



Critical Analysis of Noise Pollution and Its Effect on Human Health

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ABSTRACT

Noise pollution is an unseen threat. It cannot be seen, although it is present both on land and beneath the water. Any undesired or irritating sound that impacts the health and well-being of humans and other organisms is referred to as noise pollution. It is harmful to human health. According to WHO, more than 70 decibels of sound will be harmful to health. The average noise level in Kathmandu was 66.8 decibels (A), with high-traffic zones producing the most noise, followed by commercial, low-traffic, and residential zones. The main objective of this review paper is to identify the effect of noise pollution on human health. It is a reviewed article. There are different kinds of effects explored in the previous studies such as hearing loss, sleep disruption, cardiovascular disease, social handicaps, reduced productivity, bad social behavior, irritation reactions, absenteeism, and accidents. Noise pollution is a significant problem in Nepal, particularly in Kathmandu. The studies suggest that the enforcement of noise standards and No Horn Regulation can be effective in reducing noise pollution. However, more efforts are needed to monitor and enforce these regulations. Noise pollution can cause a variety of health problems, and it is essential to take measures to reduce it to protect public health.

INTRODUCTION

Noise pollution is defined as repeated exposure to excessive sound levels that may cause harm to humans or other living beings. Sound levels of less than 70 decibels are not harmful to living creatures, according to the World Health Organization, regardless of how long or regular the exposure is. Continuous noise above 85 dB for more than 8 hours can be dangerous. If people work 8 hours a day near a busy road or highway, they are likely to be exposed to traffic noise pollution of roughly 85 decibels (Environmental Pollution Centers, 2022). Noise pollution is an unseen threat. It cannot be seen, although it is present both on land and beneath the water. Any undesired or irritating sound that impacts the health and well-being of humans and other organisms is referred to as noise pollution.

Noise pollution is no longer a fresh problem for the average person, especially in most industrial towns and metropolitan areas. Any sound that the recipient does not like is referred to as noise pollution. The frequency of sound influences human beings. The human ear is known to be sensitive to a wide range of intensities, ranging from 0 to 180 decibels. The noise is created by humans in a variety of ways (Pantawane, Maske, & Kawade, 2017). Noise pollution is a significant issue in cities all around the world. Unwanted sound is referred to as noise. All undesirable sounds in our communities, excluding those that originate in the workplace, are classified as environmental noise. Noise pollution, which is a type of air pollution, is hazardous to one's health and well-being. Because of population growth, urbanization, and the related growth in the usage of increasingly powerful, diversified, and highly mobile sources of noise, it is more severe and ubiquitous than ever before, and it will continue to expand in scale and intensity. It will also continue to expand as highway, rail, and air traffic continue to grow, all of which are major sources of environmental noise. In the factory workplace, workers are exposed to high noise due to machinery routine (Jariwala, Syed, Pandya, & Gajera, 2017). Human beings are irritated by noise pollution. The noise is typically a machine-generated sound that interrupts human activity or balance. It is a growing environmental problem that is progressively becoming a prevalent, yet undetectable kind of pollution not just in rich countries but also in developing countries. The word noise comes from the Latin word "Nausea," which means "unwanted sound," or a loud, unpleasant, or unexpected sound. It's defined as the incorrect sound, at the wrong moment, in the wrong place (Firdaus & Ahmad, 2010).

The following types of pollution are present in today's society that we often fail to even notice them any more:

- Street traffic sounds from cars, buses, pedestrians, ambulances, etc.
- Construction sounds like drilling or other heavy machinery in operation
- Airports, with constant elevated sounds from air traffic
- Workplace sounds, often common in open-space offices
- Constant loud music in or near commercial venues
- Industrial sounds like fans, generators, compressors, mills
- Train station traffic

- Household sounds, from the television set to music playing on the stereo or computer, vacuum cleaners, fans and coolers, washing machines, dishwashers, lawnmowers, etc.
- Events involving fireworks, firecrackers, loudspeakers, etc.
- Conflicts generate noise pollution through explosions, gunfire, etc. The dysfunctions, in this case, are likely caused by the conflict and insecurity and less by the noise pollution in itself, although that compounds stress levels too. (Environmental Pollution Centers, 2022)

Based on data from 4869 observations from the Chinese Social Survey in 2019, the effect of noise pollution on life satisfaction is estimated by using ordinary least squares and propensity score matching methods. The results show that noise pollution has a significant negative effect on Chinese life satisfaction. Moreover, the effect is heterogeneous depending on individuals' education levels and ages (Yang, Liu, Ren, & Li, 2022). Noise pollution can cause sleep disorders, anxiety, depression, aggravation of personal troubles, damage to interpersonal relationships, and other factors related to well-being and life satisfaction (Xiao, Li, & Zhang, 2016; Ma, Li, Kwan, & Chai, 2018; Hegewald, et al., 2020).

