



NOISE POLLUTION : THE UNSEEN STORM OF HEALTH ISSUES

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ABSTRACT

Noise is an unwanted and disharmonic sound pollutant which has a direct and indirect effect on human health. It is an environmental pollutant but does not affect the air, soil or water environment. With increasing industrialization and modernization over the last decade, the health hazard of this measurable pollutant has increased to label it a "Silent Killer" with lots of health related issues. According to WHO, around 63 million people i.e. around 6.3% of total population is affected by hearing loss in India due to noise pollution. Despite our ability to precisely measure noise, its effects on health have been largely neglected until recently in most countries and unfortunately this neglect continues in most developing countries, including India. Worldwide it is estimated that hundreds of millions of people suffer a range of health effects due to noise pollution but there is no national plan in India to reduce environmental noise pollution.

KEYWORDS : Noise, Pollution, Environment, Health Problems, Hearing loss.

INTRODUCTION

Noise is defined as any unpleasant or loud undesired sound interfering with one's hearing and concentration. Acoustic signals producing a pleasant sensation are referred to as 'sound' whereas the unpleasant sounds are referred to as 'noise'. World Health Organisation regards Noise as an underestimated threat that can cause a number of short and long term health problems such as stress, sleep disruption, cardiovascular effects, poorer work and school performance, hearing impairment, endocrine effects and increased incidence of diabetes. In 21st Century, the noise has emerged as a modern day pollutant and an environmental stressor. Source can be both indoors (audio and video devices, musical toys, games, electrical gadgets, kitchen appliances, classroom noises etc.) or outdoors (vehicular traffic ranging from aircrafts to road traffic, factory sirens, loud speakers, environmental noises in play grounds etc.). Increasing pollution and industrialization has contributed to the menace.¹

Noise affects all vital organs adversely. Central nervous system, Cardiovascular, Endocrine and Immune systems are the most vulnerable & all life style diseases are aggravated by exposure to loud sounds.

Noise : A Health Hazard for All Ages**1. Impact of Noise on Foetal Life**

Harmful effects of noise may start even from the intrauterine period and children are passive consumers of harmful noise, and are more susceptible to its damaging effects. A functional vestibular system develops by 28-29 weeks of gestation. That fetus is able to hear, is indicated by observations of blink-startle responses to vibro-acoustic stimulation during antenatal ultrasonography around 24 weeks of gestation. Fetus can respond to auditory stimulus originating both inside and outside the womb. Sources of sound in the materno-fetal unit include heartbeat of mother, placental flow, mother's voice, and vibroacoustic stimulations from antenatal ultrasonography. Intrauterine exposure to excessive sound can have longlasting effects. Studies have documented high frequency hearing loss in children who were exposed to noise in the range of 85 to 95 decibels (dB) during intrauterine period. In utero exposure to loud noise can also cause cochlear damage. Besides auditory damage, intrauterine exposure to noise may contribute to prematurity and birth

defects.²

2. Impact of Noise on Neonatal & Infantile Period

In neonatal period high intensity sounds may cause damage to the cochlear cilia leading to hearing loss. Repeated arousal of the baby as a result of the sounds produced by equipment may lead to fatigue and irritability. Preterm infants are more vulnerable to adverse physiological effects of noise. New born exposed to sound above 45 decibels may experience increase in blood pressure, heart rate, respiratory rate, and decreased oxygen saturation, increase in caloric consumption. Neonatal intensive care unit (NICU) environment is characterized by continuous sounds from monitors, ventilators, alarms, infusion pumps, incubators, and conversations between doctors, staff and family. The American Academy of Pediatrics (AAP) Committee on Environmental Health has recommended that sounds levels should be at or below 45 dB in neonatal intensive care units (NICU).^{3,4}

3. Impact of Noise on Childhood Period

School children spend most of their time in classroom and playground. Noise in schools is multipronged originating from the poor acoustics of the room, slamming of doors, noisy corridors, ventilation systems and computers. In addition there is external noise from road traffic particularly from schools built on highways or near congested roads. Background noise is found to be higher in classrooms with natural ventilation as compared to those with mechanical ventilation. Children in noisy environments have poor school performance, which leads to stress and misbehavior. They also have decreased learning, lower reading comprehension, and concentration deficits.⁵

There is significant drop in children's reading performance when background noise interfered with speech. Teenagers & young people frequently visit discotheques and concerts where a very high sound pressure level is generated; this increases the chances of hearing loss. Youths also turn up the volume of their car stereo while driving, which is damaging not only for ears it further increases the chances of traffic accidents.

