Original Research Paper

Volume-8 | Issue-5 | May-2018 | PRINT ISSN No 2249-555X

Physiology

EFFECT OF IMPACT NOISE ON AUDITORY ACUITY IN FORGING INDUSTRIAL WORKERS

Dr Wankhede SG Professor, Department of physiology, MGM College, Aurangabad. Maharashtra India.

Dr Irani FB* Assistant Professor, Department of physiology, MGM College, Aurangabad. Maharashtra India. *Corresponding author

ABSTRACT

Introduction: Noise is unwanted sound at wrong time and wrong place. Such noise is found to cause some kind of physical, physiological and psychological harm or stress to body. Excessive noise can result in decrease in productivity, increase in accidents and loss of hearing.

Method: A total of 30 workers in study group engaged in forging industries with exposure to impact noise in age group of 28 to 45 yrs and 24 persons not exposed to any impact noise in age group 25 to 45 yrs who have satisfied inclusion and exclusion criteria and have consented to participate in study were enrolled. Each enrolled subjects detailed history and year of exposure to noise and use of protective measures was obtained. They were evaluated by Tuning fork tests and pure tone Audiometry.

Result: There was significant effect on hearing, with sensori-neural deafness at 90dB in study group who are exposed to impact noise for more than five years in forging industries.

Conclusion: It is always advantageous, economical and effective to identify the noise sources and noise problems and incorporate noise control measures rather than attending problems at later stage.

KEYWORDS : Audiometry, impact noise, forging industry, sensorineural hearing loss

INTRODUCTION

Noise is unwanted sound. It is regarded as an important pollutant of the environment. The noise pollution results in speech communication interference, loss of productivity, hearing impairment and other physiological and psychological effects for the personnel working in various industries. A person exposed to high level noise goes deaf more quickly than one who is exposed to a relatively noise free environment during his day to day activities. This effect depends upon the sound pressure, frequency and time of exposure. In developing countries like India beside the economical growth and technological changes, the companies are striving for increasing the sales turnover, thus the workers are more stressed for the productivity along with the additional burden of noise exposure[1]. Forging industries of developing countries are lagging far behind in implementing hearing conservation, noise control programmes and occupational health and safety programmes. Workers of hand tool forging units are exposed to the noise levels beyond the permissible limits. Most of operations at different locations generates high noise > 90dB (A) (beyond the permissible limits). The impact produced by a hammer falling on a plate can generated an impulse whose peak level and duration can be varied 140-470 ms[2]. Continuous noise is a noise whose maxima occur more often than once per second. Impulsive noise is assumed to have peaks occurring less often than once a second, and is limited to peak sound pressure levels of 140dB[3]. Indian factory act -1948 lay down a limit of 90dB (A) for 8h/day but the Indian working hours are 48 /wk which leads to high noise exposure [4].

Pure tone Audiometry is a simple, non-invasive test and can detect type and degree of hearing loss. Pure tone Audiometry involves the estimation of the threshold of hearing for certain standardized stimuli via air and bone conduction routes[5]. Most of the studies have been carried out in developed countries. Most of the workers in India are illiterate and not aware of hazardous effect of noise on health. Few studies are done in India showing effect of impact noise on auditory acuity, the present study is undertaken to determine the incidence of impact noise on auditory acuity.

MATERIAL AND METHOD

Study Design: 30 workers in the age group 28-45 years engaged in forging industries with noise exposure (impact noise) for more than five years were selected and labeled as 'STUDY GROUP'. For comparing and evaluating the effect of impact noise exposure in workers a 'CONTROL GROUP' is selected, which included 24 persons with age 25-45 years not exposed to any impact noise. The various forging industries from which the workers were selected were from Chikalthana and Waluj area in Aurangabad where hammer is used having capacity of >2 tones, which produces impact noise.

Method: The detailed history of workers was taken. The number of years of exposure to noise. Whether any protective measures were used or not? A detailed personal history of Study group and Control group was obtained to rule out any history of ear surgeries, recent infection in ear, nose or throat.

Tests for Hearing: the tuning fork tests- Weber test, Rinne test and Absolute bone conduction tests were done for both the ears of all subjects.

Pure Tone Audiometery (PTA) - is the most routine audiometric evaluation. It is based on the measurement of hearing thresholds for a range of pure tones presented through earphones according to the ascending method (Hughson – Westlake, up 5, down 10 method) Audiological examination was performed using a Pure Tone Audiometer model(EDA Giga 3 of ELKON). The audiometer [ELKON EDA Giga 3] is an electronic device that produces pure tones, the intensity of which can be increased or decreased in 5-dB steps. It was performed in a sound proof room in the ENT department, MGM'S Medical College and Hospital. The patient was described what will happen during the test and the purpose of the test. Ear phones were used to test hearing by air conduction and a small vibrator placed over the mastoid was used to test hearing by bone conduction. All audiometers incorporate a calibration circuit, which allows the output sound level to be set at each frequency. The signals presented to the subject by an audiometer were characterized by its frequency, sound pressure level and wave form which were all controlled. Biological calibration was done every day before starting the test. Both air and bone conduction were tested for each ear. Air conduction thresholds were measured for tones of 250, 500, 1000, 2000, 4000 6000 and 8000 Hertz. Bone conduction thresholds were measured for 250, 500, 1000, 2000, 4000 Hz.

