

FREQUENCY OF HEARING LOSS IN NOISY OCCUPATIONAL SETTINGS

Naveed Khan¹, Arif Raza Khan¹, Amjad Khan², Sartaj Khan²

¹Department of ENT, Khyber Teaching Hospital, Peshawar - Pakistan

²Department of ENT, Naseer Teaching Hospital, Peshawar - Pakistan

ABSTRACT

Objectives: To determine the frequency of noise induced hearing loss in occupational settings.

Material and Methods: This was a hospital based descriptive study. The study was conducted at the Department of Ear Nose Throat and Head and Neck Unit Khyber Teaching Hospital, Peshawar from 10-06-2010 to 09-06-2011. Patients who were diagnosed having sensorineural hearing loss due to occupational exposure to noise were included in the study. Data was collected using a written, structured questionnaire and analyzed using SPSS.

Results: A total of 217 patients who had occupational exposure to noise were seen at the Outpatient Department of Khyber Teaching Hospital, Peshawar. All of these patients were men. The calculated frequency of occupational Noise Induced Hearing Loss (NIHL) was 20.3 %. Mean age at the time of presentation was 48.82 years and standard deviation was calculated as 6.746. Occupation was significantly associated with hearing loss ($p=0.014$).

Conclusion: Noise is the hazardous industrial pollutant causing severe hearing loss in workers of every country in the world. A national program should be established considering the amount of damage the NIHL causes to the quality of life of workers.

Key Words: Occupational, noise induced hearing loss.

INTRODUCTION

Occupational noise induced hearing loss (ONIHL) is defined as bilateral sensorineural hearing loss that develops slowly over a period of several years as the result of exposure to continuous or intermittent loud noise at work place¹. The hearing loss may be temporary known as temporary threshold shift (TTS) or it may be permanent called permanent threshold shift (PTS). Permanent threshold shift may occur following repeated temporary threshold shift or following single noise exposure. The term acoustic trauma has however been utilized to describe the situation where single exposure to intense sound leads to immediate hearing loss².

Acoustic over stimulation results in Noise Induced Hearing Loss (NIHL) due to increase neurotransmitter release or due to decrease in cochlear blood flow. However other metabolic cochlear mechanisms that are focus of experimental investigations include outer hair cell plasma membrane fluidity³.

In a study conducted in Karachi, 17 % of permanent workers had high frequency hearing loss specially at 4kHz was noted⁴. Hearing damage occur sooner at 4000 and 8000 Hz than lower frequencies⁵. It is seen that on average, changes starts after 2 years of noise exposure. It is wide spread problem of the industrial world. Strategies of noise assessment and control are introduced which may help to improve the working environment and preserve hearing of factory workers⁶.

The purported significance of my study is to disseminate the results of my study to the health department and concerned government bodies who will have facts and figures to formulate and implement noise regulations in Pakistan to hinder this preventable morbidity (by the use of hearing protective devices during working hours and other necessary measures).

MATERIAL AND METHODS

This descriptive study was conducted at the Department of Otorhinolaryngology & H & N Surgery, Khyber Teaching Hospital (KTH) which is a public sector tertiary care hospital in Peshawar, Khyber Pakhtoonkhwa. The study was conducted from March 10-06-2010 to 09-06-2011.

Address for Correspondence:

Dr. Naveed Khan

Room 83, Olds Doctor's Hostel,
Khyber Teaching Hospital, Peshawar.
Contact: 0334-9414243
E-mail: naveedkhan196@gmail.com

Patients who are exposed to noise during their working times were included in the study. Patients who were > 60 years or having diabetes mellitus or hypertension suggested by history past medical record, ototoxic drug history, history of previous ear disease, previous history of ear surgery or family history of hearing loss were excluded from the study.

After approval from the ethical committee, patients who fulfilled the inclusion criteria were included in the study. Informed consent was taken from patients and purpose of study, use of data for research and publication was explained. Patients demographic features e.g age, gender etc was also considered.

Patients were diagnosed on the basis of history of exposure to noise during working hours. SNHL was diagnosed by tuning fork tests and confirmed by pure tone audiograms. Full Ear Nose Throat and systemic examination were carried out. All pure tone audiograms were performed by single qualified audiologist. All relevant information was recorded on proforma for each patient. All confounding variables and bias were controlled by strictly following the exclusion criteria.

Informed consent was taken from all patients. Participation in the study was completely voluntary. Complete confidentiality was ensured. Data was entered and analyzed using SPSS version 16.

