Lead Article

Prevalence of occupational noise induced hearing loss amongst traffic police personnel

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Abstract

Traffic branch personnel of Pune traffic police were screened for presence of noise induced hearing loss. A very significant number (81.2%) showed sensorineural hearing loss. The various factors responsible for noise induced hearing loss are discussed.

Introduction

Relationship between noise and deafness is very well known. Bell ringer's deafness observed by Victor Hugo, canon deafness reported by Alberti, Copper Smith deafness described by Ramazinni and Black Smith deafness mentioned by Forbroke are some of the examples.

Modern day living and increasing urbanisation has resulted in increased incidence of noise pollution and thereby its deleterious effects on the human body especially the delicate sense of hearing. Traffic policemen standing in the midst of this environmental pollution are constantly exposed to this occupational hazard.

A study was undertaken by the Department of ENT, Armed Forces Medical College, Pune during October, 1995 with an aim to :-

(a) study the incidence of noise induced hearing loss amongst traffic police personnel in Pune city.

(b) create awarness regarding noise induced hearing loss.

(c) suggest preventive measures to reduce incidence of noise induced hearing loss.

Material and Method :

The subjects for this study were the traffic constables of Pune traffic branch. A total of 421 constables were examined. All individuals underwent a complete general, systemic and ENT examination to detect any obvious pathology which may result in hearing loss. A detailed history was taken regarding the number of years of service in traffic branch, place of duty, psychological build up of the individuals, past h/o ear disease or intake of oto toxic drugs. All the individuals were subjected to pure tone audiometry to detect the degree and type of hearing loss. The subjects in the study had undergone pre-enrolment medical examination and had normal hearing at the time of enrolment.

Results

A significant number of personnel were detected to be suffering from noise induced sensorineural hearing loss. Out of total of 421 personnel

examined as many as 342 (81.2%) were found to have raised hearing thresholds. The following observations were made :-

(a) ***Age :*** No significant relationships was found between hearing loss and the age group of the individuals. There was an even distribution of hearing impaired individuals in all age groups. (Table I).

(b) ***Duration of exposure :*** Those personnel who had less than 2 years service in the traffic branch had slightly less (60.3%) incidence of hearing loss as compared to others who had a higher incidence of approximately 85%. (Table-II).

(c) ***Place of work :*** The noise levels at various important traffic junctions were almost similar ranging from 65-75dB for light vehicles and 70-90 dB for heavy vehicles. No correlation was found between place of work and prevalence of hearing loss.

(d) ***Degree of hearing loss :*** The hearing loss was mild in case of 213 (62.3%) constables and more than 40 dB in 129 (37.7%) constables. It was unilateral in 103 (30.8%) individuals and bilateral in 239 (69.2%) individuals.

(e) ***Audiometric pattern :*** There types of audiometric pattern were encountered :-

(i) Descending curve - hearing loss in frequency beyond 4000 Hz - Fig 1.

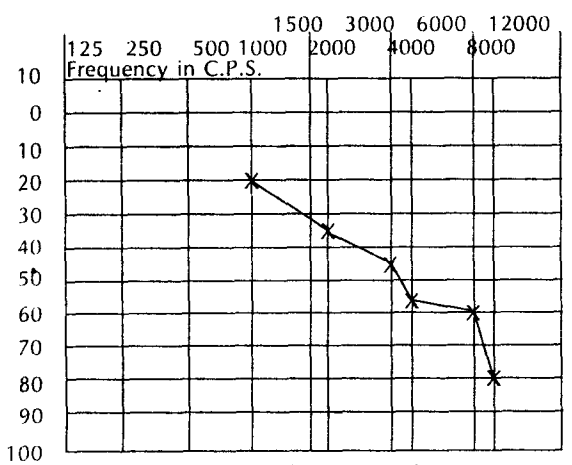

Fig. 1 *A descending type audiogram*

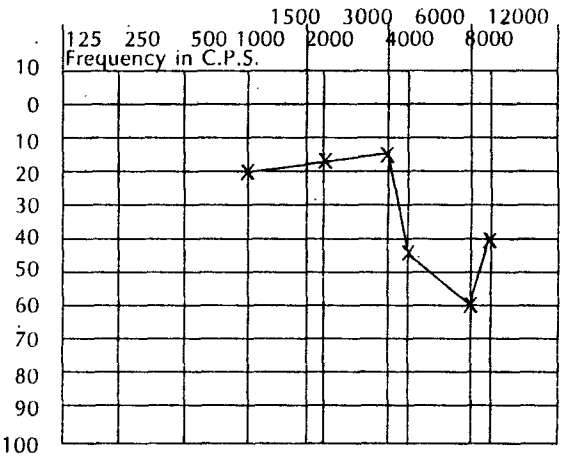

Fig. 2 *A pattern of audiometric notiching*

(ii) Notching - Notching was seen at 4000 Hz or 6000 Hz - Fig 2.

(iii) Flat curve - symmetrical loss in all frequencies. Fig. 3.

