

Parental Perspectives on the effect of Air and water pollution on
early childhood development among urban disadvantaged
children (0- 8) in Dhaka.

By

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A thesis submitted to BRAC Institute of Educational Development in partial
fulfillment of the requirements for the degree of
Master of Science in Early Childhood Development

BRAC Institute of Educational Development
BRAC University
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Declaration

It is hereby declared that

1. The thesis submitted is my/our own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I/We have acknowledged all main sources of help.

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Ethics Statement

Title of Thesis Topic: Parental Perspectives on the effect of Air and water pollution on early childhood development among urban disadvantaged children (0- 8) in Dhaka.

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1. Source of population: Parents of children aged between 0 to 8 years from Urban disadvantaged setting.

2. Does the study involve (yes, or no)

- a) Physical risk to the subjects (No)
- b) Social risk (No)
- c) Psychological risk to subjects (No)
- d) discomfort to subjects (No)
- e) Invasion of privacy (No)

3. Will subjects be clearly informed about (yes or no)

- a) Nature and purpose of the study (Yes)
- b) Procedures to be followed (Yes)
- c) Physical risk (Yes)
- d) Sensitive questions (Yes)
- e) Benefits to be derived (Yes)
- f) Right to refuse to participate or to withdraw from the study (Yes)
- g) Confidential handling of data (Yes)
- h) Compensation and/or treatment where there are risks or privacy is involved (N/A)

4. Will Signed verbal consent for be required (yes or no)

- a) from study participants (N/A)
- b) from parents or guardian (Yes)
- c) Will precautions be taken to protect anonymity of subjects? (Yes)

5. Check documents being submitted herewith to Committee:

- a) Proposal (Yes)
- b) Consent Form (Yes)
- c) Questionnaire or interview schedule (Yes)

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Abstract

Air and water pollution have become serious everyday problems in Dhaka, especially for families living in urban disadvantaged communities. Young children are more vulnerable to environmental pollution because their bodies and minds are still developing during the early years of life. Exposure to polluted air, unsafe water, poor sanitation, and unhealthy living conditions can affect children's health, growth, learning, and emotional well-being. This study aims to explore how parents and caregivers in Dhaka understand the effects of air and water pollution on children under 8 years of age. The study also focuses on the steps caregivers take to protect their children from pollution and the difficulties they face in trying to ensure a safe and healthy environment for early childhood development. A quantitative research approach was used, and data were collected from the 60 parents and caregivers through structured questionnaires. The findings of the study provide a better understanding of caregivers' experiences, awareness, and daily coping practices related to environmental pollution. The study may also help to support future awareness programs, child-focused environmental policies, and interventions for improving children's health and development in Bangladesh.

Keywords: Early Childhood Development (ECD); Air Pollution; Water Pollution; Parents and Caregivers; Urban Disadvantaged Communities; Dhaka

Dedication

This thesis is lovingly dedicated to my two beloved children, whose love and inspiration led me to pursue a Master's in Early Childhood Development.

Acknowledgement

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List of Acronyms

AAP – Ambient Air Pollution

ADHD – Attention-Deficit/Hyperactivity Disorder

AQI – Air Quality Index

AQLI – Air Quality Life Index

ARI – Acute Respiratory Infection

ASD – Autism spectrum disorder

CO – Carbon Monoxide

CO₂ – Carbon Dioxide

DGHS – Directorate General of Health Services

DoE – Department of Environment (Bangladesh)

DPHE – Department of Public Health Engineering

ECD – Early Childhood Development

HAP – Household Air Pollution

IAP – Indoor Air Pollution

IQAir – International air quality monitoring organization

LGD – The Local Government Division

LPG – Liquefied Petroleum Gas

MoEFCC – The Ministry of Environment, Forest and Climate Change

MoHFW – The Ministry of Health and Family Welfare

MoIB – The Ministry of Information and Broadcasting

MoWCA – The Ministry of Women and Children Affairs

NAP – National Adaptation Plan

NAQMP – National Air Quality Management Plan

NO_x – Nitrogen Oxides

PAHs – Polycyclic Aromatic Hydrocarbons

PM_{2.5} – Fine Particulate Matter (≤ 2.5 micrometers)

RHD – The Roads and Highways Department

SD – Standard Deviation

SDG / SDGs – Sustainable Development Goal(s)

SO₂ – Sulfur Dioxide

SPSS – Statistical Package for the Social Sciences

UNICEF – United Nations Children’s Fund

UVB – Ultraviolet B Radiation

WHO – World Health Organization

n – Number

f – Frequency

% – Percentage

Chapter I: Introduction & Background

Introduction

Environmental pollution has become a rapid growing global concern, affecting both ecosystems and human health. In South Asia, rapid urbanization, industrial growth, and population pressure have significantly worsened air and water quality, particularly in densely populated cities. Bangladesh faces this challenge acutely, especially in Dhaka, where unplanned urban expansion, traffic congestion, industrial emissions, and poor waste management have increased everyday exposure to environmental hazards.

Early childhood (0–8 years) is a critical stage of development, during which children are highly sensitive to environmental conditions. Their developing bodies and higher intake of air and water relative to body size make them vulnerable to pollution (World Health Organization, 2018). Exposure to polluted air and water during this period has been linked to respiratory illnesses, poor lung development, diarrhea, malnutrition, and delays in cognitive and motor development (UNICEF, 2016; Philip J. Landrigan et al., 2018). These effects can also extend to stunting, asthma, and socio-emotional difficulties, ultimately limiting children’s learning potential and future opportunities (Jeong Joshua et al., 2021).

The situation is more severe for children living in urban disadvantaged communities, such as informal settlements in Dhaka. These environments are often characterized by overcrowding, unsafe housing, poor sanitation, polluted air, limited access to clean water and healthcare, increasing children’s exposure to multiple environmental risks. In such settings, poverty and low awareness further restrict families’ ability to reduce these risks, placing children at a higher risk of developmental challenges.

In this context, parents and caregivers play a crucial role. As primary caregivers, their knowledge, awareness, and daily practices such as maintaining hygiene, ensuring safe water use, and reducing exposure to pollution can significantly influence children's health and development. Understanding these parental perspectives is therefore essential for designing effective interventions and policies.

Given these challenges, this study explores what parents and caregivers in Dhaka think about the impact of air and water pollution on young children, and how they try to protect them. These insights can help guide actions to ensure safer environments and healthier development for vulnerable children.

Statement of the Problem

Environmental pollution has become a serious public health concern in Bangladesh, particularly in rapidly growing cities such as Dhaka. Air pollution alone places a substantial burden on health and the economy. In 2019, it was associated with more than 159,000 deaths and millions of days lived with illness, along with considerable economic losses (World Bank, 2023a). More recent estimates indicate that air pollution contributes to more than 200,000 premature deaths each year. Bangladesh was also ranked as the world's most polluted country in 2023, with PM_{2.5} concentrations far above recommended safety levels (IQAir, 2023; CREA, 2025).

The situation is particularly concerning for children living in Dhaka. PM_{2.5} concentrations in the city can reach around 90–100 µg/m³, nearly 20 times higher than the World Health Organization (WHO) guideline of 5 µg/m³, and levels generally increase during the dry season (AQLI, 2024; Ministry of Environment, Forest and Climate Change, 2024). Regular exposure to polluted air increases children's risk of

respiratory illnesses, including acute respiratory infections, which remain an important cause of death among children under five in Bangladesh (UNICEF & Health Effects Institute, 2024). Air pollution in Dhaka comes from several sources, including brick kilns, road dust, vehicle emissions, industrial activities, and the burning of biomass and waste (Begum et al., 2014; World Bank, 2019; Department of Environment Bangladesh). Brick kilns also release pollutants such as black carbon, SO₂, NO_x, and CO (Begum et al., 2013; Eil et al., 2020; Weyant et al., 2014). Children living close to roads, industries, and brick kilns may therefore experience greater exposure, particularly during winter, increasing their risk of asthma, pneumonia, reduced lung function, and possible effects on brain development (Rahman et al., 2021; Sherris et al., 2021; Guxens et al., 2023).