A study was conducted to assess noise pollution in Kathmandu, Nepal, and the effectiveness of the enforcement of noise standards and No Horn Regulation to control noise pollution (Chauhan et al., 2021). The study was conducted in 23 locations of four different zones (high traffic, low traffic, commercial, and residential) where 12 sites were considered for evaluating the effectiveness of No Horn Regulations. The noise level was studied at five different times of the day using a sound level meter to compute maximum, minimum, equivalent, and average noise levels. The study concluded that there is a noise pollution problem in Kathmandu, and the No Horn Regulation is in place but has not been strictly followed by the drivers and riders and monitored adequately by concerned authorities. However, the regulation has been effective in reducing the noise level significantly. The average noise level of Kathmandu was recorded as 66.8 dB(A) with the highest noise level in high-traffic zones, followed by commercial, low-traffic, and residential zones. In 65.2% of the sampled sites, the noise level was beyond the permissible limit of WHO and the National Sound Quality Standard of Nepal, 2012 (Chauhan et al., 2021, Singh et al., 2022).

Another study conducted in Kathmandu found that automobiles and loudspeakers are the main sources of noise pollution (Chand et al., 2022). The study also found that more than 90% of the studied educational institutions in Kathmandu Valley have a noise pollution problem, exceeding the national noise standards (Chauhan & Bhatta, 2019). Transportation contributes largely to environmental noise. The government of different countries has rules & regulations against hazardous noise sources, but enforcement seems to be lenient. Noise laws and ordinances vary widely across the globe (Jhanwar, 2016).

Noise pollution is a growing public health concern in Kathmandu, and it is one of the major environmental problems affecting the health and well-being of millions of people in Nepal. Noise pollution can cause a variety of health problems for people, including increased stress levels, sleep disturbance, hearing

damage, cardiovascular disease, type 2 diabetes, cognitive impairment, and low birth weight (Chand et al., 2022, Chauhan et al., 2021, Flacke et al., 202, Singh et al., 2022). It's important to note that addressing noise pollution in Nepal is not just a scientific or technical challenge but also a socio-cultural and policy challenge. Collaborative efforts involving researchers, government agencies, local communities, and NGOs are crucial to tackle this issue effectively. There is very little literature available on the effect of noise pollution in the Nepalese context so it is important to explore it and find out the research gap. The practical problem of noise pollution in urban cities and the findings of previous literature raised questions about the status and effect of noise pollution on human health in general.

How does noise pollution affect individuals over time?

METHODOLOGY

It is a systematic literature review-based report. It has collected and reviewed the related previous literature from various online sources. It has collected secondary information to generate knowledge on this topic. It has followed the qualitative narrative design. The researcher has visited different online sites to collect the previous literature and analyze the effect of noise pollution on human health. The previous findings are critically analyzed and presented in different themes as the effect of noise pollution is reported by previous findings.

Inclusion and exclusion criteria

This research article presents the results of an in-depth study that included conference and article. It excludes information from edited books, preprints, monographs, and book chapters.

RESEARCH RESULT

Effects of Noise Pollution

Noise pollution is any unwanted or disturbing sound that affects the health and well-being of humans and other organisms (Angelo, 2023). There are some problems caused by noise pollution explained in previous literature. The negative impacts of noise pollution on health are headache, sleeplessness, psychological disorders, lack of concentration at work, and other health impacts such as hearing loss, learning difficulties, stroke, hypertension, and reduced quality of life (Wokekoro, 2020). The effect of noise pollution is hearing Problems, Health Issues, Sleeping Disorders, Cardiovascular Issues, Trouble Communicating, and Effect on Wildlife (Pantawane, Maske, & Kawade, 2017). Noise pollution has a wide range of potential health impacts that are widespread, long-lasting, and medically and socially significant. Noise has immediate and cumulative negative health consequences, as well as degraded residential, social, and working environments, resulting in tangible (economic) and intangible (well-being) losses. Hearing loss, sleep disruption, cardiovascular disease, social handicaps, reduced productivity, bad social behavior, irritation reactions, absenteeism, and accidents are all potential consequences of noise. It can make it

