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Research Article

EFFECT OF TRAFFIC NOISE ON HEARING THRESHOLDS IN TRAFFIC POLICEMEN OF BANGALORE CITY

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ABSTRACT

Objectives & Background: The Traffic policemen working near signal junctions are exposed to harmful noise of around 72 – 100db for 7 – 8 hours per day. Noise affects several physiological processes of the body including hearing. In our study we intended to record Hearing Thresholds in Traffic policemen & to test the hypothesis "Exposure to traffic Noise will reduce Hearing Thresholds".
Methodology: 30 Traffic policemen & 30 office policemen, not worked at signal junctions, were selected based on inclusion & exclusion criteria. Their Hearing Thresholds were recorded using Audiometer
Results & Conclusions: The Hearing threshold for A/C in both ears were significantly high in study group for frequencies 1000, 2000, 6000Hz with 'p'<0.05. Hearing threshold for B/C in Rt ear was significantly higher in study group at 1000, 4000Hz. Hearing threshold for B/C in Lt ear was significantly higher in study group at 1000, 2000Hz. Threshold shift (10db change) was found for A/C in both ears at 1000Hz frequency. Wear, tear and adaptive changes in hair cells are responsible for such finding.
Keywords: Hearing impairment, Hearing threshold, traffic noise, traffic policemen

INTRODUCTION

Bangalore is a city well known for its noisy and crowded traffic. Traffic generates a considerable amount of noise which originates from engines, air turbulence and frictional contacts of vehicle tires with the ground. The noise level increases with increment of vehicle volume and flow. According to a survey noise produced by vehicles at traffic signal junctions average about 72-100 db[1].

Noise is a risk factor in sleep disturbance, cardiovascular dysfunction, speech interference, mental distortion including hearing impairment and balance disorder. Repeated & prolonged exposure to noise levels greater than 80db cause hearing impairment[2].

Traffic police standing at signals to control signal lights or observe whether drivers are following the signals are exposed to noise level of about 72-100db for about 7 hours per day. The noise produced by vehicular traffic directly affects hearing capabilities of traffic police. The effect on hearing is very slow & usually without any alarming symptoms and individual become aware of their disability when irreversible damage has occurred.

Although occupational hearing loss is a well recognized hazard in some industries or occupations with exposure to high noise levels, it has not been evaluated in occupations for which the risk is not so overt such as traffic police officers. Hence the present study is undertaken to test the hypothesis "Exposure to traffic noise will reduce hearing thresholds in traffic policemen." Such study would be helpful to identify hearing impairment at early stages and suggest possible recommendation to police officers and also to higher authorities regarding preventive measures.

Objectives

1) To record hearing thresholds in traffic policemen (study group) using Audiometer
2) To record hearing thresholds in Control group using Audiometer
3) To compare hearing thresholds of both the groups for significant results

METHODOLOGY

The present work is comparative cross-sectional study involving 30 traffic policemen & 30 controls of Bangalore city. The control group were selected from office policemen but not worked at traffic signal junctions. The subjects were selected as per inclusion & exclusion criteria laid down.

Inclusion criteria

1) Policemen working at traffic signal junctions atleast since 6 months
2) Age-group – 25-50 years

Exclusion criteria

1) H/O having worked/resided in noisy environment
2) Smoking, Alcohol
3) Ear infections
4) Ingestion of ototoxic drugs
5) Previous H/o head trauma
6) Diabetes mellitus, Hypertension

Written informed consent was taken and each subject was interviewed about his personal data, occupational history, H/O ear infection, accidents, ototoxic drug intake. Subjects were examined clinically then their hearing thresholds were recorded using pure tone audiometer, ARPHI 500 MK1 model, at physiology lab, Bangalore Medical College & Research Institute.

RESULTS

Table 1: Shows Agewise distribution of study & control groups

Age-group	Study	Controls
21-30	6	4
31-40	16	19
41-50	8	7
Mean + SD	37.38 ± 8.16	36.98 ± 8.03

P = 0.118

Table 2: Comparison of Hearing thresholds of Rt ear for air conduction between study & controls

Frequency	Hearing threshold Controls	Hearing threshold Study	P value
250	15.56 ± 3.91	16.6 ± 2.78	0.419
500	14.6 ± 6.7	16.5 ± 6.7	0.09
1000	14.63 ± 4.3	24.83 ±11.5	<0.05
2000	17.17 ± 4.3	19.17 ± 8.1	0.08
4000	16.17 ±4.3	19.17 ±8.1	0.11
6000	14.33 ± 4.9	21.67 ±7.7	< 0.05
8000	15 .8 ± 2.77	16.11 ± 2.2	0.917

Table 3: Comparison of Hearing thresholds of Lt ear for air conduction between study & controls

