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Original Article

Mode, Pattern and Precipitating factors of Acute Poisoning in a Southern District Hospital in Bangladesh.

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Abstract:

Acute poisoning is common in Bangladesh and causes a significant number of hospital admissions. That causes a number of mortality, morbidity as well as increases the economic burden in health care system. But it can be prevented. For that it is necessary to observe and study the poisoning related factors and events around the country. So, the aim of our study is to find out and describe the mode, pattern and precipitating factors of poisoning in a southern district hospital. This cross-sectional observational study was done in the department of Medicine of Pirojpur District Hospital, from January to December 2020. The study was conducted among 100 patients of both genders those were hospitalized with the history of poisoning. In the study young people (40% in 14-25 years and 37% in 26-35 years) were predominantly affected and 61% were female. Suicidal attempt was the commonest (74;74%) mode of poisoning that mostly caused by pesticides. Stupefying mode was observed in case of 15(15%) male travelers as street poisoning. Highest number of poisoning (45;45%) was caused by pesticides. The sedative (14;14%), copper sulphate (11;11%) and harpic (5;5%) poisoning was observed mostly as a suicidal mode. History of savlon (4;4%) and Kerosene (2;2%) poisoning was found as an accidental mode. As a recreational mode two male were admitted with alcohol poisoning. Considering the precipitating factor, maximum cases (54;54%) had the history of unsatisfactory family events. Street poisoning (15;15%) was precipitated by the careless behavior of travelers. Accidental poisoning (9,9%) was invited by unmindful and hurried attitude. Problem related to love and affair was observed in 8(8%) cases. Study and examination result precipitated poisoning in 7(7%) cases. History of job and income dissatisfaction was found in 4(4%) cases. So those factors related with the poisoning should be considered. That will help to make a comprehensive strategy in order to resist these preventable events.

Key words: Poisoning, Suicidal, Pesticides, Street poisoning.

Introduction:

Acute poisoning is a global problem which has steadily increased over the past few years in developing countries. According to the World Health Organization, 99% of the fatal poisoning cases occurred in developing countries[1]. Acute poisoning is a common medical emergency in Bangladesh. It is the seventh commonest cause of in-hospital mortality in Bangladesh[2]. The poisoning agents involved in our country are different because of the social structure, economic status, educational level, awareness of our people and availability of drugs are different from that of the western countries[3]. Common types of poisoning in this country are organophosphate poisoning, poisoning with unknown substances especially in commuter (travel-related) poisoning; poisoning with sedatives, corrosive agents, rodenticides, Kerosene/petrol and alcohol, and snakebite[4,5]. Estimated case load of poisoning in hospitals of Bangladesh was 7.1% of total admissions[5]. However pattern of poisoning and motive behind poisoning might have changed over the years[6].

With this background, the aim was to find out and describe the mode, pattern and precipitating factors of poisoning. These may identity and explain the important factors related to such preventable events. That will help to make the comprehensive strategies for the declining of poisoning burden. So there will be ultimate reduction of mortality, morbidity and economic cost of health care system.

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Materials and Methods:

This cross-sectional observational study was done in the department of Medicine of Pirojpur District Hospital, Pirojpur from January to September 2020. The study was conducted among 100 patients of both genders who were more than 13 years of age. Those patients were admitted in Medicine ward with the history of poisoning. With informed consent, the aim of the study was explained clearly and their detailed history was taken from patient and attendant. Food poisoning, snake bite, drug reaction and who were unwilling to give informed consent were excluded from the study. All the data was collected in a data sheet. That data was analyzed and tabulated systematically.

Results:

In this study among 100 cases 40(40%) were in the age group of 14-25 years then 37(37%) in 26-35 years, 12(12%) in 36-45 years 6(6%) in 46-54 years, 3(3%) in 56-65 years and 2(2%) were above 65 years. Here female gender was predominant (61;61%) with male to female ratio was approximately 2:3 (Table I).

Table I: Distribution of patients according to age and sex (n=100).