difficult to enjoy one's home and leisure time, as well as increase the likelihood of antisocial behavior. Noise, like prolonged stress hurts general health and well-being. It hurts future generations by deteriorating residential, social, and learning environments, as well as resulting in financial losses (Jariwala, Syed, Pandya, & Gajera, 2017). Noise pollution can cause a variety of health problems for people and wildlife, both on land and in the sea. The most common health problem it causes is Noise Induced Hearing Loss (NIHL) (Angelo, 2023). Here are some of the ways noise pollution can affect human health:

Increased stress levels: Exposure to noise pollution can increase stress levels, which can lead to a variety of health problems (Millar, 2020).

Sleep disturbance: Noise pollution can reduce the depth and quality of sleep, altering the amount of rapid eye movement sleep. This can impact a person's mood and ability to concentrate (Millar, 2020).

Hearing damage: In severe cases, loud sounds can directly cause hearing impairment. Some forms of noise-induced hearing impairment include abnormal loudness perception, tinnitus, and distorted hearing (Millar, 2020).

Cardiovascular disease: There is an association between long-term exposure to noise and higher rates of cardiovascular disease. Short-term exposure to noise pollution can temporarily raise blood pressure and increase blood viscosity (Dutchen, 2022).

Type 2 diabetes: Noise pollution can cause or exacerbate type 2 diabetes (Dutchen, 2022).

Sleep disturbances: Noise pollution can cause sleep disturbances (Peris, 2020).

Stress: Noise pollution can cause stress-related illnesses (Peris, 2020).

Cognitive impairment: Noise pollution can cause cognitive impairment in children (Peris, 2020).

Low birth weight: Noise pollution can cause low birth weight (Peris, 2020).

Children are particularly vulnerable to the negative health effects of noise pollution (Millar, 2020). Noise pollution significantly impacts public health, and it is a major environmental problem affecting the health and well-being of millions of people in Europe and the United States (Dutchen, 2022). It may be possible to reduce noise pollution by using a combination of different measures including technological improvements, ambitious noise policies, better urban and infrastructure planning, and changes in people's behaviors (Peris, 2020).

There are various types of adverse health effects of noise pollution on humans are explained in the previous literature. Some adverse effect of noise pollution is noise-induced hearing impairment; interference with speech communication; disturbance of rest and sleep; psychophysiological, mental-health, and performance effects; effects on residential behavior and annoyance; and interference with intended activities (World Health Organization, 1995).

Some of the health problems caused by noise pollution are as follows:

Hearing Impairment

Impaired hearing may come from the workplace, from the community, and from a variety of other causes (eg, trauma, ototoxic drugs, infection, and heredity) (Hsu, Ryherd, Wage, & Ackerman, 2012). There is widespread agreement that exposure to sound levels less than 70 decibels (dB) does not affect hearing loss, regardless of length. There is also widespread consensus that sound levels over 85 dB for more than 8 hours are potentially hazardous; to put this in perspective, 85 dB is similar to the noise of heavy truck traffic on a busy route. When sound levels exceed 85 decibels, damage is proportional to sound pressure (measured in decibels) and exposure time. Occupational noise is the most common cause of hearing loss, but other types of noise, particularly recreational noise, can also cause significant deficiencies (Berglund & Lindvall, 1995). A one-minute exposure to a sound level over 100 can cause permanent hearing loss. A large number of textile workers, especially weavers, suffer from occupational hearing loss due to high levels of noise emissions from manufacturing machines (Talukdar, 2001). The noise levels detected in all the industries were much above the 80 dBA. Due to high noise pollution, 73.83% of the workers in these industries were disturbed by the noise in their workplaces, 60.96% of them had complaints about their nervous situations, 30.96% of these workers suffered from hearing problems although they had not had any periodical hearing tests and they are not using ear protection equipment (Atmaca et al., 2005). A study conducted in the Banepa area of Kavre district, Nepal found that the noise levels observed at the highway were a minimum of 60.1dB(A) to a maximum of 110.2 dB (A). Similarly, the minimum and maximum noise levels for the Link Road were 52.7dB (A) and 100.1dB (A) respectively. Overall noise levels measured at the nearest residences located in the vicinity of the main road ranged from 59.1 to 104.2 dB(A) (Murthy, Majumder, Khanal, & Subedi, 2007). A previous study revealed that 36% of people suffered from hearing disability. Chi-Square test found that noise has a significant ($\alpha = 0.05$) effect on hearing loss (Gupta & Ghatak, 2011).

