

A Preliminary Study on Noise Induced Hearing Loss in Serving Aircrew of Indian Air Force

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Incidence of acoustic trauma in 226 serving aircrew belonging to jet fighter/bomber and transport/helicopters was studied with 100 subjects of non-aircrew population (excluding technical personnel) acting as control. An overall incidence of acoustic trauma of 43.8% was found among the aircrew and of 10% among the controls. The incidence was higher amongst the transport/helicopter aircrew (73.3%) as compared to the jet fighter/bomber crew (25.7%). A higher incidence of moderate and severe degree of hearing loss was observed in aircrew as compared to control. Decrease in the hearing level has been noticed with increasing age due to increased exposure to noisy environment. In majority of cases typical involvement of 4 KHz and higher frequencies has been observed.

to demonstrate the aviator's dip at 4 KHz. Progress in biomedical electronics and improved techniques of histopathological studies have considerably added to the present day knowledge of physiology of cochlea and the effects of noise on cochlea.

That a noise level above 85 dB when prolonged and repeated leads to hearing loss, is an established fact. Glorig⁵ proved noise induced hearing loss audiometrically. Murty et al⁶, in an exhaustive study of incidence of acoustic trauma amongst the technical personnel working on jet aircraft, found the incidence to be 45.6%, 49.1% and 68.1% in age groups 30 years and below, 30 to 40 years and above 40 years respectively. The latest jet aircraft in Indian Air Force produce a noise of an intensity as high as 140 dB. Murty and Verghese⁶ surveyed the noise environment for most of the aircraft and found noisy environments far exceeding the maximum safe permissible limits. A lack of information on the incidence of acoustic trauma amongst the serving aircrew prompted this study.

It is an undisputed fact that prolonged and repeated exposures to noise can lead to deafness. Today, noise constitutes one of the serious occupational hazards in the modern industrialisation flare up. Deafness amongst aviators due to aircraft noise was not known till the advent of audiometry by Fowler in 1929¹. Dickson et al² were the first

Material and Methods

The study included 226 subjects from the serving aircrew population of Indian Air Force (IAF) from transport/helicopters and fighter/jet bomber

aircraft. The age of the subjects ranged from 20 to 49 years. The non-availability of the basic audiometric records of the aircrew necessitated a study of 100 controls from the non-aircrew population of IAF. The subjects were evaluated at the Medical Evaluation Centre of the Institute of Aviation Medicine for any systemic disability. Those suffering from conditions which could cause deafness were not included in the study. Deafness due to causes other than noise was also ruled out by various investigations.

A Bharat Electronic Ltd audiometer type KM 222A was used for audiometry. The audiometry was done in an anechoic chamber.

A detailed history was obtained from the subjects regarding any ear disease in the past. A detailed ENT clinical examination including tuning fork tests was carried out followed by pure tone audiometry using discrete tones (125 Hz to 8 KHz).

The severity of hearing loss was graded as follows :

Normal	—	0 - 15 dB loss
Mild	—	15 - 20 dB loss
Moderate	—	30 - 60 dB loss
Severe	—	60 - 90 dB loss
Profound	—	> 90 dB loss
Total deaf	—	no hearing.

Results and Discussion

The number of subjects and controls in the various age groups is as shown in Table — I.

TABLE — I

Age group (Yrs.)	Subjects No. (%)	Controls No. (%)
20 - 29	96 (42.5)	45 (45)
30 - 39	93 (41.1)	39 (39)
40 - 49	37 (16.4)	16 (16)
Total	226	100

Table II shows the number of subjects in each of the two groups, viz., fighter/bomber and transport/helicopter crew.

Among the 226 subjects, 99 showed evidence of deafness giving an incidence of 43.8%. Of the 140 fighter/bomber aircrew, 36 (25.7%) and of the 86 transport/helicopter aircrew, 63 (73.3%) were affected. The incidence of hearing loss among the

TABLE — II

Type of aircraft	No. of subjects (%)
Fighter/Bomber	140 (61.9)
Transport/Helicopter	86 (38.1)

control group was 10%. The higher incidence of noise induced hearing loss amongst the transport/helicopter aircrew may be attributable to long hours of exposure to high intensity noise during flying. The practice of not wearing bone dome over inner helmet by these aircrew is an additional factor as the sound attenuation by inner helmet alone is not much whereas appreciable attenuation is achieved when both the helmets are used together. The fighter aircrew always wear both the helmets during flying.

