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Review Article

CLINICAL MANIFESTATIONS AND PROTECTIVE MEASURES OF ENVIRONMENTAL NOISE: AN OVERVIEW

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Abstract: Noise pollution (or environmental noise) refers to unwanted or unpleasant sound that disrupts the activity or balance of human and animal life. It reduces the concentration and negatively affects the mental activity. The noise is generated by the human through various ways and activities. Noise must be controlled and prevented by using various effective techniques at the source itself is today's need. This review basically discuss the various sources of noise pollution, measurement of noise, dB scale, equipments used in the measurement of noise levels, adverse effects of noise pollution on health, control of indoor noise, control technologies available for noise pollution and Indian penal codes to prevent noise pollution are the main points of focus of attention.

Keywords: Behavioral problems, Cardiovascular, Cognitive performance, dB, Psychological stress.

INTRODUCTION

Any sound that is unpleasant or irritating is called noise. Noise can be defined as, "wrong sound in the wrong place at the wrong time." The term "noise" is derived from the Latin word "noxia", which means injury or hurt. Noise by definition is unwanted sound produced through natural causes such as wind, volcanoes, and ocean as well as man-made sources like automobiles, machines, explosives, loud

speakers etc. Noise is a disturbance to the human environment that is intensifying at an alarming rate and becoming a major threat to human lives. The major source of noise includes industries, transportation (air, rail and road), electronic gadgets, music instruments, loudspeakers, etc. Any social or religious function cannot be held without causing noise pollution. There is no doubt that with the passage of time the concept of silence is about to pass into oblivion. The endless

invention of the machines and devices that promise betterment of our life also pave to the increased noise pollution and distract humanity from the essence of life. No one on the Earth can escape noise – an unwanted, disturbing sound that causes a nuisance in the eye of the beholder (Rajalakshmi *et al.*, 2016).

Now a day, noise pollution is not a new problem for common man, especially in most of the industrial towns and metropolitan cities. Noise pollution means any sound that is undesired by the recipient. The effect of sound on human depends upon its frequency. Human ears are known to be sensitive to an extremely wide range of intensity varied from 0 to 180 dB. Since the overall loudness of environmental noise is increasing every ten years, immediate and serious attention must be given to control this growing problem. Researchers are studying the effect of noise pollution on human's health and also their capability intake of high or low doses of sound pressure levels as measured by decibels (dB). The noise level varies at different places. Normal conversation has 35-60 dB sound, heavy street traffic has a sound of 60-80 dB and recording room has 30 dB sound. The WHO has fixed 45 dB sounds as the safe noise level for a city. In metro cities, the noise level is more than 80dB which is tolerable without much discomfort.

The federal Occupational Safety and Health Act (OSHA), administered by the US Department of Labour, require that specified noise exposures not to be exceeded 95dB. OSHA has set the danger level at 95dB and above for 4 or more hours per day as likely to induce permanent hearing impairment. Sounds at 0-10dB are so quiet that are almost impossible to hear, while at the top end of the scale, at around 150dB it can damage our eardrums (Chauhan *et al.*, 2009). The exposure to this type of noise at a rate of eight hours a day or five days a week can lead to permanent hearing loss. Kidd (1962) pointed out that exposure of high level of noise leads to increased arousal of stress. The incidence of diseases related to stress would increase deafness, eye irritation,

hypertension, ulcers, tuberculosis, neurological and psychological problems.

Not only does prolonged exposure to industrial noise lead to hearing impairment of workers, but it may also cause a range of different health problems among workers and residents. For example, industrial noise can lead to increased stress and blood pressure, ongoing headaches, vertigo, extreme fatigue and stomach ulcers. Industrial noise pollution may also affect workers' mental health, causing psychological stress, anxiety and withdrawal. Consequently, these problems can further worsen the health conditions of workers, causing some additional issues such as speech problems, tremors and behavioural problems. This inevitably affects their ability to perform their tasks properly, which may further endanger their colleagues and the community. It's also important to mention that industrial noise pollution may also affect unborn babies in the community. Since the foetus is extremely sensitive to sounds, noise pollution may affect organogenesis, differentiation and early development of organs..

GENERAL HEALTH EFFECTS OF NOISE POLLUTION

A vast array of harmful health effects can be observed from noise exposure. Though hearing loss is the direct observable consequence, there are a number of other direct or indirect non-auditory associated effects. When noise becomes sufficiently loud or unpredictable, our first annoyance can graduate to more extreme behaviour affecting our social and mental well-being. Noise pollution leads to sleep disturbances or insomnia, interferes with communication, concentration, cognitive performance, efficiency and learning as well as cardiovascular and immunological problems. Other effects are nausea, fatigue, anxiety, reduced gross motor efficiency or activity, changes in the electrical activity of the brain, dilation of the pupil of the eye, changes in the respiration rate, changes in the size of various glands of endocrine systems etc. Excessive noise pollution is being responsible for hypertension, heart trouble and increased level of serum lipid triglycerides,

platelet count, and plasma viscosity. In addition there is increased frequency of headaches, fatigue, stomach ulcers and vertigo and abnormally high rates of birth defects. Many people are exposed to daily occupational hazards. The big power plants, which become the source of income for larger bulk of our population, become the source of peril for many, in the long run, depending on the variability of exposure (Field, 1993).