Statistical analysis: The hearing loss was evaluated on the basis of the values of PTA obtained for right and left side. PTA values exceeding 25 indicated hearing loss. On the basis of PTA > 25, the comparisons within and among various groups were evaluated by students t test. 'p'value > 0.05 was considered non significant, 'p'value < 0.05 was considered significant, 'p'value < 0.01 was considered highly significant.

RESULTS AND DISCUSSION

54 subjects (study group, workers exposed to impact noise n-30)and (control group, not exposed to impact noise n-24) were selected.

Table 1: Comparison of number of persons with the age in groups

Groups	No. of persons examined	Age (range)
Study Group	30	28 to 45
Control Group	24	25 to 45

Table 2: comparison between study and controlled groups hearing loss

Groups	Mean ± SD (Right ear)	t value	P value	Groups	Mean ± SD (Left ear)	t value	P value
Control Group	15.25±2.16	4.805	0.0001	Control Group	13.25±3.11	4.7673	0.0001
Study Group	38.5±21.5			Study Group	38±23		

Table – 2 showed highly significant increase in PTA levels in both ears in Study group when compared with control group.

Table 3 : Tests to differentiate between conductive and sensori-neural deafness

Sr, no	Test / parameter	Conductive	sensori –neural type
1	Rinnie's test	BC > AC	AC > BC
2	Weber test	Lateralized to worse ear	Lateralized to the better ear
3	Audiometry	BC > AC	AC similar to BC
4	Hearing loss	Not more than 60 dB	May be more than 60 dB
5	speech	Speaks in low volume	Speak loudly
6	Speech communication	Good	Poor

BC = bone conduction AC = air conduction

Table -3 shows the various tests which are perform to differentiate between the conductive and sensori-neural deafness.

Table 4: showing study group, cases studied and showing the type of deafness

Group	Total no. cases studied	Conductive deafness	Sensori-neural deafness
Study	30	2	21
Control	24	3	Nil

Table -4 showing the results of impact sound exposure of more than 5 years on the hearing i.e. Acoustic trauma. This table shows out of 30 cases studied for impact noise 21 cases show the sensori-neural type of deafness. It comes to 70% of the total cases studied. Where as in control group out of 24 cases studied not single cases suffered from sensori-neural type of deafness. Only 2 cases in study group shows conductive deafness and 3 cases in control group out of 24 cases.

Disscussion:

In present study, the effect of exposure to impact noise of 2 tonnes and 8 tonnes hammer is studied. Because of excessive sound stimulation acoustic trauma can be there. The normal ear responds to excessive or prolonged noise stimulation by producing a temporary threshold shifts (TTS). This is essentially a physiological phenomenon and after period of time the hearing threshold returns to a normal level. Beyond a certain point however, a permanent threshold shift (PTS) occurs[6]. When this happen the lesion is essentially one of the losses of hair cells in the Organ of Corti, the deafness accordingly is sensori-neural type. In this study more exposure for impact noise, more chances of sensori-neural deafness. The acoustic trauma is as a result of excessive, sound stimulation[7,8]. It may occur from either a sudden exposure e.g. blast or from prolonged exposure to loud noise as occur in certain occupations.

Conclusion: this study show that long term exposure to impact noise shows the effect on hearing function in forging industrial workers. The value of 90 decibels is obtained for sensori-neural deafness. And exposure to impact noise, the sensori-neural deafness is developed in forging industrial workers.

As there is no specific treatment once the sensori-neural deafness is there, it is better to avoid further exposure to noise. 1) There should be social motivation, 2) Identify the noise sources and noise problems right in the design and erection stages and incorporate noise control measures, 3) Application of mufflers to machines, 4) Workers are advice to wear ear plugs, 5) suitable legislation to prevent noise pollution and to award compensation for noise trauma. 6) Health education to workers, about the effects of noise on health and related preventive measures.7) hearing protection for all workers exposed to noise louder than 85dB. 8) Workers must be regularly rotated from noisy areas to comparatively quiet post in factories.

References:

1. Lakhwinder P.S, Bhardwaj A, K.K. Deepak, Bedi Raman. 'Occupational Noise Exposure in Small Scale Hand Tools Manufacturing (Forging) Industry (SSI) in Northern India' . Industrial Health. 2009: 47, 432-430.
2. Tremolieres C, Hetu R (1980) Amulti- parametric study of impact noise-induced TTS. J Acoust Soc Am 68, 1652-9.
3. OHSA's Noise Standard Defines Hazard Protection, Resource Guide 2000.
4. IS: 7194-(1994) Indian standard, assessment of noise during work for hearing conservation purpose. (First revision) BIS India, New Delhi.
5. Kerr AG, Stephans D. 'Scott-Browns Otolaryngology:Adult Audiology'. Volume 2. 6th ed. Butterworth Heinemann; 1997. P. 2/1/6-9
6. Che C-J, Dai Y-T, Sun Y-M, Chang Y, Juang Y-J (2007)Evaluation of auditory fatigue in combined noise, heat and workload exposure. Ind Health 45, 527-34.
7. Hetu R(1994) The risk of hearing loss from exposure to noise. Groupe d' acoustique de l' universite de Montreal, University of Montreal, Montreal.
8. Aghilinejad M, Alimohammadi I, Mohammadi S, Fallahi M. Assessment of the effect of occupational noise on workers hearing in small scale industries in Tehran. Journal of Army University of Medical Sciences of the I. R. Iran. 2007: 5 (19): 1305-1310.