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The Prevalence and Risk Factor of Noise-Induced Hearing Loss Among Industry Workers

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Abstract **Original Research Article**

***Background*:** Noise-induced hearing loss (NIHL) has been gradually noticed for its insidious nature as an occupational hazard concomitant with various adverse personal health and industrial hygiene issues, including tinnitus, temporary threshold shift, hypertension, annoyance, elevated occupational accidents by aprosexia, stress, and poorer production performance. ***Objective*:** To assess prevalence and risk factor of noise-induced hearing loss among industry workers. ***Method*:** This cross sectional study was carried out at tertiary hospital from January 2021 to 2022, Dhaka. Where 97 workers exposed to noise and administrative controls were enrolled in study as a sample population. A structured questionnaire was developed by the expert-review method and applied to all the subjects with face-to-face interviews**.** ***Results*:** Out of 97 sample, 26 workers were having noise induced hearing loss (NIHL). Workers younger than 35 had a 20.59 percent NIHL incidence, while those older than 35 had a 41.38 percent NIHL incidence. The generator area of the plant had the loudest machinery (96-100 dB). As much as 46.67 percent of the generating crew had trouble hearing. ***Conclusion*:** We found out that the prevalence of noise induced hearing loss among industry workers. 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.

Keywords: Noise-induced hearing loss (NIHL), noise intensity, industry worker.

INTRODUCTION

Noise-induced hearing loss (NIHL) is a significant occupational health concern, particularly among industry workers exposed to high noise levels. The prevalence of NIHL and its associated risk factors have been the subject of extensive research due to the potential detrimental effects on workers' hearing abilities and overall well-being. Understanding the prevalence and risk factors associated with NIHL is crucial for implementing effective preventive measures and developing targeted interventions to protect the hearing health of industry workers [1-4].

The World Health Organization (WHO) defines NIHL as a sensorineural hearing impairment resulting from exposure to excessive noise levels, either continuous or intermittent, over an extended period. It is estimated that approximately 16% of the worldwide population, or around 1.1 billion individuals, are at risk of developing NIHL due to occupational noise exposure. Among industry workers, the prevalence is even higher, making it a significant occupational health challenge.

Numerous industries, such as manufacturing, construction, mining and transportation, involve high noise levels generated by machinery, equipment, tools and processes. Prolonged exposure to these hazardous noise levels can lead to irreversible damage to the delicate structures of the inner ear, resulting in NIHL. The severity of NIHL varies depending on the intensity and duration of noise exposure, as well as individual susceptibility [5-7].

Several risk factors contribute to the development of NIHL among industry workers. Firstly, the intensity of noise is a critical determinant with higher decibel (dB) levels associated with increased risk. Other

factors include the duration of exposure, the presence of impulsive or intermittent noise, and lack of appropriate hearing protection measures. Additionally, individual susceptibility to NIHL can be influenced by genetic factors, age, underlying health conditions and lifestyle habits such as smoking or alcohol consumption [6-10].

The consequences of NIHL extend beyond the impairment of hearing ability. It can lead to communication difficulties, reduced job performance, decreased quality of life and increased risk of accidents and injuries in the workplace. Moreover, the economic burden associated with NIHL is significant, including healthcare costs, compensation claims and lost productivity.

Given the potential impact of NIHL on the well-being of industry workers, it is imperative to understand its prevalence and identify effective strategies for prevention. This research aims to explore the prevalence rates of NIHL among different industries, assess the risk factors associated with its development and examine the effectiveness of existing preventive measures. By enhancing our understanding of these aspects, we can develop evidence-based interventions to minimize the occurrence of NIHL and safeguard the hearing health of industry workers, promoting safer and healthier work environments [11].

Objective

To assess prevalence and risk factor of noise-induced hearing loss among industry workers.

METHODOLOGY

This cross sectional study was carried out at tertiary hospital from January 2021 to 2022, Dhaka. Where 97 workers exposed to noise and administrative controls were enrolled in study as a sample population. A structured questionnaire was developed by the expert-review method and applied to all the subjects with face-to-face interviews. Its content included demographics (name, national ID number, age, and education level), employment history (length of employment, work arrangement, and tasks), self-report heath concerns (noise disturbance, physical/mental symptoms, other discomforts, and ergonomic problems), drinking/smoking habit and occurrence of occupational accidents or illness. The interviewers were trained with standard processes to unify various responses. Validity and reliability of the questionnaire had been properly verified.

RESULTS

Table-1 shows age status of the patients where it was observed that almost three fourth (71.7%) patients belonged to age <40 years.

Table-1: Age distribution of the patients

Age (in years)	Percentage
<40	71.7
>40	28.3

Figure-1 shows gender distribution of the patients 52% were male.

