History of Medicine, 2024, 10(2): 2094-2102

DOI: 10.48047/HM. V10.I2.2024.2094-2102

# Prevalence of noise induced hearing loss in truck drivers in Western Uttar Pradesh.

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**Abstract:**

*Introduction: Noise-induced hearing loss (NIHL) is a growing public health concern that affects millions of people worldwide. Truck drivers are at high risk of NIHL due to prolonged exposure to loud engine noises, traffic sounds and other environmental factors.*

*Objective: This study aimed to determine the prevalence and severity of NIHL among truck drivers, to provide an overview of NIHL identify risk factors associated with NIHL and discuss ways to prevent and mitigate the effects of NIHL*

*Materials and method: A cross-sectional study was conducted among 261 male truck drivers working at Pilkhuwa, Hapur, between the age group 21 - 65 years and all the participants underwent pure tone audiometric evaluation.*

*Results: The study found a high prevalence of NIHL among truck drivers (16.85%). Risk factors associated with NIHL included years of driving experience, average daily driving time and lack of hearing protection use. Truck drivers with more years of job experience had high levels of hearing threshold both for lower and higher frequencies but significantly more for higher frequency. Out of 44 truck drivers who had NIHL majority 16 (36.36%) falls in to age group of 41-50 years.*

*Conclusion: NIHL is a significant occupational health concern among truck drivers. Effective prevention strategies such as regular hearing tests, education on hearing protection and enforcement of hearing conservation regulations, are essential to reduce the risk of NIHL among truck drivers. The risk of NIHL increase with the sound intensity, duration of exposure to noise and individual susceptibility. Awareness has to be created in truck drivers by implementing education and training programs.*

Keywords: ***Noise induced hearing loss; Prevalence; Truck drivers. Occupational health, Hearing conservation, Prevention strategies***

## Introduction:

Noise-induced hearing loss (NIHL) is a growing public health concern worldwide. With the increasing use of personal audio devices, exposure to loud music, and occupational noise

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exposure, the risk of NIHL is becoming more prevalent. NIHL is a permanent and irreversible condition that affects millions of people globally.

According to WHO estimates around 63 million people are found to have a hearing impairment in India, while 291 per one lakh population suffer from severe to profound hearing loss. Consequences of hearing loss have potentially devastating effects on physical health, mental health, education and employment. The World Health Organization (WHO) estimates that nearly 16% of hearing loss cases worldwide are attributed to occupational noise exposure. Recreational noise exposure, such as listening to loud music, accounts for a significant proportion of NIHL cases.

Noise induced hearing loss is the second most common cause of hearing loss after presbycusis[1]. Globally, NIHL is estimated to affect approximately 5% of the population and is more common among adult men[2].

Occupational hearing loss includes noise-induced hearing loss and acoustic traumatic injury, and it can be defined as a partial or complete hearing loss in one or both ears as the result of one's employment[3].

Prolonged exposure to loud sounds can cause damage to the delicate hair cells in the inner ear, leading to permanent hearing loss. The effects of NIHL can be devastating, impacting not only an individual's quality of life but also their social, emotional, and economic well-being. NIHL can lead to feelings of isolation, depression, and anxiety, as well as reduced job performance and decreased earning potential.

Noise is a risk factor for noise-induced hearing loss (NIHL) and tinnitus. Noise is defined as an aperiodic complex sound2. The word noise is derived from the Latin word "nausea" meaning unpleasant and unwanted. Noise may be continuous, fluctuating, intermittent or impulsive. Noise pollution can be defined as any unwanted or excessive sound, which interferes with human communication, comfort and feeling of wellbeing. Noise-induced hearing loss can range from mild hearing loss to complete hearing loss depending on degree of damage. Noise induced hearing loss is not a life-threatening condition but it can interfere with ability to communicate.

The drivers are easily affected by both auditory and non-auditory ill effects of noise pollution4. The professional truck drivers who drive the trucks at the busy traffic lanes are always at a risk of exposure to high levels of noise due to traffic congestion along roadside5,6.

Long term exposure to loud noise affects the hearing capacity of drivers eventually resulting in hearing loss and a decrease in their work performance7,8. Occupational noise may also contribute to accidents in the workplace, loss of attention, loss of concentration and memory, stress and excessive fatigue.

As early hearing loss usually does not accompany complaints of hearing loss, audiometry is the most efficient method for diagnosing and screening of NIHL.