The source of noise in children can be both indoors and outdoors. Rural homes are less burdened with sound exposure compared to urban homes. Machines used in agriculture are

less distressing compared to traffic noise. Due to lack of proper planning and lack of space in urban areas, particularly the metropolitan cities, residential colonies and schools are placed close to busy roads, airports, railway stations and even factories. Sources of noise inside the houses include air conditioners, coolers, washing machine, televisions, music systems, vacuum cleaners, video and computer games. Noise from social, cultural and recreational activities is another nuisance, particularly in densely populated cities. Many toys produce noise and children love to play with them. Preschool children who spend quite a good amount of time in day care institutions are also exposed to noise originating from toys, overcrowding, and air conditioners.

The body response to noise is in terms of fight or flight, thus resulting in adverse nervous, hormonal and vascular changes. Exposure to noise during sleep increases the adrenaline, noradrenaline and Cortisol excretion which are associated with insulin resistance, hypertension, stress ulcers and cardiovascular diseases. Another side effect of noise is enhanced pain sensation, which may increase the requirement of dose of analgesics.

Noise-induced hearing loss is particularly more pronounced in children with learning disabilities, attention difficulties and children on ototoxic medications. Noise-induced hearing impairment is usually accompanied with loudness recruitment, paracusis and tinnitus. These changes may be temporary or permanent. Noise-induced sleep deprivation suppresses the rapid eye movement (REM) sleep pattern.

4. Impact of Noise on Adult Health

Hearing impairment as a result of noise exposure presents a serious public health problem; it is estimated that, worldwide, 1.3 billion people suffer from this condition and the World Health Organisation (WHO) estimates that 10% of the global population is currently exposed to noise levels that could lead to hearing impairment. It has been estimated that 50% of the population in the USA had an annual exposure to traffic noise that were high enough to be harmful to health.

1. Stress.

Environmental noise is not only a health risk to people who report being annoyed by noise, but these individuals are also at risk for additional health effects. The effects of noise on conscious subjects are insidious and result at least in part from increased psychosocial stress. Annoyance from continuous sound appears to vary substantially by individual, and there are a number of factors that may influence annoyance and subsequent stress. Annoyance increases sympathetic tone, especially in noise-sensitive individuals, and may be the non-sleep mediated pathway that is present in individuals with high occupational noise exposures who subsequently develop heart disease.

2. Cardiovascular Diseases & Sleep Disturbance

Those who live in surrounding of noisy environments experience a subjective habituation to it, but their cardiovascular system does not habituate with the time and they still experience activations of the adrenergic nervous system and changes from deep sleep to a lighter stage of sleep in response to noise. The body's initial startle response to noise is due to activation of the sympathetic nervous system. Although blood pressure normally drops during sleep, people experiencing sleep fragmentation from noise have difficulty achieving a nadir for any length of time because blood pressure rises with noise transients and heart rate increases with increase in noise levels. Decreased quality and quantity of sleep elevates cardiovascular strain, which manifests as increased blood pressure and disruptions in cardiovascular circadian rhythms alongwith increased levels of stress hormones. Microarousals appear to be associated with

increased lipids and Cortisol levels. Increased blood lipid, heart rate, blood pressure, and stress levels from noise lead to atherosclerosis, which is causally related to heart disease. The priming of the neuroendocrinal stress response in some individuals make them vulnerable to depression, distraction and masking effects.⁵

3. Noise induced Hearing Loss

Noise induced hearing loss is a function of sound level and duration of exposure. Noise Induced Hearing Loss (NIHL) can be caused by a onetime exposure to an intense impulse sound (such as explosives) or more commonly by a steady long-term sustained exposure with sound pressure levels in excess of 80-85dBHL. Long-term exposures to noise levels > 75 dBA can cause metabolic changes in sensory hair cells within the cochlea, eventually leading to their loss and increasing inability to perceive sound (e.g., NIHL). Neuronal destruction may also occur; in such cases, the ability to perceive sound may remain undiminished, but the ability to understand the meaning of sound deteriorates.