Water pollution adds another important dimension to these environmental risks. Rapid urbanization, inadequate sanitation, and untreated industrial discharge have contributed to the contamination of water sources with pathogens and toxic substances, including arsenic, lead, and chromium (Rahman et al., 2019; Hasan et al., 2018). In Dhaka, industrial discharge, untreated sewage, solid waste, and other forms of runoff are important sources of water contamination (World Bank, 2018; Department of Environment Bangladesh; WHO, 2017; FAO). Poor water and sanitation conditions can contribute to diarrhoeal illness, malnutrition, stunting, and other health and developmental problems among children. Around 24% of children under five in Bangladesh are reported to be stunted (NIPORT, 2022), while early exposure to toxic metals has also been associated with poorer cognitive and behavioural outcomes (Wasserman et al., 2007; WHO, 2023).

Environmental risks may begin even before birth. Maternal exposure to air pollution and extreme heat has been associated with preterm birth, low birth weight, neonatal mortality, and some congenital conditions, including heart defects (Syed et al., 2022; WHO, 2018). Bangladesh continues to experience a neonatal mortality rate of approximately 20 deaths per 1,000 live births, and adverse conditions during the prenatal and neonatal periods may increase the risk of longer-term health and developmental difficulties (Landrigan et al., 2018; NIPORT, 2022; Chamarthi, 2025).

The burden is particularly serious for children living in urban disadvantaged communities and informal settlements in Dhaka. About one-third of the population in City Corporation areas lives in slum settlements, while more than 20% of Dhaka's population lives in slums, where many households depend on shared taps or handpumps for water (BBS & UNICEF, 2018; World Bank, 2016). Limited access to safe water, sanitation, and adequate living conditions can increase children's exposure to polluted air and water, waste, and other environmental hazards. The scale of the sanitation challenge is further illustrated by the estimated 230 tons of fecal waste entering Dhaka's open water bodies each day (UNICEF, 2025). For families with limited resources, avoiding these environmental risks can be difficult, increasing children's repeated exposure during critical stages of development.

These overlapping risks are especially important during early childhood, when the brain and other developmental systems undergo rapid growth. Exposure to air and water pollution alongside poor nutrition, overcrowding, and psychosocial stress may contribute to neuroinflammation and oxidative stress, potentially affecting memory, attention, language, behaviour, and socio-emotional development (Landrigan et al., 2018; Guxens et al., 2023). Recurrent illness and unsafe surroundings may also reduce

children's opportunities for play, learning, and responsive interaction, potentially contributing to later behavioural and learning difficulties (Jeong et al., 2021; Sheffield et al., 2011).

Despite growing evidence, gaps remain in understanding how combined air and water pollution affects different areas of early childhood development, particularly among children in disadvantaged urban communities. Parents' and caregivers' experiences are also less explored. Understanding their perspectives can reveal how pollution affects children's daily lives, how families try to protect them, and the challenges they face, helping to inform appropriate support, improved WASH services, and safer, child-sensitive environments in Dhaka.

Purpose of the study

This study is about to explore parents' as well as caregivers' perceptions regarding how air and water pollution affect the health and early childhood development of children aged 0–8 years living in urban disadvantaged areas of Dhaka. The study particularly focuses on how caregivers understand the effects of pollution on children's physical health and different developmental domains, including cognitive, motor, language, and socio-emotional development. It also aims to understand the challenges families face in polluted urban environments and the everyday practices they use to protect their children from environmental risks.

Environmental risks are further shaped by climate-related changes. Evidence from the Lancet Countdown on Health and Climate Change highlights that current patterns of climate exposure relate serious risks to both present and future health (Watts et al., 2018). Children are exposed to these risks from the prenatal stage and throughout the

environments where they live and grow (Nazir et al., 2019). In urban disadvantaged settings, exposure to polluted air, unsafe water, and changing environmental conditions can limit children's ability to engage in healthy regular activities and early learning, ultimately affecting their cognitive and emotional development.

In this context, parents and caregivers play a crucial role. As primary caregivers, their awareness and everyday practices can help reduce children's exposure to environmental risks and support their overall well-being. Caregivers who understand these risks are better able to take preventive actions and foster resilience, coping skills, and emotional stability in young children (Sanson et al., 2018; Corraya, 2022).

Therefore, this study seeks to understand how parents and caregivers perceive environmental pollution, the challenges they face in protecting their children in resource-constrained environments, and how their awareness shapes daily practices. By bringing together environmental exposure, child development, and parental perspectives, the study aims to find out context-specific insights that could be useful for effective interventions, strengthen caregiver awareness, and support policies for creating safer and healthier environments for young children.

Significance of the study

Children are among the most affected by environmental and climate-related risks, yet their needs are often overlooked in decision-making processes (Corraya, 2022). Although they have a strong stake in environmental outcomes, they are rarely included in policies that shape their future (Currie et al., 2016). Despite contributing the least to environmental degradation, children face disproportionate risks to their health, development, and future livelihoods (Islam, 2014).

Climate change is intensifying these challenges, especially for vulnerable communities. As environmental hazards increase, the burden of disease is also expected to rise. Respiratory infections and diarrheal diseases already leading causes of child mortality in low-income settings are projected to become more common (Sheffield & Landrigan, 2011; Ragavan et al., 2020; Ullah et al., 2019). In Bangladesh, this risk is heightened due to its geographical vulnerability as a delta region. Changes in temperature, rainfall, and environmental conditions contribute to the spread of diseases such as acute respiratory infections (ARI) and diarrhea, disproportionately affecting children (Benevolenza & DeRigne, 2019).

Environmental pollution further compounds these risks, particularly in urban disadvantaged areas like Dhaka. Air pollution is strongly associated with physical health impacts & long-term exposure to fine particulate matter (PM_{2.5}) is linked to reduced attention, impaired working memory, and lower school readiness (Guxens et al., 2023).

Water pollution adds another critical dimension. In Bangladesh, widespread contamination including arsenic and microbial pollutants increases disease burden and limits children's physical and cognitive development (UNICEF, 2023; World Bank, 2020). Exposure to contaminated water during pregnancy is also associated with adverse birth outcomes such as stillbirth and fetal loss, due to its impact on placental function, fetal growth, and maternal health (World Health Organization, 2022; Ahmed et al., 2011).

Despite growing global evidence, significant research gaps remain in Bangladesh. Most studies focus on single environmental exposures or isolated health outcomes, with limited attention to the combined effects on both air and water pollution on multiple

domains for early childhood development. There is also very limited research exploring how parents and caregivers perceive environmental risks and how their awareness shapes protective practices in resource-constrained urban settings.

The Lancet Commission on Pollution and Health emphasizes that environmental risk factors such as air pollution remain insufficiently integrated into Early Childhood Development (ECD) policies, despite their strong influence on children's survival, growth, and cognitive development (Landrigan et al., 2018). Focusing on this issue, it is essential for developing effective and context-specific interventions, especially considering the main role like parents role on children's everyday life.

The findings of this study will be valuable for multiple stakeholders. Policymakers can use the evidence to design child-sensitive environmental and urban policies. Health professionals and early childhood practitioners can better integrate environmental risks into child development programs. Caregivers and communities can benefit from increased awareness and practical strategies to reduce children's exposure. Additionally, this study will contribute to the limited body of research on environmental health and early childhood development in Bangladesh.

The study also aligns with key global and national priorities, including the Sustainable Development Goals (SDG 3: Good health & Wellbeing, SDG 4: Quality Education, SDG 6: Clean Water & Sanitation, SDG 11: Sustainable Cities & Communities, and SDG 13: Climate Action), as well as the Paris Agreement, Bangladesh's National Adaptation Plan (NAP 2023–2050), and the National Air Quality Management Plan (NAQMP). By generating evidence on the intersection of environmental pollution, climate change, and early childhood development, this study contributes to the ongoing

efforts to promote healthier and more equitable environments for the children of Bangladesh.