RESULTS

A total of 217 patients who had occupational exposure to noise were seen at the outpatient department of Khyber Teaching Hospital Peshawar. All of these patients were men. During the study period a total of 3000 patients came to ENT outpatient department for consultation regarding hearing problem, 217 of whom were coded for occupational exposure to noise. The calculated frequency of ONIHL is shown (Table no 1)

Mean age at the time of presentation and the distribution according to age group is shown. (Table

2a, 2b). Prevalence of hearing loss increased with advancing age (Table no 3). All the workers were males no single female presented to outpatient department with occupational exposure to noise. The distribution according to the type of occupation revealed that most of them 97 (44.7%) were factory workers followed by rickshaw drivers 82 (37.8%), traffic police 18 (8.3%), construction workers 12 (5.5%) and carpenters 8 (3.7%). Occupation was significantly associated with hearing loss ($p=0.014$).

Of the occupation type, factory workers 29 (29.8%) were more likely to have hearing loss followed by rickshaw drivers of whom 13 (15.85%) had hearing loss, followed by carpenters 1 (12%) and construction workers 1 (8.33%). None of the traffic police had hearing loss.

There was statistically significant association between duration of noise exposure and presence of hearing loss ($p=0.000$). Those workers who were exposed for 30 or more years 25 (37.87%) exhibited hearing loss as compared to workers with 19 or less years of exposure only 3 (6.25%) got some degree of deafness. Those with exposure duration of 25 to 29 years 11 (21.56%) and those with exposure duration of 20 to 24 years 5 (9.16%) suffered from hearing loss.

The degree of hearing loss showed that most of the workers 23 (52.3%) had moderate hearing loss followed by mild and severe hearing loss 10 (22.7%). Only (2.3%) suffered from profound hearing loss. Most of the workers in this study did not exceed the sound level permitted for eight hours, given that 182 (84%) of the workers examined in this study were working for 8 or less hours per day and 35 (16.1%) were working for more than 8 hours and equal to or less than 12 hours per day, no single worker worked for more than 12 hours per day in a place proven to be inappropriate for hearing.

Mean median and standard deviation was calculated for daily exposure in hours and total noise exposure duration in years. The mean for daily

Table 1: Presence of Hearing loss in patients presenting to the outpatient otolaryngology clinic (n=217)

Presence of hearing loss	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	44	20.3	20.3	20.3
No	173	79.7	79.7	100.0
Total	217	100.0	100.0	

Table 2a: Age in years of patients presenting to the outpatient otolaryngology clinic (n=217)

Mean	48.82
Median	48.00
Std. Deviation	6.746

exposure in hours was 8.31 and for total noise exposure in years was 24.07, median for daily exposure in hours was 8 and for total noise exposure in years was 25 and standard deviation for daily exposure in hours was 0.868 and for total noise exposure in years was 8.059.

Table 2b: Age Groups of patients presenting to the outpatient otolaryngology clinic(n=217)

Age in years	Frequency	Percent	Valid Percent	Cumulative Percent
Less than or equal to 45	59	27.2	27.2	27.2
46 to 49	52	24.0	24.0	51.2
50 to 54	48	22.1	22.1	73.3
More than or equal to 55	58	26.7	26.7	100.0
Total	217	100.0	100.0	

Table 3: age in years (groups) vs presence of hearing loss in patients presenting to the outpatient otolaryngology clinic (n=217). P value= 0.001

Age in years	Hearing loss		
	Yes	No	Total
Less than or equal to 45	6	53	59
46 to 49	6	46	52
50 to 54	10	38	48
More than or equal to 55	22	36	58
Total	44	173	217

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.377 ^a	3	.001
Likelihood Ratio	16.718	3	.001
Linear-by-Linear	15.243	1	.000
N of Valid Cases	217		

DISCUSSION

The prevalence of cases suggestive of NIHL 20.3% in the present study was equal to all the other studies analyzed. Other studies presented a range of prevalence from 20 to 46.2%⁷.

Age of patient was significantly associated with the presence of hearing loss in the studied population (p=0.001). Prevalence of hearing loss increased with advancing age. Men aged 55 years or more were 3.8 times more likely to have NIHL as compared to those with age equal to or less than 45 years. This finding is not consistent with data in literature⁸, because the groups studied were different, most of them considering age above 50 and below 30 as opposed to this study which considered men aged above 55 years and those below 45 years.

Given the historical gender-typing of specific employment roles (i.e., construction/heavy manufacturing/drivers), all of patients presenting with ONIHL in the contemporary setting were males, no single female presented with occupational noise induced hearing loss this is consistent with data in literature.^{9,10,11}

This burden is not distributed evenly among all workers, but is heaviest among certain occupations like factory workers (mills ,mine etc) and those who are professional drivers (rickshaw) , other occupations do effect hearing but to lesser extent this is consistent with the study Nelson, D et al - The Global Burden of Occupational Noise-induced Hearing Loss¹².

