

Research Article

Frequency of Noise Induced Hearing Loss Among Traffic Wardens of Lahore

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ABSTRACT

Introduction: Noise-induced hearing loss (NIHL) is a major cause of disability throughout the world. It is the most common irreversible job-related hazard in the world; the burden being higher in the developing regions as compared to developed regions of the world. Certain occupations are at high risk for NIHL. Traffic wardens could be considered highly vulnerable group as they are exposed to long hours of traffic noise. **Objective:** The objective of the study was to determine the frequency of noise induced hearing loss among traffic wardens of Lahore city. **Methodology:** It was across-sectional, descriptive study, carried out from November 2018 to March 2019 in which 329 traffic wardens appointed in 34 beats/sectors of Lahore city were included. Data was collected through a structured questionnaire, followed by Pure Tone Audiometry (PTA) of all the subjects. **Results:** Total 329 traffic wardens were selected for this study. Mean age of the traffic wardens was 35.35 ± 1.21 years. NIHL was present in 174 (52.9%) traffic wardens, out of which, 138 (79.3%) had mild, 32 (18.4%) moderate, and 4 (2.3%) with moderately severe degree of hearing loss. Among the 329 traffic wardens, 165 (50.2%) had exposure to noise between 7am-3pm (morning shift) and 42 (12.8%) had some problem with their hearing. Only 12 (3.6%) have had ringing in the ears or tinnitus, 140 (42.6%) wore any hearing protection during duty hours and 42 (12.8%) said they need to frequently ask people to repeat themselves. **Conclusion:** Overall frequency of noise induced hearing loss was 174 (52.9%).

Keywords: Noise-induced hearing loss, pure tone audiometry, traffic wardens, hearing impaired, pollution, vehicles.

INTRODUCTION

Noise is defined as an unwanted sound which is unpleasant, or disruptive to hearing. In physics, both noise and sound are vibrations that travel through a medium, such as air or water, so they cannot be differentiated from one another.

Noise-induced hearing loss (NIHL) is the most frequent cause of acquired hearing impairment.

It can be easily prevented¹. There is lack of awareness about NIHL which is a major health problem nowadays. According to World Health Organization (WHO), among all hearing loss cases, one-third are linked with noise exposure². Particular 4000Hz hearing impairment (Audiometric Notch) is the characteristic of

NIHL onset³, which can be defined as hearing impairment above 30 dB (unilateral or bilateral). Generally, NIHL is bilateral and in both ears demonstrates the same pattern⁴.

The difference between noise and sound depends on how the brain receives and perceives a sound⁵. Noise is associated with many psychological problems that can contribute to stress⁶. The adverse effects of noise are auditory (damage of hearing) and non-auditory such as impulsive behavior, depression, fatigue and poor concentration⁷. NIHL occurs due to repeated and sustained exposure to high levels of sound. Any kind of noise exposure with enough strength and time can cause NIHL⁸.

Outer hair cells (OHCs) of cochlea are main site of hearing impairment, and their damage is irreversible. When two supporting hair cells die, their apical domain expands rapidly leading to compression of hair cell beneath its apical domain⁹.

When the ear is exposed to a sound level of approximately 85 dB, initially it will cause impermanent tediousness of hearing which is called temporary threshold shift (TTS) that mostly regains within twenty four hours after exposure; but if the exposure is sustained and repeated, TTS will become permanent which is called permanent threshold shift (PTS) caused by degeneration of the nerve fibers¹⁰.

90 decibels has been set by Occupational Safety & Health Association (OSHA) as time weighted average (TWA) for eight hour daily work exposure to sound¹¹. While this limit is 85 decibels as per National Institute of Occupational Safety & Health (NIOSH)¹².

The mechanism of damage includes accretion of the reactive oxygen genus and lively stimulation of the intracellular stress paths, that leads to cell death¹³. The hearing loss due to cochlear dysfunction also changes the organization of the central auditory pathway¹⁴. Varying degrees of permanent deafness occurs due to damage in inner ear.