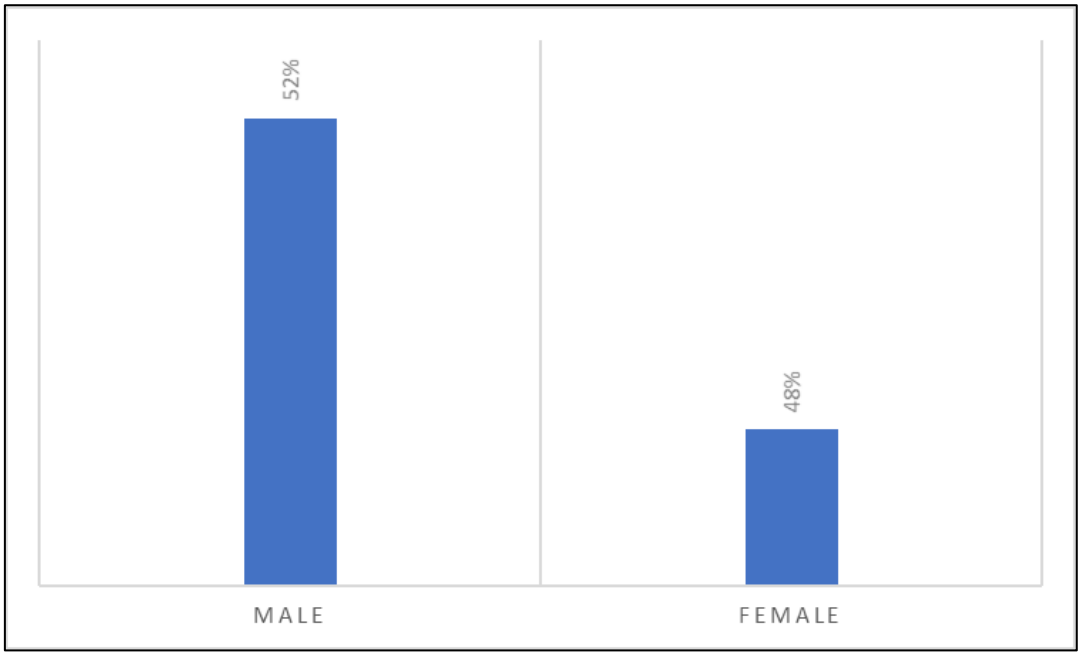

Figure-1: Gender distribution of the patients

Table-2 shows Exposure status per day where all department employees exposed hours per day.

Table-2: 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

Table-3 shows Departmental distribution of overtime working. Where The average overtime worked in a month by subjects in every section was calculated. Among all the department. Administration department did increased hours of overtime.

Table-3: Departmental distribution of overtime working

Department	% Who worked overtime	Mean overtime Hours/Month	Mean overtime Hours/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

Table-4 shows Departmental distribution of average daily exposure to noise. Administration & sewing department got highest mean hours noise exposed, 12.17 hours per day followed by 11.33 hours per day in Knitting & dyeing department.

Table-4: 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

Table-5 shows Distribution of NIHL as exposed to noise where department such as 46.67% who had generator department 96-100dB had undergone high level of noise intensity

Table-5: Distribution of NIHL as exposed to noise

Department	Noise intensity	% NIHL level Ranges
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

Figure-2 shows Mean hearing loss where highest hearing loss was seen in >15 years age group.

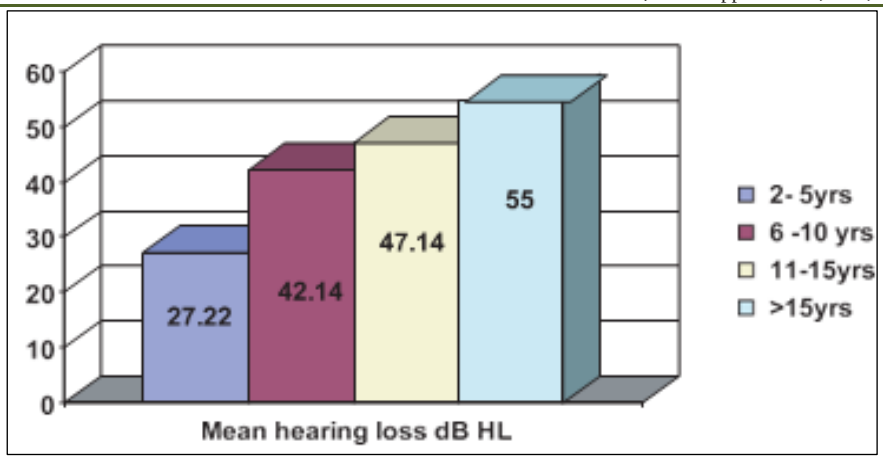

Figure-2: Mean hearing loss dB HL

DISCUSSION

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.

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.

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 Asma15, 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

We found out that the prevalence of noise induced hearing loss among industry workers. 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.

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