Age group (Years)	Number of patients (%)	Male(39)	Female (61)
14-25	40(40%)	12	28
26-35	37(37%)	14	23
36-45	12(12%)	8	4
46-55	6(6%)	2	4
56-65	3(3%)	2	1
>65	2(2%)	1	1

Regarding occupation, highest (40;40%) number was housewife, then 28(28%) were students, 12(12%) were businessmen, 8(8%) were farmer, 4(4%) were service holder, 6(6%) were unemployed (Table II).

Table II: Distribution of patients according to occupation category (n=100).

Occupation	Number of patients (%)	Male (39)	Female (61)
Housewife	40(40%)	0	40
Student	28(28%)	11	17
Business	12(12%)	12	0
Farmer	8(8%)	8	0
Service	4(4%)	3	1
Others	2(2%)	2	0
Unemployed	6(6%)	3	3

Table III Shows distribution of patients according to residence. Maximum number (43;43%) lived in village then 35(35%) lived in thana and 22(22%) lived in district town.

Table III: Distribution of patients according to residence (n=100).

Residence	Number of patients (%)
Village	43(43%)
Thana	35(35%)
District	22(22%)

In this study mode of poisoning was determined by history and clinical examination. Suicidal attempt was the commonest (74;74%) mode of poisoning then 15(15%) had stupefying mode, 9(9%) had accidental event and 2(2%) had recreational mode. (Table IV)

Table IV: Distribution of patients according to mode of poisoning (n=100).

Mode of poisoning	Number of patients (%)
Suicidal	74(74%)
Stupefying	15(15%)
Accidental	9(9%)
Recreational	2(2%)

In this study, highest number (45;45%) were caused by pesticides. History of street poisoning was observed in 15(15%) cases then 14(14%) had sedative poisoning and 11(11%) had coppersulphate poisoning. Harpic, savlon, Kerosene and alcohol poisoning was observed in 5(5%), 4(4%), 2(2%) and 2(2%) respectively. (Table V).

Table V: Distribution of patients according to types of poisoning (n=100).

Types	Number of patients (%)
Pesticides	45(45%)
Street poisoning	15(15%)
Sedative	14(14%)
Copper sulphate	11(11%)
Harpic	5(5%)
Savlon	4(4%)
Kerosine	2(2%)
Alcohol	2(2%)
Others	2(2%)

In our study, we tried to identify the possible precipitating factor of such an attempt of poisoning. The information was obtained from patient and his/her attendant or guardian. According to that, 54(54%) had unsatisfactory family events. During travel, 15(15%) poisoning was occurred due to careless behavior of passengers. Unmindful and hurried attitude invited accidental poisoning in 9(9%) cases. Problem related to love and affair was observed in 8(8%) cases. Study and examination result precipitated in 7(7%) cases. Poisoning was precipitated by dissatisfaction of job and income in 4(4%) cases (Table VI).

Table VI: Distribution of patients according to Precipitating factors of poisoning (n=100).

Precipitating factors	Number of patients (%)
Unsatisfactory family event	54(54%)
Careless behavior during travel	15(15%)
Unmindful and hurried attitude	9(9%)
Love and affair related	8(8%)
Study and examination result related	7(7%)
Job and income dissatisfaction	4(4%)
Unknown	3(3%)

Discussion:

In this observational study, young people were predominanty affected (40% in 14-25 years and 37% in 26-35 years). This was consistent with the study by Dr. Mohammad Abul Bari[7] and Dewan G et al[5]. Almost all the study showed, the incidence was maximum from 2nd to 4th decade. Mild variation of percentage among young was observed by Mohammad Rafiqul Islam et al[8] that showed 38.71% in 21 to 30-years and 33.22% in 11 to 20-years of age group. Female gender was more (61;61%) in our study with male to female ratio was approximately 2:3. This was consistent with the study by SM Hossain et al[9] in Khulna, in which 37% were male and 63% were female. This may be due to the place of two studies were geographically nearer. On the other hand, the study in Dhaka Medical College Hospital (DMCH), by Mohammad Rafiqul Islam et al[8] showed male to female ratio was almost equal (1: 0.9). Again male dominated gender distribution was observed in the study by Howlader MAR et al[6] and Hossain AKMM et al[10]. So gender distribution may be variable in different geographical location.