Occupational NIHL is a major cause of disability throughout the world¹⁵. As per WHO, 360 million individuals worldwide have hearing impairment¹⁶. In America, most common reasons of hearing impairment for adults and are

noise, ear infection and age¹⁷. Globally it is estimated that about 3.4% of population aged between 40-59 years and 14% people aged above 60 years have hearing impairment of more than 40 decibels¹⁸.

Pure Tone Audiometry (PTA) is the procedure done to evaluate an increase in the hearing threshold, called the threshold shift, which is the initial effect to the excess sound. The threshold shift is described as modification in the hearing threshold of a normal 10 decibels or above at 2000, 3000, and 4000 Hz in any ear (poor quality hearing)¹⁹.

NIHL is one of the most common problems seen among the individuals working in noisy environment. It is a sensorineural hearing loss (SHL), which may be occupational or non-occupational²⁰.

Vehicle noise is main contributor²¹. The rapid growth of many cities in developing countries like Pakistan increases the use and ownership of motor vehicles²², thereby increasing the level of noise pollution²³. It is a notable problem of urban areas of the country including Lahore²⁴. People residing in Lahore remain under constant threat of noise pollution. As per survey report, on any given day in Karachi, Lahore, Peshawar, Rawalpindi and Quetta, the noise produced by vehicles is about $95\text{dB} \pm 5\text{dB}$ ²⁵. The vehicle which produces most of the noise is auto rickshaw, which is upto 100-110dB²⁶.

Among the professional people, the traffic wardens are the ones who are under a constant threat of becoming hearing impaired due to heavy traffic noise in the city.

Traffic wardens standing during their working shifts in the center of vehicular noise are continuously exposed to job related hazards²⁷. Most of them are unaware regarding effects of noise on their hearing capability as this process requires long period to become overt²⁸.

In Lahore, traffic wardens work in 3 shifts of 8 hours: In City Traffic Police, there are almost 3000 traffic wardens²⁹. Lahore city is divided into 34 Beats/Areas for traffic management. Two senior traffic wardens are appointed in every Beat/Sector, one in morning shift and one in evening shift. Senior traffic wardens report to DSP/TO.

The study can provide awareness to traffic wardens about hearing impairment in relation to noise exposure and help them to take precautionary measures.

MATERIAL AND METHODS

It was a cross-sectional, descriptive study in which 329 traffic wardens appointed in 34 beats/sectors of Lahore city were included. The study was carried out from November 2018 to March 2019. Non probability purposive sampling technique was used. Data was collected through a structured pre-tested questionnaire, followed by Pure Tone Audiometry (PTA) of all the 329 traffic wardens and entered into computer using SPSS 24.0. Frequencies and percentages were calculated and data was presented in tables and figures. Formal consent was taken from concerned authority to conduct the study. Written consent was taken from respondents.

RESULTS

Among 329 traffic wardens, 194 (59.0%) were upto 35 years old while 135 (41.0%) were more than 35 years old. The mean age of traffic wardens was 35.35 ± 1.21 years (Table I). Among 329 traffic warden, 165 (50.2%) had exposure to noise between 7am-3pm (morning

shift), 163 (49.5%) between 3pm-11pm (evening shift) and only 1(0.3%) traffic warden had exposure to noise between 11pm-7am (night shift) (Figure 1).

Among 329 traffic wardens, 42 (12.8%) said they currently have any problem with their hearing, including visit to a doctor/audiologist while majority 287 (87.2%) said they did not have any problem. 12 wardens (3.6%) said they have had ringing in the ears or tinnitus while majority 317 (96.4%) never faced this problem. 140 traffic wardens (42.6%) wore hearing protection during duty hours while 189 (57.4%) traffic warden did not wear any hearing protection (Table II).

42 (12.8%) said they need to frequently ask people to repeat themselves while 287 (87.2%) wardens didn't have such difficulty (Table III).