Frequency	Hearing threshold Controls	Hearing threshold Study	P value
250	16 ± 3.1	16. 17 ± 6.7	0.91
500	15.56 ± 3.91	16.6 ± 2.78	0.419
1000	13.17 ± 2.8	23.83 ± 6.5	<0.05
2000	16.17 ± 6	21 ± 6.8	< 0.05
4000	21 ± 2.8	19.83 ± 9.9	0.52
6000	21.33 ± 2.6	25.7 ± 7.2	< 0.05
8000	15 ± 2.9	16.17 ± 10.14	0.6

Table 4: Comparison of Hearing thresholds of Rt ear for Bone conduction between study & controls

Frequency	Hearing threshold Controls	Hearing threshold Study	P value
250	20 ± 3.54	20.4 ± 3.51	0.792
500	16.6 ± 7.1	17 ± 5	0.82
1000	16.83 ± 5	21.5 ± 5.7	<0.05
2000	17.5 ± 5.2	19.5 ± 5.7	0.22
4000	18.67 ± 4.5	23.5 ± 7.9	< 0.05

Table 5: Comparison of Hearing thresholds of Lt ear for Bone conduction between study & controls

Frequency	Hearing threshold in db Controls	Hearing threshold in db study	P value
250	20 ± 3.78	21.2 ± 3.62	0.092
500	17.17 ± 2.5	17.5 ±7.21	0.8
1000	17.17 ± 2.5	22.17 ± 9.1	<0.05
2000	19.3 ± 6.7	23.83 ± 4.8	< 0.05
4000	22.2 ± 6.9	23.67 ± 3.5	0.3

Table 1 shows agewise distribution of subjects & controls It is evident from table 2, & table 3 that Hearing thresholds for A/C in both ears are significantly increased in study group for mid-frequency average of 1000, 2000 Hz and high frequency range of 6000Hz The hearing thresholds for B/C is significantly higher in study group for frequency ranges of 1000, 4000Hz in Rt ear, 1000, 2000Hz in Lt ear.
Threshold Shift (10db change) is found in both ears at 1000Hz frequency for A/C.

DISCUSSION

The traffic policemen working near signals are exposed to harmful noise of around 72 – 100db for 7 – 8 hours per day
The first effect of exposure to excess noise is an increase in the hearing threshold called "Threshold Shift" and is assessed by Audiometry. Threshold Shift is a change in hearing threshold of an average 10db or more at 1000, 3000, 4000Hz in either ear[3]. In our study we have found Threshold Shift in Rt ear for A/C at 1000Hz. Threshold Shift is the precursor of NIHI (Noise Induced Hearing Impairment)(3). NIHI occurs predominantly at higher frequencies (3000 – 6000Hz). NIHI develops slowly over a long period of time as a result of exposure to continuous or intermittent loud noise. It is irreversible and increases in severity with continued exposure.
The probable explanation for NIHI would be persistent stimulation of any ear and firing of the hair cells leading on to wear, tear and adaptive changes. Sensorineural damage results more often from noise pollution [4]. *Outer hair cells ar*e more susceptible to noise exposure than inner hair cells. Temporary Threshold Shifts are anatomically correlated with decreased stiffness of the stereocilia of outer hair cells. The stereocilia become disarrayed and floppy. With more severe exposure, injury can proceed from a loss of adjacent supporting cells to complete destruction of organ of corti[5]. It is yet uncertain which of the two ears is more susceptible to damage by noise.
S.T Ingle, B. G. Pachpande [6], Abdel-Aziz M Kamal, Samia E. Eldamati[1] have also found in their studies Audiometric hearing impairment (Threshold average greater than 25db) for all frequencies in traffic policemen.
Hearing loss is only one of the hazards of Noise. Prolonged or excessive exposure to noise, whether in community or at work place, can cause medical conditions as Hypertension and Diabetes Mellitus. Noise can adversely affect performance, attentiveness and memory [7]. On roads or in industry these deficits in performance can lead to accidents. Noise above 80db may increase aggressive behavior and can result in changes in social behavior.
The damage that has been done cannot be corrected, only prevention is the treatment of NIHI. Noise control measures can be in the form of various types of engineering, personal protection and administrative approaches. Most important is awareness among community about health hazards of noise pollution.

CONCLUSION

A comparative study was done to show the Effect of Noise on Hearing. 30 Traffic policemen and 30 Office policemen matched for age, Height & Weight were recruited for study and their Hearing Thresholds were recorded using Audiometer. The Hearing Threshold for A/C in both ears were significantly high in study group for frequencies 1000, 2000, & 6000Hz. Hearing Thresholds for B/C in both ears were significantly higher in study group for frequencies 1000, 4000Hz. Threshold Shift (10db change) was found for A/C in both ears at 1000Hz frequency. Wear, tear & adaptive changes in hair cells in response to excessive noise are responsible for such findings.

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