Original Research Paper

Physiology



Physiological Evaluation of Extra Auditory Effect of Noise-A Study on Paper Mill Workers in Vikarabad

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ABSTRACT	 Aim: The purpose of the study was to ascertain industrial noise pollution and it physiological effects on hearing capabilities of paper mill workers of vikarabad. It was also tried to determine any relationship between degree of hearing loss and extra auditory effect of sound. Materials and methods: 100 male workers of different paper mills of vikarabad district were examined by audiometry to determine degree of hearing loss and interviewed for subjective feeling of headache, vertigo or tinnitus. Age group of workers was between 25-50 years. Controls were taken from different parts vikarabad. Results: Among 100 workers exposed to high level of sound, 40% workers had complained about tinnitus whereas among controls only 4% had complained about it. Prevalence of tinnitus was significantly high among exposed group which increases with increase in duration of exposure. 			

KEYWORDS

Introduction:

Noise is an inescapable part of human life. While we may enjoy occasional moments of solitude, it is usually not long before we are confronted with noise of some sort. Noise is defined as, "the unwanted, unpleasant or disagreeable sound that causes discomfort to all living beings". Sound intensity is measured in decibels (dB), that is the tenth part of the longest unit Bel. One dB is the faintest sound that a human ear can hear. As per the rules, the prescribed highest limit of noise levels for residential localities is 55 and 45 decibels (during the day and the night respectively), for silence zones the level is 50 and 40 decibels, respectively. For the industrial area, the permissible noise level is 75 and 70 and for commercial 65 and 55 decibels respectively. Exposure to sufficiently intense noise for a long enough duration results in damage to the inner ear and thus decreases one's ability to hear. In addition to a general decrease in the ability to detect sounds, the quality and clarity of auditory perception can be affected, as well. While these effects are often temporary, it is not uncommon for some residual permanent damage to persist for the remainder of the affected person's life. Whether temporary or permanent, hearing loss due to noise exposure primarily affects the inner ear, especially when the noise is presented over a significant period of time. It is sound with a high intensity sound caused by industry machines. Sources of such noise pollution is caused by machines from machines in various factories, industries and mills.

Effects of Noise pollution: Noise pollution affects both human and animal health. It leads to: contraction of blood vessels, making skin pale, excessive adrenalin in the blood stream which is responsible for high blood pressure.Blaring sounds are known to cause mental distress Heart attacks, neurological problems, birth defects and abortion, Muscle contraction leading to nervous breakdown, tension, etc, The adverse reactions are coupled with a change in hormone content of blood, which in-turn increases heart beat, constriction of blood vessels, digestive spams and dilation of the pupil of the eye, Adverse affects health, work efficiency and behaviour. Noise pollution may cause damage to the heart, brain, kidneys, liver and may produce emotional disturbance.The most immediate and acute effect of noise is impairment of hearing that diminishes some part of the auditory system. Prolonged exposure

to noise of certain frequency pattern leads to chronic damage to the inner ear, Impulsive noise may cause psychological and pathological disorders, Ultrasonic sound can affect the digestive, respiratory, cardiovascular system and semicircular canals of the internal ear. The brain is adversely affected by loud and sudden noise by jets and airplanes. People are subjected to psychiatric illness.Recent reports suggest that blood is thickened by excessive noise. The optical system of human beings is also affected by noise pollution. Specifically, it is the organ of corti that is most commonly affected, sound induced motion of the fluid in the cochlea induces shearing and bending movements of the hair cells in the Organ of Corti, which, in turn, result in electrical stimuli transmitted by the auditory nerve. Prolonged and excessive noise eventually produces deterioration and, finally destruction of hair cells, and thus disrupts the sound transmission mechanism". In addition to its effects on hearing, noise has also been implicated as having other physiological effects. Specifically, non-auditory physiological effects of noise pollution that have been identified thus far include cardiovascular, autonomic, and gastric effects. Further, it appears that noise can exert its non-auditory effects independent of hearing loss. The first category of non-auditory physiological effects includes effects on the cardiovascular system. Knipschild indirectly demonstrated this effect by noting an increase in antihypertensive medication consumption in a village near an airport that correlated with an increase in aircraft traffic. A control village that was not near the airport did not demonstrate an increase in cardiovascular medication consumption during the same period. Exposure to noise can lead to gastric changes, as well. Most of the machines that have been developed for industrial purposes, for high speed transportation, or to make life more enjoyable, by furnishing additional comfort, reducing the drudgery of everyday living and speeding up our daily routines to provide additional leisure hours, are accompanied by noise. Noise prevention and control is important as noise affects us in hearing, ability to communicate and behaviour. Undoubtedly, lesser noise can make the environment more friendly and life becomes pleasant.

