

EFFECT OF NOISE POLLUTION ON HEARING OF PUBLIC TRANSPORT DRIVERS IN LAHORE CITY

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ABSTRACT

Objective: To study the effects of noise pollution on hearing of public transport drivers of Lahore city.

Methodology: It was a cross-sectional, descriptive study carried out at ENT Department, Sir Ganga Ram Hospital, Lahore, from February 1st, 2003 to June 31st, 2003. One hundred drivers of public transport, driving in Lahore city for more than 8 - 10 years were included in the study. These included 25 autorickshaw drivers, 25 taxi car drivers, 25 wagon drivers, and 25 bus drivers. All subjects were questioned according to a Performa. After wards ENT examination was carried out, followed by Pure tone audiometry.

Results: The mean age of the drivers was 41.35 years. Most of them (51%) were driving from last 8 - 10 years. 65% of the subjects had noise induced hearing loss. (NIHL) 25% had normal hearing threshold and 10% had disabling hearing loss.

Conclusions: Public transport drivers are exposed to excess noise on roads in Lahore and most of them are suffering from noise induced hearing loss.

KEY WORDS: Noise induced hearing loss, Public transport, Noise pollution.

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INTRODUCTION

Noise is described as an unwanted sound but this is subjective definition as one man's sound may be another man's noise.¹ Physically there is no distinction between sound and noise. Sound is a sensory perception and the

complex pattern of sound waves is labeled noise, music, speech etc. Environmental noise is a common cause of hearing loss in industrialized societies. When the noise exposure causing hearing loss is present in the workplace, it is referred to as occupational noise induced hearing loss (NIHL). Community noise also called environmental noise, residential noise, or domestic noise is defined as noise emitted from all sources except noise at the industrial work place. Main sources of community noise include road, rail and air traffic. The main indoor noise sources are the ventilation systems, office machines, home appliances and neighbors.

Noise has become a very important "stress factor" in the environment of man. The term "noise pollution" has been recently used to signify the hazard of sounds which are consequence of modern day development, leading to health hazards of different type.

Lahore is a metropolitan city of Pakistan with a population of around seven million people

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and more than three million vehicles are playing on its road. These vehicles are of different nature and include two-wheeled up to six-wheeled. The various type of vehicles which are in public use in Lahore include the autorickshaws, taxi cars, wagons, and coaster/buses/trucks and all these are being used extensively as public transport.

Residents of Lahore are under a constant threat of noise pollution. According to a survey, the noise produced by vehicles in Karachi, Lahore, Peshawar, Rawalpindi and Quetta is averaged at about 95dB +/- 5dB, on a given day.^{2,3} The most part of this noise is contributed by autorickshaws, that produce noise level of up to 100-110dB.⁴ The drivers of public transport vehicles are those people who are under a constant threat of getting community acquired NIHL. In the city the main source of traffic noise are the motors and exhaust systems of autos, smaller trucks, buses and motorcycles. This type of noise is augmented by narrow streets and tall buildings, which produce an echo effect and traffic noise reverberates.

The noise produced by the vehicular traffic directly affects the hearing capabilities of drivers who are occupationally involved in it. Exposure to loud noise for several hours of life results in damage to hearing organ. The hearing effect is very slow and usually without any alarming symptoms, and public transport drivers become aware of their disability when irreversible damage has occurred.

The objective of this research work was to study the effect of noise pollution on hearing of public transport drivers in Lahore city.

SUBJECTS AND METHODS

It was a cross sectional, descriptive study carried out at ENT Department, Sir Ganga Ram Hospital, Lahore, from February 1st 2003 to June 31st 2003. The study was carried out on public transport drivers of Lahore city.

Inclusion criteria: All drivers of public transport, having minimum of 8-10 years of driving experience in Lahore city.

Exclusion criteria: Any middle ear disease like, chronic suppurative otitis media, otitis media with effusion, and otosclerosis. Systemic disease like diabetes mellitus and hypertension and previous history of head trauma.

Sampling Technique: Non probability purposive sampling technique was used to select 100 public transport drivers from Lahore city. These were placed in following four groups.

- Group I: This group comprised of 25 rickshaw drivers.
- Group II: This group comprised of 25 taxi car drivers.
- Group III: This group comprised of 25 wagon drivers.
- Group IV: This group comprised of 25 bus drivers.

