Research Paper MEDICAL SCIENCE

"To study the effects of noise on hearing ability of bus drivers by audiometric examination."

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ABSTRACT

Background : Automobiles are important source of noise. Drivers are exposed to high noise levels. It can cause gradual hearing impairment.
Aim: To study the effects of noise on hearing ability of bus drivers.
Materials and Methods: Subjects: 60 male bus drivers (30 - 45 yrs.) working for 8 hrs/day or more. Controls: healthy males of same age. Hearing was assessed by using Pure Tone Audiometry for frequencies from 500 to 8000 Hz. Data was analyzed using Un-paired t-test and Chi square test.
Results : The hearing loss was 53.33% in cases & 8.33% in controls. Risk of hearing loss was 12.57 times higher in cases.
Conclusion : Study shows high risk of hearing impairment in cases. Measures shall be taken to minimize harmful effects of noise. Teaching and health awareness workshops may be helpful.

KEYWORDS Bus drivers , Noise Induced Hearing Loss(NIHL) , Pure Tone Audiometry (PTA)

INTRODUCTION :

Today noise has become a very important stress factor not only for occupational workers, but also for general population. Noise is an unavoidable price we all have to pay for industrialization and modernization, both at home and outdoor and at the place of work. In certain occupations noise can cause gradual impairment of hearing and in the long run may cause deafness in highly sensitive subject.**[1]**The automobiles are an important source of not only air pollution but also of a significant proportion of noise pollution.**[2]** Drivers can be exposed to high noise levels by working on old and faulty machinery, bumpy roads and transportation of masses of people. **[3]** Therefore, this study was conducted to assess the status of hearing in bus drivers so that appropriate preventive measures can be recommended for safe guarding of health.

AIM: "To study the effects of noise on hearing ability of bus drivers by audiometric examination."

MATERIALS AND METHODS:

- **Subject group:** The present study was conducted on 60 male bus drivers of age 30 - 45 years (exposed to traffic noise for 8 hours/day or more, for duration of 10 years or more).

- **Control group:** It includes 60 healthy males of age group 30 to 45 yrs. working in government medical college offices.

Those having history of Otitis Media, perforated ear drum, ear surgery, recent ear, nose, throat infection, Use of ototoxic drugs, Worked in another noisy activity and those engaged in activities that involve high level of noise were excluded.

Approval from Institutional Ethical Committee was taken. Written informed consents were obtained from all the subjects.

Instrument:-

Study and control group hearing was assessed by using **PTA.** Audiometer used was Elkon EDA-3N3 Giga 3.Audiometric testing was conducted in a dedicated room that met the audiometer manufacturer's specifications.

Test was conducted in the morning hours before joining the duty hours to minimize the effect of temporary threshold shift. Air conduction was measured by ear phones placed on the ears, while bone conduction was measured by placing the vibrator (bone probe) in contact with bones behind the ears (post-aural region). Each ear was evaluated separately and the results were reported on the graph known as audiogram. Audiogram recorded by using conventional technique.

The **modified Hughson-Westlake procedure** (Carhart and Jerger, 1959) was followed in which the signal intensity is first presented at a level the listener can hear clearly. Then the intensity is reduced in fixed-size decrements until the listener no longer responds. The intensity is then increased in smaller fixed-size increments until the listener responds again. From this point on, whenever the listener responds, the signal is decremented and whenever the listener fails to respond the signal is incremented. The intensity, when the signal is being incremented, to which the listener responds two out of three times is recorded as threshold.**[4] [5]**

Audiometric data was recorded as hearing threshold in dB HL (decibel hearing level) for air conduction and bone conduction. When hearing is tested for occupational hearing loss, only the frequencies 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz were tested. However, since a notch in the audiogram shape at 4000 and/or 6000 Hz with recovery to better hearing at 8000 Hz is the signature of a noise-induced hearing loss.**[6] [7]**

STATISTICAL ANALYSIS:-

The collected data was analyzed by using statistical tests like Un-paired Student's t-test and the values were expressed as mean ± SD of observed value. While the qualitative data of audiometry results was compared by using Chi square test. Analysis was done by using Microsoft Excel 2010.

RESULTS:

Table No. 1 – Prevalence of hearing loss.

	Normal Hearing (%)	Hearing Loss (%)	P value	Odds Ratio
Controls	55 (91.66%)	05 (08.33%)	< 0.000*	12.57
Cases	28 (46.66%)	32 (53.33%)		

*Statistically highly significant (<0.05)

Table No. 2 – Prevalence of Selective hearing loss at 4000 Hz in controls & cases.