Research Questions

As children are highly vulnerable to environmental pollution, especially air and water pollution, it is important to understand how parents and caregivers view and respond to these risks in their daily lives. Therefore, this study focuses on caregivers' perceptions, challenges, and practices related to air and water pollution. Also this study was guided by the following research questions:

RQ1: What is the perception of parents and caregivers in Dhaka regarding how air and water pollution affect the health and early childhood development of children under 8 years?

RQ2: What coping mechanisms parents and caregivers take to protect their children in a polluted environment, and what difficulties do they face in ensuring a safe and healthy environment for early childhood development?

Operational Definition

1. Early Childhood Development (ECD)

Refers to the overall development of children aged 0–8 years across physical, cognitive, language, motor, and socio-emotional domains, measured through caregiver reports on health, behavior, learning ability, and daily functioning.

2. Urban Disadvantaged Areas

Refers to low-income communities or informal settlements in Dhaka characterized by overcrowding, poor housing, unsafe water, inadequate sanitation, and limited

access to basic services, identified based on living conditions reported by caregivers.

3. Parental Perspectives

Refers to caregivers' awareness, beliefs, and experiences regarding environmental pollution, measured through their responses about perceived risks, impacts, and coping practices.

4. Consequences of Air and Water Pollution

Refers to the effects of exposure to polluted air and water on children's health and well-being, measured through reported illnesses (Respiratory problems, Diarrhea) and observed changes in daily functioning.

5. Child Development

Refers to children's progress in cognitive, motor, language, and socio-emotional abilities, assessed through caregiver observations of age-appropriate skills and behaviors.

6. Child Mental Health

Refers to children's emotional and psychological well-being, measured through caregiver reports on behavior, emotional control, stress, and social interaction.

7. Child Learning Ability

Refers to children's capacity to concentrate, understand, remember, and engage in learning activities, assessed through caregiver observations of attention, participation, and early learning skills.

8. Exposure to Pollution

Refers to the level of children's contact with polluted air and contaminated water in their daily environment, measured through caregiver reports on living conditions, proximity to pollution sources, and water use practices.

Chapter II: Literature Review

Urban disadvantaged children in Dhaka experience multiple environmental and social challenges, including overcrowding, pollution, and limited access to basic services. These conditions increase their vulnerability to poor health and developmental outcomes.

Global Overview of Air and Water Pollution

Air and water contamination is widely recognized as a major global threat to children's health and development. Exposure to polluted air and unsafe water is strongly associated with respiratory infections, diarrheal diseases, malnutrition, and increased child mortality (World Health Organization, 2021, 2023). Globally, air pollution alone is responsible for around 7 million deaths each year, making it one of the leading environmental health risks (World Health Organization, 2016).

Children are mostly in vulnerable situation. Air pollution is the second leading risk factor for death among children under five, contributing to about 15% of global deaths in this age group (UNICEF & Health Effects Institute, 2024). Each year, approximately 700,000 children under five die due to air pollution, including nearly 500,000 deaths linked to household air pollution, with the highest burden in South Asia and sub-Saharan Africa (UNICEF & Health Effects Institute, 2024). Beyond physical health, early contact with pollutants like fine particulate matter (PM_{2.5}) can disrupt brain development, leading to cognitive delays, reduced attention, and lower learning capacity (Guxens et al., 2023).

Water pollution and inadequate sanitation remain equally critical concerns. Contaminated water is closely linked to diarrheal diseases, which is the leading cause of illness as well as death among young children (World Health Organization, 2017a, 2017b). Repeated infections contribute to malnutrition and stunting, both of which negatively affect children's physical growth and cognitive development (Black et al., 2013).

These environmental risks are further intensified by climate change. Rising temperatures, extreme weather events, and environmental degradation are expected to increase disease burden, particularly in low- and middle-income countries. It is estimated that climate-related factors may result in around 250,000 additional deaths annually between 2030 and 2050 (World Health Organization, 2023).

Overall, global evidence shows that environmental pollution affects children not only by increasing illness and mortality but also by causing long-term harm to their development, learning, and emotional well-being.

Air and Water Pollution in Dhaka, Bangladesh

In Bangladesh, environmental pollution has become a major public health concern, driven by rapid urbanization, industrial growth, and continued reliance on traditional energy sources. In cities like Dhaka, air pollution from traffic, industries, and brick kilns frequently exceeds safe levels and is strongly linked to respiratory and cardiovascular diseases, as well as reduced life expectancy (World Bank, 2023; Mohammad et al., 2025).

A major contributor to this problem is the brick kiln industry. Bangladesh has over 7,000 brick kilns, many of which use outdated and highly polluting technologies (World

Bank, 2011). During the dry winter season, when production peaks, brick kilns contribute approximately 33–58% of PM_{2.5} pollution in Dhaka (World Bank, 2019; Department of Environment Bangladesh). Some estimates suggest that around 40% of fine particulate pollution during peak periods comes from brick production (Croitoru & Sarraf, 2012). In addition, the brick sector accounts for roughly 15 -20% of CO₂ emissions within Bangladesh’s industrial sector, linking it directly to both poor air quality and climate change (International Finance Corporation, 2017). Together, this highlights the significant role of brick kilns in shaping urban air pollution and public health risks.

Household air pollution is another critical concern. Around 87% of households rely on biomass fuels such as wood and crop residues for cooking, exposing families especially women and children to harmful indoor smoke (Juwel et al., 2022). This exposure increases the risk of respiratory diseases, child mortality, low birth weight, and developmental delays. Emerging evidence also suggests that early exposure to such pollutants can negatively affect brain development through neurotoxic and inflammatory pathways.

Water pollution further compounds these risks. Industrial discharge, poor waste management, and inadequate sanitation have led to widespread contamination of water sources. Arsenic exposure alone affects millions of people in Bangladesh, while unsafe water contributes significantly to diarrheal diseases among children (Flanagan et al., 2012; Amin, 2015). Repeated infections are closely linked to malnutrition and stunting, which in turn affect children’s physical growth and cognitive development (Black et al., 2013; Rahman et al., 2019).

These environmental challenges are particularly severe in Dhaka, one of the fastest-growing cities in the world. Rapid and unplanned urban expansion has led to the growth of informal settlements, where living conditions are often poor. Children in these areas are exposed to multiple environmental risks, including polluted air, unsafe water, overcrowding, and limited access to healthcare and education (World Bank, 2024).

As a result, children living in urban disadvantaged communities face overlapping vulnerabilities. The combined effects of environmental pollution, poverty, poor nutrition, and limited access to basic services create a cumulative burden that impacts not only physical health but also cognitive development, learning ability, and emotional well-being, contributing to long-term social and health inequalities.

Effects of Air and Water Pollution on Early Childhood Development

Environmental pollution has a profound impact on early childhood development, particularly during the early years when the brain is rapidly growing and highly sensitive to external influences. Exposure to pollutants such as fine particulate matter (PM_{2.5}) is associated with attention difficulties, behavioral problems, and challenges in emotional regulation, all of which can affect children's ability to learn and engage in daily activities (Guxens et al., 2023).

Environmental risks begin even before birth. Maternal exposure to high levels of air pollution can reduce sunlight and ultraviolet (UVB) exposure during pregnancy, contributing to vitamin D deficiency and increasing the risk of rickets and poor bone development in infants (Buka et al., 2006). In addition, prenatal and early-life exposure to toxic air pollutants such as benzene and polycyclic aromatic hydrocarbons has been linked to an increased risk of childhood leukemia, likely due to DNA damage and

disruption of fetal immune and blood-forming systems (World Health Organization, 2018). These findings highlight that pollution can affect children both before and after birth through multiple biological pathways (WHO, 2018; Buka et al., 2006).

The effects of early exposure can extend into later life. Studies show that children exposed to air pollution early in life have a higher risk of developing chronic conditions in adulthood, including cardiovascular diseases such as heart attack and stroke, as well as type 2 diabetes, due to long-term impacts on metabolic and cardiovascular systems (Kim et al., 2020).

Water pollution also plays a critical role in shaping early childhood outcomes. Exposure to contaminated water during pregnancy and early childhood is associated with impaired fetal growth and long-term neurological effects (WHO, 2018; Landrigan et al., 2018). In early childhood, unsafe water increases the risk of diarrheal diseases and repeated infections, which reduce nutrient absorption and contribute to stunting and delayed brain development (WHO, 2019; UNICEF, 2021).