(f) Other defects : 43 individuals complained of subjective tinnitus. A fairly large number complained of allergic rhinitis. Some individuals showed non auditory effect of noise like - sleep deprivation and occasional headaches

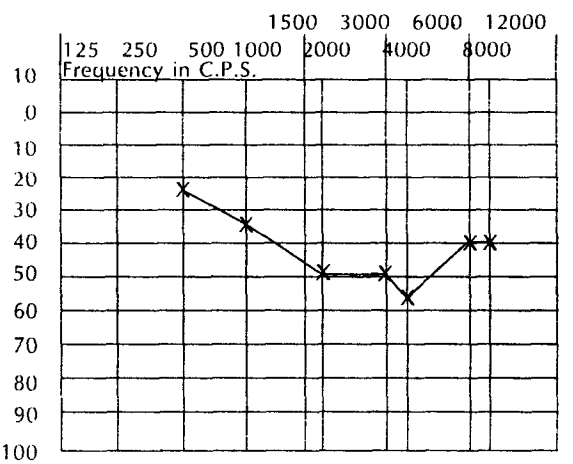

Fig. 3 *Flate curve pattern*

and expressed a desire to switch jobs.

Discussion :

Urbanisation has brought with it the hazards of noise pollution. The human ear is constantly

being subjected to noise trauma there are a number of mechanisms which protect inner ear from damage from impulse noise like :

(a) Slippage of incudomalleolar joint.

(b) Rotational displacement of stapes above SPL more than 130 dB.

(c) Uncoupling of ossicular chain (Jahrsdrefar 1979).

However, there is no protection against steady state noise and exposure to sound more than 45 dB for four hours a day can produce permanent threshold shift. Within this hazardous noise level the average initial change is a temporary threshold shift (TTS) which imperceptibly blends into PTS.

The degree of threshold shift depends upon the following factors :-

(a) ***Intensity of noise :*** It is seen that low levels of sound produces biochemical damage and higher levels produces mechanical damage of cochlea. The mechanical damage is in t he form of ciliary damage to outer hair cells of organ of corti. In the case of TTS there is shortening of supracuticular rootlets while at higher sound levels producing PTS there is fracture of rootlets of hair cells (Gao et al 1992). The greater the intensity the more is the damage produced.

(b) ***Frequency spectrum of noise :*** High frequency sounds are more damaging than low frequency sounds. The lower the frequency of stimulus the higher the basal level above which threshold shift occurs.

(c) ***Time interval between exposure :*** Introduction of appropriate rest intervals away from noise reduces the danger of developing permanent threshold shift. However, hair cell damage may continue even though the audiogram remain static (Ward et al 1980).

(d) ***Age :*** Hearing in noisy surroundings deteriorates as much in one year as it does in three years by ageing.

(e) ***Duration of exposure :*** The earliest indication of noise trauma is a small threshold shift anywhere between 3 - 4 KHz. With greater exposure the gap grows deeper and broader the higher frequencies being more rapidly affected than low frequencies.

(f) ***Susceptibility :*** The degree of hearing loss varies from individual to individual. This individual susceptibility is due to the following factors (Boettcher 1993).

(i) Difference in mass and shape of ossicles.

(ii) Difference between area of tympanic membrane and oval window.

(iii) Elasticity of skin in external ear.

(iv) Chemical characteristics of endolymph.

(v) Size and tension of middle ear muscles.

(vi) Blood supply of cochlea.

There is no reliable test to predict the susceptibility of an individual. Some studies however, indicate a role for otoacoustic emissions as indicators of susceptibility. Size of otoacoustic emissions dimishes even before there is detectable pure tone threshold shift in case of over exposure to noise (Leepage 1993). This may make a sensitive screen for susceptibility to noise damage. Otoacoustic emissions also serve as a screen against exaggerated hearing loss since their presence implies hearing better than 35 dB whatever be the exaggerated threshold.

A significantly large number of subjects (81.2%) in this study showed sensorineural hearing loss which was of moderate to severe intensity in as many as 37.7% of the individuals. It was bilateral in majority of the subjects and was directly related to the duration of exposure.

In view of the high incidence of acoustic damage a number of preventive measures were suggested like, rotation of beat of traffic personnel between high and low noise intensity areas, withdrawal of individuals with significant hearing loss and use of personal ear pro-

tectors like ear fenders or ear muffs and creation of awareness among exposed individuals about the hazards of noise pollution and stressing the importance of hearing conservation by constant education and regular monitoring of susceptible individuals.

Table - I

Age Incidence of noise induced hearing loss

Age in yrs	No. of individuals	No. of individuals with hearing loss
21 — 30	114	90 (78.9%)
31 — 40	210	173 (82.3%)
41 — 50	74	60 (81.8%)
51 — 60	23	19 (82.6%0
	421	342

Table - II

Showing correlation between HL & Duration of Exposure

Yrs of servicee	No. of individuals	No. of individuals with hearing loss
> 2 years	63	38 (60.3%)
2 — 4 yrs.	229	194 (84.7%)
4 — 6 yrs.	67	57 (85%)
6 — 8 yrs.	62	53 (85.4%)

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