Tens of millions of Americans suffer from a range of adverse health outcomes due to noise exposure, including heart disease and hearing loss. The study estimated that 104 million individuals had annual L EQ (24) levels > 70 dBA (equivalent to a continuous average exposure level of >70 dBA over 24 hr) in 2013 and were at risk of noise-induced hearing loss. Tens of millions more may be at risk of heart disease, and other noise-related health effects (Jariwala et al., 2014). A study by the Science Communication Unit revealed that the World Health Organization (WHO) affirmed that 10% of the world population is exposed to environmental and social noise such as headphones that lead to hearing impairment (Science Communication Unit, 2015). Similar type of findings were reported by a study in Bangladesh which observed that the highest noise level on the roadside in Chittagong city was about 93dB found at AK Khan Circle and Agrabad Circle, which far exceeded the acceptable limit of 60 dB set by the Government of Bangladesh. The level of noise pollution is closely related to traffic volume, particularly with the number of heavy vehicles like trucks, buses as well and auto rickshaws have been observed during the study. A questionnaire survey was done during the study to determine the health impacts

on the city dwellers. Most of the common problems, the dweller suffering from noise pollution are headaches, bad temper, sleeplessness, aggravation, hearing problems, etc. (Islam et al., 2016).

Negative Social Behaviour and Annoyance

Annoyance is defined as a feeling of annoyance connected with any agent or condition that an individual believes will harm him or her. Aversion or distress might be a better descriptor of this reaction. Because it has the same effects as other stressors, noise has been utilized as a noxious stimulus in several investigations. When noise is accompanied by vibration or low-frequency components, annoyance rises dramatically (Basner, Davis, Brink, Clark, Janssen, & Stansfeld, 2014).

Noise exposure has complicated, nuanced, and indirect social and behavioral effects. Changes in everyday behavior (e.g., closing windows and doors to reduce outside noise; avoiding the use of balconies, patios, and yards; and turning up the volume of radios and television sets); changes in social behavior (e.g., aggressiveness, unfriendliness, nonparticipation, or disengagement); and changes in social indicators (e.g., residential mobility, hospital admissions, drug consumption, and accident rates); and mood changes (increased reports of depression) (Singh & Davar, 2004).

Interference with Spoken Communication

Concentration issues, weariness, doubt, a lack of self-confidence, annoyance, misunderstandings, lower working capacity, strained interpersonal relationships, and stress reactions are just a few of them. Some of these side effects could lead to an increase in accidents, a breakdown in classroom communication, and poor academic achievement. Children, the elderly, and people unfamiliar with the spoken language are among the most susceptible categories (Passchier & Passchier, 2000).

Noise pollution makes it difficult to understand regular speech and can result in a variety of personal difficulties, handicaps, and behavioral disorders (Basner, Davis, Brink, Clark, Janssen, & Stansfeld, 2014). A statistical analysis of the Chi-Square test found that noise has a significant ($\alpha = 0.05$) effect on hearing loss, sleep disturbances, abnormal heartbeat, and speech communication problems (Gupta & Ghatak, 2011).

Sleep Disturbances

In healthy people, uninterrupted sleep is believed to be a requirement for proper physiologic and mental performance. One of the most common reasons for sleep disturbance is environmental noise. When sleep disturbance becomes chronic, it leads to mood swings, decreased performance, and other long-term health and well-being consequences. Much recent research has focused on noise from aircraft, highways, and trains. Continuous noise over 30 decibels, for example, is known to disrupt sleep. The likelihood of getting awakened increases with the number of noise occurrences per night for intermittent noise (Berglund & Lindvall, 1995). For a good night's sleep, the equivalent sound level should not

exceed 30 dB(A) for continuous background noise, and individual noise events exceeding 45 dB(A) should be avoided (World Health Organization, 1995). Nocturnal noise has been linked to long-term psychosocial impacts. Noise annoyance during the night raises the total amount of noise annoyance for the next 24 hours. The elderly, shift workers, people with physical or mental illnesses, and people with sleep difficulties are all particularly vulnerable groups (Passchier & Passchier, 2000). A previous study revealed that 67% and 61% of people suffered from irritability and insomnia respectively. A chi-Square test was conducted among the different physiological and psychological effects and it was found that noise has a significant ($\alpha = 0.05$) effect on sleep disturbances, abnormal heart beat, and speech communication problems (Gupta & Ghatak, 2011).

