



Article info

Received : 21-04-2023
Accepted : 05-09-2023
No. of Tables : 02
No. of Figure : 08
No. of Reference : 09

Original Article

Prevalence of Noise Induced Hearing Loss among the Textile Workers

Uddin AKMS¹, Naher L², Rahaman ML³, Islam MS⁴

Abstract:

Background: Noise remains a common environmental pollutant in industrial workplaces and has been a constant issue since the industrial revolution. Occupational hearing loss is the dominant cause of preventable sensorineural hearing loss in adults. The degree of NIHL is determined by intensity, duration of exposure, spectral characteristics of the noise, and individual susceptibility

Methods: This cross-sectional study was carried out among the Nassa Taipei Textile Mills Ltd. and Nassa Taipei Spinners Ltd in Kachpur, Narayangonj. 200 Textile workers aged from 18 to 50 years were recruited in this study. Study subjects were interviewed by trained data collector through a structured questionnaire. Environmental sound intensity level in various departments were measured using a sound level meter (Quest sound level meter, Oconomowoc WISCONSIN. Model no: 2400). Pure Tone Audiometry was done by pure tone clinical audiometer (KAMPLEX Audiometer, Model no: AC 30; Calibrated by P.C. Werth Limited in October 2004) with a frequency range of 125Hz to 8000Hz and sound intensity levels of between -10dB to 120dB was used to test each ear of the subject separately. Data was analyzed using Statistical Package for Social Sciences (SPSS) program version 26.

Results: Out of 200 Textile workers who were recruited in this study, 138 (69%) were males and predominant age group was 18 to 27 years (54.5%). The prevalence of NIHL was found to be 14.5%. The most common age group was 28 to 37 years and positive association ($p < .05$) between hearing loss and long working hours. Non-user of PPD had little bit higher among the workers who developed hearing loss.

Conclusion: The prevalence of NIHL was higher in textile industry workers. This suggests the need to provide protective gear to workers in stations generating loud noise. The prevalence was higher in male, those who experienced prolonged exposure and not to use PPD.

Key words: Noise induced hearing loss (NIHL), Pure tone audiometry (PTA), Textile workers, Personal protection device (PPD)

Cite the Article: Uddin AKMS, Naher L, Rahaman ML, Islam MS. Prevalence of Noise Induced Hearing Loss among the textile Workers. Bangladesh J Otorhinolaryngol 2023; 29(2): 89-95

1. Dr. AKM Shaif Uddin, Associate Professor, Department of ENT & HNS, Shaheed Suhrawardy Medical College
2. Dr. Naher L, Vice Principal, Radda Paramedic Institute & Radda MCH & FP center, Mirpur, Dhaka
3. Dr. Rahaman ML, Registrar, Department of ENT & HNS, Shaheed Suhrawardy Medical College Hospital
4. Dr. Islam MS, Assistant Professor, Department of ENT & HNS, Shaheed Suhrawardy Medical College

Correspondence: Dr. AKM Shaif Uddin, Associate Professor, Department of ENT & HNS, Shaheed Suhrawardy Medical College, mobile: 01819-284886, e-mail: drakmsaifuddin@yahoo.com

Introduction:

Noise remains a common environmental pollutant in industrial workplaces and has been a constant issue since the industrial revolution. Occupational hearing loss is the dominant cause of preventable sensor neural hearing loss in adults. Noise is the most ubiquitous industrial pollutant¹. Occupational noise exposure is likely to contribute in very high proportion of cases of sensorineural hearing loss (SNHL) in workers who are continuously exposed to high frequency noise being emitted from industrial machines².

Exposure to sound above a level of approximately 85 dB initially manifest as a temporary hearing loss or dullness of hearing that is known as temporary threshold shift (TTS), which may have fast resolution within first 10-15 days of the exposure³. However, a repeated or sustained exposure of noise to the hair cells and associated nerve fibers leads on to degenerative changes and the TTS becomes permanent threshold shift (PTS). The effect of excessive noise could be so devastating that it can cause permanent memory loss or psychiatric disorder⁴.

Besides hearing loss, it has also been linked to annoyance and fatigue, depression, tinnitus, and to serious health conditions such as hypertension and heart disease. Moreover, noise increased risk of accidents, and decreased productivity. NIHL is usually bilateral and symmetrical affecting higher frequencies and subsequently lower frequencies⁵. Global estimates of the prevalence of disabling hearing loss from occupational exposure range from 7% to 21%⁶.

Occupational health and safety service in Bangladesh is still in the developmental stage. The main laws related to occupational health and safety in this country is the factory act 1965 and the factory Rule of 1979. There are a number of other laws and regulations that are also have some provisions related to occupational health and safety. But most of the laws are lacking in standard values and not specific rather general in nature.

