OCCUPATIONAL NOISE INDUCED HEARING LOSS IN FIRE BRIGADE (MUMBAI)

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Abstract: To analyse the result of hearing threshold, analysis of individual exposed to noise with normal conventional audiometry a total of 433 Mumbai fire brigade was examined. The diagnostic criteria for noise induced hearing loss were (a) occupational noise exposure (b) work experience (c) hearing loss (d) no significant medical history affecting hearing. Also subdivided into3 age groups (a) 45-50 yrs (b) 51-55 yrs (c) 56-60 yrs. Conventional audiometry was done for the study. Among all types of hearing loss; fire brigade having bilateral 4kHz notch were more in number succeeding from bilateral high frequency loss. The study also shows that the impact of noise is greater as age increases and there is strong and positive correlation between experience and age on Pearson's correlation coefficient r=1. The study shows strong association between noise induced hearing loss and age & also duration of service. Increasing age, longer duration of service are significant associated factors for NIHL. Study found none of them used hearing protective device. Thus, it is necessary that fire brigades are made aware of importance of use of hearing protective devices and implementing hearing conservation program.

Keywords: Fire brigade, NIHL, Occupational Hearing loss.

I. INTRODUCTION

Excessive exposure to high intensity noise may be harmful to hearing and lead to noise induced hearing loss (NIHL). NIHL is a major preventable occupational health problem with 250 million people worldwide known to have disabling impairment of moderate to greater severity. Worldwide 16% of disabling hearing loss in adults is attributed to occupational noise exposure being greater in males than in females. WHO estimated that globally 16% of individuals have a moderate to greater degree of hearing loss due to occupational noise exposure. A typical NIHL is of sensory neural type involving injury to the inner ear. It is bilateral and symmetrical, usually affecting the higher frequencies (3k, 4k, 6k); but onset of hearing loss is characterised by having visible dip in the audiogram at 4 kHz. As exposure to excessive noise level continues, neighbouring frequencies are progressively affected and dip broadens. NIHL initially cause a loss of clarity in perceived speech and then as hearing loss progress it affects the daily activities. Following symptoms are observed in early stage; problem in normal and telephonic conversation, temporal and spatial resolution, tinnitus, turning up TV / radio volume. NIHL also affects health issues such as concentration, irritation, fatigue, headache, sleep disturbance due to noise pollution.

NIHL is the second most common form of acquired hearing loss after age related loss (presbycusis), with studies showing that people who are exposed to noise levels higher than 85dB suffered from NIHL.

Kyaw N Win, Nayake B P Balala, Alice Lai June'2015, studied noise induced hearing loss in police force. They aimed at the prevalence of noise induced hearing loss in police force on 543 police personnel and study its association with age, sex, duration of service, smoking and alcohol habits, use of hearing protective devices, as well as pre-existing chronic disease. These authors reported that the prevalence of noise induced hearing loss in this study population was 34.2% with a higher prevalence in males (37.7%) than in females (23.9%). The study also showed strong association between noise induced hearing loss and male sex (odd ratio, 1.9; P<0.05) and hypertension (odd ratio, 1.9; P<0.05). Overall, 93% were found to have mild NIHL, 3.5% had moderate NIHL and 3.5% had severe NIHL. No police personnel were found to have profound hearing loss.

Rocha R L, Altherino C C, Frota S M' 2010 studied high frequency audiometry in normal military firemen exposed to noise. They aimed to analyse the results of threshold high frequency analysis of individuals exposed to noise with normal conventional audiometry. The authors reported that the result was more significant in the 40-49 years of age range, where experimental group showed significantly higher threshold values than control group 14000 Hz (P= 0.008) and 16000 Hz (P= 0.0001).

In Indian studies, Rupendra K Ranga, SPS Yadav, Ankush Yadav, Neha Yadav and Saroj Bala Ranga studied prevalence of occupational noise induced hearing loss in Industrial workers. They reported that the workers who worked in machinery area were affected more when compared to officials and helpers. The age group 36-40 years were affected more when compared to other age groups, 39% of industrial workers who were exposed to noise level >87.3dBA, for 8-12 hr/day in textile and hard strip rolling mills inspite of noise free machine are recommended suffered from sensory neural hearing loss.