As because of female predominant study, highest (40;40%) number was housewife. Again, as young predominant (40% in 14-25 years) study students were second highest (28;28%) in number. These findings were consistent with the study by Mohammad Rafiqul Islam et al[8] and G. K. Acherjya et al[11]. Just reverse number of occupational distribution was observed in the study by Shadequl-Islam AHM et al[12] that showed 18.3% were student and 16.7% were housewife. Villagers were affected more (43;43%), as our study was done in a peripheral district hospital. This was consistent with the study by G. K. Acherjya et al[11] and Shadequl-Islam AHM et al[12]. On the other hand the study was done in DMCH by Mohammad Rafiqul Islam et al[8], that showed maximum lived in urban area.

Suicide is a major public health concern in Bangladesh. Self-poisoning is the commonest method employed[5]. Same scenario was observed in our study, in which suicidal attempt was the commonest (74;74%) mode of poisoning. Mohammad Rafiqul Islam et al[8] showed the main mode of poisoning was suicidal (62.25 %,) and that was consistent with our study. Very alarming result was observed in the study by G. K. Acherjya et al[11] in which almost all (97.3%) had the suicidal mode. In our study suicidal attempt was conducted by pesticides (OPC, Carbamates, Rodenticide), sedative, copper sulphate etc. Among all types of poison pesticides were the commonest (45;45%) and all was used as suicidal mode. Pesticides may easy to use for poisoning purpose especially in villages as because those are the most commonly used for agriculture purpose. This is available in farmers home and enough precaution is not followed about its preservation. A study by Shadequl-Islam AHM et al[12] showed in different parts of Bangladesh, pesticides have been responsible for poisoning in great number of patients admitted to hospitals. Smilarly Dewan G et al[5] described pesticide poisoning accounted for 39.1% of total poisoning cases admitted in different levels of hospitals. This was consistent with our study.

In our study, among all sedative poisoning (14;14%) suicidal mode was observed in 12 cases. Commonly, victims collected sedatives from self home which was taken by other member as medication. The study by Mohammad Rafiqul Islam et al[8] was consistent with our study in which sedative poisoning was observed in 16.96% cases. Variable number of sedative poisoning was also described by Howlader MAR et al[6] (8.33%) and Howlader MAR et al[13] (4.98%). A significant number (11;11%) of copper sulphate poisoning was observed in our study as the suicidal mode. Howlader MAR et al[6] showed it in 11.11% cases and this was consistent with our study. But the study by G. K. Acherjya et al[11] showed in 6.2% and Mohammad Rafiqul Islam et al[8] showed in 0.26% cases of copper sulphate poisoning.

The study by Howlader MAR et al[13] showed, street poisoning was highest in number. They also remarked that, trends have been changed in poisoning and transport related poisoning is an emerging social and

public health emergency in Bangladesh. In our study street poisoning as stupefying mode was observed in second highest (15;15%) in number. Recently human mobilization is marked especially due to education and professional purpose as well as improvement of vehicle facilities. That's why travel related occurrences are increasing. Street or travel related poisoning as second height was observed in Rabiul Hossain et al[14] (27%) and Chowdhury FR et al[4] (16.03%). On the other hand Mohammad Rafiqul Islam et al[8] showed the most common poisoning agents were commuter poisoning. As the study was conducted in Dhaka city; human mobilization is significant in there, so it was the commonest. But G. K. Acherjya et al[11] showed travel related poisoning was 1.6% and this was not consistent with recent studies. Food like dub water, soft drinks, tea, coffee, jhal muri and traditional medicine for instant pain relief, cough & asthma relief by hawker physician in the vehicles, are used as media of poisoning for the purpose of pick pocket[13]. In all the study victims were male and precipitated by careless behavior during travel. Food or drinks was offered by unknown near passenger or hawker in vehicles or vehicles stand with a very sympathetic approach. Subsequently the victim was convinced to take food or drink that contains sedatives. Then he turns to deep sleep.