There is also growing evidence linking air pollution to neurodevelopmental disorders. Studies have found associations between polluted air and conditions such as attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD), suggesting that early exposure may alter brain development and increase the risk of cognitive and behavioral challenges (Perera et al., 2019; Sunyer et al., 2015). Prenatal exposure to certain pollutants has also been linked to a higher likelihood of ASD, indicating that these risks can begin before birth (Stieb et al., 2023).

Children living in polluted environments often face additional challenges, including overcrowding, noise, and unsafe living conditions. These combined stressors can

increase anxiety, irritability, and difficulties in social interaction, affecting both emotional development and learning (Sheffield et al., 2011; Jeong et al., 2021). Furthermore, exposure to toxic substances such as arsenic and lead is associated with lower IQ, memory problems, and reduced academic performance (Wasserman et al., 2007; Ema et al., 2016).

Environmental challenges can also affect children emotionally. Feelings of worry and uncertainty about environmental issues, often described as “eco-anxiety,” may reduce children’s motivation and confidence in learning (Sanson et al., 2018; Pihkala, 2020).

Overall, environmental pollution influences early childhood development through both biological and environmental pathways, affecting children’s cognitive abilities, emotional well-being, and learning outcomes over time.

Parental Perspectives on Air and Water Pollution in Dhaka

In Dhaka, many parents and caregivers are aware that air and water pollution can harm their children’s health, but their understanding is often partial. Caregivers commonly recognize visible signs such as smoke, dust, and unsafe water, and associate them with health problems like coughing, breathing difficulties, and frequent illness among children (Hossain et al., 2022). However, awareness of the long-term impacts—particularly on child development, learning, and overall well-being remains limited (Rahman et al., 2021).

For families living in urban disadvantaged areas, pollution is often seen as an unavoidable part of daily life. Exposure to traffic emissions, nearby industries, poor waste management, and unsafe water systems makes it difficult for parents to fully protect their children. Even when caregivers are concerned, their ability to act is

constrained by limited resources, including lack of access to clean water, safe housing, and healthcare services (Islam et al., 2020).

Parental knowledge plays a key role in shaping responses to these risks. Caregivers who are more informed are more likely to adopt protective practices, such as maintaining hygiene, monitoring children's activities, and seeking timely healthcare. In contrast, limited awareness can lead to underestimation of the long-term effects of pollution on children's growth and development (UNICEF et al., 2023).

Overall, parental perspectives in Dhaka reflect a mix of concern, limited understanding, and practical constraints. This underscores the need for improved awareness, resources, and support systems to help families reduce children's exposure to environmental risks.

This study is beneficial because research identified that air and water pollution can harm young children's health and development, especially in their early years. However, little is known about how parents and caregivers in Dhaka's disadvantaged areas understand these risks and how they try to protect their children. This study aims to fill that gap by exploring their perspectives and everyday coping practices.

Theoretical Perspectives on Environmental Influences and Child Development

Bronfenbrenner's Ecological Systems Theory explains that children's development is shaped by different layers of their surrounding environment (Bronfenbrenner, 1979). This framework is relevant to the present study because it helps explain how environmental pollution, caregiving practices, and broader urban conditions together influence the health and early childhood development of children living in disadvantaged areas of Dhaka. Since the study focuses on parents' and caregivers'

perceptions of air and water pollution, the framework also helps in understanding how families experience and respond to environmental risks in their everyday lives.

At the first level, the microsystem, children are directly influenced by their immediate surroundings, including household air quality, water safety, nutrition, and caregiving practices (Landrigan et al., 2018; WHO, 2021). For example, children living near busy roads, brick kilns, polluted canals, or waste dumping areas may experience regular exposure to smoke, dust, and contaminated water within their daily environment. The mesosystem reflects the connections between home, healthcare, and learning environments, while the exosystem includes broader influences such as traffic, industrial activities, and poor waste management that indirectly affect children's lives (Jeong et al., 2021; World Bank, 2023). At the macrosystem level, wider social factors such as poverty, inequality, urbanization, and environmental policies shape families' living conditions and their exposure to pollution (UNICEF, 2022). The chronosystem further highlights how long-term exposure to environmental risks and changing climate conditions may affect children's health and development over time.

In addition, the life-course perspective suggests that exposure to pollution during prenatal and early childhood stages can have lasting effects on children's physical, cognitive, and emotional well-being (Barker, 1990; WHO, 2020). Together, these perspectives support the study's objective of understanding how environmental pollution and caregivers' experiences are connected to children's overall development and well-being in urban disadvantaged communities. These theoretical perspectives therefore provide a useful foundation for exploring the relationship between environmental risks, parental perceptions, and early childhood development.

Chapter III: Methodology

This study adopted a quantitative research approach to examine parents' and caregivers' perceptions of the effects of air and water pollution on the early childhood development of children living in urban disadvantaged areas of Dhaka. A structured questionnaire containing close-ended and Likert-scale questions was used to collect measurable data on caregivers' demographic characteristics, perceptions of environmental pollution, child health and development, and protective practices.

Research Approach and Design

To achieve the objectives of this study, a quantitative survey design was employed to examine parents' and caregivers' perspectives on environmental pollution and its effects on children aged 0–8 years in urban disadvantaged areas of Dhaka. Quantitative methods rely on numerical data and statistical analysis to identify patterns and relationships, making them appropriate for assessing caregivers' knowledge, perceptions, and experiences (Apuke, 2017). A survey design was used to collect standardized information from participants through structured questions (Check & Schutt, 2012). This approach enabled the study to capture overall trends and characteristics within a relatively short period while ensuring consistency across responses. A structured questionnaire was developed to explore Parents or Caregivers knowledge of air and water pollution, their understanding of its impact on children's health, growth, and learning, and their awareness of environmental risks.

Research Site

The research was conducted in selected urban disadvantaged slum areas of Dhaka and nearby regions, including Rayer Bazar, Hazaribagh, Korail, Tejgaon Link Road, and Savar. These locations were selected because they are characterized by high population density, informal settlements, poverty, and limited access to essential services such as healthcare, education, and early childhood support. Many of these areas are also situated near major pollution sources, including industrial zones, heavy traffic, and brick kilns.

Research Participants

The study included 60 primary caregivers of children aged 0–8 years from urban disadvantaged and low-income communities in Dhaka. These participants represented households experiencing both economic hardship and high levels of environmental exposure. According to the Household Income and Expenditure Survey (HIES) 2022, conducted by the Bangladesh Bureau of Statistics, a substantial proportion of the urban population continued to live below the poverty line, reflecting persistent socio-economic inequality (Bangladesh Bureau of Statistics [BBS], 2023). Such economic challenges often limited access to healthcare, safe housing, clean water, and other essential services, increasing children's exposure to environmental risks such as air and water pollution, which may have negatively affected their health and early development. Focusing on this group enabled the study to better understand the experiences of caregivers facing both environmental and socioeconomic challenges, ensuring that the findings reflected the realities of children who were most vulnerable to environmental pollution.

Sampling Procedure

The participants were chosen through cluster sampling. Five communities (clusters) were selected based on their high levels of poverty and environmental exposure. From each cluster, 12 caregivers were recruited, resulting in a total sample of 60 participants. Eligible participants were parents or primary caregivers of children aged 0–8 years living in low-income households. Participants were identified with the support of local contacts and selected based on their willingness to participate. Before collecting the data, the study purpose was explained clearly to all participants, and informed consent was obtained from each of them.

Data Collection Tool

A structured survey questionnaire was used to collect quantitative data from parents and caregivers of children living in urban disadvantaged areas of Dhaka. The questionnaire included items on participants' demographic characteristics, their knowledge and perceptions of air and water pollution, the effects of pollution on children's health and early childhood development, and the protective measures adopted by families to reduce environmental risks. Both close-ended and Likert-scale questions were included to ensure systematic data collection. The collected data were analyzed using IBM SPSS Statistics.