According to Shepherd, McBride, Kim, Dirksand Welch (2014) Noise remains a potent degrader of health in many global contexts, capable of inducing severe annoyance and sleep disturbance. Science Communication Unit (2015) reviewed several articles on the noise impacts on health and found that stress and sleep disturbance due to environmental noise leads to cardiovascular disease and that night-time noise impacts more on cardiovascular health than daytime noise. Noise exposure at night is a particular problem because it disturbs sleep.

Oviasogie and Ikudayisi (2019) investigated the effect of noise exposure on residents' well-being in Benin City, Nigeria adopting a cross-sectional survey of urban residents and ordinal regression analysis to determine factors that influenced neighborhood well-being and found hindrances to communication, interference with sleep, stress, annoyance, as the major effects of urban neighborhood noise pollution. Their study concluded that most residents perceived neighborhood noise as harmful to health and might stimulate aggression and other antisocial behavior.

Cardiovascular Disturbances

Cardiovascular disturbances are independent of sleep disturbances; noise that does not interfere with the sleep of subjects may still provoke autonomic responses and secretion of epinephrine, norepinephrine, and cortisol. These responses suggest that one can never completely get used to night-time noise (Passchier & Passchier, 2000). A previous study revealed that 40% of people suffered from high blood pressure whereas 15%, 67%, and 61% of people suffered from cardiovascular diseases, irritability, and insomnia respectively. Chi-Square test was conducted among the different physiological and psychological effects and it was found that noise has a significant ($\alpha = 0.05$) effect on abnormal heartbeat (Gupta & Ghatak, 2011).

Muñzel, Goril, Babischand Basner (2014) reviewed the literature on cardiovascular effects of environmental noise exposure and found that environmental noise affects the auditory system, causes annoyance, disturbs sleep, impairs cognitive performance, increases arterial hypertension, myocardial infarction, stroke, blood pressure, stress hormone levels, oxidative stress. Noise is a stressor that affects the autonomic nervous system and the endocrine system. Previous studies reported that noise increases the prevalence of hypertension which is one of the risk factors for cardiovascular disorders. The

increasing number of hypertensive individuals in developing countries might be attributed to incessant noise. If the governments of these countries do not take necessary measures to combat noise pollution, their countries might be populated with cardiovascular disease individuals (Aluko et al., 2015). Noise is also a threat to marine and terrestrial ecosystems. Health risks from noise are correlated with road traffic. In other words, noise health effects are the health consequences of elevated sound levels (Geravandi et al., 2015).

A growing body of evidence confirms that noise pollution has both temporary and permanent effects on humans (and other mammals) by way of the endocrine and autonomic nervous systems (Singh & Davar, 2004). High-quality epidemiological evidence described in the systematic review on cardiovascular and metabolic effects of environmental noise indicates that exposure to road traffic noise increases the risk of IHD (Van Kempen, Casas, Pershagen, & Foraster, 2018).

Disturbances in Mental Health

Although noise pollution is not thought to be a cause of mental disease, it is thought to hasten and worsen the emergence of latent mental problems. The following negative impacts may be caused by or contributed to by noise pollution: Anxiety, stress, nervousness, nausea, headache, emotional instability, argumentativeness, sexual impotence, mood swings, increased social conflicts, neurosis, hysteria, and psychosis are all symptoms of anxiety, stress, nervousness, nausea, and headache (Berglund & Lindvall, 1995). Major effects of noise pollution include interference with communication, sleeplessness, and reduced efficiency. The extreme effects e.g. deafness and mental breakdown neither is ruled out (Singh & Davar, 2004).