Data collection tool: A semi structured questionnaire was used to record the details of subjects. Their age, driving years, driving hours, and working days were recorded. They were also questioned about the maintenance of their vehicle and whether they were aware of the ill effects of noise, and used any protective devices in the presence of excessive noise.

Consent was taken from each subject, and afterwards the above mentioned details were entered in the Performa designed for this purpose. Then local examination of ears was carried out in each subject to rule out the presence of wax or any abnormality like perforation in tympanic membrane.

Afterwards Pure tone audiometry was performed on all subjects. The Audiometry was carried out at ENT department Sir Ganga Ram hospital. The test was carried out in sound proof room for this purpose. Pure tone audiometry was carried at following frequencies for all subjects: 500, 1000, 2000, 3000, 4000, 6000, and 8000Hz.

Hearing impairment was graded according to World Health Organization (WHO) criteria (WHO 1991).⁵ The hearing levels for the better ear was taken as an average of four frequencies; 500, 1000, 2000, and 4000 Hz (Table-I). Hearing loss was labeled normal if the hearing threshold was 25dB or better at the above men-

tioned frequencies. The criteria adopted for a case to be labeled as noise induced hearing loss are as follows:⁴

1. History of noise exposure, which was present in all the subjects.
2. The threshold of the better ear is more than 25 dB hearing level at four frequencies mentioned above.
3. The hearing impairment is predominantly sensorineural (air-bone gap average at 1000, 2000, and 4000 Hz is less than 15 dB).
4. The hearing impairment is not unilateral (asymmetry average at 1000, 2000, and 4000 Hz is less than 15 dB).

All the data collected was put in a master sheet and analyzed manually.

RESULTS

One hundred subjects included in the study were all male public transport drivers, driving in Lahore city. Their age range was 33 years to 55 years with mean age of 41.35 years. All of the drivers are driving at least from last 8-10 years (51%). 14% were driving from last 10-15 years, 21% driving from last 15-20 years, and 14% were driving from more than 20 years at the time of interview. Most of the subjects drive for 10-12 hour daily (42%). 35% drive for 6-8 hours a day, 17% for 8-10 hours a day, and only 6% drive for more than 12 hours per day.

About 72% are concerned regarding maintenance of their vehicle and they carry out routine check up of their vehicles monthly. Remaining 28% carry out maintenance of their vehicles irregularly. 62% of the subjects work for 7 days a week and 38% work for 6 days a week. 84% are aware of the ill effects of excessive noise but only 4% use any type of protective devices in the presence of noise.

According to criteria of WHO mentioned (Table-I); 25% of the subjects had Grade 0 (hearing loss of 25 dB) hearing impairment, or they had normal hearing levels. 65% had Grade 1 hearing impairment or slight hearing impairment (hearing loss of 26 – 40 dB). And 10% of the drivers had Grade 2 or moderate hearing impairment (hearing loss of 41 – 60 dB).

DISCUSSION

It is generally accepted that the link between excess noise and hearing loss is obvious. But this fact is supported by epidemiological studies that compared the prevalence of hearing loss in different categories of occupations, or in particularly noisy occupations.⁷⁻¹⁰

These studies show a strong association between noise and NIHL, and also the fact that increase in duration and magnitude of exposure increases NIHL. Although other factors may also contribute to hearing loss, such as

Table-I: Grades of Hearing Impairment

<i>Grades of hearing impairment</i>	<i>Audiometric ISO value Average of 500, 1000, 2000, 4000 Hz.</i>	<i>Performance</i>
0 No impairment	≤25 dB (better ear)	No, or very slight, hearing problems. Able to hear whisper
1 Slight impairment	26-40 dB (better ear)	Able to hear and repeat words spoken in normal voice at 1 meter.
2 Moderate impairment	41-60 db (better ear)	Able to hear and repeat words using raised voice at 1 meter.
3 Severe impairment	61-80 dB (better ear)	Able to hear some words when shouted in better ear.
4 Profound impairment, Including deafness	≥80 dB (better ear)	Unable to hear and underst and even a shouted voice.

(WHO (1991). Report of the informal Working Group of Deafness and Hearing Impairment Programme Planning. Geneva, World Health Organization.)

exposure to vibrations, ototoxic drugs and some chemicals, the association with noise remains robust after accounting for these influences.