Impairment of hearing at high frequencies will initially cause a loss of clarity in perceived speech and then interfere with daily activities as hearing loss progresses. Hearing loss-related symptoms, such as trouble in normal and telephone conversation, turning up the radio/television volume and tinnitus, usually occur in the early stages of NIHL9.

While NIHL is permanent, it is preventable. By taking simple steps to protect our hearing, such as wearing earplugs or earmuffs in loud environments, we can reduce our risk of NIHL. Early intervention is also critical, as prompt treatment can help to mitigate the effects of NIHL.

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As a healthcare professionals, it is essential to understand the causes, consequences, and prevention strategies for NIHL. Western Uttar Pradesh and NCR region are currently facing the problem of increasing noise pollution due to the growing traffic and industrialization. There is paucity of reports on the prevalence of noise induced hearing loss in truck drivers in this region of Uttar Pradesh. This study highlights the occurrence of hearing loss in the absence of ear complaints. This study was done on truck drivers at Hapur Uttar Pradesh as they are more prone for the health hazards of noise pollution.

## Objective:

To determine the prevalence and severity of hearing loss in truck drivers, to provide an overview of NIHL and discuss ways to prevent and mitigate the effects of NIHL

### Materials and Methods:

This cross-sectional study was conducted in the department of Otorhinolaryngology and Head and Neck Surgery, RAMA Medical College & hospital, Hapur. A total of 261 apparently healthy male truck drivers were examined within the age group 21 to 65 years between July 2023 to June 2024. Detailed clinical history of participants was noted. Detailed examination of ear, nose, throat and neck was done. All subjects were examined by Otoscopy and otoendoscopy. Females and subjects with family history of hearing loss, any middle or inner ear pathology and having conductive or mixed hearing loss, subjects on ototoxic drugs were excluded from the study. All cases subjected to pure tone audiometry. Audiometry was done by using Arphi Proton SX 3 audiometers by an experienced audiologist, who was unaware of the subject's hearing status.

The hearing thresholds for both air and bone conduction were obtained. Air conduction (From 125 to 8 kHz's) is measured by ear phones placed on the ears, while bone conduction (from 250 to 4 kHz) is measured by placing a vibrator in contact with the skull on the mastoid bone behind the ears. Each ear was evaluated separately and test results were reported in audiogram. The audiometric analysis was done to assess the type and degree of the hearing loss and the results were expressed in dB HL. The classification into conductive and sensorineural hearing impairment was also done on the basis of audiometry. Hearing was considered as normal when pure-tone audiometry (PTA) was 0–25 dB, mild hearing loss was considered when PTA was 26–40 dB, moderate hearing loss was PTA 41–55 dB, moderate– severe hearing loss was PTA 56–70 dB, severe hearing loss was PTA 71-90 dB, Profound was above 90 dB. Before test, the subjects were clearly instructed about the test procedure and necessary information was logged by audiometric technician. Data was tabulated in MS Excel and analysed using SPSS Ver 22.

### Results:

The data obtained from study conducted in truck drivers at department of otorhinolaryngology, RAMA Medical College & hospital, Hapur was analysed.

Out of 261 subjects 116 (44.44%) were found in age group of 31-40 years. 76 (29.12%) were found in age group of 21-30 years, 53 (20.31%) falls in to age group of 41-50 years. 13 (4.98%) were found in age group 51-60 years and 3 (1.15) were found in age group 61-70 years. Table 1 is showing distribution of age of examined truck drivers.

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Table 1. Distribution of age of examined truck drivers

| Age (Years) | Number of Subjects (N) | Percentage (%) |
|---|---|---|
| 21-30 | 76 | 29.12% |
| 31-40 | 116 | 44.44% |
| 41-50 | 53 | 20.31% |
| 51-60 | 13 | 4.98% |
| 61-70 | 3 | 1.15% |
| Total | 261 | 100% |

Among the 261 subjects, 217 (83.14%) had hearing thresholds within normal limits, and 44 (16.86%) had noise induced hearing loss. The prevalence of noise induced hearing loss in truck drivers in this study was 16.85%.

Out of 44 subjects who had NIHL, 6 (13.64%) were found in age group of 21-30 years. 14 (31.82%) were found in age group of 31-40 years,16 (36.36%) falls in to age group of 41-50 years. 5 (11.36%) were found in age group 51-60 years and 3 (6.82) were found in age group 61-70 years. Table 2 is showing distribution of subjects with NIHL according to age of truck drivers.

