

## The Hearing Level among the Workers of Cement Industry

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### ABSTRACT

**Objective:** In this study our main goal is to evaluate the hearing level among the workers of cement industry.

**Methodology:** This Cross-sectional observational study was conducted at Department of Physiology, Chittagong Medical College, Chittagong and Heidelbargh Cement Bangladesh Ltd. East Halishar, Chittagong, One year (January 2011 to December 2011). Where total number of 800 (Eight hundred) subjects were included. During the study, all subjects were selected purposively on the basis of noise exposure study procedure. After selection and proper counseling, the aim, objective and procedure of the study was explained in details to all subjects, in the cement industry.

**Results:** During the study highest frequency of hearing loss was found in 30-40 years age group. Most of the patients worked in production area for 5-10 years. most of the patients exposed to 70-80dB, 41.4%.51.6% patients exposed >8 hours daily and 65.5% patients exposed 42-48 hours weekly.

**Conclusion:** From our study we can conclude that the study clearly demonstrated that noise is a serious health hazard in

the cement industry. Hearing threshold for the subjects exposed to noise increase with the progress of age and duration of employment. Further study is needed for better outcome.

**Keywords:** Hearing Level, Noise Induced Hearing Loss (NIHL).


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### INTRODUCTION

Noise is one of the physical environmental factors affecting human health. Exposure to excessive noise is the major avoidable cause of permanent hearing impairment. Noise induced hearing loss (NIHL) is the second cause of hearing loss comparing to age – related hearing loss. NIHL is an important public health priority due to spreading industrialization. Exposure to continuous and extensive noise at a level higher than 85dB may lead to hearing loss. In early stages of hearing loss, due to noise exposure symptoms usually are difficulties in conversation, difficulty in enjoying TV/Radio at low volume and tinnitus.<sup>1,2</sup>

According to WHO, over 5% of the world population has disabling hearing loss that jeopardizes their daily lives. WHO reports that noise causes 4 million dollars health damage everyday WHO in 2002 reported a prevalence of 7.9% hearing impairment in Bangladeshi people.

Audiometry is a standard test to detect and evaluate hearing loss. It is used to determine the auditory threshold of an individual to pure tones of 250-8000Hz and sound levels between 10 to 110dB. The first effect of exposure to excess noise is increase in hearing threshold (threshold shift) by audiometric assessment. A change

in hearing threshold of average 10dB or more at 2000, 3000 and 4000Hz in either ear (poorer hearing) by audiometry is defined as threshold shift.<sup>3-5</sup>

In this study our main goal is to evaluate the hearing level among the workers of cement industry.

### OBJECTIVES

#### General Objective

- To assess the hearing level among the workers of cement industry.

#### Specific Objectives

- Sound level in NIHL
- To identify association of the case of NIHL with age.

### METHODOLOGY

**Type of Study:** This was a Cross sectional observational study

**Place and Period of Study:** This study was conducted at Department of Physiology, Chittagong Medical College, Chittagong and Heidelbargh Cement Bangladesh Ltd. East Halishar, Chittagong, from One year (Jan 2011 to Dec 2011).

**Study Population:** Workers in cement industry (both gender) age ranged from 18 to 55 year who are working for more than 2 years (two years of work place noise /www.hear-it.org) were selected as case, while the age and sex matched healthy medical staffs were selected as control.

**Sampling Technique:** Purposive sampling

**Sample Size:** A total number of 800 (Eight hundred) subjects were included.

In one study the prevalence of NIHL was approximately 33% (E.Atameca et al) determine the sample size, the following formula has been used:

$$n = Z^2pq/e^2$$

Where,

n=The desired sample size.

z = The standard normal deviate set at 196 which corresponds to the 95% confidence level.

p = the proportion of the target population (Anticipated population proportion) estimated to have particular characteristics, here, P = 0.33, ie: 33%

e = Degree of accuracy desired (absolute precision), set at 0.033, ie. 3.3% (10% of p)

$$q = 1-p$$

So, the desired sample size will be:

$$n = 779 = 800 \text{ (approximately).}$$

**Grouping of Subjects**

Group A (case/ Study group): Consists of 600 workers of cement industry.

Group B (Control): Consists of 200 subjects, age and sex matched medical staffs.

