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Original Articles

Noise induced hearing loss among the textile industry workers

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Abstract

Noise is one of the common physical environmental hazard in the workplace. A study was carried out in a textile industry at Gazipur from July 2004 to December 2004 to find out the prevalence, types and severity of hearing loss among the workers. The sample size was 97 and the total number of workers was 1900. Out of 97 sample, 26 workers were having noise induced hearing loss (NIHL). The incidence of NIHL was 20.59% in workers aged less than 35 years and 41.38%. in workers aged above 35 years Among the departments of factory, highest noise level was in generator department (96-100 dB). In generator department, 46.67% workers had the hearing loss. Overall, the prevalence of NIHL among textile workers of the study place was 33.46%.

Key words: *Noise, NIHL, industrial workers.*

Introduction

Occupational hearing loss is the dominant cause of preventable sensorineural hearing loss in adults. Noise is the most ubiquitous industrial pollutant. All noise exposure is important. The ear does not distinguish between social, military or industrial noise; they are additive [1]. The effect of noise or any acoustic trauma is of considerable industrial or public health importance. Repeated exposure to high levels of noise is a major cause of deafness, particularly in certain industrial occupations and in places public or private entertainment where theatre is over amplification of sound[2]. Noise induced hearing loss is a process of permanent metabolic cochlear damage caused by chronic exposure to loud sound levels between 90dB and 140dB[3].

Habitual exposure to noise above 85 dB will cause a gradual hearing loss in a significant number of individuals, and louder noises will accelerate this damage. The noise exposure standard is estimated as for unprotected ears; the allowed exposure time decreases by one half for each 5 dB increase in the average noise level. For instance, exposure is limited to 8 hours per day at 90 dB, 4 hours per day at 95 dB, and 2 hours per day at 100 dB. The highest permissible noise exposure for the unprotected ear is 115 dB for 15 minutes per day. Any noise above 140 dB is not permitted[4]. Noise induced hearing loss (NIHL) has been associated with industry for many years. The results reported from many industrialized countries[5] are alarming to authorities all over world including Bangladesh. The management of cases of NIHL is proved to be hopeless[6-7]. Most of the western countries have their own regulations and rules for the protection of the workers in noise producing factories[8].

The United States Department of Occupational Safety and Health Administration (OSHA) developed the Hearing Conservation Amendment in 1983 that limited occupational exposure to noise[4]. The recommended permissible noise levels and duration of noise exposure are shown in table I. Where actual noise exposures exceed those prescribed, steps should be taken to reduce noise levels for employees working in those areas. The current regulations will protect 85% of the individuals exposed to recommended noise levels. The remaining 15% could be attributable to individual susceptibility to noise[9], the effect of melanin concentration in the cochlea[10] and aging[11].

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Bangladesh is a developing country. The industrial sectors in Bangladesh are growing slowly. Among the workers in the industries most of the populations in both genders either skilled or unskilled are involved in textile and related industries. Workers in certain industries are concerned about developing NIHL as compared with other lower noise levels industries or with the general population. The size of the problem in Bangladesh is unknown. The aim of study is to see the effects of noise among the workers of a textile industry.

Methods

01. Type of study : Cross sectional, prospective study

02. Place of study : Study has been conducted in a textile industry at Gazipur.

03. Period of study : July 2004 to December 2004

04. Population size : 1900 workers

05. Sample size : 97 workers

06. Measurement of environmental sound intensity levels in various departments using a sound level meter (Quest sound level meter, Oconomowoc W, WISCONSIN. Model no: 2400).