Evaluation of noise levels within textile mill workplaces, together with the hearing assessment of mill workers will help to shed light on the health risk of these environments. Information gained from such an evaluation will highlight the need for preventive measures. The present research work assessed the prevalence of hearing loss among textile workers which will also assist the Government and policy maker as well as programmer in the design, implementation and evaluation of strategies and interventions for facilitating more effective occupational noise control.

Objectives:

1. To assess the prevalence of hearing loss among the textile workers
2. To investigate the early sign of hearing loss amid them and its impact on their social life.

Methods:

Study design: It was a cross sectional study which was carried out among the workers of textile industries.

Place of study: Nassa Taipei Textile Mills Ltd. and Nassa Taipei Spinners Ltd in kachpur, Narayangonj were the study site.

Study population: The target population was the workers who have been working in a noisy environment where sound level is more than 85dB.

Study period: Data were collected from the study subjects within two months.

Sample size

Study sample was taken by using the following formula

$$n = z^2 p (1-p) / d^2$$

Where,

n = required sample size

z = confidence level, i.e., 1.96

p = prevalence rate of the condition

d = degree of accuracy desired, i.e., 0.05.

Global prevalence of the NIHL is estimated to be about 7%. We desire a 0.05 degree of accuracy and a confidence level of 1.96. Therefore, $n = 1.96^2 \times 0.07 / 0.05^2 = 100.04$ H" 100 workers respectively from each textile mill. So total no was $100 \times 2 = 200$

Each mill worker was interviewed by trained data collector through a structured questionnaire. The questionnaire probed for self-reported hearing loss in normal listening situations and in the presence of background noise, tinnitus, knowledge on the health hazards associated with work in a noisy environment, the use of hearing protective device and the duration of service at the textile mill. Demographic data, such as educational background, monthly income, were also collected.

Environmental sound intensity levels in various departments were measured using a sound level meter (Quest sound level meter, Oconomowoc W, WISCONSIN. Model no: 2400).

Pure Tone Audiometry: A pure tone clinical audiometer (KAMPLEX Audiometer, Model no: AC 30; Calibrated by P.C. Werth Limited in October 2004) with a frequency range of 125Hz to 8000Hz and sound intensity levels of between -10dB to 120dB was used to test each ear of the subject separately.

Inclusion criteria:

- Age: 18 years to 50 years.
- Duration of Service: More than two years.
- No past history of viral disease or drug therapy, which may cause sensorineural hearing loss.
- Otoscopy: Apparently normal looking tympanic membrane

Exclusion criteria:

- Age: Below 18 years.
- Duration of service: Less than two years:
- Any history of middle ear disease.

Data collection method

A team consists of one research physicians and two data collectors and two audiometrician were engaged in data collection. Questionnaire was formulated in three segments:

- Socio-demographic profile
- Treatment seeking behavior
- Audiometric hearing test profile

Before data collection, questionnaire was pretested. First and second part of the questionnaire was filled up by data collectors and later part of the questionnaire was filled up by audiometrician.

Results:

Optimistically the findings of the study would be helping the government to formulate an operative intervention to regulate the noise level at industrial sectors. Ultimately it will improve the health and well-being of the workers.

Table I. Background characteristics

Age	Frequency	Percent
18-27 years	109	54.5
28-37 years	59	29.5
38-47 years	23	11.5
48 and above	9	4.5
Mean Age	28.9+8. years	
Total	200	100.0
Sex		
Male	138	69.0
Female	62	31.0
Total	200	100.0
Monthly income in Taka		
4000-8999	118	59.0
9000-13999	56	28.0
14000-18999	15	7.5
19000-23999	8	4.0
2400 and above	3	1.5
Total	200	100.0

Mean = 8882.47+4593.62

Table I shows that the total number of workers was 200. The majority of workers (69%) were males. The mean age was 28.9±8 years. Above half of them (54.5%) were at the age group 18-27 years. 29.5 percent workers were belonging to age group 28-37 years. Nearly 60% workers income was between 4000-8999 taka and 28% workers income was 9000-13999 taka respectively. Mean monthly income was 8882.47±4593.62 taka.

Table II: Hearing loss in different age group

Age group (years)	Hearing status		Total
	No hearing loss	Hearing loss	
18-27	103(60.2%)	6(20.7%)	109(54.5%)
28-37	52(30.4%)	7(24.1%)	59(29.5%)
38-41	11(6.4%)	12(41.4%)	23(11.5%)
48 and above	5 (2.9%)	4 (13.8%)	9(4.5%)
Total	171	29	200
	100.0%	100.0%	100.0%

Number of noise induced hearing loss (NIHL) was 6(20.7%) in 18-27 years, 7(24.1%) in 28-37 years, 12(41.4%) in 38-47 years and 4(13.8%) in 48 years and above.