**Inclusion Criteria: For both group**

- 1) Age: Over 18 years to 55 years
- 2) Duration: of service: More than two years.
- 3) No past history of viral disease, drug therapy or any aural pathology which may cause sensory neural hearing loss.
- 4) Otoscopy: Apparently normal looking tympanic membrane.

**Sampling Method**

All subjects were selected purposively on the basis of noise exposure study procedure. After selection and proper counseling, the aim, objective and procedure of the study was explained in details to all subjects, in the cement industry. Age and sex matched, not exposed to noise staffs in Chittagong medical college hospital and clinics in Chittagong city were selected as control. The subjects were allowed to withdraw themselves if they like. A informed written consent was taken from all subjects included in the study and detailed personal information, medical and family history were recorded in a preformed questionnaire (Appendix -1) Height in cm and weight in kg were measured by scale (Biospace BSM370), pulse, blood pressure were recorded by aneroid sphygmomanometer. Anemia, jaundice, oedema, dehydration were observed in all subjects.

**Data Analysis**

Data were expressed in number and frequency. For statistical analysis chi-square test was used. P< 0.05 was accepted as level of significance.

**RESULTS**

In figure-1 shows distribution of NIHL in different age groups of study subjects (n = 600) where highest frequency of hearing loss was found in 30-40 years age group.

In table-1 shows distribution of NIHL in section of workers and employment duration in study groups (n = 600) where most of the patients worked in production area for 5-10 years.

In figure-2 shows distribution of NIHL according to exposure to sound level, where most of the patients exposed to 70-80dB, 41.4%.

In table-2 shows distribution of NIHL according to daily and weekly exposure in group A (n = 600) where 51.6% patients exposed >8 hours daily and 65.5% patients exposed 42-48 hours weekly. The following table is given below in detail:

Table-3 shows the association of the case of NIHL with age. In this study the number of NIHL is 312 & normal hearing status is 488. The mean age for NIHL is 38.64 years in the age range of 21-55 years. In normal hearing status the mean age is 37.14 years in the age range of 21-55 years. Highly significant association (p<0.001) was found among the study groups in their age. In control group the association was not significant.

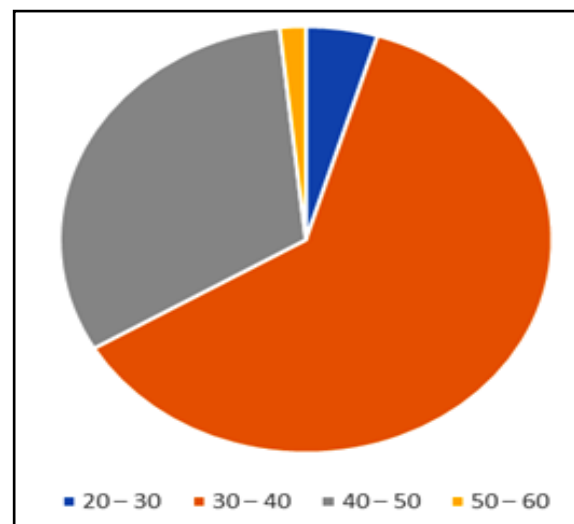


Fig 1: Distribution of NIHL in different age groups of study subjects.

Table 1: Distribution of NIHL in section of workers and employment duration in study groups (n = 600).

Section of Working	%
<b>Production</b>	55.7
<b>Mechanical</b>	23.0
<b>Human Resources &amp; Administration</b>	1.6
<b>Duration of employment</b>	%
<b>Less than 5 years</b>	29.6
<b>5-10 years</b>	40.8
<b>10-20 years</b>	27.3
<b>More than 20 years</b>	2.3

Table 2: Distribution of NIHL according to daily and weekly exposure in group A (n = 600)

Daily exposure	N	%
8 Hours	147	48.4
> 8 Hours	157	51.6
Weekly exposure	N	%
40 Hours	00	00
42-48 Hours	199	65.5
> 48 Hours	105	34.5



Fig 2: Distribution of NIHL according to exposure to sound level

Table 3: Statistics of age among the study groups and according to the diagnoses (with independent samples t - test significance)