Table 2. Distribution NIHL according to age of truck drivers(N=44)

| Age (Years) | Number of Subjects (N) | Percentage (%) |
|---|---|---|
| 21-30 | 6 | 13.64% |
| 31-40 | 14 | 31.82% |
| 41-50 | 16 | 36.36% |
| 51-60 | 5 | 11.36% |
| 61-70 | 3 | 6.82% |
| Total | 44 | 100% |

Regarding laterality of noise induced hearing loss in truck drivers with the abnormal audiometry test (Table 3), it was found that the cases suggestive of NIHL with bilateral hearing loss 29 subjects (65.91%) predominated in comparison of those with only one side affected.

Table 3. Side (laterality) of hearing loss

| Hearing loss | Right | | Left | | Bilateral | | Total | |
|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % |
| NIHL | 4 | 9.09 | 11 | 25 | 29 | 65.91 | 44 | 100 |

As far as years of driving is concerned 13 (29.55%) subjects falls into less than 10 years of driving group and 31(70.45%) subjects falls into more than 10 years driving group. Years of exposure (duration of work) was found to have relation with NIHL. Table 4 and figure 1 is showing years of truck driving in subjects with NIHL.

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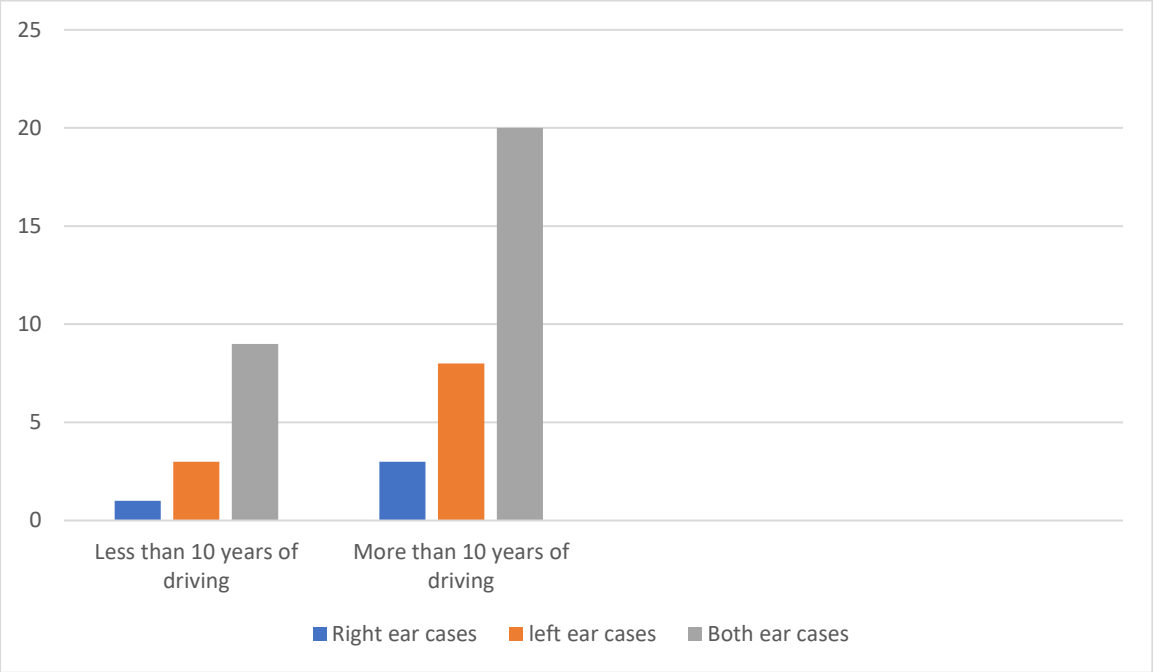
Table 4: Years of truck driving in subjects with NIHL

| Years of truck driving | At risk Number | Right ear cases prevalence | Left ear cases prevalence | Both ear cases prevalence |
|---|---|---|---|---|
| Less than 10 years | 112 | 1(0.9) | 3(2.67) | 9(8.04) |
| More than 10 years | 149 | 3(2.01) | 8(5.36) | 20(13.42) |

Figure 1: Years of driving in subjects with NIHL




Out of 44 subjects with NIHL 10 (22.73%) subjects had less than 8 hours of driving per day while 34 (77.27%) subjects had more than 8 hours of driving per day. Daily working hours was found to have relation with NIHL. Table 5 and figure 2 is showing daily hours of truck driving.