Pure Tone Audiometry test revealed that out of the 329 traffic wardens, more than half 174 (52.9%) had noise induced hearing loss while 155 (47.1%) traffic wardens had no NIHL. Out of those 174 traffic wardens who had noise induced hearing loss, 138 (79.3%) had mild, 32 (18.4%) had moderate while only 4 (2.3%) traffic wardens had moderately severe hearing loss (Table IV).

Table I: Frequency distribution of traffic wardens according to age

	Frequency	Percentage (%)
≤35 years	194	59.0
>35 years	135	41.0
Total	329	100.0
Mean ± SD	35.35 ± 1.21	

Figure 1: Frequency distribution of traffic wardens according to exposure to noise

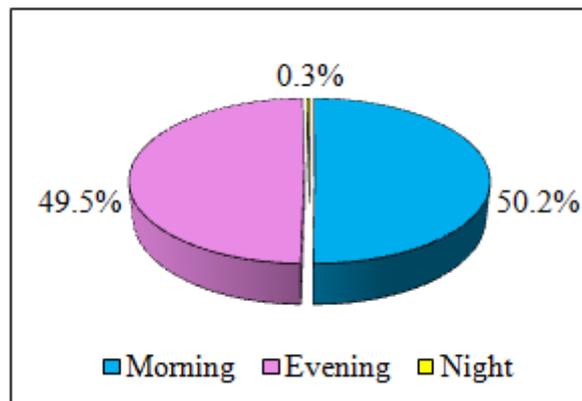


Table II: Frequency distribution of traffic wardens according to use of any hearing protection during duty hours

	Frequency	Percentage (%)
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Yes	140	42.6
No	189	57.4
Total	329	100.0

Table III: Frequency distribution of traffic wardens according to need to frequently ask people to repeat themselves

	Frequency	Percentage (%)
Yes	42	12.8
No	287	87.2
Total	329	100.0

Table IV: Frequency distribution of traffic wardens according to NIHL revealed in PTA

	Frequency	Percentage (%)
NIHL		
Yes	174	52.9
No	155	47.1
Total	329	100.0
Degree of hearing loss (n = 174)		
Mild	138	79.3
Moderate	32	18.4
Moderately severe	4	2.3
Total	174	100.0

DISCUSSION

Current study was conducted to know the frequency of noise induced hearing loss among traffic wardens of Lahore city. 329 traffic wardens were included in the study. 59.0% of the traffic wardens were upto 35 years old and remaining portion 41.0% was more than 35 years old. The mean age of traffic wardens was 35.35 ± 1.21 . The findings of a study carried out in Ambala city (India) by Singh and coworkers (2015) showed different scenario that majority 78.0% of traffic wardens were more than 35 years old and only 22.0% traffic wardens were upto 35 years old²¹. Similarly another study undertaken by Venkatappa and teammates (2018) reported that mean age of the traffic warden was 42.46 ± 6.78 years²⁸.

Constant exposure to heavy noise is too dangerous for traffic wardens because all of them work eight hours daily and work when noise level is too high. The results of the study also confirmed that almost all 99.7% traffic wardens had high level of noise exposure because they were working in morning and evening shift and only one traffic warden was

working in night shift when exposure to noise is low.

It was found during the study that few traffic wardens had problem with their hearing and visited a doctor/audiologist but none had infections or discharges from their ears. Study further disclosed that only 3.6% traffic wardens had ringing in the ears or tinnitus. The results of our study exhibited better scenario than a study carried out by Sreenivasulu (2016) who confirmed that 40.0% traffic wardens complained for ringing in the ears or tinnitus³⁰. Another study performed by Sliman and teammates (2015) could not provide better results than our study who reported that 26.1% wardens had tinnitus in the ears.

Use of hearing protective tools during duty hours, for example, ear muffs and plugs prevent traffic wardens from hearing loss. It is significant to mention that 42.6% traffic wardens used hearing protective devices but such protective measures should be followed by all traffic wardens. The results of a study undertaken by Win and fellows (2015) are much better than our study results who confirmed that 64.0% traffic wardens used hearing protective

devices. But another study carried out by Singh and coworkers (2015) showed very discouraging results that only 2.0% traffic wardens used hearing protective equipments²¹.