Materials and Methods:

A sample size of 60 male textile workers of vikarabad city who were exposed to high level of noise was taken. For control 60 people of different places of vikarabad city were taken who were not exposed to any kind of such high noise in their life. Age group of both study and control group were between 25-50 years. After exclusion criteria, data were collected by interviews, physical and local examinations and by audiometry. Study was conducted with the help of pre tested structured questionnaire which includes a detail and relevant history, duration of exposure, any difficulty in hearing or speech. All of them were especially enquired about headache, tinnitus and vertigo. All audiometric tests were carried out in a quiet room outside the factory before the workers entered their work shift. Testing frequency was between 300-8000 Hz.

Audiometry:

An audiometry exam tests your ability to hear sounds. Sounds vary based on their loudness (intensity) and the speed of sound wave vibrations (tone).Hearing occurs when sound waves stimulate the nerves of the inner ear. The sound then travels along nerve pathways to the brain. Sound waves can travel to the inner ear through the ear canal, eardrum, and bones of the middle ear (air conduction). They can also pass through the bones around and behind the ear (bone conduction) (Fig.2).

Test method:

The first steps are to see whether you need an audiogram. The procedure most often involves blocking one ear at a time and checking your ability to hear whispers, spoken words, or the sound of a ticking watch. A tuning fork may be used. The tuning fork is tapped and held in the air on each side of the head to test the ability to hear by air conduction. It is tapped and placed against the mastoid bone behind each ear to test bone conduction. Audiometry provides a more precise measurement of hearing. For this test, you wear earphones attached to the audiometer. Pure tones of controlled intensity are delivered to one ear at a time. You are will be asked to raise a hand, press a button, or otherwise indicate when you hear a sound. The minimum intensity (volume) required to hear each tone is graphed. A device called a bone oscillator is placed against the bone behind each ear (mastoid bone) to test bone conduction.

Fig.1.Paper mill machine



Fig.2.Audiometry



Results and Discussion:

In this study Most important association was found between noise and tinnitus. Among study group 28% workers had complained about tinnitus whereas it was only 3% among controls. It was highly significant as p < 0.01. (Table 1, Figure 3). After this the effect of duration of exposure on tinnitus was studied. For this workers were divided into three groups->20 years of exposure (n=20), 10-20 years of exposure (n=20), <10 years of exposure (n=20). With duration of exposure >20 years, 55% workers had complained about tinnitus whereas with duration of exposure 10-20 years it was 20% and with duration of exposure < 10 years it was only9.25 %. it is statistically highly significant as p<0.01. Then it was tried to find out whether there is any relationship between degree of hearing loss and tinnitus is present or not. 40% workers were suffering from tinnitus. Among them no one had normal hearing or mild degree of hearing loss. As far as subjective feeling of difficulty in hearing is concerned, it was present in 12% of workers whereas 6% people among control group had difficulty in hearing. It was statistically not significant as p>0.05. In this study 20% workers have complained about headache whereas among controls it was 6%. Statistically this difference was significant .(Table 2, Figure 4).

Table.1. Comparison of Prevalence of Tinnitus among test and control groups

Tinnitus	Test group (n=60)	Control group (n=60)
Present	17(28%)	2(3%)
Absent	43(71%)	58(96%)

Table.2.Comparion of prevalence of Head ache among test and control groups

Headache	Test group (n=60)	Control group (n=60)
Present	12 (20%)	4(6%)
Absent	48(80%)	56(93%)

Figure.3. Prevalence of Tinnitus



Fig.4.Prevalence of Head ache



Prevalence of difficulty in hearing was statistically not high among workers exposed to noise, but it was confined to those workers only who were suffering from moderate degree of hearing loss. There is significant relationship between noise and headache can be found in this study.

Conclusion:

From this study it can be concluded that the prevalence of tinnitus is very high among Paper mill workers of Vikarabad city who were exposed to very high level of sound at their workplace. The prevalence is increasing with increase in duration of exposure as well as with increase in severity of hearing loss. It certainly shows that the condition is critical which demands some modification at their workplace to keep the sound level at lower level. Construction of soundproof rooms for noisy machines in industrial and manufacturing installations must be encouraged. This is also important for residential building-noisy machines should be installed far from sleeping and living rooms, like in a basement or garage.

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