Data Collection Method and Procedure

The study collected data from parents using a structured survey questionnaire. The questionnaire was developed based on the study objectives and reviewed by experts to ensure its clarity and relevance. A pilot test involving four participants was conducted to identify any ambiguities or gaps in the questionnaire, and the necessary revisions were made before the final data collection.

Data were collected through face-to-face interviews, with assistance provided whenever needed to ensure that participants clearly understood the questions. All participants took part voluntarily, provided informed consent, and had their information kept confidential throughout the study.

Data Management and Analysis

After data collection, all responses were carefully checked, coded, and organized to ensure completeness and accuracy. The data were then entered into IBM SPSS Statistics for analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize participants' characteristics and responses. Inferential statistics, including cross-tabulation and correlation analysis, were performed to examine relationships between selected variables, such as caregivers' perceptions of pollution and its effects on children's development. The results were presented using tables and charts to facilitate clear interpretation. Throughout the study, all data were stored securely, and participants' confidentiality was strictly maintained.

Validity & Reliability

To ensure the quality of the research, the questionnaire was reviewed by Early Childhood Development (ECD) experts to assess its clarity, relevance, and appropriateness. A pilot study involving four participants was conducted to evaluate the clarity and usability of the questionnaire. Feedback from the pilot study was used to refine the instrument and address any ambiguities before the final data collection. Throughout the research process, data were carefully checked, and consistent procedures were followed to ensure the accuracy and reliability of the findings.

Ethical Issues

This study followed appropriate ethical guidelines to protect all participants. Personal information was not collected, and all responses were kept anonymous and confidential. The data were stored securely and used solely for research purposes.

Participation was entirely voluntary, and caregivers were informed of their right to withdraw from the study at any stage without any consequences. Before participation, the purpose of the study was clearly explained, and written informed consent was obtained from each participant.

The study was conducted in a manner that ensured no harm to either children or caregivers. All questions were designed to be respectful, culturally appropriate, and suitable for the participants. Ethical approval was obtained from the BRAC Institute of Educational Development (IED) Ethics Committee, and the research was conducted in accordance with standard ethical principles for studies involving human participants.

Limitations of the Study

It is important to consider some limitations when interpreting the study findings. First, the research was completed within a limited time frame, which may have restricted the depth of data collection and analysis. Second, the study used a relatively small sample from selected urban disadvantaged communities, which may have limited the generalizability of the findings to other settings. Third, the study focused on participants from specific urban areas, which may not fully represent the diversity of experiences and perspectives across different socio-economic and geographic contexts. Finally, as the study was conducted in an urban setting, participants may have had limited direct experience with certain climate-related disasters, which could have influenced their perceptions and responses

Timeline of the Study (table format)

Activity	Start	End	Duration-Day	Status	March				April				May				June				July				August			
					W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4
Finalize proposal & questionnaire	1-Mar	8-Mar	7	Done																								
Ethical approval	8-Mar	15-Mar	7	Done																								
Pilot testing questionnaire	15-Mar	22-Mar	7	Done																								
Revise & finalize questionnaire	22-Mar	26-Apr	35	Done																								
Data collection (survey)	26-Apr	31-May	35	Done																								
Data entry & cleaning (SPSS)	24-May	7-Jun	14	Done																								
Data Analysis	7-Jun	2-Jul	25	Done																								
Interpretation of findings	25-Jun	10-Jul	15	Done																								

Activity	Start	End	Duration-Day	Status	March				April				May				June				July				August			
					W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4
Drafting results & discussion	10-Jul	20-Jul	10	Done																								
Submission	15-Jul	30-Jul	15	Done																								
Revision	1-Aug	12-Aug	12	Done																								
Final Submission	24-Aug	24-Aug	1	Done																								

Chapter IV: Results/Findings & Discussion

This study aimed to examine parents and caregivers' perceptions of the effects of air and water pollution on the early childhood development of children aged 0–8 years in urban disadvantaged areas of Dhaka. It also explored the protective measures adopted by caregivers and the challenges they face in reducing children's exposure to environmental pollution. A quantitative research design was used, and data were analyzed using descriptive statistics. The findings are presented in five sections: Demographic Information, Knowledge of air and water pollution and related health risks, Effects of pollution on early childhood development and children's learning, and Parental perceptions, challenges, and protective practices. Data were collected through face-to-face interviews with 60 parents and caregivers, with each interview lasting approximately 25–30 minutes. The final data collection was carried out from 16 May 2026 to 2 July 2026.

Results/Findings

Demographic Information

A total of 60 participants ($n = 60$) took part in the study. Among them, 53.3% were female and 46.7% were male. The participants ranged in age from 20 to 62 years. The mean age of the participants were 36.43 years ($SD = 11.07$), indicating that the respondents represented a wide range of adult caregivers.

Table 1 presents the demographic characteristics of the caregivers who participated in the study. It summarizes their educational attainment, occupation, and monthly household income, providing an overview of the socioeconomic background of the study participants.

Table 1: Demographic Characteristics of Respondents (n=60)

Variable	Category	n (%)
Gender (Caregiver)	Female	32 (53.3)
	Male	28 (46.7)
Age Range (Caregiver)	20 – 62 years	-
Education (Caregiver)	No Formal Education	18 (30)
	Primary Level	18 (30)
	SSC	10 (16.7)
	HSC	6 (10)
	Vocational	8 (13.3)
Occupation	Domestic Worker	14 (23.3)
	Garments Worker	6 (10)
	Rickshaw puller	12 (20)
	Vendor	7 (11.7)
	Tailor	6 (10)
	Labor	8 (13.3)
	Support Stuff	5 (8.3)
	Goldsmith	2 (3.3)
Household income	Less than 10,000 BDT	24 (40)
	10001-15000 BDT	27 (45)
	15001 BDT and Above	9 (15)

Table 2: Demographic Characteristics of Respondents Children

Variable	Category	n (%)
Child Gender	Boy	27 (45)
	Girl	33 (55)
Child Age	0-3 Years	18 (30)
	4-6 Years	29 (48.3)
	7-8 years	13 (21.7)

Table 1 shows that the caregivers generally had low educational attainment, with 30.0% having completed only primary education and another 30.0% having no formal education. Most caregivers were engaged in informal occupations, with domestic workers (23.3%) and rickshaw pullers (20.0%) representing the largest occupational groups. Monthly household incomes were generally low, with 45.0% of households earning BDT 10,001–15,000 per month. Table 2 shows that the children were distributed across the 0–8-year age range, with nearly half (48.3%) aged 4–6 years and more than half of them were girls.

1. Understanding of the Knowledge on Air and Water Pollution of the Caregivers

Caregivers' knowledge of air and water pollution was assessed by examining whether they had heard of pollution, their sources of information, experiences of pollution exposure, and perceptions of environmental pollution.

The findings showed that 96.7% of the respondents had heard of pollution, while only 3.3% had not. However, when asked specifically about air and water pollution, the

responses differed. A total of 63.3% of respondents had heard of air pollution, whereas 36.7% had not. In contrast, 96.7% had heard of water pollution, with only 3.3% reporting that they had not. These findings indicate that although almost all caregivers had heard of pollution in general, a considerably smaller proportion had heard specifically of air pollution compared with water pollution.

Regarding the seriousness of air pollution, 76.7% of respondents either agreed or strongly agreed that air pollution is a serious problem in their area. In comparison, 15.0% remained neutral and 8.3% disagreed. When asked whether the water in their area was safe for children, 38.3% of respondents considered the water safe, while 50.0% stated that it was not safe and 11.7% were not sure. Overall, the findings suggest that caregivers generally recognized pollution as an environmental concern, particularly water pollution, while a substantial proportion also perceived air pollution as a serious problem in their area. At the same time, half of the respondents expressed concerns about the safety of local water for their children.