Table 5: Daily hours of truck driving in subjects with NIHL

| Daily hours of truck driving | At risk Number | Right ear cases prevalence | Left ear cases prevalence | Both ear cases prevalence |
|---|---|---|---|---|
| Less than 8 hours | 104 | 1(0.96) | 2(1.92) | 7(6.73) |
| More than 8 hours | 157 | 3(1.91) | 9(5.73) | 22(14.01) |

Figure 2: Daily hours of truck driving in subjects with NIHL

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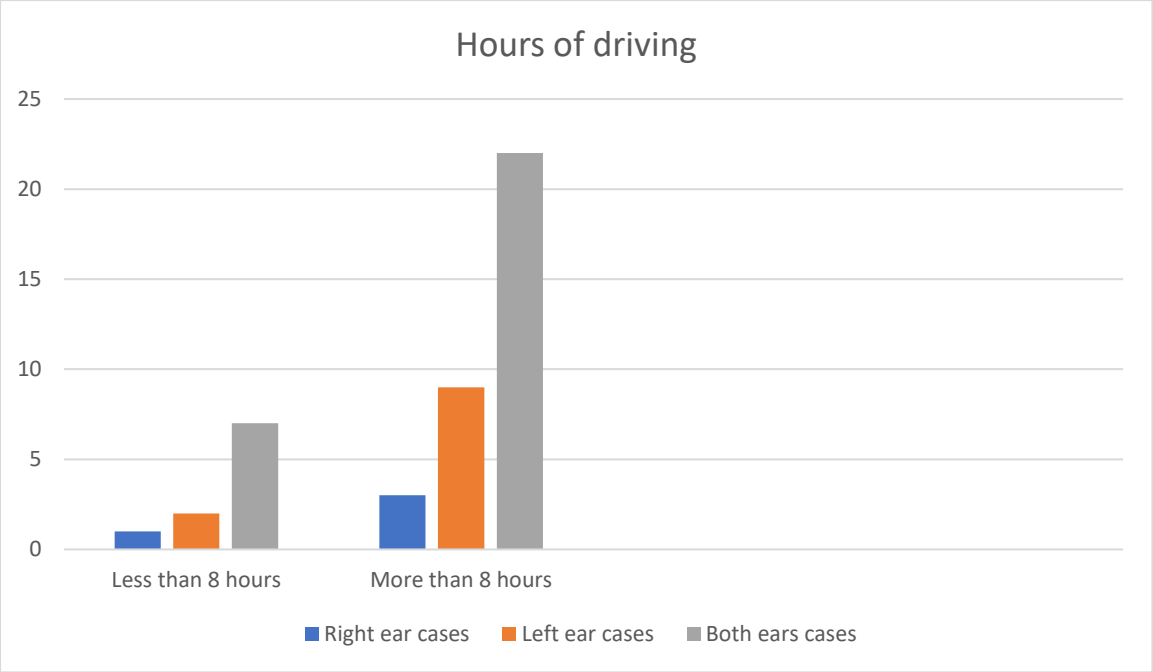


In this study it was observed that in the 44 individuals suggestive of NIHL, the hearing loss was greatest at 4000 Hz and 3000 Hz for right ear. For left ear it was greatest at 4000 Hz and 6000 Hz

**Discussion:**

A cross-sectional study to detect noise induced hearing loss in truck drivers was conducted in department of otorhinolaryngology RAMA medical college and hospital. All subjects included in this study do not have any complaints of hard of hearing. All members of study were subjected to routine pure tone audiogram.

Noise induced hearing loss is a major heath concern and is on the rising trend in today's world. Noise has obviously a serious impact on hearing and may cause hearing impairment in terms of hearing loss and tinnitus. Noise-induced hearing loss is the second most common cause of Sensorineural hearing loss in adults. Hearing loss may be temporary or permanent. Temporary hearing loss is a reversible loss (temporary threshold shift) and recovery may range from minute to hours. Magnitude of temporary threshold shift depends on the intensity, frequency and temporal pattern of noise. High frequency sounds are more dangerous than low frequency sounds. If the ear is again exposed to loud noise before recovery, Permanent Threshold Shift will occur. Permanent Threshold Shift is due to the structural damage of cellular system of cochlea. Repeated episode of temporary threshold shift leads to permanent threshold shift and focal loss of hair cells and degeneration of nerve.