Harpic is the solution of hydrochloric acid[8] that is widely used as toilet cleaner. Now a days poisoning by it is not uncommon. In our study harpic poisoning was in 5% cases and all were in suicidal mode. Others studies showed almost same result, such as in Howlader MAR[6] (5.55%) and in G. K. Acherjya et al[11] (6%).

In our study 9(9%) had accidental mode of poisoning that was precipitated by unmindful and hurried attitude. Almost similar result was observed in Mohammad Rafiqul Islam et al[8] in which accidental mode was 12.38%. But the study by SM Hossain et al[9] showed 0.05% and that is not consistent with our study. Accidental mode of poisoning was occurred by Savlon, Kerosene, Sedatives etc. In our study Savlon (4;4%) and Kerosene (2;2%) poisoning were occurred during heavy thirst, they started to drink with hurried approach and unmindfully. The study by Howlader MAR et al[6] described Savlon poisoning was in 5.55% case and G. K. Acherjya et al[11] showed Kerosene poisoning in 4.1% cases. As recreational mode alcohol poisoning (2;2%) was observed among the male. Mohammad Rafiqul Islam et al[8], in their study Methanol poisoning was in 0.34% cases. So poisoning by alcohol was not significant in number.

Unsatisfactory family events were the main (54;54%) precipitating factor of poisoning in our study. Those factors included quarrel, misunderstanding, lack of sacrificing tendency, adjustment and ego problem, lack of implementation of own decision etc that occurred with husband and others members of the family. Familial disharmony/domestic trouble were predominant precipitating factors observed in the study by G. K. Acherjya et al[11] (56.1%), Howlader MAR et al[13] (57%) and SM Hossain et al[9] (45%). Those were consistent with our study.

Our study showed highest number (40%) was in the age group of 14-25 years and students were 28%; these groups of people are emotional and are involved in love and affair. Considering these 8% poisoning were precipitated by love and affair related events and 7% were precipitated by study and examination result. Love and affair related events included relation breakup, misunderstanding with partner as well as study and examination result described as poor class performance, failure or unsatisfactory result. Howlader MAR et al[13] described in 15% cases and G. K. Acherjya et al[11] described in 13.3% cases were precipitated by failure in affairs. These were consistent with our study. But the study by SM Hossain et al[9] showed a big portion (27%) was precipitated due to failure of love and that was not consistent with our study. Poisoning precipitated by failure of examination was found in 8.2% cases in the study by G. K. Acherjya et al[11] and in 11% in the study by Howlader MAR et al[13]. SM Hossain et al[9] described 7% poisoning was education related. Regarding those precipitating factors, all the study result was nearer in percentage. Poisoning was precipitated by dissatisfaction of job and income in 4(4%) cases that were among the unemployed person, service holders and businessman.

In our study in 3% cases no precipitating factor was identified. There was no history of previous self harm or suicidal attempt, chronic illness or psychiatric illness as a precipitating factor in the study.

Conclusion:

Our study showed that young people were affected more. Commonest mode was suicidal and pesticides were used by highest number of cases. Travel related poisoning were significant in number. Almost all cases had precipitating factor that was related to psychological and behavioral conflict at the personal, family and social level. We need to plan a comprehensive strategy considering the factors related with poisoning events. That will help to prevent the events and its prognosis.

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Original Article

Prevalence of Hearing Loss among Noise Exposed Industrial Workers.