Figure 1: Sources of Information about Pollution among Caregivers

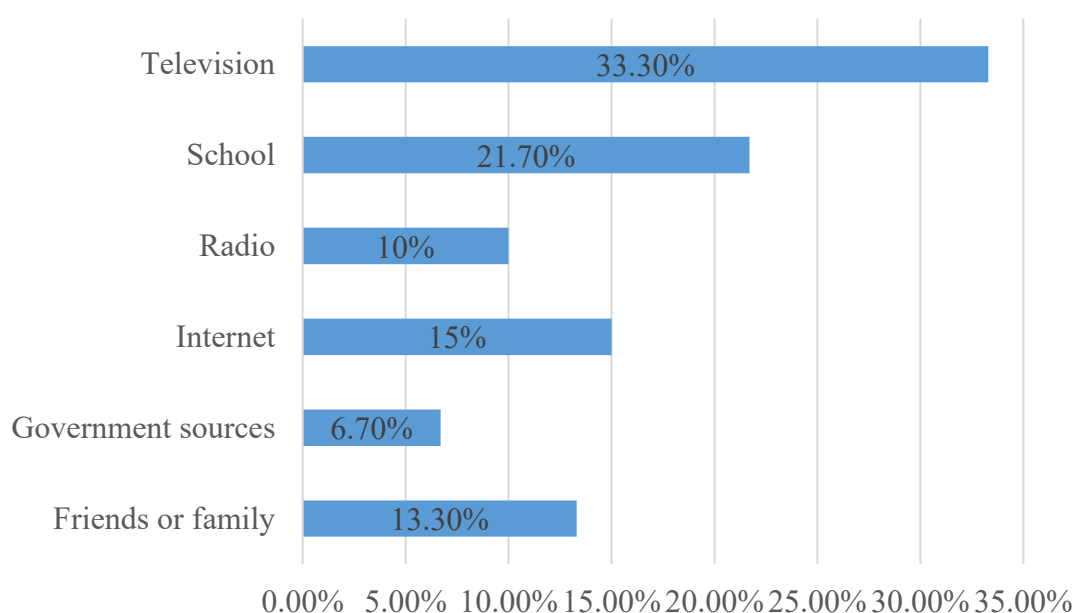


Figure 4.1 shows the primary sources of pollution-related information among caregivers. Television was the most common source (33.3%), followed by schools (21.7%), the internet (15.0%), friends or family (13.3%), and radio (10.0%). Government sources were the least common source of information (6.7%), indicating that most caregivers learned about pollution through television rather than through official government channels.

Table 3: Sources of Air & Water pollution identified by Caregivers

Variable	Category	n (%)
Air Pollution Sources	Vehicle smoke	27 (45)
	Brick kilns	17 (28.3)
	Factories	7 (11.7)
	Dust	9 (15)
Water Pollution Sources	Industrial Waste	17 (28.3)
	Dirty Drains	13 (21.7)
	Garbage	14 (23.3)
	Unsafe water supply	16 (26.7)

Table 3 presents caregivers' perceptions of the major sources of air and water pollution in their communities. For air pollution, vehicle smoke was identified as the most common source (45.0%), followed by brick kilns (28.3%), dust (15.0%), and factories (11.7%). Regarding water pollution, industrial waste was the most frequently identified source (28.3%), followed by unsafe water supply (26.7%), garbage or solid waste (23.3%), and dirty drains (21.7%).

These findings indicate that caregivers perceive vehicle emissions and industrial waste as the major sources of pollution and recognize children as being more vulnerable to its effects than adults.

2. Understanding on the Knowledge of Pollution related Health Risks

Most caregivers (88.3%) reported that unsafe water can cause diseases among children. Regarding the health effects of air pollution, weak growth or stunting was most frequently identified (30.0%), followed by cough or breathing problems (26.7%), asthma (15.0%), and eye irritation (11.7%). However, 16.7% of caregivers did not know about the health effects of air pollution on children. Diarrhea was the most commonly identified water-borne disease (40.0%), followed by skin diseases (23.3%), cholera (11.7%), and typhoid (10.0%). Additionally, 15.0% of caregivers were unable to identify any water-borne disease.

Table 4: Caregivers' Knowledge of Health Problems Caused by Pollution

Variable	Category	n (%)
Health Problem caused by Pollution	Cough or breathing problem	27 (45)
	Diarrhea	12 (20)
	Skin disease	2 (3.3)
	Weak growth	8 (13.3)
	Don't know	11 (18.3)

Overall, cough and breathing problems were the most commonly cited health consequence of pollution (45.0%), suggesting that caregivers mainly associate pollution with respiratory health problems among children. Furthermore, in another

question from survey, 80.0% of caregivers believed that children are more affected by pollution than adults, while 16.7% were not sure and only 3.3% believed that children are not more affected. This highlights that caregiver recognize children as particularly vulnerable to pollution, especially in relation to respiratory health.

3. Caregivers understanding on children's Overall development

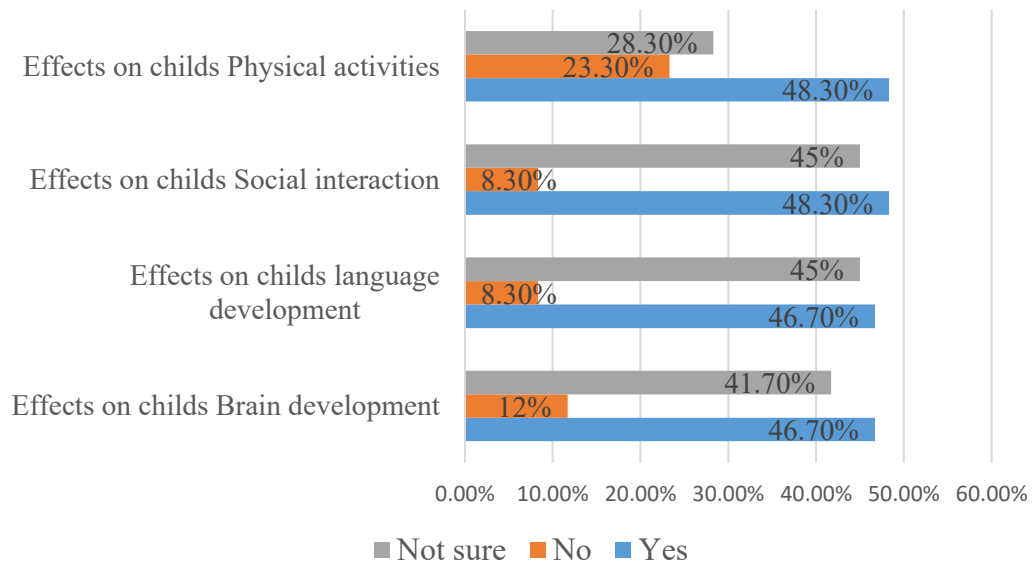
This section presents caregivers' understanding of the potential effects of air and water pollution on children's overall development. It includes their perceptions of its impact on early childhood development, children's mental health & behavior also their learning process.

3.1 Caregivers' Perceptions of the Effects of Air and Water Pollution on Early Childhood Development

Most caregivers believed that pollution affects their child's overall development, with 66.6% agreeing or strongly agreeing. In contrast, 20.0% disagreed or strongly disagreed, while 13.3% remained neutral. This perception was reflected in caregivers' reports of children's health and development. The highest proportion of caregivers (73.3%) reported that their children frequently experienced illnesses such as cough or diarrhea, whereas 26.7% reported no frequent illness. More than half (53.3%) noticed a delay in physical or motor development, while 30.0% were unsure and only 16.7% reported no delay. Similarly, 61.7% reported low energy or weakness during daily activities, compared with 13.3% who reported no such symptoms and 25.0% who were unsure. Most caregivers also believed that repeated illness affects children's growth, with 71.6% agreeing or strongly agreeing, while only 8.3% disagreed or strongly disagreed and 20.0% remained neutral. Overall, these findings suggest that caregivers

commonly see pollution as a concern for their children’s health and development, particularly in relation to frequent illness and low energy.

Figure 2: Caregivers’ Perceptions of the Effects of Pollution on Children’s Brain Development, Language Development, Social Interaction, and Physical Activity



A larger proportion of caregivers reported that pollution affects children’s physical activities (48.3%), social interaction (48.3%), brain development (46.7%), and language development (46.7%). Only small proportions said “no” (8.3% – 23.3%), while many remained unsure (28.3% – 45.0%).