Study revealed that due to hearing loss, only 12.8% traffic wardens elucidated that they frequently ask people to repeat themselves while Gupta and fellows (2015) confirmed in their study 35.5% traffic wardens asked people to talk loudly²³.

When noise induced hearing loss was evaluated among traffic wardens using pure tone audiometry, study revealed that NIHL was prevalent among more than half 174(52.9%) of traffic wardens. Among the traffic wardens who had noise induced hearing loss, 138(79.3%) had mild, 32(18.4%) had moderate and 4(2.3%) had moderately severe degree of hearing loss.

The results of a study performed by Venkatappa and teammates (2018) are much better than our study results who confirmed that 8 out of 30 (26.7%) traffic wardens had noise induced hearing loss in which 5(62.5%) had mild and 3(37.5%) had severe degrees of hearing loss²⁸. Another study carried out by Sreenivasulu (2016) showed the frequency of NIHL at 23 out of 60 (38.3%) among traffic wardens and among them who had noise induced hearing loss, 10 (43.5%) had mild, 5 (21.7%) had moderate and 8 (34.8%) had moderately severe degree of hearing loss³⁰. A recent study conducted in 2018 by Kanitha and colleagues showed worst situation that noise induced hearing loss was prevalent among 94% traffic wardens and severity of NIHL was mild, moderate and severe observed among 26.0%, 38% and 36% traffic wardens, respectively.

CONCLUSION

Overall frequency of noise induced hearing loss was 174(52.9%). Among these traffic wardens, 138(79.3%) had mild, 32 (18.4%) had moderate and 4 (2.3%) had moderately severe degree of hearing loss. The problem of noise induced hearing loss is increasing and it is anticipated that traffic wardens will suffer more in future due to nature of job. Further studies are required to be conducted on large scale to assess the frequency of noise induced hearing loss among

traffic wardens to prevent them from ill effects of hearing loss.

REFERENCES

1. Fausti SA, Wilmington DJ, Gallun FJ, Myers PJ, Henry JA. Auditory and vestibular dysfunction associated with blast-related traumatic brain injury. *J Rehabilitation Res Dev.* 2009; 46(6): 797-810.
2. Jordan CG, Hetherington O, Woodside A, Harvey H. Noise induced hearing loss in occupational motorcyclists. *J Environ Health Res.* 2004; 3(2): 70-4.
3. McBride D, Williams S. Audiometric notch as a sign of noise induced hearing loss. *Occup Environ Med.* 2001; 58(1): 46-51.
4. Ingle ST, Pachpande PG, Wagh ND, Attarde SB. Noise exposure and hearing loss among the traffic policemen working at busy streets of Jalgaon urban centre. *Transportation Res Part D.* 2005; 10: 69-75.
5. Elert G. The nature of sound – the physics hypertextbook. Cited on 2018 Mar 14, Retrieved from www.physics.info/sound.
6. Goines L, Hagler L. Noise pollution: a modern plague. *South Med J.* 2007; 100(3): 287-94.
7. Himanshu KS, Mohit SG. Are bullet riders at risk of noise induced hearing impairment? *Otolaryngol Open Access J.* 2018; 3(1): 000166.
8. Concha-Barrientos M, Campbell-Lendrum D, Steenland K. Occupational noise: assessing the burden of disease from work-related hearing impairment at national and local levels. Geneva: WHO; 2004.
9. Nandi SS, Dhatrik SV. Occupational noise-induced hearing loss in India. *Indian J Occup Environ Med.* 2008; 12(2): 53-56.
10. Raphael Y. Cochlear pathology, sensory cell death and regeneration. *Br Med Bull.* 2002; 63(1): 25-38.
11. Occupational Safety and Health Administration (OSHA). OSHA fact sheet: laboratory safety noise. Washington, DC: OSHA; 2011. Cited on 2018 Jun 12, Retrieved from www.osha.gov/Publications.

