Noise Pollution: An Alarming and Invisible Danger for Public Health

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Abstract

Over the years, it has become clear that environmental noise has a strong negative impact on the populations of the world's major cities. Environmental noise is considered to be one form of air pollution, and as we have already established, undeniable deteriorate our health and well-being. But it goes beyond that: it disregards any and all sounds generated outside interference that are deemed superfluous and pesky. Alarms constitute part of this category, however they are regarded as acceptable when the intended purpose, or context, of the sound justifies it. The development of urban centers, metropolitan areas, and industrial facilities leads to a significant growth in the number and variety of noise sources that will not only increase in number, but also grow more diverse and powerful. The scope of the problem will continue to broaden due to the expanding air, train, and highway traffic expansion, all of which are major contributors to environmental noise. Socially and medically significant we now turn to the adverse health effects of noise pollution that are relatively widespread and long lasting in nature. A strong risk factor for many diseases is noise pollution. It causes heart and vascular diseases, hearing impairments, sleep disorders, social disorganization, reduced work efficiency, aggressive behavior, irritability hostility, absenteeism and accidents. Striving to remember oneself may make appreciation of free time and possessions more difficult and increase antisocial tendencies. Noise is also detrimental to an overall health and well-being just as chronic stress. Apart from adversely affecting future generations by degrading living, social, and educational conditions coupled with financial losses, it does more harm by making life more difficult. Intelligent government policies should aim at protecting people from the negative effects of airborne pollution, especially noise pollution. We shouldn't have to choose a noise environment because we have a good one.

Keywords: Noise pollution, Sources of noise, Impact of noise, Human health problems.

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Introduction

Mother Teresa stated about God when she said "He is not found in restlessness and noise, in fact, He has a friend to silence." Noise is defined as a 'nausea' in Latin which is a type of sound that is primarily 'unwanted' or 'expected too loud and unpleasant' for example ocean storms or volcanic eruptions. People have become major sources of noise, there is extensive growth in transportation, industry and urban activities. Human activities produces noise in their environment as a result of increased job opportunities, industrial growth and urban migration (Geravand, 2015).

Noise, which is definitely a pollution, has an awful negative impact on people's lives, well-being, and already poor health conditions. Everyone has to deal with high noise levels that are considered unsafe. It is responsible for about 12000 too early deaths in the European region. 60% of people around the world experience 50 or higher levels of decibels of noise. It affects the European region by approximately 30 billion dollars per year. In cities, 90% of people are exposed to high levels of noise. WHO (2018) describes noise pollution as a slow and silent killer in nature.

Intensity of Noise

Sound intensity is measured in decibels. The range of sound in the environment can vary from the quiet rustling of leaves which equals 20 to 30 decibels to thunderclaps which are around 120 decibels or the wailing sirens that can go up to 140 decibels. Exposure to 85 decibels and above signifies detrimental sounds which can cause damage to one's eardrums. Many familiar items such as power lawn mowers which produce 90 decibels or subways that make a noise level ranging from 90 to 115 decibels to even guitar heavy rock concerts that can reach 120 decibels cross this limit set by (Bhatti & Hassan, 2017).

Sources of Noise Pollution

Cars with broken engines are a part of the reasons for which noise pollution occurs, the noise generated by the engine is unneeded and it

becomes a nuisance for those caused by it. Industrial noise pollution generated from machinery along with loudspeakers, heavy televisions, and radios has been known to result in a higher chance of people getting headaches and even high blood pressure. Sinzaki *et al*., (2020) have proposed the following as the sources of noise pollution which include transportation such as traffic jams, airplanes, and trains, Industrial pollution from factories, Loud speakers, Concerts, Mowers and other household appliances, Air sonic booms and Demolition, Fireworks and Sports (Table 1).

Table 1: Some Noise sources. (Rabinowitz, 2000).

Noise Sources	Levels (DB)
Fire of Gun	140 to 170
AirJet	140
Rocket	110 to 120
Motobike	90
Talking b/w friends	60
No sound in Room	50
Whispering	30 to 40

Impact of Noise pollution on Wild and Marine Life

Wildlife health and well-being are seriously affected by noise pollution. Studies show that loud sounds can lead bluebirds to produce fewer offspring, and caterpillars experience increased heart rates. Animals depend on sound for important activities like navigation, finding food, attracting mates, and evading predators (Oyedepo, 2019).