07. Auroscopic Examination : Examination of tympanic membrane

08. Tuning Fork Test : A tuning fork of 512 Hz was used to assess bone and Air conduction by the Rinne, Weber and Absolute Bone Conduction method

09. Pure Tone Audiometry : A pure tone clinical audiometer (KAMPLEX Audiometer, Model no: A C 30; Calibrated by P.C. Werth Limited on 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

10. Inclusion criteria:

a) Age : Over 18 years to 50 years.

b) Duration of Service : More than two years.

c) No past history of viral disease or drug therapy, which may cause sensorineural hearing loss.

d) Otoscopy : Apparently normal looking tympanic membrane

11. Exclusion criteria:

a) Age : Below 18 years.

b) Duration of service : Less than two years : Any history of middle ear disease.

12. Collection of Data : Data has been collected in a pretested data sheet.

13. Data analysis and presentation: Data has been analyzed and presented in tables and graphs in a simplified manner.

Aims and objectives

1. To determine the prevalence, type and severity of hearing loss among the people working in a noisy environment.
2. To assess the Sound Pressure Levels at different departments of the industry.

Observation & Results

Table-I

Distribution of workers in various departments

Department	Number	Percentage
Administration	19	19.59%
Knitting	16	16.49%
Dyeing	16	16.49%
Finishing	14	14.43%
Sewing	17	17.53%
Generator	15	15.46%
Total	97	100.00%

The participants were distributed in various departments

Table-II

Departmental noise intensity levels

Department	Noise Intensity level (dB
Administration	45-50
Knitting	86-88
Dyeing	90-95
Finishing	76-82
Sewing	77-85
Generator	96-100

There are six departments among which our study population is distributed. Noise intensity levels in various departments were as above.

Table-III

Exposure status per day

Department	Hours at Work	Mean Daily Break (Hours)	Hours of exposure/Day
Administration	9	1	8
Knitting	9	1	8
Dyeing	9	1	8
Finishing	9	1	8
Sewing	9	1	8
Generator	9	1	8

The table explains the average duration of exposure of each subject in the various departments in a working day.

Table-IV

Departmental distribution of overtime working

Department	% Who worked overtime	Mean overtime Hours/Month	Mean overtimeHours/day
Administration	68.42	100	4.17
Knitting	100%	80	3.33
Dyeing	100%	80	3.33
Finishing	100%	80	3.33
Sewing	83.33	100	4.17
Generator	100	80	3.33

The average overtime worked in a month by subjects in every section was calculated.

Table-V

Departmental distribution of average daily exposure to noise

Department	% Who worked overtime	Mean overtime Hours/Month	Mean hours of exposure /day
Administration	68.42	100	12.17
Knitting	100%	80	11.33
Dyeing	100%	80	11.33
Finishing	100%	80	11.33
Sewing	83.33	100	12.17
Generator	100	80	11.33

The table represents the average duration of exposure of each subject in the various departments in a working day

Table-VI

Departmental prevalence of NIHL in relation to mean annual exposure.

Department	Mean annual exposure (wks)	% NIHL
Administration	48	00
Knitting	48	31.25
Dyeing	48	37.5
Finishing	48	28.57
Sewing	48	23.53
Generator	48	46.67

The average exposure status of the subjects per year to noise in their various departments at work was calculated from the actual weeks at work per year. Each employee was to work 52 weeks per year with 4 weeks off for annual leave. This gives the actual weeks at work per year as 48 weeks.

Table-VII
Distribution of NIHL among the departments

Department	No. of workers	No. of NIHL	% of NIHL
Administration	19	00	00
Knitting	16	05	31.25
Dyeing	16	06	37.5
Finishing	14	04	28.57
Sewing	17	04	23.53
Generator	15	07	46.67

Table-VIII
Distribution of NIHL as exposed to noise

Department	Noise intensity level Ranges	% NIHL
Administration	45-50 dB	00
Knitting	86-88 dB	31.25
Dyeing	90-95 dB	37.5
Finishing	76-82 dB	28.57
Sewing	77-85 dB	23.53
Generator	96-100 dB	46.67

Table-IX
Departmental prevalence of NIHL in relation to mean duration of employment

Department	Average duration of employment Yrs	% of NIHL
Administration	7.24	00
Knitting	4.88	31.25
Dyeing	9.58	37.5
Finishing	5.14	28.57
Sewing	5.13	23.53
Generator	5.11	46.67