Table 5: Cross-tabulation Between Gender and Caregivers' Perceptions of Pollution's Effect on Children's Brain Development

Factors	Yes	No	Not Sure	Total
	n (%)	n (%)	n (%)	n (%)
Male	11 (39.3)	4 (14.3)	13 (46.4)	28 (100)
Female	17 (53.1)	3 (9.4)	12 (37.5)	32 (100)

Table 5 presents the relationship between caregivers' gender and their perception of whether pollution affects children's brain development. Among female caregivers, 53.1% believed that pollution affects children's brain development, compared with 39.3% of male caregivers. In contrast, 46.4% of male caregivers were unsure, compared with 37.5% of female caregivers. A smaller proportion reported that pollution does not affect brain development, with 14.3% of males and 9.4% of females selecting "No." Overall, female caregivers were more likely to perceive a possible effect of pollution on children's brain development, while male caregivers showed a higher level of uncertainty. This may indicate that awareness of the potential developmental effects of pollution varies by gender.

3.2 Caregivers' Perceptions of the Effects on Children's Mental Health & Behavior

Caregivers reported several emotional and behavioral concerns among children. Most caregivers (71.7%) observed behavioral changes such as irritability or restlessness, while 28.3% reported no behavioral changes. More than half (58.3%) also reported that their children had difficulty concentrating or staying focused, while 21.7% were unsure and 20.0% reported no difficulty.

Regarding environmental influences, 66.7% believed that heat and pollution affect their child's mood, while 6.7% reported no effect and 26.7% were unsure. Similarly, 56.7% reported signs of anxiety or fear related to environmental conditions, compared with 10.0% who reported no such signs and 33.3% who were unsure. More than half of the caregivers (53.3%) agreed or strongly agreed that pollution increases children's stress or discomfort, while 25.0% remained neutral and 21.6% disagreed or strongly

disagreed. Regarding emotional development, 43.3% believed that pollution has an effect, 3.3% reported no effect, while 53.3% were unsure.

Overall, the highest proportion of caregivers reported behavioral changes such as irritability or restlessness (71.7%), while uncertainty was highest regarding pollution's effect on emotional development (53.3%). These findings suggest that caregivers commonly notice changes in children's behavior and emotions, but many are less certain about whether these changes are directly related to pollution.

3.3 Caregivers' Perceptions of the Effects of Pollution on Children's Learning Process

To examine caregivers' perceptions of the effects of illness and environmental conditions on children's learning, several learning-related concerns were explored. Most caregivers (83.3%) reported that their children missed school or learning activities because of illness or environmental conditions, while 16.7% reported no missed activities. Similarly, 75.0% believed that frequent illness affects their child's school performance, while 23.3% were unsure and only 1.7% reported no effect. More than half of the caregivers (51.7%) agreed or strongly agreed that pollution affects their child's ability to learn or understand, while 26.7% remained neutral and 21.7% disagreed or strongly disagreed. More than half (53.3%) also reported that their children had difficulty paying attention during learning activities, compared with 30.0% who were unsure and 16.7% who reported no difficulty. In addition, 56.7% stated that environmental conditions made it difficult for their children to study at home, while 31.7% were unsure and 11.7% reported no difficulty.

Overall, the highest proportion of caregivers reported that their children missed learning activities due to illness or environmental conditions (83.3%), while the lowest proportion reported no effect of frequent illness on school performance (1.7%). These findings suggest that illness and environmental conditions may create significant challenges for children's regular learning, concentration, and participation in educational activities.

4 Parents Perceptions, Challenges, and Protective Practices Related to Pollution

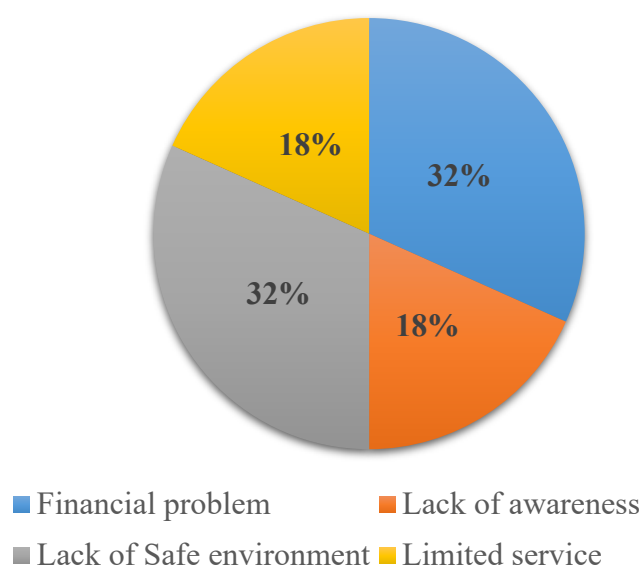
This section presents caregivers' perceptions of pollution-related risks, their protective practices, and the challenges and support needed to protect young children in urban disadvantaged areas of Dhaka.

Table 6: Caregivers Pollution Awareness and Protective Efforts (n = 60)

Variable	Category	n (%)
Parental Awareness of Pollution Effects	Highly aware	32 (53.3)
	Moderately aware	13 (21.7)
	Slightly aware	9 (15)
	Not aware	6 (10)
Adequacy of Protection	Yes	31 (51.7)
	No	18 (30)
	Not sure	11 (18.3)

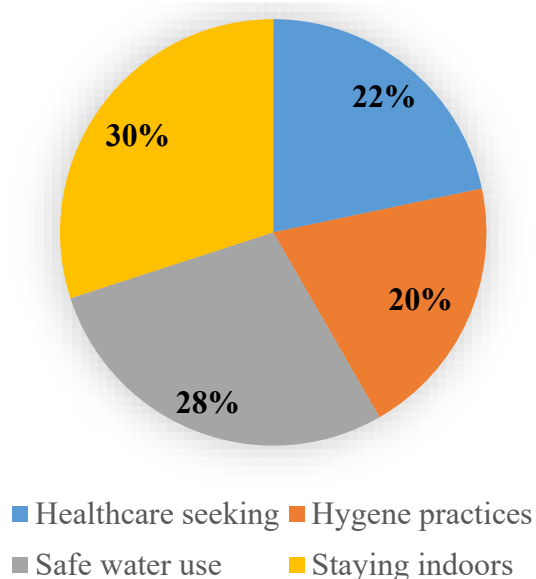
More than half of caregivers were highly aware of pollution's effects on children (53.3%), while 10.0% were not aware. Despite this awareness, only half believed their protective efforts were sufficient (51.7%); 30 % felt their efforts were inadequate, indicating a gap between awareness and the ability to protect children from pollution

Figure 3: Major Challenges to protect children from pollution



The figure 3 shows that financial problems and lack of a safe environment were the main challenges reported by caregivers (32% each). Lack of awareness and limited services were also identified by 18% of caregivers each. These findings suggest that caregivers face both economic and environmental barriers in protecting their children from pollution.

Figure 4: Actions taken to reduce exposure



The figure 4 shows that staying indoors was the most common protective practice reported by caregivers (30%), followed by safe water use (28%). Healthcare-seeking (22%) and hygiene practices (20%) were also used to protect children from pollution-related risks. These findings suggest that caregivers use a range of practical measures to reduce children's exposure to pollution.

Table 7: Caregivers' Views on the Need for More Pollution Awareness Campaigns

Variable	Category	n (%)
Needs for awareness campaign	Strongly agree	37 (61.7)
	Agree	11 (18.3)
	Neutral	10 (16.7)
	Strongly disagree	2 (3.3)

Caregivers were asked whether more pollution awareness campaigns are needed. A high proportion supported this need, with 61.7% strongly agreeing and 18.3% agreeing. This strong agreement highlights caregivers' recognition that community awareness campaigns can help families protect children from pollution-related risks.