Furthermore, noise pollution is becoming a serious problem for creatures in water as well, not only terrestrial wildlife. Disturbing noises from ships, oil drilling, sonar equipment, and seismic testing have replaced the calm maritime environment. Noise pollution poses a particular threat to whales and dolphins. Their ability to echolocate—which is essential for communication, navigation, foraging, and mating is hampered by the increased noise (Karthik, 2015).

Noise Pollution and Birds

Significant stressors like noise can cause physiological stress reactions like elevated glucocorticoid levels. Birds may experience increased oxidative stress and compromised immune systems as a result of this rise. Long-term stress exposure can cause physiological alterations that impair the hypothalamic-pituitary-adrenal (HPA) axis's ability to function. The body uses glucocorticoids, which are hormones released in reaction to stress, to help manage stressors, however during stressful times, their production may increase. Depending on the length and severity of the stress, glucocorticoids can have both positive and negative effects (Amjad, 2023). According to research, stress brought on by noise may cause the pituitary gland to produce less gonadotropin-releasing hormone (GnRH), which in turn may result in less LH (luteinizing and follicle-stimulating hormone (FSH) being secreted. Productivity and reproductive success may suffer as a result of this reduction in reproductive hormones. Specifically, progesterone, oestrogen, FSH, and LH levels were considerably lower in the blood of pigeons exposed to persistent noise stress ($P < 0.05$) (Amjad, 2024).

Adverse Effects of Noise on Human Health

- **Nueropsychiatric impact**

Noise pollution is widely acknowledged to exacerbate and accelerate the manifestation of pre-existing mental health issues; however, it is not formally recognized as a direct cause of mental illness. The negative effects associated with noise pollution include anxiety, tension, nervousness, nausea, headaches, emotional instability, irritability, sexual dysfunction, mood fluctuations, increased social discord, neurosis, hysteria, and psychosis. Research indicates a correlation between noise exposure and various mental health indicators, such as symptom profiles, well-being assessments, the consumption of sleep aids and psychoactive drugs, as well as the frequency of mental health facility admissions (Berglund & Lindvall, 1995). Certain populations, including children, the elderly, and individuals with pre-existing depression, may be particularly susceptible to these adverse effects due to their limited coping strategies. According to Basner (2014), children exposed to high noise levels often find the environment distressing and report a diminished quality of life. Furthermore, noise levels exceeding 80 dB have been linked to an increase in aggressive behavior and a decrease in prosocial behavior. Disputes over excessive noise frequently escalate into violent altercations, as reported by various media outlets, sometimes resulting in injuries or fatalities. The aforementioned effects of noise pollution may contribute to the dehumanization observed in contemporary, crowded, and noisy urban environments (Goines & Hagler, 2007).

- **Cardiac Disruptions**

It has been demonstrated that noise pollution has both immediate and long-term effects on the hormonal and parasympathetic nervous systems in human beings and other species (Singh & Davar, 2004). According to some hypotheses, noise acts as a global biological stressor, setting off reactions that prime the body for a fight-or-flight scenario. The cardiovascular system may be impacted by these reactions, which could raise the risk of developing cardiovascular disease (Figure 1). These effects can be brought on by acute encounters with noise levels above 80 to 85 dB or by continuous exposure to levels above 65 dB. Temporary spikes in the heart rate, blood pressure, and vasoconstriction are caused by hormonal and neurological reactions brought on by acute noise exposure. Over time, consistent exposure to high-intensity environmental or occupational noise has been linked to heightened peripheral resistance, increased heart rate, elevated blood lipid levels, higher blood pressure, increased blood viscosity, electrolyte imbalances, and elevated levels of cortisol, norepinephrine, and adrenaline (Goines & Hagler, 2007).

