

# NOISE INDUCED HEARING LOSS AND PSYCHOMOTOR CHANGES DUE TO HIGH INTENSITY SOUND IN INDUSTRIAL WORKERS

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## ABSTRACT

**Objectives:** To determine Noise induced hearing loss in industrial workers in a ceramic industry with comparison to office workers working in a quiet environment.

**Material and Methods:** A comparative cross sectional study was conducted in industrial workers with comparison to office workers. Sixty workers of a ceramic industry were compared with same number of office workers. Variables like Noise Induced Hearing Loss (NIHL), blood pressure, pulse rate and sleep were compared using chi square test. The study was conducted from February 2014 to September 2014.

**Results:** Out of 60 industrial workers and 60 office workers, 43% industrial workers and 20% office workers showed significant NIHL. Blood pressure and pulse rate were significantly high among industrial workers. Sleeping hours were reduced in industrial workers. NIHL was reduced among those workers using ear plugs.

**Conclusion:** Hearing loss is the major public health problem in industrial workers all over the world. Proper protective measures can prevent occupational hazards in industrial workers.

**Key Words:** NIHL, Noise, psychomotor, hearing loss, industry.

## INTRODUCTION

Hearing loss exists when there is diminished sensitivity to the sounds normally heard. The severity of a hearing loss is categorized according to the increase in volume above the usual level necessary before the listener can detect it<sup>1</sup>. It is probably caused by either aging or noise pollution<sup>2</sup>. Noise pollution is responsible for more than half of the cases of hearing loss, causing some degree of problems in 5% of the population globally<sup>3</sup>. According to WHO Report more than 16% of the world population is suffering from industrial induced NIHL<sup>4</sup>. Occupational noise degenerates hair cells and nerve fibers which causes sensorineural hearing loss (SNHL) in industrial workers exposed to high frequency noise for prolonged periods<sup>5</sup>. Noise is one of the common physical environmental hazards in the workplace<sup>6</sup>. Levels of noise higher than 85 dB for 8 daily hours for a long period are enough to cause cochlear damage<sup>7</sup>.

Noise health effects are the health consequences of elevated sound levels. High intensity sounds can cause hearing impairment, hypertension, ischemic heart disease, annoyance, and sleep disturbance. Noise can cause changes in the immune system and birth defects<sup>8</sup>.

Noise has been associated with important cardiovascular health problems<sup>9</sup>. In 1999, the World Health Organization concluded that the available evidence suggested a weak correlation between long-term noise exposure above 67-70 dB and hypertension<sup>10</sup>. More recent studies have suggested that noise levels of 50 dB at night may also increase the risk of myocardial infarction by chronically elevating cortisol production<sup>9</sup>.

Proper conservative programs require division of management in categories of senior management, the ability of middle management for hearing conservation measures and specialist technical knowledge of noise and legislation<sup>10</sup>. When engineering or administrative controls cannot be used to reduce noise, workers should always use hearing protection devices (HPDs) when exposed to loud noise to prevent noise-induced hearing loss (NIHL)<sup>11</sup>.

## MATERIAL AND METHODS

The study conducted was a cross sectional comparative study. Subjects were selected from industrial workers of a ceramic industry located in Hayatabad

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Industrial State, Peshawar. For comparison, controls were selected from staff and students of Khyber Medical College, Peshawar. Sixty workers in industry and same number of workers were selected from office workers. All those subjects fulfilling inclusion criteria were selected through random sampling. Male workers with age limit of 18-45 years with minimum exposure of one year for six hours a day were included in the study. Those who were unwilling to be examined were excluded. Those subjects with congenital defects, diagnosed cases of hearing loss, ototoxic drug consumers and those previously treated for ear diseases were also excluded from the study. Variables studied in the study are Hearing ability, sleep duration, blood pressure, pulse rate and use of ear muffler. Printed questionnaire was used for data collection. Audiometer of Merck Company was used for audiometry operated by a trained technician. Data was analyzed using SPSS version 16. For comparison of data, chi2 test was used.