II. MATERIALS AND METHODS

A cross sectional study, in which 433 subjects of Mumbai fire brigades (33 stations) were studied. All males who undergoes periodic medical examination over a 12 month period; was examined. Audiometric testing conducted using Conventional Audiometry this is usually carried out by doing air conduction test at frequencies of 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz and 8000 Hz taken for each ear and bone conduction test at frequencies 250 Hz, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz taken for better ear in closed room environment with a minimal ambient noise level of 20-25 dBA .The diagnostic criteria for NIHL were: - (a) Occupational noise exposure (b) work experience (c) hearing loss (d) no significant medical history affecting hearing.

They were subdivided into 3 groups i.e. (a) 45-50 yrs (b) 51-55 yrs (c) 56-60 yrs. The high frequencies were studied immediately after conventional audiometry.

The responses were scored and tabulated subjected to statistical analysis using SPSS (version 16.0) software.

III. RESULTS AND DISCUSSION

The results are as follows:

The total number of fire brigade subjects on which study was done was 433 subjects. The mean age for fire brigade personnel was 50.6 years and the mean duration of service was 28.6 years. Among 433 subjects, normal hearing population (123 subjects) and the population having pathologic cases (31 subjects) were excluded from the study. And rest 279 subjects were considered for the analysis.

The study showed following results of hearing types of 279 subjects. It is summated in the following Table and Diagrams.



Figure 1 Hearing Types with respect to Thresholds

Table 1 Percentage of sum of number of subject with respect to type of loss.					
TYPES OF LOSS	NUMBER OF SUBJECTS	PERCENTAGE			
4kHz Notch (unilateral)	42	15%			
4kHz Notch (bilateral)	105	37.5%			
High Frequency (unilateral)	32	11.5%			
High Frequency (bilateral)	68	24.4%			
4kHz Notch (one ear) + High Frequency Loss (other ear)	32	11.5%			
Total	279	100%			

Total sum of experience age of 279 subjects = 8097 years.



Figure 2 Sum of Experience Age

Table 2 Percentage of sum of experience age of subjects in noise with respect to type of loss.				
TYPES OF LOSS	SUM OF EXPERIENCE AGE	PERCENTAGE		
4kHzNotch(unilateral)	1184	14.62%		
4kHz Notch (bilateral)	3020	37.30%		
High Frequency	905	11.18%		
(unilateral)				
High Frequency (bilateral)	2026	25.02%		
4kHz Notch (one ear) + High	962	11.88%		
Frequency Loss (other ear)				
Total	8097	100%		

The percentage of above two data were correlated on Pearson's correlation and it was found that there is strong and positive correlation between experience age and type of loss on Pearson's correlation coefficient i.e. r=1; r=1 which is positive correlation of all 5 type of loss considering mean of age and experience.

Overall, 43% of the total analysed subjects were found to be in the age range of 45-50 years, 45.5% were in the age range of 51-55 years and 11.5% were in the age range of 56-60 years.



Figure 3 Age Range

TYPES OF HEARING LOSS	45-50 years	51-55 years	56-60 years	
4kHz Notch (unilateral)	21	20	1	
4kHz Notch (bilateral)	53	43	9	
High Frequency (unilateral)	13	18	1	
High Frequency (bilateral)	24	31	13	
4kHz Notch(one ear) + High Frequency (other ear)	9	15	8	
TOTAL	120	127	32	
PERCENTAGE	43%	45.5%	11.5%	

 Table 3 Pearson's correlation

NIHL was also seen to be more prevalent in 45-50 years age group, as well as in groups with experience >25 years of service in fire brigade Mumbai. Our result is similar to studies showing that the prevalence of NIHL is directly proportional to increasing age and longer duration of service.

Thus, the impact of noise is greater as age increases.

Statistically significant hearing loss occurs in fire brigade. Thus the study shows strong association between NIHL and age and also duration of service.

IV. SUMMARY AND CONCLUSION

In summary, these results showed the importance of new research, noise exposure of fire brigade at work environment in order to identify possible adverse condition as well as aid in the diagnosis of hearing loss. The prevalence of NIHL in this study is compared to other similar studies. The discovery of a number of NIHL among Fire Brigade led the study to estimate the prevalence of NIHL, as well as to study the relationship between NIHL and its associated factors.

This study shows that increasing age, longer duration of service are significant associated factors for NIHL. The study found out that none of them used hearing protective device.

Thus, it is necessary that fire brigade are made aware of the importance of the use of hearing protectors. Preventing strategies include health surveillance, implementation of a hearing conservation program. Further to this, it aimed to implement Hearing Conservation Program as a control measure in prevention of NIHL.

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