Venturing into heart ailments and associated disorders:

Noise pollution has become a very significant “stress factor” in the social environment of the man. Cardiovascular effects have been correlated with noisy intensity, type and duration of exposure and there is prevalence of electrocardiogram abnormalities exposed to higher noise intensity in experimental subjects (Field, 1993). Noise causes stress and our body reacts with the changes in heart rate and a rise in blood pressure. Especially coronary arteries supplying the heart itself are sensitive to narrowing and hypertensive effects.

Important cardiovascular consequences follow from the elevated sound levels, principally because the elevated level of stress hormones *viz.* adrenaline and corticoid, trigger a narrowing of the blood vessels (vasoconstriction). Those hormones are part of the body's “fight or flight” response, which helps a person deal with sudden emergent situations. Blood pressure and heart beat rate go up in preparation of action. The immune system gets suppressed, as part of the shift towards fulfilling short-term needs rather than long-term health. The response can be life saving in an attack, but it is counterproductive when activated chronically. In course of time, it can corrode the body, eating away at blood vessels and other organs and predisposing a person to other medical woes and premature death. Thus, noise exposure causes a number of predictable short-term physiological responses mediated through our autonomic nervous system. Exposure to noise causes physiological activation including peripheral vasoconstriction, increased

peripheral vascular resistance as well as irregular cardiac rhythms (Fuller *et al.*, 2007).

OCCUPATIONAL STUDIES: NOISE AND HIGH BLOOD PRESSURE

The strongest evidence for the effect of noise on the cardiovascular system comes from the studies of blood pressure in occupational settings. Many occupational studies have suggested that individuals chronically exposed to continuous noise at levels of at least 85dB have higher blood pressure than those not exposed to noise. A recent pioneering longitudinal individual noise study has shown that the noise levels predicted raised systolic and diastolic pressure in those doing complex but not simple jobs and predicts increased mortality risk. Occupational noise exposure has recently been linked to the greater risk of death from motor vehicle injury. One possibility is that the effects of noise on blood pressure are mediated through an intermediate psychological response such as noise annoyance. Noise and cardiovascular disease in community: There is evidence from community studies that environmental noise is related to hypertension and may be a minor risk factor for coronary heart disease. Children attending kindergartens situated in the area with traffic noise > 60dB have been shown to have higher mean systolic blood pressure and diastolic blood pressure and lower mean heart rate than children in quiet areas. A significant association has been observed between noise and potential ischemic heart disease risk factors, including total triglycerides, platelet count, plasma viscosity, glucose (increased) and systolic and diastolic blood pressure (decreased).

Honking is another risk factor for heart disease. Vehicle horns, bombs, and other loud sounds are extremely dangerous for the heart, especially for heart patients, who need to recover in peace and quiet. According to a research by the WHO, thousands of people in Britain and around the world are dying prematurely from heart disease triggered by the long-term exposure to excessive noise. Coronary heart disease caused 1, 01,000 deaths in the UK in 2006, and the study suggests that 3,030 of these are caused by chronic noise

exposure, including daytime traffic. The WHO has yet to finalize what levels of chronic exposure cause problems, the threshold for cardiovascular problems is chronic night-time exposure of 50dB or above and a daytime exposure above 60dB (Rosenhall *et al.*, 1990).

Protection against noise:

To protect ourselves against noise and maintain the ecological equilibrium, we have to come forward together to combat noise from the source along with the use of personal devices to reduce its deleterious effect. The first step in this context is to identify the source and then implement some step to save us. In case of higher noise level of an area, steps must be taken to reduce or control it. This can be done by:

- Eliminating or reducing the noise at its source by acoustic treatment of machine.
- Redesign of the machine etc.
- Blocking the sound transmission path by painting walls with light blue or light green colour.
- Planting greeneries around cities and noise polluting industries.
- Providing hearing protection to exposed persons such as earplugs, ear muff etc.
- Using noise-reducing devices on all vehicles.
- Reducing exposure time to every operator by giving frequent rests.
- Banning noise-polluting activities like use of loudspeakers etc.