Study Groups		N	Mean	± SD	Median	Range	Sign.
Age (Years)	Case	600	37.57	4.89	37.50	21 – 55	t = 1.281
	Control	200	38.21	6.58	37.00	21 – 55	P = 0.201
	TOTAL	800	37.73	5.37	37.00	21 – 55	Not Significant
Diagnoses		N	Mean	± SD	Median	Range	Sign.
Age (Years)	NIHL	312	38.64	5.41	39.00	21 – 55	t = 3.891
	Normal	488	37.14	5.26	37.00	21 – 55	P = 0.000
	TOTAL	800	37.73	5.37	37.00	21 – 55	Highly Significant
Diagnoses		N	Mean	± SD	Median	Range	Sign.
Age (Years)	NIHL	304	38.73	5.23	39.00	26 – 55	t = 6.110
	Normal	296	36.37	4.21	36.00	21 – 50	P = 0.000
	Cases	600	37.57	4.89	37.50	21 – 55	Highly Significant
Diagnoses		N	Mean	± SD	Median	Range	Sign.
Age (Years)	NIHL	08	35.25	10.11	33.50	21 – 52	t = 1.304
	Normal	192	38.34	6.40	37.00	21 – 55	P = 0.194
	Control	200	38.21	6.58	37.00	21 – 55	Not Significant

**DISCUSSION**

The cement industry in which we conducted our study has different sound levels in its different section. Due to different sound level in different section of the industry, the cases have different presentation. In the sound level of 50-70 dB, the cases have normal hearing status in the section of HR & Admin, plant, environment, quality control and laboratory. The section of production, processing, crusher unit and cement mill have the sound level above 90 dB. In mechanical section sound level is above 85 dB. The workers in the cement industry are exposed to

sound level above 85 dB in these respective sections. They work for 8 hrs a day/12 hrs a day (with overtime) and prone to develop NIHL. A total of 304 (50.7%) cases have NIHL. Of them, mild NIHL is 128 (42.41%) and moderate NIHL 176 (57.9%). NIHL develops due to exposure to excessive noise (>85 dB) and duration of exposure. Here the workers have NIHL according to their duration of employment (More than 5 years) and exposure to noise (more than 85 dB for more than 8 hours per day). One study reported that moderate noise induced hearing loss (NIHL) was 26.31% to the subjects exposed to noise level of 87 to 98 dB for more than 8

hours per day in their study with employment duration of 5 years.<sup>6,7</sup> So, the findings of our study are similar to the findings of their study.

The duration of employment for the cases was in between 2 to 20 years. Among them, the number of NIHL below 5 years 90 (29.6%), 5 to 10 years 124 (40.8%), 10-20 years 83 (27.3%) and more than 20 years 7 (2.3%) was found. In case of normal hearing status the duration of employment below 5 years 90 (30.4%), 5-10 years 183 (61.8%) and 10-20 years 23 (7.8%) was found. So, the number of NIHL incases with duration of employment 10 years onwards. Here the cases of NIHL have mean duration of employment (years) 8.68 and for normal cases 6.30. The independent sample t- test is highly significant ( $p < 0.001$ ).

This study demonstrates that noise is a serious occupational health hazard in the cement industries. The major risk factors for noise induced hearing loss were the duration of employment and the intensity of noise exposure. Here the cases of NIHL are 304 (50.7%) who have noise exposure to  $>85$  dB sound for more than 8 hours per day. Here  $X^2$  test is highly significant ( $P < 0.001$ ). In Nigeria, it was found that employment (more than 5 years) and intensity of sound level (more than 80 dB) are responsible for predisposition to NIHL. The cases have a daily exposure for more than 8 hours and a weekly exposure of  $\geq 48$  hours. The cases of normal hearing status have daily exposure for 8 hours per day. Here t test is highly significant ( $p < 0.001$ ). A similar study done in USA found that hearing loss is present among the industrial workers having duration of employment for more than 5 years and with noise exposure to 85 dB for more than 8 hours per day.<sup>6,8</sup>

#### LIMITATIONS

- Our sample size is small. This study with a large sample size would be more accurate.
- Since the data collection was restricted to a period of around six months, the program did not achieve 100% converge over the workers for performing evaluations on all workers with potential exposure to noise in the working environment.

#### CONCLUSION

From our study we can conclude that noise is a serious health hazard in the cement industry. Hearing threshold for the subjects exposed to noise increase with the progress of age and duration of employment. Further study is needed for better outcome.

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