NIHL is the most common cause of acquired hearing loss which is totally preventable.¹¹ This problem is quite prevalent in our society but the awareness about this is lacking. NIHL is one of the most prevalent occupational conditions as is the fact that noise is one of the most pervasive occupational hazards found in a wide range of industries, on roads, and recreational activities (rock concerts).¹² NIHL develops slowly over a long period of time as a result of exposure to continuous or intermittent loud noise. In contrast acoustic trauma is a sudden change in hearing as a result of a single exposure to sudden burst of sound. According to WHO minimum limit of noise exposure for those working in noisy environment is 85dB(A) for 8 hours per day for 5 days a week. Moderately high noise exposure is 85-90 dB(A) and high noise exposure is more than 90 dB(A)

The first effect of exposure to excess noise is an increase in hearing threshold "Threshold shift" and is assessed by Audiometry. Threshold shift is defined as change in hearing threshold of an average 10 dB or more at 2000, 3000, and 4000 Hz in either ear (poorer hearing).¹³ Noise induced hearing loss is measured by comparing the threshold of hearing at a specified frequency with a specified standard of normal hearing, and is reported in units of decibel of hearing loss (dBHL). Threshold shift is the precursor of NIHL. As the hearing impairment is gradual and the affected person will not notice changes in hearing ability until large threshold shift has occurred. Noise induced hearing loss occurs predominantly at higher frequencies (3000 – 6000 Hz). It is irreversible and increases in severity with continued exposure.

The mean age of the subjects in our study was 41.35 years and mostly they were driving from last 10 years or more. Although high levels of noise for short time can lead to noise induced hearing loss early but usually 10 years of exposure is generally required for significant hearing loss to occur.¹⁴ In this study most of

the drivers are driving for 10-12 hours per day (42%) and therefore the more they are on roads the more they are exposed to noise pollution. More over most of the subjects (62%) are driving for 7 days a week adding to the burden on their ears. 84% of the subjects are aware of the ill effects of excessive noise. It shows the level of health education that most are aware of this health hazard but nearly all of them (96%) are not using any protective measures.

According to WHO criteria (Table-I) 75% of the drivers had hearing impairment of different grades and only 25% had hearing levels considered normal. Of the subjects with hearing impairment 65% had slight hearing impairment (Grade-1) and 10% had moderate hearing impairment (Grade-2). WHO defines disabling hearing loss as "permanent unaided hearing threshold level for the better ear of 41 dBHL or greater for the four frequencies 500, 1000, 2000, and 4000 Hz."⁵ According to this criteria 10% of the subjects had disabling hearing impairment and 90% had no disabling hearing impairment. But the fact is that hearing loss has started in remaining 65% of subjects which is slight hearing impairment and if their ears are exposed to the current noise levels on roads they will ultimately progress to disabling hearing impairment.

There is no doubt that there is excess noise on roads in all major cities in Pakistan. This fact is proven by various studies in all major cities but the problem of noise pollution is also present in many smaller cities, from where no data is available. According to ISO standard noise levels on roads should not exceed 70 dB.¹⁵ This fact is proven by various studies that noise levels of 70 dB or less, 24 hours a day for life time are not damaging to ears.¹⁶

In Pakistan the noise limit on roads laid down by National Environment Quality Standards, Environmental Protection Agency, is 85 dB(A) with in the radius of 7.5 meters. Also the Motor Vehicle Rules 1969: Section 158 states that every motor shall be so constructed and maintained as not to cause noise when in motion. But the fact is other wise and noise levels on roads average around 90 dB(A).^{2,3,17}

This excessive noise on roads in Lahore city has resulted in hearing loss in 75% of the subjects studied. This NIHL will continue if corrective action is not taken. More over NIHL is progressive if noise pollution is not controlled and this hearing loss is irreversible. What damage has been done cannot be corrected, only prevention is the treatment of NIHL. Hearing loss is only one of the hazards of noise. Prolonged or excessive exposure to noise, whether in community or at work place, can cause permanent medical conditions as hypertension and ischemic heart disease. Noise can adversely affect performance, attentiveness, and memory.¹⁸ On roads or in industry these deficits in performance can lead to accidents. Noise above 80 dB may increase aggressive behavior, and can result in changes in social behavior. The main social consequence of hearing impairment is the inability to understand speech in normal conditions, which is considered severe social handicap.

Noise control measures can be in the form of various type of engineering, personal protection, and administrative approaches. Most important is awareness among community about the health hazards of noise pollution.

CONCLUSIONS

Public transport drivers are exposed to excess noise on roads in Lahore city. About 75% of them are suffering from NIHL and 10% have disabling hearing impairment.

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