Table III: Currently Using PPD

Currently Using PPD	Frequency	Percent
Yes	139	69.5
No	61	30.5
Total	200	100.0
How PPD is used		
Not regularly	13	9.4
Regularly	109	78.4
If the noise is severe	17	12.2
Total	139	100

Presently about 70% workers were found to use PPD and 30% of them did not use PPD while working in harmful noisy environment.

Among the PPD users 78.4% used regularly and rest of the workers used irregularly or when they felt the severity of noise was unbearable.

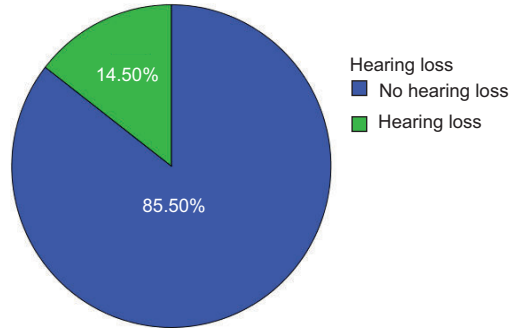


Fig. 1: Reason for not using PPD

Among the non-users of PPD, nearly 50% of them could not use PPD as there was no supply of personal protective device in their textile mill. 16.4% of the workers did not use PPD as their co-workers also did not use PPD. Very few of them did not use PPD as they could tolerate the noise level. Other reported reasons of not using PPD were to feel difficult to hear supervisor/ Co-workers, to feel uncomfortable to use PPD, not to work much time in noisy place.

Table IV: Hearing evaluation by Audiometric test

Hearing status by Audiometric test	Frequency	Percent
Normal	171	85.5
Mild hearing loss (unilateral/bilateral)	22	11.5
Moderate hearing loss (unilateral/bilateral)	7	3.5
Total	200	100.0

By Audiometric test, 85.5 percent workers hearing were found normal. While mild

hearing loss was found in 11.5 percent of the respondent and 3.5 percent had Moderate hearing loss.

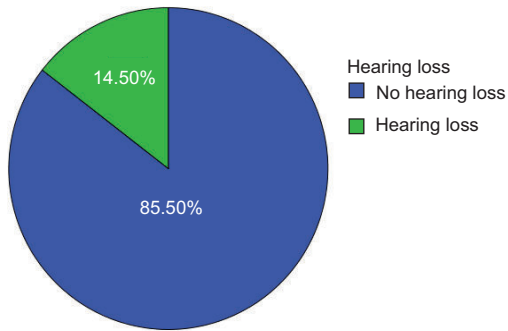


Fig. 2: Hearing Status

Among the textile workers 14.5% have developed noise induced hearing loss due to working in a noisy environment.

Table V: Association between Hearing status of workers and currently using PPD

Hearing Status	Currently use PPD		Total
	Yes	No	
No hearing loss	131 (76.6%)	40 (23.4%)	171 (100.0%)
Hearing loss	22 (75.9%)	7 (24.1%)	29 (100.0%)
Total	153 (76.5%)	47 (23.5%)	200 (100.0%)

Among the textile workers who have normal hearing, 77% of them used PPD and 23% did not use PPD. Between the workers who have hearing loss, 76% of them used PPD and 24% of them did not use PPD. So, there is a non-user of PPD is a little bit higher among the workers who developed hearing loss.

Table VI: Association between hearing loss and working hours

Working period	Audiometric test			Total	P value
	Normal	Mild hearing loss	Moderate hearing loss		
8 hours	81	8	2	91	.045
10 hours	10	2	2	14	
12 hours	80	12	3	96	
Total	171	22	7	200	

Analyzed data revealed a positive association ($p < .05$) between hearing loss and long working hours.

Table VII: Association of gender and education of the textile workers

Gender	Education				Total	P value
	No Education	Up to Primary	Up to Secondary	Above Secondary		
Male	7(5.1%)	15(10.9%)	89(64.5%)	27(19.5%)	138(100%)	.000
Female	16(25.8%)	25(40.3%)	17(27.4%)	4(6.5%)	62(100.0%)	
Total	23(11.5%)	40(20.0%)	106(53.0%)	31(15.5%)	200(100.0%)	

Above table shows that male textile workers are significantly higher level of education than female workers ($P < 0.05$).