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Abstract:

Exposure to any type of noise has a potential risk. Higher the level of noise and longer duration of exposure, more the risk for hearing sensitivity and health as a whole. Occupational noise induced hearing loss (ONIHL) is a major cause of disability throughout the world. So this study was designed to know the prevalence of NIHL among the noise exposed industrial workers in Bangladesh. A prospective observational study of 377 People working at industrial environment in Jute mills at Faridpur region were studied between January 2021 to June 2021. Data collected from each respondent recorded on a predesigned data collection form. Pure tone audiometry was performed in both ears. Among 377 study population, 157(41.6%) subjects had hearing loss and 220 subjects (58.4%) had no loss. Among the workers with hearing loss, 98(62.4%) got hearing loss on both sides, 32(20.4%) on the right side and 27(17.2%) on the left side. Among them 83(52.9%) had mild hearing loss, 37(23.6%) had moderate hearing loss, 31(19.7%) had severe hearing loss and 6(3.8%) had profound hearing loss. The average duration of work in the industry was 6.94±5.64 years and majority (78.5%) had 8 hours working hour per day and 21.5% had more than 8 hours. The average sound intensity was 91.51±8.12 dB(A) with 10.9% exposed to ≤85 dB(A) and 89.1% to >85 dB(A). This study shows Noise-induced hearing loss (NIHL)as highly prevalent among noise-exposed workers in Bangladesh. Age >35 years, high noise level, exposure of more than 10 years, were significantly associated with increased risk of hearing loss. The local and national authority should focus on noise monitoring, engineering modifications of buildings and machinery, occupational safety policies, administrative controls, providing education on NIHL, periodic audiometric assessments and follow-up evaluation for hearing threshold shift. This study supported the elements for further research studies related to the employer compliance with occupational health and safety regulations to address awareness of their responsibility in minimizing hazards in workplaces.

Key words: Sensorineural hearing loss, Noise exposure, Industrial workers.

Introduction:

Exposure to any type of noise has a potential risk. Higher the level of noise and longer duration of exposure, more the risk for hearing sensitivity and health as a whole. Occupational noise induced hearing loss (ONIHL) is a major cause of disability throughout the world[1-3].

Occupational noise induced hearing loss is a major problem in the workers serving in industries, armed forces, aircrafts, ships, heavy mechanical transports, weaponry and aviation industries where there is continuous exposure to noisy environment[4]. 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 intensity noise being emitted from industrial machines[5]. 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 exposure[6]. 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). Hearing loss can impact one's life in many ways. A ringing in the ear, called tinnitus, commonly occurs after noise exposure, and it often becomes permanent[7]. An increase in pulse rate and blood pressure, or an increase in stomach acid includes some of the negative impact of noise on health. With

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the rapid development of industries and automobiles the noise hazard is increasing by many folds in Bangladesh as well as in the whole world.

According to American Academy of ophthalmology and Otolaryngology excessive noise pollution can lead onto difficulty in communication, while at work and ringing sound in the ear for several hours even after work[8]. Globally, about 16% to 24% of hearing impairments in adults are due to occupational noise. Apart from noise emitted from manufacturing and agriculture industries, lack of awareness among the workers and health professionals contributes to higher prevalence of NIHL in Asia[9]. Same study showed that 43.5% of workers being exposed to noise level exceeding 91dBA for 8 hours a day contributes to higher risk of acquiring hearing loss[6,10]. However, there is limited or no information on the Occupational Noise Induced Hearing Loss in Bangladesh. In this study, we have conducted surveys of different Jute mills in Faridpur region to assess hearing loss in the industrial worker in relation to noise level, duration of exposure, age, sex and type of work in the factory.

Materials and Methods:

Prospective observational study was conducted among 377 people working at industrial environment in Jute mills at Faridpur region. Data collected from each respondent were recorded on a predesigned data collection form. Pure tone audiometry was performed in both ears. Main outcome measures are prevalence rate of hearing loss and relative risk of hearing loss by demographic factors and surrogates for noise exposure.