The characteristic pathology of NIHL is the loss of auditory sensory cells (hair cells) in the Organ of Corti in the cochlea. Since mammals have lost the ability to regenerate, NIHL is irreversible. Inflammatory and immune responses are central mechanisms in cochlear defensive response to noise but if unregulated, they contribute to inner ear damage and hearing loss. Extreme exposures can cause direct mechanical damage (acoustic trauma) to cochlear hair cells. Noise exposure is also associated with tinnitus (ringing in the ears) and hyperacusis. NIHL has traditionally been associated with occupational noise, but there is increasing evidence that music may play an important role as well.

The auditory effects of noise probably represent a complex interplay of genetic and environmental factors which leads to oxidative stress at a molecular level. The identification of NOX-3 and CDH-23 gene are identified as key genes for susceptibility to NIHL.⁷

Environment Noise : The Legal Issues

A National Ambient Noise Monitoring Network on the pattern of existing Air and Water Networks was created in the country. The network will result in creation of base line data and facilitate its analysis for policy makers and implementing agencies to take appropriate actions for noise control at regional and national level. The Supreme Court of India gave a significant verdict on noise pollution in 2005. Unnecessary honking of vehicles makes for a high decibel level of noise in cities. The use of loudspeakers for political purposes and for sermons by temples and mosques makes noise pollution in residential areas worse. In January 2010, Government of India published norms of permissible noise levels in urban and rural areas.

Facts & Strategies to Prevent Noise Pollution

Facts :

1. Noise is a health hazard and zero dB is the quietest audible sound a healthy hearing person can hear in absolute noise free environment and each 10 dB increment will double the sound intensity.
2. Never expose a child to a sound above 120 decibels.
3. Safe limit for short time exposure is 75 dB. Exposure to less loud sounds for longer times is also harmful for our health. The damage may develop at a later period & slowly.
4. A whisper is 30 dB, conversational speech is 60 dB, and someone shouting at you from an arm's length away is 85 dB.
5. Exposure to noise greater than 120-125 dB can cause hearing loss or pain in the ears.
6. The permissible work limit for noise is 8 hours for 90 dB, 4 hours for 95 dB and 2 hours for 100 dB.
7. Silence zone are areas up to 100 metres around hospitals,

educational institutions and courts.

8. Permissible noise : Industrial area 75 dB in day time and 70 dB in night time; Commercial area 65 dB in day time and 55 dB in night time; Residential area 55 dB in day time and 45 dB in night time and silence zone 50 dB in day time and 40 dB in night time.
9. Noise-induced hearing loss usually happens slowly, with no pain and it is also the commonest cause of preventable permanent deafness.
10. One can complain to the authorities if the noise levels exceed more than 10 dB than the allowable limit.

Measures to Minimise Noise Pollution :

Outdoor Measures :

- Encourage safe driving and avoid honking. By honking you are disturbing and damaging not only fellow citizen's health but yours also. Honking is to be used only to avoid an accident.
- If intended to use – Use soundless fire crackers.

Indoor Measures :

- Home noise is also dangerous. Even use of fan at very high speed produce 60 dB sounds. Reduce the fan speed to minimum needed. TV and Radio volume should be kept at minimum.
- Pregnant ladies and children should not be permitted to sit near TV and Radio. Loud sound is more dangerous to foetus and young children.
- Discard or exchange high noisy home appliances for more modern silent equipments even though they may be little more costly. The damage to your health is much more costlier.

Personal Measures :

- Break for a few minutes when you use ear phones or head phones to listen to music. It will help in recovery of fatigued hair cells and restore normal enzymatic activity of cochlea and brain neurones.
- Avoid continues use of mobile phones. Those who have to use mobile phones continuously, may use speaker phones whenever possible.
- MP3 players including iPods can be turned up to a maximum of around 103 dB using standard iPod earphones.
- Use personal sound protection devices (ear plugs and muffler) when exposed to loud sounds above 80-85 dB.
- If only we remember "Your Joy Can Be Someone's Noise" the noise pollution can be checked.⁸

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