Table VIII : Predictor of hearing loss

Predictor of hearing loss	B	S.E.	Wald	df	Sig.	Exp(B)
Presently use PPD	-.147	.647	.052	1	.820	.863
Cannot hear people talking 3 feet away just after leaving noisy area	1.715	.957	3.214	1	.073	5.556
Feeling fullness of ears just after leaving noisy area	1.953	.641	9.285	1	.002	7.051
Having tinnitus just after leaving noisy area	1.300	.551	5.575	1	.018	3.669
Difficulty in understanding speech just after leaving noisy area	1.305	.618	4.465	1	.035	3.689
Daily Working hour	.021	.156	.017	1	.895	1.021
Constant	-4.010	1.888	4.512	1	.034	.018

Above table shows that those who used PPD has less chance of hearing loss by .88 times than who does not used PPD, some warning signs have significant effect on developing hearing loss. The workers who Cannot hear people talking 3 feet away just after leaving noisy area has 5.55 times higher chance of hearing loss and those who have Feeling fullness of ears immediately after leaving noisy area has 7 times more chance of hearing loss than normal, the workers who have Difficulty in understanding speech just after leaving noisy area has 3.6 times more chance of hearing loss. One-hour extra work increase the hearing loss 1,02 times.

Discussion:

Occupational hearing loss is one of the most pervasive problems in today's occupational environment. NIHL is a hearing disorder characterized by a gradual, progressive loss of high frequency hearing sensitivity over time, as a result of exposure to excessive noise levels.

Environmental sound intensity levels in various departments of the textile were measured using a sound level meter. Noise-induced

hearing loss (NIHL) is an irreversible sensory neural hearing loss associated with exposure to high levels of excessive noise. In this study the mean age of the textile workers was 28.9±8 years. Above half of them (54.5%) were at the age group 18-27 years. The majority of the workers (69.2%) were males. Number of noise induced hearing loss (NIHL) was 6(20.7%) in 18-27 years, 7(24.1%) in 28-37 years, 12(41.4%) in 38-47 years and 4(13.8%) in 48 years and above. This finding is similar to a study done by Hong⁷.

This study revealed that among the textile workers 14.5% have developed noise induced hearing loss due to working in a noisy environment. Mild hearing loss was found in 11.5 percent of the respondent and 3.5 percent had Moderate hearing loss. It also revealed a positive association ($p < .05$) between hearing loss and long working hours. Similar result found in other study done by Agawam et al⁸.

Among the textile workers who have normal hearing, 77% of them used PPD and 23% did not use PPD. Between the workers who have hearing loss, 76% of them used PPD and 24% of them did not use PPD. So, there

is a non-user of PPD is a little bit higher among the workers who developed hearing loss. Similar relation found in study done by Einhorn⁹.

NIHL develops gradually so that people may lose a significant amount of hearing before becoming aware of its presence. During the early stages, sufferers often report to having some warning sign. Concerning about hearing difficulty, 10% of the study population reported to have decrease hearing and about half of them noticed it three months ago. 38 out of 200 workers complained about tinnitus in their ear. Unfortunately, the effects of noise are often underestimated because the damage takes place so gradually.

Conclusion:

The prevalence of NIHL was higher in textile industry workers. This calls for the need to provide protective gear to workers in stations generating excessive noise. Moreover, the prevalence was higher in males, older workers, and those experiencing prolonged exposure.

Recommendations:

NIHL is almost entirely preventable. In the light of the current research on NIHL, following are recommended to reduce occupational hearing loss.

- i. Every six-monthly noise level should be measured and the workers who are working in the area where noise level is more than 85 dB should wear ear plug and it should be monitor strictly by factory authority..
- ii. For the workers of the noisy section, Factory should make a provision of audiometric hearing test in every year and there should be pre-employment hearing test especially who will be required for working in noisy place.

- iii. There must be provision of awareness program in the factory to educate the workers about the harmful effect of noise and its preventive measure.
- iv. Factory owners ought to pay attention to engineering control of Noise

References:

1. Ludman.H. Noise Induced Hearing Loss disease of the ear.6th Edition:1998;483-494
2. Bedi R.Evaluation of occupational environment in two textile plants in Northern India with specific reference to noise. *Ind Health* 2006;44:112-6
3. Ravikumar A, Mohanty S, Senthil K, Raghunandam S. Evoked Otoacoustic emission to detect early noise induced hearing loss. *Indian J Otol*2004;10:7-16
4. Singh N, Davar SC. Noise pollution sources, effect and control. *J Hum Ecol*2004;16:1817
5. Consensus conference.Noise and hearing loss. *JAMA* 1990;263:3185-90
6. Nelson DI, Nelson RY, Concha-Barrientos M, Fingerhut M. The global burden of occupational noise induced hearing loss.*Am J Ind Med* 2005;48:446-58
7. Hong O. Hearing loss among operating engineers in American construction industry.–*International Archives of Occupational and Environmental Health*. 2005. August 1; 78(7): 565–74.
8. Agrawal Y, Platz EA and Niparko JK. Prevalence of hearing loss and differences by demographic characteristics among US adults: Data from the National Health and Nutrition Examination Survey, 1999–2004. *Archives of Internal Medicine*. 2008. July 28; 168(14): 1522–30.
9. Einhorn K. The medical aspects of noise induced otologic damage in musicians. *Hearing Review*. 2006. March; 13(3): 38.