Table-X
The Frequency of NIHL among workers of various age groups was analysed as follows

Age (Years)	NIHL (%)	No NIHL (%)	Total
< 35	14 (20.59)	54 (79.41)	68 (100)
>35	12 (41.38)	17 (58.62)	29 (100)

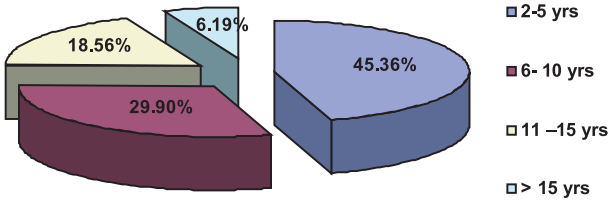
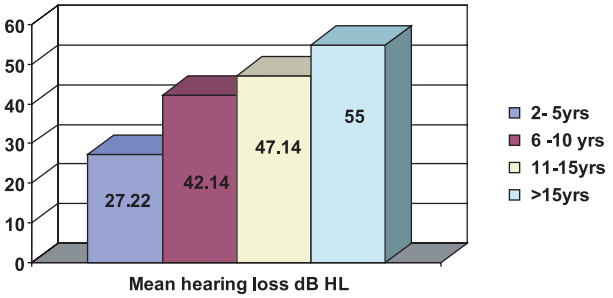


Fig.-1: *Distribution of workers according to duration of employment*



Discussion

This study was carried out in one of the textile industries in Kashim Bazar, Gazipur to explore the problem of hearing loss among its workers.

This study demonstrated that noise is a serious occupational health hazard in the textile factory which was studied. The major risk factors for noise induced hearing loss were the duration of employment and the intensity of noise exposure. This relationship is similar to that observed in previous studies in Thailand and Egypt [9,10]

High intensity sound level has been noted to cause more damaging effects than low intensity sound. People exposed to high levels soon develop a hearing threshold shift, which may be either permanent or temporary depending on the duration of exposure. Textile industry has been noted as one of the industries having very high sound intensity levels[11].

The industries in which we have carried out our study have noise levels ranging from 45 dB to 100 dB. Generator and Dyeing departments have the highest noise levels of 96 dB to 100 dB and 90 dB to 95 dB respectively. Administration unit has the lowest sound levels of 45 dB to 50 dB.

In a similar study done in Eldoret, Kenya[11] Rivatex industry has noise levels ranging from 33 dB to 101 dB. Weaving and Spinning departments have the highest noise levels of 99 dB to 101 dB and 91dB to 97 dB respectively. Administration unit has the lowest sound levels of 33 dB to 40 dB.

However the industry in which we have carried out our study have no weaving and spinning departments, Generator and Dyeing departments have almost same noise levels as in the weaving and spinning departments of the Rivatex industry. Noise intensity levels at Administration unit of our study industry is much higher than the Rivatex industry, Eldoret, Kenya[16].

In a similar study done in Tanzania [11] , Ethiopia [12] both sections also constitute the noisiest department with noise intensity levels of 92dB to 103.8 dB & 91 dB to 92.4 dB; 90dB to 94 dB & 99 dB to 101 dB respectively which is similar to many industrialized countries in Europe and United States [13] as well as in some African Countries, including Zimbabwe [14] and Kenya [15,16]

The noise level of 96 dB to 100 dB in Generator department in our study industry is comparable to 99.5 dB measured in Weaving section in textile mills in Asma[15], 102.5 dB in Hong Kong [16] ,101.3 dB in Thailand [10], 100 dB in Egypt [9,16,] And 99 dB to 102 dB in a jute weaving mill in UK [17]

In this study we found out that 33.46% of workers had a hearing threshold shift characteristic of noise induced hearing loss. This figure is also portrayed in a survey done in the Rivatex industry in Kenya[18] in which reported 32.25% and in a Tanzanian textile industry[11.] Which reported 36.4%, Dire Dawa textile factory in Ethiopia[13](34%) and (30%) of the workers in a textile factory in Jordan[19]had noise induced hearing loss.