Noise levels above 80 decibels are linked to an increase in hostile behavior as well as a decrease in helpful behavior. Violent behavior resulting from noise disagreements is frequently reported in the press; in many cases, these disputes resulted in damage or death. The consequences of noise outlined above may help explain part of the dehumanization witnessed in today's congested and noisy metropolitan environment (Goines & Hagler, 2007). Noise is associated with the physical, mental, emotional, and psychological to all individuals be it human beings or even animals. This is a potential risk to the requirements of sound living conditions and needs to be checked at the judicial (Muhammad Anees et al., 2017). Traffic noise was reported as the most important source of noise pollution. The most important effects noise pollution had on nervousness (29.1%), conversation problems (19.8%), amnesia (18.3%), and loss of concentration (12.8%). Furthermore, 54.8% of the respondents considered the environmental noises annoying, and 32.5% reported it very annoying (Moteallemini et al., 2018).

A previous study of meta-analysis was done including 31 studies (26 on depression and/or anxiety disorders, 5 on dementia). The meta-analysis of five aircraft noise studies found that depression risk increased significantly by 12% per 10 dB LDEN (Effect Size = 1.12, 95% CI 1.02–1.23). The meta-analyses of the road (11 studies) and railway traffic noise (3 studies) indicated 2–3% (not

statistically significant) increases in depression risk per 10 dB LDEN (Hegewald, et al., 2020).

Physiological Functions

In workers exposed to noise, and in people living near airports, industries, and noisy streets, noise exposure may have a large temporary, as well as permanent, impact on physiological functions. After prolonged exposure, susceptible individuals in the general population may develop permanent effects, such as hypertension and ischaemic heart disease associated with exposure to high sound levels (World Health Organization, 1995).

Noise has been demonstrated to harm cognitive task performance, particularly in workers and children. Although noise-induced arousal improves performance in basic tasks in the near term, it significantly degrades cognitive function in more complicated ones. Noise has a significant impact on reading, attention, problem-solving, and remembering, to name a few cognitive impacts. Noise can also be a distracting stimulus, and impulsive noise episodes can disrupt due to startling responses (World Health Organization, 1995). High noise level causes psychological effects and physical damage, including irritability, loss of concentration, anxiety, and increased pulse rate (Talukdar, 2001). A previous study revealed that 36% of people suffered from anxiety due to high levels of noise pollution (Gupta & Ghatak, 2011).

In the case of Nepal, A report prepared by Environment Statistics of Nepal 2019 shows that areas with heavy traffic, commercial-cum-residential areas, and industrial areas inside Kathmandu Valley have exceeded the noise pollution limit set by the World Health Organization (Himalayan News Service, Jun 25, 2019).

A study by Raju Chauhan, Alina Shrestha & Dharmendra Khanal conducted on 'Noise pollution and effectiveness of policy interventions for its control in Kathmandu, Nepal' has stated that Pollution of the air, water, and solid waste has received a lot of attention in Nepal, both in terms of research and policymaking. Noise pollution is an underappreciated contaminant that is becoming a serious public health concern in Kathmandu. This research aims to measure noise pollution in Kathmandu and investigate the effectiveness of noise standards enforcement and the No Horn Regulation in reducing noise pollution. The research was carried out in 23 locations across four different zones (heavy traffic, low traffic, commercial, and residential), with 12 sites being used to assess the impact of the No Horn Regulations. The maximum, minimum, equivalent, and average noise levels were calculated using a sound level meter at five different times of the day. This study concluded that (i) there is a noise pollution problem in Kathmandu, (ii) No Horn Regulation is in place but it has not been strictly followed by the drivers and riders and monitored adequately by concerned authorities, and (iii) the regulation has been effective in reducing the noise level significantly. The average noise level in Kathmandu was reported as 66.8 dB(A) with the highest noise level in High-traffic zones, followed by commercial, low-traffic, and residential zones. The noise level was over the WHO and National Sound Quality Standard of Nepal, 2012 permitted limit in 65.2

percent of the measured sites. 48.1 percent of all honking incidents violated the No Horn Regulation (Chauhan, Shrestha, & Khanal, 2021).

In summary, the literature review provides comprehensive insights into the effects of noise pollution on human health and well-being. The following key findings emerge from the reviewed literature:

Health Impacts: Noise pollution is associated with various adverse health effects, including headache, sleeplessness, psychological disorders, lack of concentration, hearing loss, learning difficulties, stroke, hypertension, and reduced overall quality of life.