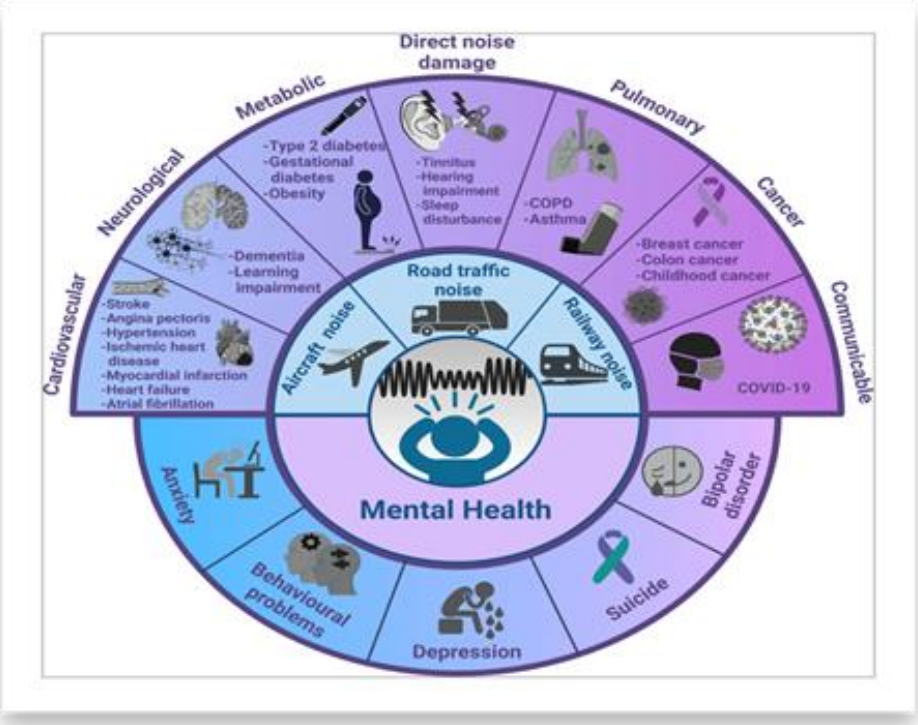

Fig. 1: Impact of Noise pollution on Human Health (Hahad, 2024).

- **Metabolic Abnormalities**

The main factors contributing to mental stress induced by noise include increased heart rate, elevated blood pressure, and heightened levels of stress hormones. These factors can subsequently exacerbate cerebro-cardiovascular conditions such as myocardial infarction, stroke, hypertension, and ischemic heart disease. Additionally, maladaptive coping strategies, including alcohol consumption and smoking, are intensified by psychological issues and mental health symptoms such as anxiety and depression that arise from exposure to traffic noise (Figure 1). Furthermore, traffic noise exposure may elevate stress hormone levels by activating nicotinamide adenine dinucleotide phosphate oxidase and uncoupling endothelial and neuronal nitric oxide synthase, which can trigger inflammatory and oxidative stress pathways, ultimately resulting in compromised endothelial function and neuronal health (Hahad et al., 2019).

- **Sleep Interruption**

Continuous sleep is vital for the optimal physiological and mental functioning of healthy individuals. Environmental noise is a major cause of sleep disruption, which can result in mood swings, poor performance, and a host of chronic health and wellness problems. Recent studies have particularly examined noise from roads, railways, and aircraft. Research indicates that consistent noise levels exceeding 30 dB can disrupt sleep during the night time (Mohamed, 2021).

- **Anti-Social Misconuduct**

Noise has been shown to produce effects similar to those of other stressors, leading to its use as a harmful stimulus in various research studies. Anger can be characterized as a sense of displeasure linked to any factor or situation that an individual perceives as detrimental to their well-being; terms such as aversion or distress may more accurately capture this emotional response. Noise pollution can elicit a range of negative reactions, including anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, and fatigue (Figure 1). These adverse effects tend to intensify when individuals feel they have little control over the noise (Goines & Hagler, 2007).

- **Disruption with Communication**

Noise pollution not only contributes to various human difficulties, disabilities, and behavioral issues, but it also impairs effective speech understanding (WHO, 2018). The challenges associated with noise pollution encompass difficulties in concentration, feelings of fatigue, uncertainty, diminished self-confidence, impatience, miscommunication, reduced productivity, disrupted social interactions, and heightened stress levels. Some of these consequences can result in an increase in accidents, communication breakdowns in educational settings, and lower academic achievement. Young people, the elderly, and people who are not fluent in spoken language are among the vulnerable populations (Goines, 2007).