Results:

Table I : Demographic characteristics of study subject (n=377)

Characteristics	Frequency	Percentage (%)
Age in years		
20	79	21.0
21-30	126	33.4
31-40	85	22.5
41-50	61	16.2
51-60	20	5.3
>60	6	1.6
Mean±SD	31.96±12.38	
Sex		
Male	280	74.3
Female	97	25.7
Education		
No formal education	66	17.5
Primary school	178	47.2
Secondary school	106	28.1
Post secondary	27	7.2

Table I shows maximum (33.4%) were in age group 21-30 years followed by 22.5% were 31-40 years, 21% were 20 years, 16.2% were 51-50 years, 5.3% were 51-60 years and only 1.6% were >60 years. Majority (74.3%) of them were male and 25.7% were female. Education of maximum (47.2%) were primary school level followed by 28.1% were secondary school, 17.5% were no formal education and 7.2% were post secondary.

Table II: Type of work of study subject (n=377)

Type of work	Frequency	Percentage (%)
Production	259	68.7
Mechanical	88	23.3
Office Staff	15	4.0
Security guard	13	3.5
Medical Assistant	2	0.5

Table II shows maximum (68.7%) work in production section followed by 23.3% in mechanical work, 4% were office staff, 3.5% were security guard and 0.5% were medical professional.

Table III: Pre-existing ear discharge study subject (n=377)

Pre-existing ear discharge	Frequency	Percentage (%)
Right ear		
Present	5	1.3
Absent	372	98.7
Left ear		
Present	19	5.0
Absent	358	95.0

Table III shows 19(5%) worker had pre-existing left ear disease and 5(1.3%) had pre-existing disease in right ear.

Table IV: Noise exposure level of study subject (n=377)

Noise exposure level	Frequency	Percentage (%)	Mean±SD
85 dB(A)	41	10.9	91.51±8.12
>85 dB(A)	336	89.1	

Table IV shows 10.9% study population were exposed to ≤85 dB(A) sound and 89.1% were exposed to >85 dB(A). The average sound level was 91.51±8.12 dB(A).

Table V: Duration of work of study subject (n=377)

Duration of work	Frequency	Percentage (%)	Mean±SD
1-5 years	180	47.7	6.94±5.64
6-10 years	123	32.6	
11-15 years	45	11.9	
15-20 years	17	4.5	
>20 years	12	3.2	

Table V shows 47.7% workers have 1-5 years duration of work, 32.6% have 6-10 years, 11.9% have 11-15 years, 4.5% have 15-20 years and 3.2% have>20 years. The average duration of work was 6.94±5.64 years.

Table VI: Per day working hour of study subject (n=377)

Working hour	Frequency	Percentage (%)	Mean±SD
≤8 hours	296	78.5	8.96±2.26
>8 hours	81	21.5	

Table VI shows that majority (78.5%) work 8 hours or less per day and 21.5% work more than 8 hours.

Table VII: Awareness level regarding NIHL study subject (n=377)

Awareness level regarding NIHL	Frequency	Percentage (%)
Yes	117	31.0
No	260	69.0

Table VII shows 31% had awareness about NIHL level and 69% had no awareness.

Table VIII: Prevalence of hearing loss of study subject (n=377)

Hearing loss	Frequency	Percentage (%)
Present	157	41.6
Absent	220	58.4
Affected side of loss	**(n=157)**	
Both ears	98	62.4
Right ear	32	20.4
Left ear	27	17.2

Table VIII shows 41.6% had hearing loss and 58.4% had normal hearing. Among the workers with hearing loss, 62.4% got hearing loss on ears, 20.4% on the right ear and 17.2% on the left ear.

Table IX: Degree of hearing loss of study subject (n=157)

Hearing loss	Frequency	Percentage (%)
Mild (20 - 40 dB)	83	52.9
Moderate (41 – 60 dB)	37	23.6
Severe (61 – 90 dB)	31	19.7
Profound(< 90 dB)	6	3.8

Table IX shows maximum (52.9%) had mild hearing loss, 23.6% had moderate hearing loss, 19.7% had severe hearing loss and 3.8% had profound hearing loss.