There is no doubt that noise induced hearing loss is a major problem because people are unaware of its warning signs and effects until it is too late. Since there is a strong social pressure to have normal hearing, an individual rarely admits having a hearing problem until the effects are extremely substantial. Early awareness and restorative actions are essential to eliminate noise till acts as a hearing hazard. If the individual allows his ears to be exposed to the invisible dangers of noise or high sound level sources, the result could be permanent hearing loss. It is up to every individual to choose a life with all the joys

of sound and a life of dead silence due to heavy hearing loss caused by noisy environment. Assault on hearing must end to save the liveliness of the society as a whole.

Going green isn't only about implementing eco-friendly practices in every aspect of our society, but also about creating a healthy environment for its members. It's about striking a balance and creating a nurturing atmosphere where both people and nature can flourish. This often entails tackling some overlooked and surprising issues, such as noise pollution. Although environmental noise emission may not have a direct effect on the environment, it's increasingly being treated and classified as a pollutant. Since it can be detrimental to people's health and well-being, it requires us to gain a deeper understanding of this issue and take appropriate measures to prevent it.

Considering the fact that environmental noise pollution can have such a detrimental effect on industrial workers and community members, it's essential that all the necessary measures and restrictions be implemented to mitigate this problem and eliminate the risks that it brings. Typically, the leading industry giants hire professionals who can implement highly effective environmental noise control solutions that can reduce noise emission levels and ensure the adherence to legal restrictions and guidelines. After a full acoustic assessment, these professionals develop appropriate noise reduction plans that target specific noise problems and their source (Maheshwari *et al.*, 2012).

Noise control measures:

Noise pollution limits are being breached in almost all Indian cities. Violations are the worst in urban areas. The laws should be properly implemented in India to control this ever-growing menace. The government is now working on devising new noise pollution standards. City-wise noise pollution mitigation strategies should be worked out at all levels.

The technical approach of noise control refers to implementing effective solutions throughout the

entire process. For instance, this approach entails purchasing the quietest equipment available in the market and regular maintenance that will minimize noise and vibration. This approach can also entail the use of soundproof barriers, panels and walls, which is one of the most flexible and affordable solutions.

When it comes to sound attenuation approach, it refers to modifying machines and tools or using certain products, such as silencers, to minimize noise pollution and ensure that equipment operates as quietly as possible. Since industrial equipment can cause noise emissions through heating and ventilation systems, different types of silencers are used to prevent this problem. They are installed on ventilation openings, reducing some of the acoustic energy. Blowers, silencers, in particular, are the most commonly used ones in different industrial settings. This type of silencers reduces the noise by moving the air around, preventing the transfer of sound. Furthermore, there are also exhaust silencers, an effective solution for limited space.

Administrative noise control doesn't entail the use of protective equipment, but rather the restrictive access to noisy equipment. This approach ensures that only those employees who need to be around such equipment have access to this workspace. The administrative approach also entails ensuring that these employees spend limited time around this equipment and work as far away as possible. Industrial noise pollution is a serious issue that brings numerous health and safety implications.

Creation of unnecessary noise has to be prohibited and should be punishable under the law. Noise pollution, beyond doubt, takes a toll on our health and happiness. We must fight against this debilitating pollution. It is for our sake we should change our behaviour and make us survive on this beautiful Earth. It is easier to throw the blame at someone else than trying to fight out the solution ourselves, but we should not forget it is our life that is at stake. Finally, coordinated and long-term integrated noise pollution research (comprising assessment of

noise descriptors, noise mapping, prediction by noise modeling, experimental demonstration of exposure-effect relationship and acoustic absorption material) is the need of the hour (Goswami and Swain, 2017).

CONCLUSION

The combined effect of anthropogenic activities, increasing industrialization, greater mechanized transportation, and development of mega-cities with greater population are producing greater exposure at higher levels of noise. Slowly, insensibly, we seem to accept noise and the physiological and psychological deterioration that accompanies it as an inevitable part of our lives. After so many studies and analysis, we can no longer afford to neglect the issue of noise pollution, which shows the magnitude of the problem. For the health, sanity, and the well being of present population as well as for our future citizens, it is high time we take this problem seriously and must implement solutions. Together with NGOs and different media we must encourage the government to enforce all existing laws on noise pollution. The use of old machines and vehicles creating disturbances, use of loudspeakers for election campaigns, processions, and advertising, etc. should be completely banned. Government should ban making noise in quiet zones and above all enforce limits on decibels in urban areas. We should try to reduce noise at the source itself with the aid of silencing devices. We must plant enough trees for absorption of sound. The highest exposure groups at each individual industrial plant should continue to wear hearing protection while working inside the plant and the periodic monitoring should be continued. However, there is an urgent need that the Government of India should manage to get a legislation passed for the control of noise pollution and implement the noise pollution control act to meet the condition. Apart from such kind of legislation, there should be a city noise control code for all major cities in India. Public awareness campaign is strongly recommended.

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