As seen from Table III, of the affected aircrew 35.4% had mild hearing loss, 53.5% moderate hearing loss and 11.1% severe degree of hearing loss. Among the controls, 40% revealed mild, 50% moderate and 10% severe hearing loss. The incidence of moderate and severe deafness is higher amongst the aircrew population. None of the subjects had profound or total hearing loss.

TABLE — III

	Hearing Loss		
	Mild	Moderate	Severe
Aircrew (N=99)	35 (35.4%)	53 (53.5%)	11 (11.1%)
Control (N=10)	4 (40%)	5 (50%)	1 (10%)

The severity of noise induced hearing loss amongst the two groups of aircrew as compared to controls is shown in Table IV. The incidence of mild deafness was high in the fighter/bomber aircrew whereas the incidence of moderate deafness was higher amongst the transport/helicopter aircrew. A significant difference in the severe hearing loss in the two groups was also noted.

The incidence of mild, moderate and severe degree of hearing loss in various age groups amongst the affected subjects and controls (Table V) reveals that mild deafness is more prevalent in the younger age group whereas moderate and severe deafness is more in the older age groups. This is typical of noise induced hearing loss. The

TABLE - IV

Grade of hearing loss	Fighter/Bomber (N=36)	Transport/Helicopter (N=63)	Control (N=10)
Mild	20 (55.5%)	15 (23.8%)	5 (50%)
Moderate	14 (38.9%)	39 (61.9%)	4 (40%)
Severe	2 (5.6%)	9 (14.3%)	1 (10%)

hearing loss goes on increasing as an individual is repeatedly exposed to noisy environment. Mild to moderate deafness is seen in 60% of the controls in the age group of 40 — 49 years which could be due to presbycusis process. Bhatia et al¹ have shown an early onset of presbycusis amongst the Indian population.

TABLE - V

Age group (Yrs.)	Mild loss		Moderate loss		Severe loss	
	Sub-jects	Con-trols	Sub-jects	Con-trols	Sub-jects	Con-trols
20-29	21 (21.2%)	1 (10%)	4 (4%)	1 (10%)	1 (1.1%)	—
30-39	10 (10.1%)	—	23 (23.2%)	1 (10%)	4 (4%)	1 (10%)
40-49	4 (4%)	4 (40%)	26 (26.3%)	2 (20%)	6 (6.1%)	—
Total	35	5	53	4	11	1
	Subjects N=99		Controls N=10			

The various frequencies involved in deafness due to aircraft noise exposure are shown in Figure 1. In this study, the commonly involved frequencies were 4 KHz to 8 KHz. The noise induced hearing loss is most commonly seen to involve 4 KHz and then subsequently other frequencies are gradually involved. Intensive low frequency non-impulsive noise could cause hearing loss in frequencies 500 Hz to 2 KHz^{2,7}. Appreciable deafness at below 2 KHz on exposure to intense jet noise has also been reported⁸. In this study, the involvement of fre-

quencies between 500 Hz and 2 KHz was seen only in a small number of cases. There are numerous explanations for the involvement of 4 KHz frequency due to noise exposure. The theories based on anatomical and physiological considerations appear to be more appropriate.

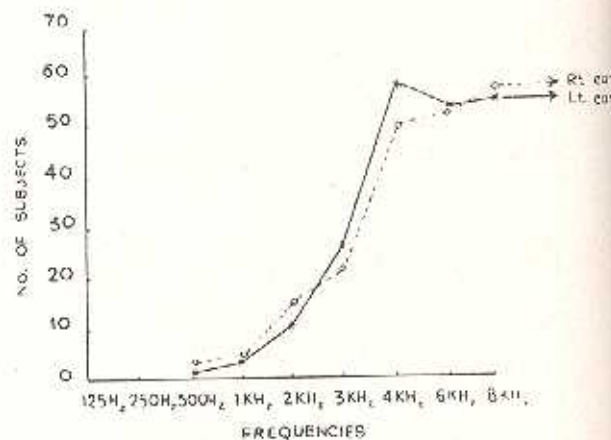


Fig. 1. - Frequencies involved in noise induced deafness

The majority of the subjects were not aware of their hearing loss as, most of them had normal hearing in the speech frequencies. They came to know of their disability when audiometry was done during medical evaluation or when the deafness extended to other neighbouring frequencies. This involvement of the other frequencies may be due to repeated 'acoustic insults' or it may be due to summated effect of ageing process and acoustic trauma.

Conclusions

Repeated exposure to noise affects the hearing of aircrew particularly those flying transport aircraft and helicopters. High noise levels in the cockpit, longer hours of flying and non-use of bone dome may be some of the factors responsible for the higher incidence of noise induced hearing loss in transport/helicopter aircrew.

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