Specific Health Issues: The literature identifies specific health problems resulting from noise pollution, such as Noise-Induced Hearing Loss (NIHL), increased stress levels, sleep disturbances, cardiovascular diseases, type 2 diabetes, and cognitive impairment, particularly in children.

Vulnerability of Children: Children are particularly vulnerable to the negative effects of noise pollution, experiencing a range of health problems and potential long-term consequences, affecting their learning and development.

Public Health Impact: Noise pollution significantly impacts public health on a widespread scale, affecting millions of people in Europe and the United States. The detrimental effects include hearing impairment, sleep disturbances, cardiovascular disturbances, and disturbances in mental health.

Sources of Noise Pollution: Various sources contribute to noise pollution, including industrial activities, traffic, and recreational noise. Occupational noise is a common cause of hearing loss, and noise pollution in urban areas is linked to traffic volume, particularly heavy vehicles.

Social and Behavioral Effects: Noise pollution has nuanced and indirect effects on social behavior, leading to changes in everyday behavior, social behavior, and mood changes. Annoyance is a common response to noise pollution, and it can lead to stress-related illnesses.

Cardiovascular Effects: Long-term exposure to noise is associated with higher rates of cardiovascular diseases, including high blood pressure. Night-time noise, in particular, is linked to disturbances in sleep and cardiovascular health.

Mental Health Impact: While noise pollution is not considered a direct cause of mental disease, it is believed to exacerbate latent mental problems. Negative impacts on mental health include anxiety, stress, nervousness, nausea, headache, emotional instability, and increased social conflicts.

Physiological Functions: Noise exposure affects physiological functions in workers and residents, with potential temporary and permanent impacts such as hypertension and ischaemic heart disease. Noise-induced arousal may initially improve performance but can lead to cognitive function degradation in the long term.

Policy Interventions: The review suggests that noise pollution is a serious public health concern, and policy interventions, including technological improvements, noise policies, urban planning, and changes in behavior, may help reduce noise pollution.

ORIGINAL CONTRIBUTION

This literature review makes a noteworthy contribution by comprehensively synthesizing existing knowledge on the diverse and far-reaching impacts of noise pollution on human health and well-being. It brings attention to the intricate web of health issues stemming from noise exposure, spanning physical ailments such as cardiovascular diseases and hearing impairment to psychological and cognitive challenges like stress, anxiety, and impaired concentration. The research underscores the vulnerability of certain populations, particularly children, and highlights the pervasive public health implications of noise pollution on a global scale. Additionally, the review emphasizes the need for multifaceted interventions, including technological advancements, robust noise policies, urban planning improvements, and behavioral changes, to effectively mitigate the detrimental effects of noise pollution. Overall, this comprehensive synthesis consolidates the understanding of noise pollution's multifaceted health impacts and advocates for urgent and targeted interventions to address this pressing environmental and public health concern.

CONCLUSIONS AND RECOMMENDATIONS

The impact of noise pollution in Nepal is a multifaceted issue with significant consequences for both public health and well-being. Noise pollution, characterized by unwanted and disruptive sounds, has been shown to lead to various health problems, including hearing impairment, increased stress levels, sleep disturbances, cardiovascular disturbances, and negative effects on mental health. It interferes with spoken communication, disturbs cognitive functions, and can lead to annoyance and disruptions in daily life. Moreover, noise pollution has been associated with disturbances in physiological functions and can exacerbate pre-existing mental health conditions. In Nepal, there is evidence that noise pollution levels exceed recommended limits, particularly in areas with heavy traffic, commercial activities, and industrial zones, such as Kathmandu Valley. Despite the existence of noise standards and regulations, enforcement remains a challenge, with the No Horn Regulation being inadequately monitored and enforced. This research highlights the pressing need to address noise pollution in Nepal, not only through stricter regulation but also through effective enforcement, public awareness, and measures to mitigate noise levels, especially in high-traffic and commercial areas. Addressing noise pollution is essential for the overall health and well-being of the population, as well as for creating more livable and harmonious urban environments in the country.

In conclusion, the findings of this study emphasize the wide-ranging and significant impact of noise pollution on human health, indicating the need for effective strategies and policies to mitigate its adverse effects on individuals and communities. The findings underscore the urgency of addressing noise pollution as a critical environmental and public health issue.

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