Table X shows the factors associated with hearing loss. Age >35 years and exposure of more than 10 years were significantly associated with increased odds of hearing loss. Those who were aged more than 35 years had increased odds of hearing loss (OR = 2.28; 95% CI: 1.7- 2.9) compared to workers aged 35 years or less. Exposure to noise for a period of more than 10 years (OR = 1.9; 95% CI: 1.4-2.8) had increased odds of hearing loss compared to workers who were exposed to noise over a period of 10 years or less.

Table X: Multivariate analysis of the factors associated with hearing loss

Variables	Hearing loss				OR	P value	95% CI	
	Yes		No				Lower	Upper
	no	%	no	%				
Age in years								
35	70	44.6	180	81.8				
>35	87	55.4	40	18.2	2.28	0.001	1.749	2.988
Sex								
Male	123	43.9	157	56.1				
Female	34	35.1	63	64.9	0.86	0.126	0.722	1.033
Noise level								
85	18	43.9	23	56.1				
>85	139	41.4	197	58.6	0.95	0.756	0.719	1.273
Duration of work								
10 years	107	35.3	196	64.7				
>10 years	50	67.6	24	32.4	1.99	0.001	1.421	2.800
Working hours								
8 hours	118	39.9	178	60.1				
>8 hours	39	48.1	42	51.9	0.82	0.180	0.635	1.080
Awareness level								
Yes	50	42.7	67	57.3				
No	107	41.2	153	58.8	0.97	0.773	0.807	1.173

Discussion:

Noise-induced hearing loss (NIHL) is the only type of hearing loss that is completely preventable, but it is remaining as a significant health problem with economic consequences in South East Asia countries[11].

The result of the study showed that the mean age of the workers was 31.96±12.38 years with the range of 12 to 66 years. This finding was consistent with other studies carried out in Myanmar with 32.42 years mean age, Ethiopia with 34.3 years of mean age and in Thailand with 33.8 years of mean age 12-14. The studies conducted in Thailand, Turkey, and India showed that most workers were within 31-40 years[15-17].

All workers in weaving sections operated at an 8-hour work shift in the jute mills. Similarly, a study conducted in Pakistan and Myanmar showed that the duration of work in each shift was 8 hours per day with daily break of 72 minutes[11,18]. It was also consistent with the recommended exposure limit for noise that was recommended by the NIOSH. According to Factories Act 1951, normal working hours in Bangladesh were not to exceed 8 hours a day or 44 or 48 hours (for continuous process) a week which was standardized by the International Labor Organization Law. Most workers had less than 10 years of service duration in the jute mills. This finding was also consistent with similar studies conducted in Turkey and Bangladesh[16,19]. However, the other studies stated that more than 10 years of service duration occurred in a large proportion of workers[14,17].

The workers exposed to more than 85 dB(A) of noise level were within the Jute Mills. The means of noise exposure was 91.51±8.12dB(A) in the jute mills. Similar study carried out in Myanmar found that mean noise exposure was 91.94 dB(A) in the weaving section and 85.61 dB(A) in the spinning section[20]. In addition, other studies showed that mean sound levels of weaving sections were 99.5 dB(A) in Ethiopia, 87.3 dB(A) in India and 95.3 dB(A) in Pakistan[13,17-18]. It could be suggested that weaving sections had the highest noise level, and it might be hazardous to workers[20].

The prevalence, 41.6% of hearing loss in this study, it's found that more than half (50.7%) of the industrial workers are suffering from hearing impairment either due to ONIHL or other types of hearing impairments. Which was higher than 34% found the studies conducted in Ethiopia, 30.86% in Turkey, 38% found in India, 33.46% in Bangladesh, 30% in Jordan, 35% in Canada and 27.9% in Bhutan[13,16,17,19,21-23]. These differences of hearing loss may have resulted from the use of hearing loss prevention programs for all workers whose unprotected 8-hr TWA exposures equal or exceed 85 dB(A) with assessment of noise exposure and audiometric monitoring.