There was statistically significant association between duration of noise exposure and presence of hearing loss (p=0.0001). Cross-classification of noise intensity level and time since first noise exposure revealed increasing trends for the time for workers exposed to noise for 10 years or more. Workers exposed for more than 20 years above 85 dB (A) had an eleven-fold increased risk of hearing handicap.

This is consistent with the study by Tine Rubak et al – The risk of noise induced hearing loss in Danish workforce. Workers exposed to noise levels of 85 dB have a permissible maximum daily average exposure of only eight hours. Most of the workers in my study did not exceed the sound level permitted for eight hours, given that 84% of the workers examined in this study were working for 8 or less hours per day and 16.1 % were working for more than 8 hours and equal to or less than 12 hours per day, no single worker worked for more than 12 hours per day in a place proven to be inappropriate for hearing which is not consistent with literature¹³ because the study was carried out in such an area where there is no concept of overtime and most people adhere to work for maximum of eight hours with the exception of some professions like driving which is self employment some of them do work for extended period of time in a day.

CONCLUSION

Noise is the hazardous industrial pollutant causing severe hearing loss in workers across the

world. The workers in industries like mining, construction, printing, saw mills, crushers, etc are at risk. Workers are exposed to high levels of noise throughout their lifetime of work, but there are very few NIHL studies in Pakistan to show its prevalence.

Awareness should be created among workers about the harmful effects of noise on hearing and other body systems by implementing education and training programs.

Research studies are needed to know the exact prevalence of NIHL among various industries in Pakistan. A national program should be established considering the amount of damage the NIHL causes to the quality of life of workers.

REFERENCES

1. Krishnamurthi S. Sensorineural hearing loss associated with occupational noise exposure: effect of age correction. *Int J Environ Res Public Health* 2009; 6: 889-99.
2. Baguley DM, Mccombe A. Noise induced hearing loss. In Glesson editor. *Scott Brown's Otorhinolaryngology, Head and Neck Surgery*. Great Britain: Edward Arnold 2008; 3548-57.
3. Chen GD, Zhao HB. Effect of intense sound exposure on the outer hair cells plasma membrane fluidity. *Hearing Research* 2007; 226: 14-21.
4. Khalid AA, Ishtiaq AK. Effect of noise pollution on hearing. *Pak J Otolaryngol* 2005; 21(2): 33-34.
5. Karimi A, Nasiri S, Kazerooni FK, Ollaei M. Noise induced hearing loss risk assessment in truck drivers. *Noise Health* 2010; 12(46): 49-55.
6. Syed MI, Ishtiaq AK. Occupational noise induced hearing loss. *Pak J Otolaryngol* 2007; 23(1): 2-6.
7. Martins AL, Alvarenga KF, Bevilacqua MC, Costa Filho OA. Perda auditiva em motoristas e cobradores de ônibus. *Rev Bras Otorrinolaringol* 2001; 67(4): 467-73.
8. Bauer P, Körpert K, Neuberger M, Raber A, Schwetz F. Risk factors for hearing loss at different frequencies in a population of 47,388 noise-exposed workers. *J Acoust Soc Am* 1991; 90(6): 3086-98.
9. European Agency for Safety and Health at Work. Reducing the risks from occupational noise exposure (2005). Accessed online: 19:10 25/03/2007. http://osha.europa.eu/publications/reports/6805535/full_publication_en.pdf.
10. Nelson DI, Nelson RY, Concha-Barrientos M, Fingerhut M. The global burden of occupational noise-induced hearing loss. *Am J Ind Med* 2005; 48(6): 446-58.
11. Palmer KT, Griffin MJ, Syddall HE, Davis A, Pannett B, Coggon D. Occupational exposure to noise and the attributable burden of hearing difficulties in Great Britain. *Occup Environ*.
12. Nelson D. The Global Burden of Occupational Noise-induced Hearing Loss This is a preprint of an article accepted for publication in the *American Journal of Industrial Medicine*© copyright 2005, copyright owner: Wiley-Liss, Inc. The global burden of occupational noise-induced hearing loss Deborah Imel Nelson, Ph. Med 2002; 59(9): 634-39.
13. Conlee JW, Abdul-Baqi KJ, McCandless GA, Creel DJ. Differential susceptibility to noise induced permanent threshold shift between albino and pigmented guinea pigs. *Acta Otolaryngol (Stockh)* 1986; 23: 81-91.

The Journal of Medical Sciences, Peshawar is indexed with WHO IMEMR (World Health Organisation Index Medicus for Eastern Mediterranean Region) and can be accessed at the following URL.

<http://www.who.int/EMRJorList/details.aspx?docn=4468>