Social Challenges Related to Noise Pollution

Examining how noise pollution affects society and the economy is also crucial. Babisch (2006) investigates the monetary consequences of noise-induced health problems, including missed work and medical expenses. The study emphasises how figuring out these costs can help policymakers and stakeholders make informed decisions on noise management and remedies. By addressing the financial cost of noise

pollution, societies can more efficiently allocate resources and implement effective strategies to reduce noise exposure (Babisch, 2006). The larger social effects of pollution from noise, such as its impact on interpersonal interactions and the overall health of the community, are also examined in a research by Weinstein (1978). In order to develop comprehensive methods for noise management and to try to manifest the health and well-being of the community, it is important to investigate how noise pollution might reduce social cohesiveness and quality of life (Weinstein, 1978).

Approaches to Noise Pollution Effects

The impact of noise pollution on people has been demonstrated using Bronfenbrenner's ecological systems theory. When one system changes, all the others do too. Every system is related to every other system, either directly or indirectly. This relationship can be represented diagrammatically as follows.

The individual is viewed as the core, surrounded by five systems: the **environment, macro, exo, meso, and micro systems.** A person's close relationships with family, coworkers, and other individuals make up their microsystem. A mesosystem is a microsystem system. The connections and exchanges that occur between two or more settings make up the exo system. The connections and interactions among multiple environments, at least one of which excludes the developing individual but in which events take place that indirectly affect the processes occurring in the developing individual's immediate environment, comprise the exo system. The macro framework is the overall structure of micro-, meso-, and exo systems that are typical of a given culture or subculture, with particular reference to the religious systems, bodies of information, material possessions, border control, ways of life, possibilities structures, dangers. and life course possibilities that have become embedded in each other of these broader systems. A chrono system considers how an individual's characteristics and their environment can change throughout time.

Let's move from the innermost system to the outer one to provide a clear illustration. The brain, a supercomputer found in humans, is capable of creation, adaptability and other functions. Because of this cognitive capacity, people are creating technology to fulfil their conveniences. As technology advanced, people became accustomed to their conveniences. To properly grasp this viewpoint, let's look at an example.

Humans created vehicles to make transportation easier. A person purchases a car. Direct touch amongst family members makes them feel content and at ease. The person's social status increases. Coworkers and peer groups also want to buy a car. These are changes that occur within the microsystem. According to the meso system, as car sales increase, the entrepreneur needs to produce additional cars. The business operator hires more employees as demand increases, which indirectly affects their families. The exo system is composed of governmental institutions and the social environment. Road construction, traffic laws, RTOs for travel police departments, and vehicle traffic are all subject to new legislation. The macrosystem is composed of cultures, cultural groups, and other components. Because of modernisation, people are leading mechanical lifestyles and lack the leisure to regularly participate in their customary eco-friendly hobbies. Consequently, they are adopting modern practices that profoundly change people's traditions. One is harming his own environment when he does not use eco-friendly techniques. Its negative impact on the environment-based chrono system is demonstrated by this. Air pollution and noise pollution are caused by automobiles. These days, noise pollution is one of the worst pollutants. A person's health is negatively impacted by these pollutants.

Sleep disturbances, irritability, transient and permanent deafness, hypertension, heart disease, mental disorders, endocrine response imbalances, pregnancy abortions, inability to focus, exhaustion, and delayed growth and development in newborns are all caused by noise pollution. A person's poor health can divert his psychological behaviour as well. A person might not devote enough time to his peers, family, coworkers, etc. Insufficient focus and prolonged absences from work can result in a person's socioeconomic imbalance. This has a significant impact on workers, industry, etc., and new governmental organisations have emerged as a result. One of these organisations is the Pollution Board. The government provides funding to these departments in order to control pollution.

Some traditional eco-friendly activities are going extinct due to people's growing lack of focus, fatigue, laziness, and poor health. For instance, applying turmeric powder to a home's threshold is an old Indian custom. Turmeric is thought to have antibacterial properties and help keep germs out of the house. However, yellow paint is currently utilised in place of turmeric powder. This demonstrates how people's cultures have changed. The ecology suffers when such environmentally friendly practices are not followed. This cycle never stops (Sravani, 2016).