NIHL occurs due to continuous chronic exposure of sound and mainly affects outer hair cells. Typically, the threshold shift occurs bilaterally. It produces characteristic notching at 4000 Hz with high frequency hearing loss. Hearing loss is initially at higher frequency. Once noise exposure is discontinued hearing loss does not progress. The development of hearing loss mainly starts in the high frequency level and gradually progress to middle and low frequencies.

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Asymmetric pattern of noise induced hearing loss is also noticed in some persons involved in sports like shooting etc.

Noise damage cellular system of cochlea by production of reactive oxygen species which in turn initiates death by apoptosis and necrosis. The apoptosis starts from the centre to basal end of cochlea and is driven by lipid peroxidation[10]. Because of high level noise exposure high level of reactive oxygen species is generated. Finally, cells are destroyed with extrusion of cellular contents into extracellular matrix. Reactivity continues for several days due to which hair cells continue to die after exposure to loud noise. Degenerated cochlear hair cells do not recover, repair or regenerate in human beings. Once cochlear inner hair cells damaged by noise exposure, they will not recover and lost forever.

Cochlea also has several defence mechanisms to protect it from high level noise. It produces heat shock proteins. It also increases the activities of antioxidant system namely glutathione reductase, catalase, gamma glutamyl cysteine synthetase.

Out of 44 truck drivers who had NIHL majority 16 (36.36%) falls in to age group of 41-50 yrs. 14 (31.82%) were found in age group of 31-40 yrs, 6 (13.64%) were found in age group of 21-30 years., 5 (11.36%) were found in age group 51-60 years and 3 (6.82) were found in age group 61-70 yrs. The age profile of the subjects was similar to other studies involving the drivers[11,12,13,14].

Regarding laterality of noise induced hearing loss in truck drivers with the abnormal audiometry test, it was found that the cases suggestive of NIHL with bilateral hearing loss 29 subjects (65.91%) predominated in comparison of those with only one side affected. Freitas et al. studied 104 drivers, 19% of subjects with data suggesting NIHL, half of them showed bilateral lesions, and half presented unilateral lesions without predominance[13]. Correa Filho et al observed 44.1% of bilateral loss[14]. Lacerda et al observed 83.3% bilaterally affected, and 16.6% with unilateral right predominance of loss[15].

Among the 261 subjects, 217 (83.14%) had hearing thresholds within normal limits, and 44 (16.86%) had noise induced hearing loss. The prevalence of noise induced hearing loss in truck drivers in this study was 16.85%. Out of total prevalence of hearing loss in adults worldwide, the occupational noise contributes to 16% ranging from 7 to 21% of the preventable noise induced hearing loss[16].

In present study, the hearing loss was greatest at 4000 Hz and 3000 Hz for right ear. For left ear it was greatest at 4000 Hz and 6000 Hz. Such data have been found in other previous studies, according to which the acoustic notch at 4000 Hz is as or more frequent than at 6000 Hz. The study by Alizadeh et al., showed that hearing loss of heavy-vehicle drivers is greatest at 6000 Hz followed by 4000 Hz[17]. In an Indian study conducted in Calcutta on 90 male individuals the risk of hearing loss in professional drivers was assessed. The participants were categorized as drivers with under 10 years of experience, drivers with over 10 years of experience, and office clerks. Hearing loss was more prevalent at frequencies of 3000 and 4000 Hz[18].

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**Conclusion:**

Noise induced hearing loss is one of the important causes of morbidity in India with relation to occupational health. Exposure to loud noise is the major preventable cause of permanent hearing impairment globally. Noise-induced hearing loss is a significant occupational health risk for truck drivers. Prolonged exposure to loud engine noises, traffic sounds, and other environmental factors can cause permanent and irreversible damage to their hearing. The consequences of NIHL can be far-reaching, impacting not only a driver's ability to hear but also their safety on the road, their relationships, and their overall quality of life.

The prevalence of hearing loss in this study among the truck drivers was nearly 16.85%. Years of exposure (duration of work) and daily working hours were found to have relation with NIHL. Awareness should be created among truck drivers about the harmful effects of noise on hearing by implementing compulsory training and education programs. By implementing regular hearing tests for truck drivers, mandatory use of ear protection devices, vehicle maintenance to reduce noise levels, education and awareness programs on NIHL prevention and development of policies and guidelines for hearing conservation in the trucking industry, we can reduce the incidence of NIHL among truck drivers.

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