

# A Study on Noise-Induced Hearing Loss of Police Constables

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## Abstract

**Introduction:** Noise is defined as aperiodic complex sound. Noise is a common cause of hearing loss in adults. Hearing loss due to injurious noise at the workplace is referred to as occupational noise-induced hearing loss (ONHL). Research has shown that sounds >85 dB can cause damage to our hearing. Policemen are the people who are exposed to traffic noises than any other people and are the least to care an audiological evaluation.

**Aim:** The aim of the study was to study the incidence of NIHL in police constables and to study the effect of age, personal habits such as smoking/drinking and medical conditions such as diabetes and hypertension on hearing loss.

**Materials and Methods:** The subjects were 50 police personnel (43 - males and 7 - females). A detailed history was taken regarding the number of years of service, past ear disease, and past medical conditions affecting hearing. All the subjects underwent routine ear nose and throat examination and pure tone audiometry to identify detectable hearing loss. All the subjects had normal hearing on recruitment.

**Results:** NIHL was present in 94% of subjects. The severity of NIHL was mild in 26% of subjects.

**Conclusion:** NIHL is preventable. The NIHL is common in traffic policemen. Early detection and prevention of hearing loss will play a major role in improving the quality of life in traffic police.

**Key words:** Hearing loss, Noise, Prevalence, Sensorineural hearing loss

## INTRODUCTION

Hearing loss associated with exposure to noise has been well known in boilermakers, iron and copper smith, artillery, and salt refineries. Urbanization and excessive household noise also play a significant proportion of noise trauma nowadays.<sup>[1]</sup> Occupational hazard in case of a traffic policeman is not just to ignore which play a major role in their lifestyle and behavior. Exposure to intense sound can result in temporary or permanent hearing loss which depends on several factors including the acoustic characteristics of the sound such as intensity, duration, and

frequency content, length of exposure, and susceptibility of the individual.<sup>[2]</sup> Noise-induced hearing loss (NIHL) is caused by sustained, repeated exposure to excessive sound levels. NIHL is a major preventable occupational health hazard. The main site of impairment is the outer hair cells of the cochlea, where the damage is irreversible. Initial exposure to excessive sound level causes temporary dullness of hearing (temporary threshold shift) which usually recovers within 24 h of exposure.<sup>[3-5]</sup> If there is repeated sustained exposure, the threshold shift becomes permanent (permanent threshold shift) due to nerve fiber degeneration. Health effects of noise include both the auditory as well as non-auditory effects. The harmful effects of noise on hearing have been known since the middle of the 19<sup>th</sup> century and condition like "Boilermaker's deafness" are documented. In the early times, the noise was limited to working places such as industry and construction sites. Today the profile of noise sources is changed with noisy activities, entertainments, music, and transportation. The noise from vehicles has increased tremendously due to

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mushrooming number of various types of vehicles plying on the roads. The production of such high-level of noise from these vehicles can have impact on hearing of persons exposed.<sup>[6]</sup>

## AIM

The aim of the study was to study the incidence of NIHL in police constables and to study the effect of age, personal habits such as smoking/drinking and medical conditions such as diabetes and hypertension on hearing loss.

## MATERIALS AND METHODS

A survey based cross-sectional study conducted in the Department of Ear Nose and Throat (ENT), Tuticorin Medical College Hospital. The subjects were 50 police personnel (43 - males and 7 - females). A detailed history was taken regarding the number of years of service, past ear disease, past medical conditions affecting hearing. All the subjects underwent routine ENT examination and pure tone audiometry to identify detectable hearing loss. All the subjects had normal hearing on recruitment. Diagnosis of NIHL was based on the history of occupational noise exposure, bilateral hearing loss, hearing loss >25 dB at 4 KHz in two consecutive audiograms, and no significant medical history is affecting hearing. The severity of NIHL was based on the WHO grading. Hearing within 0–25 dB or loss (better ear) is classified as normal hearing, 26–40 dB (better ear) as mild impairment, 41–60 dB (better ear) as moderate impairment, 61–80 dB (better ear) as severe impairment, and >80 dB (better ear) as profound impairment. These ranges of levels are categorized as such by averaging the hearing level at frequencies 500 Hz, 1000 Hz, and 4000 Hz in the better ear.