How to Reduce Noise Pollution?

Noise pollution poses a significant threat to public health, necessitating immediate action to reduce exposure. It is essential to implement noise-reducing strategies, promote research in this area, advocate for legislative reforms, and raise awareness about the associated risks. By collaborating, we can mitigate the alarming and often unnoticed dangers of noise pollution. Pollution, in general, refers to the introduction of harmful substances or energies into the environment, adversely affecting ecosystems, wildlife, and human health. Key contributors to this issue include industrial activities, vehicle emissions, agricultural runoff, waste management practices, consumer behavior, population growth, and climate change. It is imperative to establish and enforce noise regulations. Innovations in noise reduction technology should be developed and adopted. Additionally, urban planning must prioritize noise mitigation to create more peaceful living environments.

- We should use public transportation, minimize, reuse, and recycle renewable energy, and use eco-friendly products.
- Recycle, compost, and conserve water and energy.
- Encourage sustainable corporate practices.
- Reforestation and tree planting.
- By being aware of the origins, consequences, and remedies of pollution

Future Directions and Challenges

✧ **Research Gaps**

While significant research has been conducted on the health impacts of high-level noise exposure, there is a need for further investigation

into the long-term effects of low-level noise exposure. This covers possible effects on mental and cardiovascular health as well as general quality of life. According to the report, additional longitudinal research is required to fully comprehend these impacts and guide public health recommendations (Münzel, 2018). To fill this research gap, the World Health Organisation (WHO) has also recognised the need for additional studies on low-level noise exposure. According to their review, the health effects of extended exposure to lower noise levels are still little understood, especially with regard to vulnerable populations and chronic health conditions, whereas high-level sound exposure is well-documented (WHO, 2018).

✧ **Development of Noise Sources**

New causes of noise pollution have emerged as a result of the quick development of new technology and modifications to urban settings; they need more investigation. For example, the growing popularity of electric cars (EVs) creates new difficulties for noise control and monitoring. Although EVs are often quieter than conventional cars, Campello-Vicente's (2016) research shows that they may nevertheless leads to noise pollution in a number of ways, including increased noise from tyre friction and interactions with the road surface. It is essential to comprehend the complete effects of these new sources in order to create efficient noise management plans (Campello-Vicente, 2016).

✧ **Economical Issues**

Economic concerns have a big impact on how well noise pollution control methods work. Since noise control methods and infrastructure upgrades sometimes require significant financial investments, companies and government agencies may find it challenging to apply them. According to a study by Guski, (2017), financial constraints may make it more difficult to enforce noise regulations and install state-of-the-art noise reduction equipment, particularly in lower-income neighbourhoods (Guski, 2017).

✧ **Social Barriers**

Public awareness and community involvement are two social factors that affect noise pollution management programs. According to study by Basner et al. (2014), decision-makers may feel less pressure to act because the general public often lacks awareness of noise pollution and its detrimental health implications. When public concern is low, governments are less likely to prioritise and enforce noise control measures (Basner, 2014). Furthermore, socioeconomic disparity may exacerbate the challenges associated with noise pollution mitigation. Lower-income communities, which often experience higher levels of noise pollution, may lack the resources or political influence to support reasonable noise reduction measures (Morello-Frosch & Shenassa, 2006).

Conclusion

Noise causes mental stress by interfering with communication, interfering with everyday activities, and disrupting sleep. Chronic stress exposure causes autonomic instability, oxidative stress, inflammation, and endothelial dysfunction, which in turn speeds up the development of cerebrocardiovascular risk factors and disease. This is demonstrated by elevated stress hormone levels. Crucially, noise exposure promotes the development of psychological symptoms and disorders—which are linked to cerebrocardiovascular dysfunction—because it reflects mental stress. This emphasises the connection between mental stress, psychological disorders, and cerebrocardiovascular disease. To better understand the mechanisms underlying this association, more research is necessary, especially when evaluating the effects of noise on the brain, heart, and psyche in relation to one another. To sum up, environmental noise must be recognised as a significant risk factor for cerebrocardiovascular disease.

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