHODS

This study was carried out in the Department of Physiology of Government NSCB Medical College Hospital Jabalpur after approval from the Institutional Ethical Committee. The study group comprised of 60 loco-pilots (rail engine drivers) of age group 40-50yrs, employed in Western-Central Railway, Jabalpur, and exposed to continuous loud noise (>85dB) for more than 10 yrs.

A detailed history with special emphasis on duration and complains, physical examination including ontological examination was done. Each of them underwent Rinnie's test, Weber's

test and endoscopic examination before subjecting them to BAEP. Informed consent was taken. BAEP was performed using RMS NCV/EMG/EP machine.

Two tracings were obtained and superimposed in order to check replicability of waveforms. Normative data were gathered separately in 60 subjects matched in age and sex and working in offices as a control group to compare the results. The criteria for abnormal BAEP included absence of response, prolonged latencies (mean $\pm 2.5SD$) and prolonged inter-peak latencies (mean $\pm 2.5SD$).

Blood pressure was recorded in all subjects in sitting position using a mercury sphygmomanometer. After a period of 5 minutes rest, two recordings were taken on each arm at 5 minutes interval, and the average of the two recordings was taken as the blood pressure of the subject.

The data was analysed using the software SPSS 18 for windows. Appropriate univariate and bivariate analysis were carried out using the Student t test for the continuous variable (eg. Age, IMT, ESR, SBP etc) and two-tailed Fisher exact test or chi-square (χ^2) test for categorical variables. All means are expressed as mean \pm standard deviation. The critical levels of significance of the results were considered at 0.05 levels i.e. $p < 0.05$ was considered significant.

3. RESULTS

A total of 60 subjects were studied, all male loco-pilots and age distribution from 40 to 48 years, with mean age of 44.17 years (± 2.877). 37 subjects were less than 45 years of age while 23 were more than 45 years of age. The duration of service varied from 11-20 years. All the subjects were having noise exposure of 8 hours a day for a period of 10-20 years. Among the 60 cases, 36 (60%) were found to be having sensorineural deafness of varying degrees. (Table 1) It was found that subjects working in noisy environment for a very long duration were having severe degree of hearing loss. Mean age >45 years and duration of exposure >16 years were found to be directly associated with the outcome. (Table 2 and Table 3)

Table 1

Diagnosis	Case (N=60)
Sensorineural deafness	36 (60%)
Normal	24 (40%)

Table 2 Association of mean age with outcome

		Normal (n=24)	Positive (n=36)	Significance
Age	<45	19 (79.2 %)	18 (50%)	5.182; p<0.05
	>45	5 (20.8%)	18 (50%)	

Table 3 Association of mean duration of exposure with outcome

		Normal (n=24)	Positive (n=36)	Significance
Duration of exposure	<16	19 (79.2 %)	16 (44.4%)	7.143; p<0.05
	>16	5 (20.8%)	20 (55.6%)	

Headache, irritation and insomnia were the most common complains among the study group and control group. The complains of decreased hearing, tinnitus and lack of concentration were only reported by the study group. (Table 4) Hypertension and diabetes were presented by an equal number of subjects in both study and control group. Headache, irritation and insomnia are vague complains and diabetes and hypertension among the control group are attributed to sedentary lifestyle.

Table 4 Distribution of Cases According To Complaints

Complaint	No. of Cases	Percentage
Headache	30	50.0%
Irritation	22	36.7%
Lack of concentration	7	11.7%
Decreased hearing	8	13.3%
Ringing	9	15.0%
Insomnia	10	16.7%

Table 5 Association between various factors affecting the outcome

Complains		Normal (n=24)	Positive (n=36)	Significance
Headache	N	9 (37.5%)	21 (58.3%)	2.50; p>0.05
	Y	15 (62.5%)	15 (41.7%)	
Irritation	N	15 (62.5%)	23 (63.9%)	0.12; p>0.05
	Y	9 (37.5%)	13 (36.1%)	
Lack of concentration	N	22 (91.7%)	31 (86.1%)	0.431; p>0.05
	Y	2 (8.3%)	5 (13.9%)	
Decreased hearing	N	22 (91.7%)	30 (83.3%)	0.865; p>0.05
	Y	2 (8.3%)	6 (16.7%)	
Tinnitus	N	23 (95.8%)	27 (75.0%)	4.5; p<0.05
	Y	1 (4.2%)	9 (25.0%)	
Insomnia	N	18 (75.0%)	32 (88.9%)	2.000; p>0.05
	Y	6 (25.0%)	4 (11.1%)	
Diabetes	N	16 (66.7%)	24 (66.7%)	0.000; p>0.05
	Y	8 (33.3%)	12 (33.3%)	
Hypertension	N	13 (54.2%)	14 (38.9%)	1.358; p>0.05
	Y	11 (45.8%)	22 (61.1%)	

A strong association between tinnitus and duration of exposure and age was found ($p<0.05$). (Table 5) 9 subjects out of 36 positive cases (25%) reported tinnitus and the prevalence was found to be more with increasing age and duration of exposure. 30 out of 36 positive cases

(83.3%) did not report any difficulty in hearing despite having mild to moderate degrees of hearing loss as detected by BAEP, but the association was not significant. 22/36 (61.1%) were hypertensives and 12/36 (33.3%) were diabetics but the association was not significant.

4. DISCUSSION

Occupational noise is being considered as a potential cause of hearing loss among people working in noisy environment for a considerably long duration. Apart from hearing loss the major concern recently has been the quality of life of individuals. Difficulty in hearing creates stress and irritation which decreases the work capacity of the individual. In our study 60% of the cases were suffering from hearing loss of mild, moderate and severe degrees as revealed by BAEPs. Among these only 16.7% subjects actually complained of decreased hearing capability. As people who are exposed to loud noise experience stress and anxiety, which in long term leads to various health issues, for example hypertension and cardiac diseases.

Apart from noise induced hearing loss our main concerns in this study were the extra-auditory side effects of noise. Although a good number of subjects in both study group and control group were hypertensives but no significant association could be established. The most common complains among the study group were headache, irritation, insomnia, tinnitus and lack of concentration. But strong association has been established with tinnitus only. Among the subjects having severe degrees of hearing loss tinnitus was more annoying. Strong association was also established between duration of exposure and the age of the subjects.

5. CONCLUSION

The impact of extra auditory effects of noise cannot be ignored especially on the quality of life. Strong association between tinnitus and noise has been established. The severity is directly associated with duration of exposure and degree of hearing loss. It is strongly recommended that the sound level should be kept at minimum as per guidelines and use of protective ear devices should be encouraged.

LIMITATION

Small number of sample size was the limitation that some the association between some data could not be established. Complains are subjective and may be exaggerated.

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