12. Center for Disease Control and Prevention (CDC). NIOSH: Proposed national strategy for the prevention of noise-induced hearing loss. USA: CDC; 1988. Cited on 2018 Jun13, Retrieved from www.cdc.gov/niosh/docs.
13. Kurabi A, Keithley EM, Housley GD, Ryan AF, Wong ACY. Cellular mechanisms of noise-induced hearing loss. *Hearing Res.* 2017; 349: 129-37.
14. Robertson D, Irvine DR. Plasticity of frequency organization in auditory cortex of guinea pigs with partial unilateral deafness. *J Comp Neurol.* 1989; 282(3): 456-71.
15. Indora V, Khaliq F, Vaney N. Evaluation of the auditory pathway in traffic policemen. *Int J Occup Environ Med.* 2017; 8: 109-16.
16. World Health Organization (WHO). WHO global estimates on prevalence of hearing loss: mortality and burden of diseases. Geneva: WHO; 2012. Cited on 2018 Mar 14, Retrieved from http://www.who.int/pbd/deafness/WHO_GE_HL.
17. Ries PW. Prevalence and characteristics of persons with hearing trouble: United States, 1990–1991. *Vital Health Stat.* 1994; 10: 1-75.
18. International Organization for Standardization (ISO). Acoustics: Estimation of noise-induced hearing loss. Geneva, Switzerland: ISO; 2013.
19. National Institute for Occupational Safety and Health (NIOSH). Criteria for a recommended standard: Occupational noise exposure, National Institute for Occupational Safety and Health (NIOSH). USA: CDC; 1998. Cited on 2018 Jun 14, Retrieved from www.cdc.gov/niosh/docs.
20. Dhinakaran N, Karthikeyan BM. Prevalence of noise induced hearing loss among police personnel in Madurai City. *Int J Adv Res.* 2017; 5(8): 410-6.
21. Singh A, Bansal A, Goel S, Goel PK, Chhikara P, Singh NK. A rapid appraisal of traffic policemen about auditory effects of traffic noise pollution from Ambala city. *Med J DY Patil Univ.* 2015; 8: 12-5.
22. Sanju HK, Kumar P. Self-assessment of noise-induced hearing impairment in traffic police and bus drivers: questionnaire-based study. *Indian J Otol.* 2016; 22: 162-7.
23. Gupta S, Mittal S, Kumar A, Singh KD. Self-assessment of hearing quality and noise-related attitudes among traffic policemen of Patiala, India. *Int J Prev Med.* 2014; 5: 511-5.
24. Khan HU, Khan S, Ali SI. Evaluation of road traffic noise pollution in Quetta (Pakistan). *Am J Modern Phys.* 2014; 3(2): 29-36.
25. Khan MW, Memon MA, Khan MN, Khan MM. Traffic noise pollution in Karachi, Pakistan. *JLUMHS.* 2010; 9(3): 114-20.
26. World Health Organization (WHO). Prevention of noise-induced hearing loss. Geneva: WHO; 1997.
27. Gupta M, Khajuria V, Manhas M, Gupta KL, Onkar S. Pattern of noise induced hearing loss and its relation with duration of exposure in traffic police personnel. *Indian J Comm Health.* 2015; 27(2): 276-80.
28. Venkatappa KG, Shankar V, Sparshadeep EM. Effect of road traffic noise on auditory threshold in traffic policemen. *Int J Curr Res Biol Med.* 2018; 3(6): 12-7.
29. Traffic Police Information, CPLC Lahore, Home Department, Govt. of Punjab, 2010. Cited on 2018 Sep 3, Retrieved from www.cplc-lahore.gop.pk/traffic-police.
30. Sreenivasulu M. Survey and cross sectional study on noise induced hearing loss of police constables and officers working in heavy traffic areas-an Indian perspective. *TJPRC: IJOHNS.* 2016; 1(2): 17-20.