Selective hearing loss at 4000 Hz	Controls	Cases	Total	P value
Present	03(05%)	32 (53.33%)	35	< 0.000*
Absent	57(95%)	28(46.66%)	85	
Total	60	60	120	

*Statistically highly significant (<0.05)

Table No. 3 – Prevalence of hearing loss in relation to duration of service in cases.

Duration of service	Normal Hearing (%)	Hearing Loss (%)	Total	P value
10-15	28 (57.14%)	21 (42.85%)	49	0.001*
16-20	00	11	11	
Total	**28**	**32**	**60**	

*Statistically highly significant (<0.05)

Statistically there was no significant difference between controls and cases for age in years (37 years for controls vs. 38 years for cases). Present study revealed that, the prevalence of hearing loss was about 53.33% among the cases which were significantly higher than control group (08.33%), who were not exposed to noise in their working environment. The Odds ratio showed the risk of having hearing loss 12.57 times higher in cases than controls. The findings are suggestive of increased risk of NIHL in cases than controls.

DISCUSSION

The objectives of this study were to analyze the effect of noise on hearing of the S.T. Bus drivers engaged in duty. Selective hearing loss at 4000 Hz is characteristic of the onset of NIHL. Among the controls (05) all are having slight impairment of hearing loss while in cases (32), 31.25% had slight impairment and 68.75% had moderate impairment in hearing loss. In present study the prevalence of hearing loss was about 53.33% among the cases may be due to overtime they work because of less staff, duration of exposure is more, condition of vehicles (Bus) is not good and limited use of protective instruments.

Everyday noise exposure, over prolonged time has an impact on the hearing ability. The mechanism of excessive noise inducing hearing loss includes direct mechanical damage of cochlear structure and metabolic overload due to over stimulation. The amount and the type of direct hair cell damage depend on the intensity of the sound. Exposure to noise at sub-traumatic level exhibit a temporary shift in hearing sensitivity that returns to normal with time spent away from the hazardous exposure. Higher level of sound leads to collapse of stereocilia and hair cell is eventually damaged permanently. If the outer hair cells are not functioning, a greater stimulation is required to initiate a impulse; thus the threshold sensitivity of inner hair cells is raised, which perceived as a hearing loss**. 8,9,10]**

A study was done in Abha city to investigate the prevalence of possible hearing impairment in bus drivers, pure tone audiometry was performed. The prevalence of hearing loss was 19.4%.**[11]**The results are consistent with present study, indicating occupational noise leads to noise induced hearing loss.

A cross-sectional study was carried out in city of Campinas, Brazil. The prevalence of noise-induced hearing loss was 32.7%.The authors conclude that, the risk of noise-induced hearing loss was greater for drivers in job for more than 6 years. **[12]** Againthe results are consistent with present study; here duration of exposure is more than 10 years.

In another study, noise levels were measured in the driver's cabin which ranged from 89 to 106 dB & audiometric examinations were performed. In the study group 89% of the drivers showed abnormal audiograms.Theprevalence of noise-induced hearing loss is higher owing to high noise levels in bus cabin. In present study amount of actual noise level was not quantified. **[1]**

In another study in Lahore Pakistan, 65% of the public transport drivers had Grade 1 or slight hearing impairment and 10% of the drivers had Grade 2 or moderate hearing impairment. However the researchers did not measure the actual amount of noise exposure, but mentioned that there is excess noise on the roads in all major cities.Findings of present study are consistent with this finding. **[13]**

A cross sectional, exploratory study was conducted in Dhaka, Bangladesh, with a view to determine the average noise level in different places of Dhaka Metropolitan City, and also aiming at evaluating the extent of Noise-induced Hearing Loss (NIHL) in different groups of city dwellers. Profession-wise Automobile drivers showed 18.26 % prevalence of abnormal hearing**. [14, 15]**

CONCLUSION

Present study was conducted to enlighten the effect of noise on the S.T. Bus drivers engaged in their duty. Study shows high risk of hearing impairment in cases as compared to controls. Measures shall be taken to avoid or minimize harmful effects caused by the noise; like use of noise protective gears, earplugs, earmuffs and canal caps. Teaching and health awareness workshops may help in better understanding and motivation of the drivers on the impacts of noise pollution.

Limitations:-

• Some technical limitations could not be avoided in this study. First, the timing of the audiometry assessment in relation to when subjects were last exposed to noise could not be controlled.

The French norm recommends testing hearing 3 day after the last noise exposure, but it was not possible to achieve in this study. Therefore, it is possible that the effect of temporary threshold shift has led to an overestimation of the real risk of NIHL. **[16]**

• The second limitation was the small sample size of subjects.

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