## RESULTS

NIHL was present in 94% of subjects. The severity of NIHL was mild in 26% of subjects and 38% having moderate and severe in 36%. The degree of high-frequency hearing loss ranged from mild to moderate. The dip at 4 KHz was >40 dB in 38% of subjects in the age range of 40–49 years and 52% of the subjects in the age range of 50–59 years. 20% had 40 dB dip at 4 KHz sloping hearing loss (descending curve) was seen in 92% of the subjects unilaterally/bilaterally. Notched audiogram (4 KHz notch) was obtained in 12% of the subjects unilaterally/bilaterally. History of non-insulin dependent diabetes mellitus (NIDDM) was reported by

22% of the 50 people with severe NIHL compared to 78% with mild NIHL. 38% were the smoker for more than 20 years also having the sloping pattern in pure tone audiogram. However, there is no specific change in 12% of hypertensive individuals.

## DISCUSSION

The WHO estimates that globally 16% of individuals have a moderate to a greater degree of hearing loss due to occupational noise exposure. Chronic exposure to traffic noise could be an important source of occupational hearing loss, especially in motorcycle police officers.<sup>[7,8]</sup> The first signs of NIHL can be observed in the typical 4000-Hz “notch” observed on audiograms, indicating a loss of hearing ability in the middle of the frequency range of human voices.<sup>[9]</sup> Many theories attempt to explain why the region around 4 KHz seems to be more susceptible to the broadband noise. The region of the cochlea associated with 4 KHz is more vulnerable to damage because of difference in cochlear mechanics, cochlear metabolism or blood supply and noise amplification by external ear in the 2–4 KHz region by the time noise reaches the inner ear. NIHL causes damage to hair cells starting in the basal turn of the cochlea. Outer hair cells are affected by the inner hair cells. Selective 4000 Hz hearing loss is characteristic of the onset of NIHL, selective 4000 Hz hearing loss is thought to indicate early or moderate NIHL and to be specific for hearing impairment, for this reason, making it an appropriate measurement for our study.<sup>[9]</sup> Audiogram in NIHL shows a typical notch at 4 KHz both air and bone conduction. It is usually symmetrical on both sides. The patient may have tinnitus, difficulty in hearing in noisy surroundings in an early stage, later notch deepens and widens to involve lower and higher frequencies. Our result is similar to that of other studies showing that the prevalence of NIHL is directly proportional to increasing age and longer duration of service.<sup>[10,11]</sup> NIHL has been reported in police personnel worldwide. A high incidence (94%) of NIHL is reported in the present study. This is similar to the findings of other studies where the prevalence of NIHL was found to be 28% in French police officers,<sup>[2]</sup> 66.4% in traffic police personnel in Kathmandu city,<sup>[1]</sup> 81.2% in Pune traffic police<sup>[12]</sup> in India, and 84% in traffic police in Jalgaon urban center in India. The high prevalence may be attributed to longer duration of service (all the subjects in the present study had served for more than 20 years) and greater noise pollution in India. In the present study, 26% of the subjects had mild NIHL. This finding is similar to study conducted in the police force in Brunei Darussalam where 45.6% were found to have mild to severe NIHL. Of this the majority (93%) had mild NIHL, 3.5% had moderate NIHL, and

another 3.5% had severe NIHL. Further 21.7% of the subjects in the age range of 40–49 years and 29.6% of the subjects in the age range of 50–59 years had mild NIHL, increasing age and longer duration of service had an effect on NIHL.

## CONCLUSION

NIHL is an incurable but preventable occupational condition. This study shows that increasing age, longer duration of service, and presence of NIDM are significant associated factors for NIHL. Preventative strategies such as the adequate provision of a hearing protective device, regular education and training for the employer and employees, implementation of a hearing conservation program at the workplace, and regular health surveillance (audiometry) for police personnel with exposure to excessive noise, can help address the problem. Persons who have to work at places where noise is above 85 dB should have pre-employment and then annual audiograms for early detection. Ear protectors should be used. Introduction of stringent legislations regarding usage of horns Organization of intensive public awareness campaigns regarding ill effects of noise, via print, and electronic media.

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