Age-related hearing loss is one of the most common causes of high frequency hearing loss, and its effect began around the age of 40 years[18,24]. In this study, the workers aged 35 years and older were 7 times more likely to have hearing loss than those who were younger than 35 years. This observed association persisted after adjusting the service duration, and it was consistent with a study carried out in Ethiopia[13]. This might be due to a phenomenon of presbycusis which was gradually loss of hearing in older age. Similar studies conducted in India, Canada, and Brazil documented that age was positively associated with hearing loss[17,22,24].

The workers who had less than a high school education level were at greater risk of developing hearing loss than those who had a high school education level and more. This may be due to the fact that the workers who had low education level were unable to follow safety policies, to conscious in warning labels and instructions of machines, and to cooperate in hazard communication programs. Hearing difficulty is also an associated factor of hearing loss. It can be suggested that loud noise can damage the inner ear and impact day-to-day communication at workplaces as a result of difficulty to understand speech among workers.

A similar condition was observed in Great Britain in which high prevalence of severe hearing difficulty among noise-exposed workers was observed[25].

In this study, among the noise exposed workers in Jute Mills, 98 (62.4%) had right sided loss, 32 (20.4%) had both sided loss and 27 (17.2%) had left sided loss. Out of the 157 people, 83 (52.9%) had mild hearing loss, 37 (23.6%) had moderate loss and 31 (19.7%) had severe loss. Therefore, the findings of the study are in well agreement with the findings of the other research works[5,9]. Another study regarding flour mill workers done by Mgbe et al. they found twenty six (44.33%) had right sided loss, sixteen (26.66%) had left sided loss, and nine had bilateral loss[26]. Out of the thirty two people, 26 (50.98%) had mild loss and 6 (11.76%) had moderate loss.

Exposure to extremely loud noise for one time or exposure to loud noise for an extended period can cause hearing loss. Long periods of continuous noise exposure induce progressive and irreversible hearing loss in both ears[27]. The rate of hearing loss was particularly higher among workers with long duration of work experience in the industries. In this study, the workers with more than 10 years of service in the Jute Mills were 6 times more likely to have hearing loss than those with 10 years and less service duration. This finding was consistent with other studies conducted in Myanmar, Ethiopia, Thailand, Bangladesh, and Jordan where long duration of employment predisposed to hearing loss among workers[12,13,15,19,21].

The NIHL restricted the 85 dB(A) and more noise exposure level to protect hearing loss. It was expected that the workers who were exposed to 85 dB(A) and more noise exposure levels were at greater risk of developing hearing loss than those were who exposed to less than 85 dB(A). The studies conducted in Jordan, Ethiopia and Thailand stated that noise exposure level was associated with a significantly higher prevalence of hearing loss[11,13,15]. However, there was no significant association between noise exposure level and hearing loss in this study.

This study showed that exposure to noise for 10 years or more is associated with increased risk of hearing loss. A study in Denmark showed that the risk of hearing loss was tripled by exposure to noise for more than 20 years[24]. The objective risk of hearing damage was significantly higher for construction workers compared with controls (OR = 1.6, 95% CI = 1.3-2.1) and increased with the duration of time employment, although the confounding effect of other factors such as age and smoking was not ruled out[25]. Previously reported Alamaayeha et al. showed that exposure to noise for period of 10 years or more is associated with increased risk of hearing loss[28].

Results of this study might be generalized to elsewhere in which the workers are employed in same occupational settings. However, if the implementation of occupational safety and health regulations were different (even in other occupational settings located in different regions/ states), the study results might vary, particularly among those with diversity of demographic factors, risk behaviors, health problems, and consciousness on NIHL.

Conclusion:

This study shows noise-induced hearing loss (NIHL)was highly prevalent among noise-exposed workers in Bangladesh. Age >35 years, high noise level, exposure of more than 10 years, were significantly associated with increased risk of hearing loss. In addition, the local & national authority should focus on noise monitoring, engineering modifications of buildings and machinery, occupational safety policies, administrative controls, providing education on NIHL, periodic audiometric assessments and follow-up evaluation for hearing threshold shift. This study supported the elements for further research studies related to the employer compliance with occupational health and safety regulations to address awareness of their responsibility in minimizing hazards in workplaces.

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