From the study we found out that (46.67%) of the workers in Generator department and (37.5%) in Dyeing department had a hearing threshold shift towards hearing loss. These are also the departments with which high mean daily exposure time of (11.33) hrs and (11.33) hrs in Generator and Dyeing departments respectively (Table IX). Sewing department has the highest mean daily overtime of (4.17) hrs as compared to Generator department which has only 3.33 hrs and having (23.53%) workers with hearing impairment. This also shows that long duration of exposure to high intensity of sound predisposes to hearing impairment.

In contrast, Administrative department had none of the workers with a hearing threshold shift towards noise induced hearing loss. Mean daily exposure of (8.00) hrs and a mean daily overtime of (4.17) hrs are high but these alone can not predispose to hearing loss because low sound intensity levels of between 45dB to 50 dB in the areas where they work exposure upto 78 dB is totally safe [20].

U.G Olero et al reported that hearing thresholds for subjects increased with both age and duration of employment[21]. Gunter Rosler[22] reported compilation of 11 investigations by different authors regarding the progression of hearing deterioration during severe long term exposure to noise in all these investigations it was found that the duration of employment was the most decisive cause for pronounced hearing loss increase. In our study Dyeing department has highest duration of employment (9.58) yrs. compared to knitting (4.88) yrs with prevalence of NIHL of 37.5 % and 31.25 % respectively showing a good correlation between duration of employment and hearing loss. This might be explained by the long duration of employment. In our study majority of the subjects, employment duration is less than 10 years. It should be meaningful to compare to days hearing levels with first attending hearing levels but we had no data about the hearing levels of the subjects, before they had attended the factory years ago.

Age has a cumulative effect on hearing loss. Presbyacusis gave an additive effect to noise in causing hearing loss. This is shown by the fact that 41.38% of the above 35yrs had a threshold shift towards hearing loss as compared to 20.59% of the workers below 35yrs. In a similar study done in Rivatex industry, Eldoret, Kenya the facts were 39.6% of the above 35yrs age group and 30.9% of the workers below 35yrs respectively[22].

Noise induced hearing loss progresses rapidly during 8-10 years of exposure after which it slows down and stabilizes[23.] In our study, 75% of the cases were employed in the factory for 2-10 years and 25% of cases were employed for more than 10 years. The mean hearing loss was increasing with the increase in duration of employment reaching 55dB HL in those working for more than 15 years

Conclusion

Though it is difficult to generalize the findings of this study done in only one factory, which may be uniquely different from other textile factories in the country, the study clearly demonstrated that noise is a serious health hazard in the textile industry at Kashim Bazar, Gazipur. We found out that the prevalence of noise induced hearing loss among textile workers in Kashim

Bazar, Gazipur was 33.46%. We also found out that workers are overexposed to noise and there is little protection accorded to the workers. It also shows that high noise intensity levels and exposure for long durations leads to hearing loss.

Based on the study finding, implementation of hearing conservation programme through development and enforcement of regulations to identify and monitor occupational risk groups, restriction of importation of equipment, which emits dangerous levels of noise, are recommended. In addition, engineering modifications of buildings and machinery to reduce noise levels, and promotion of safety and health programmes, including promotion of workers' awareness on self protective measures, such as the use of personal protective device (PPD), should be consider. In Bangladesh, unfortunately, there is still no specific legislative framework to protect workers against industrial hazards.

If the occupational health laws are adhered to, this state of affairs can be reversed. The existing laws must be followed strictly and if needed, they should be amended to give more powers to occupational health officers to take stern action in cases of default. By doing this, it will reduce disability, increase productivity, save money and health resources by minimizing the cost and time spent on treatment; hence prevention is better than cure.

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