## RESULTS

The critical value for NIHL in office and industrial workers, the chi-square corresponds to 3.84. Since the value of our test is greater than 3.84. Using ear covers the value corresponds to 5.99 however value of our test is 0.951 which is lesser than 5.99. The critical value of noise and blood pressure in chi-square test corresponds 3.84, while our result is 16.88 which is greater than 3.84. The critical value of noise on pulse is 5.99 and our value is 12.67 which is far greater than 5.99. The critical value of noise on sleep is 5.99 where as our result is 12.67. The null hypothesis in above results are negative, so we adopted alternate hypothesis. The critical value for year of exposure to noise corresponds to 3.84, since the value of chi-square is 5.88 which far greater than 3.84 so we accepted the null hypothesis that is the duration of sleep is reduce in industrial workers due to exposure to noise.

### NIHL with respect to years of exposure to industrial noise

The critical value for the above two values in Chi-square chart corresponds to 5.99 since the value of our  $\chi^2$  is 0.951 which is lesser than 5.99, therefore we accept null hypothesis. i.e. there is no difference in frequency of NIHL in industrial workers with respect to years of exposure.

The critical value for the above two values in Chi-square chart corresponds to 3.84. Since the value of our  $\chi^2$  is 16.88 which is far greater than 3.84, therefore we reject the null hypothesis and adopt alternate hypothesis i.e. frequency of NIHL in industrial workers using ear covers is significantly lesser than NIHL in industrial workers not using ear covers. The critical value for the above two values in Chi-square chart corresponds to 5.99. Since the value of our  $\chi^2$  is 12.67 which is far great-

er than 5.99, therefore we reject the null hypothesis and adopt alternate hypothesis i.e. industrial workers who are exposed to noise have abnormal blood pressure values.

The critical value for the above two values in Chi-square chart corresponds to 5.99. Since the value of our  $\chi^2$  is 12.67 which is far greater than 5.99, therefore we reject the null hypothesis and adopt alternate hypothesis i.e. industrial workers who are exposed to noise have high pulse rate. The critical value for the above two values in Chi-square chart corresponds to 3.84. Since the value of our  $\chi^2$  is 5.88 which is far greater than 3.84, therefore we reject the null hypothesis and adopt alternate hypothesis i.e. duration of sleep is reduced in industrial workers due to exposure to noise.

## DISCUSSION

Noise means intensity of sound more than 85 dB. Chi square test was used for comparison of effects of high intensity sound in industrial and office workers. The analyses of effects of noise on 60 office workers shows that 20% of them have NIHL, while out of same number of industrial workers show 43% NIHL. It shows positive relationship of NIHL with high intensity sound. It is the reflection of a national and international study which shows the same results of NIHL in textile industry where the intensity of sound is very high<sup>12</sup>. In our study there was no correlation between NIHL and years of exposure which indicate that more than six months exposure is sufficient to induce NIHL. After six months a linear correlation is not observed.

High intensity sounds have psychomotor effects. These workers have high levels of cortisol which raises their pulse rate and blood pressure. In our study the pulse rate is very high compared to workers in quit environment. Blood pressure values are also high in industrial workers as compared to office workers. Traffic policemen who are exposed to high intensity traffic noise show comparatively high values of pulse and blood pressure<sup>13</sup>. Sleep is also reduced in industrial workers who are exposed to high intensity sounds.

Protective occupational measures can reduce health hazards in workers. In our study frequency of NIHL is lower in those who use ear plugs than those who do not use sound mufflers. In industries especially the textile industry workers are exposed to very high intensity sounds, merely good engineered measures to design infrastructure cannot be effective in prevention of hearing loss. The only way to prevent hearing loss and psychomotor effects is the use of ear covers. In an international study shows that use of ear covers by industrial workers sharply declined NIHL<sup>14</sup>. In the ceramic industry at Hayatabad, most of the workers do not use hearing protection devices (HPD) which is also

an observation in a study conducted at Karachi<sup>15</sup>. NIHL is irreversible but preventable. So regular physical and medical examination is required as is highlighted in a research paper published by armed forces<sup>16</sup>.

## CONCLUSION

Hearing loss is the major public health problem in industrial workers all over the world. Prolonged exposure to high intensity sound also increases blood pressure and reduces sleeping hours. Proper protective measures can prevent occupational hazards in industrial workers.

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### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

- Khan HM:** Idea, results and literature review.  
**Naeem M:** Material and methods.  
**Ullah N:** Discussion.  
**Rehman FU:** Data collection.  
**Asad M:** Data collection.  
**Rajab N:** Data collection.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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