Table 8: Cross-tabulation Between Gender and Perceived Need for More Awareness Programs About Pollution

Factors	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Strongly Agree n (%)	Agree n (%)	Total n (%)
Male	2 (7.1)	1 (3.6)	4 (14.3)	18 (64.3)	3 (10.7)	28 (100%)
Female	—	1 (3.1)	6 (18.8)	19 (59.3)	6 (18.8)	32 (100%)

Table 8 presents the relationship between caregivers' gender and their perceived need for more awareness programs about pollution. Among male respondents, 75.0% agreed or strongly agreed that more awareness programs are needed, while 14.3% remained neutral and 10.7% disagreed or strongly disagreed. Among female respondents, 78.1% agreed or strongly agreed with the need for more awareness programs, while 18.8% remained neutral and only 3.1% disagreed. Overall, both male and female caregivers showed a strong perceived need for additional awareness programs, with female respondents showing a slightly higher level of agreement than male respondents. This suggests that caregivers across both genders recognize the importance of increasing awareness about pollution and its effects on children.

Table 9: Cross-tabulation Between Household Income and Support Needed to Protect Children from Pollution

Factors	Less than 10,000 BDT n (%)	10,001–15,000 BDT n (%)	15,001 BDT and Above n (%)	Total n (%)
Government action	10 (41.7)	12 (44.4)	6 (66.7)	28 (46.7)
Community awareness	7 (29.2)	8 (29.6)	—	15 (25.0)
Clean environment	5 (20.8)	4 (14.8)	3 (33.3)	12 (20.0)
Better service	1 (4.2)	3 (11.1)	—	4 (6.7)
All of the above	1 (4.2)	—	—	1 (1.7)

Table 9 presents the relationship between household income and the type of support caregivers considered necessary to protect children from pollution. Government action was the most commonly identified form of support overall (46.7%), particularly among households earning 15,001 BDT and above, where 66.7% selected this option. Among households earning less than 10,000 BDT, government action was also the most common response (41.7%), followed by community awareness (29.2%) and a clean environment (20.8%). Similarly, among households earning 10,001–15,000 BDT, 44.4% identified government action as the most important support, followed by community awareness (29.6%) and a clean environment (14.8%).

Interestingly, community awareness was selected by 29.2% of the lowest-income group and 29.6% of the middle-income group, but none of the respondents in the highest-income group selected this option. Better services were also more commonly identified among the middle-income group (11.1%) compared with the lowest-income group (4.2%). Overall, the findings suggest that caregivers across income groups mainly look to government action to protect children from pollution, while lower- and middle-income households also place considerable importance on community awareness and a cleaner environment.

Discussion

The findings of this study show that caregivers in urban disadvantaged communities of Dhaka recognize pollution as an important concern for children, but their knowledge varies across different types of pollution. Although 96.7% had heard of pollution and water pollution, only 63.3% had heard of air pollution. This difference may be related to caregivers' everyday experiences, as unsafe water, drains, and water-related illness can be more directly visible in their communities, while air pollution is often less

visible. Television was the main source of information (33.3%), whereas government sources were used by only 6.7%, suggesting that accessible communication channels may be more effective in reaching disadvantaged families.

Caregivers identified vehicle smoke (45.0%) and industrial waste (28.3%) as major pollution sources, and 80.0% believed that children are more affected than adults. This perception is consistent with global evidence that children are particularly vulnerable because their lungs, brains, and other body systems are still developing (WHO, 2024).

Health concerns were prominent in the present study. Cough and breathing problems were the most commonly identified pollution-related health problem (45.0%), while 73.3% reported frequent illnesses such as cough or diarrhea and 61.7% reported low energy or weakness. These findings are consistent with evidence showing that air pollution remains a major environmental risk for children, particularly in low- and middle-income countries (WHO, 2024).

The caregivers also perceived effects beyond physical health. Two-thirds (66.6%) believed that pollution affects children's overall development, while 53.3% reported delayed physical or motor development. Behavioral concerns were also common, with 71.7% reporting irritability or restlessness and 58.3% reporting difficulty concentrating. These perceptions are supported by international research linking early-life air pollution exposure with attention, executive functioning, learning, and other neurodevelopmental outcomes (Castagna et al., 2022). More recent evidence has also reported an association between PM_{2.5} exposure and reduced cognitive functioning in children (Whitman et al., 2024). However, because the present study measured caregiver perceptions rather than clinical or developmental assessments, these findings should not be interpreted as proof of a direct causal relationship.

Learning was another important concern. A particularly high proportion of caregivers (83.3%) reported that children missed school or learning activities because of illness or environmental conditions, while 75.0% believed frequent illness affected school performance. More than half also reported difficulty with attention (53.3%) and studying at home (56.7%). This pattern is consistent with research suggesting that traffic-related air pollution may influence children's academic performance and learning (Stenson et al., 2021). The high level of reported missed learning activities in this study may therefore reflect both direct environmental discomfort and the indirect effect of pollution-related illness.

An important finding was the gap between awareness and the ability to act. Although 53.3% considered themselves highly aware of pollution's effects, only about half felt their current protective actions were sufficient. Financial difficulties and lack of a safe environment were the leading challenges (32% each). Staying indoors (30%) and using safe water (28%) were the most common protective practices. This suggests that caregivers may understand the risks but have limited control over the environmental conditions surrounding their homes.

The strong demand for further support was reflected in the finding that 80.0% agreed or strongly agreed that more pollution awareness campaigns are needed. Female caregivers showed slightly greater support for awareness programmes and were somewhat more likely to perceive effects on brain development, while male caregivers showed greater uncertainty. These differences may partly reflect differences in caregiving responsibilities, access to information, or daily interaction with children, although the small sample means that these patterns should be interpreted cautiously.

Income differences further highlight the role of social conditions. Government action was the most preferred support overall (46.7%) and was particularly high among caregivers from households earning BDT 15,001 or more (66.7%). In contrast, community awareness was more commonly selected by lower- and middle-income households. This may indicate that families with fewer resources rely more heavily on community-level support, while caregivers across income groups recognize that pollution cannot be addressed by families alone.

Overall, the study suggests that caregivers are relatively familiar with the visible health effects of pollution but are less certain about its wider effects on children's emotional, cognitive, and developmental outcomes. The most important finding is therefore the gap between awareness and the ability to protect children. Addressing this gap requires practical awareness programmed alongside cleaner environments, safer water and sanitation, stronger pollution control, and government action. Such an integrated approach is important because a healthy and safe environment is fundamental to children's ability to grow, learn, and develop to their full potential (WHO, 2024).

Conclusion

Environmental pollution has become part of everyday life for many families living in disadvantaged urban communities of Dhaka, where children may be exposed to polluted air, unsafe water, poor sanitation, waste, and other unhealthy environmental conditions during their early years. This study explored caregivers' perceptions of how these conditions may influence the health, development, behavior, and learning of children aged 0–8 years.

The findings show that caregivers generally recognize pollution as a serious concern, particularly in relation to frequent illness, respiratory problems, weakness, behavioral changes, concentration difficulties, and disrupted learning. However, uncertainty about its effects on emotional and cognitive development suggests that deeper understanding of the wider developmental impacts is still needed.

The study also highlights a gap between awareness and the ability to protect children. Although caregivers reported practices such as using safe water, maintaining hygiene, seeking healthcare, and limiting exposure, financial difficulties and unsafe surroundings often restricted their efforts. The strong demand for awareness programmes and government support further indicates that protecting children from pollution cannot be the responsibility of families alone.

Overall, healthier childhoods require combined efforts from families, communities, service providers, and government. Practical awareness programmes, safer water and sanitation, improved waste management, stronger pollution control, and child-sensitive urban planning can help create cleaner environments that support children's health, learning, development, and overall well-being.

Recommendations

Following recommendations are based on the key findings of this study. They reflect the experiences and challenges reported by caregivers and are intended to support healthier early childhood development through improved environmental conditions, stronger community support, and child-sensitive policies in urban disadvantaged communities.

1) Strengthen Caregiver Awareness and Parenting Support

Parents and caregivers should be provided with regular awareness programs, parenting workshops, seminars, and community-based training to improve their understanding of how air and water pollution may affect children's physical, cognitive, language, and socio-emotional development. The Ministry of Women and Children Affairs (MoWCA), NGOs, ECD organizations, and community health workers can support these initiatives. Practical guidance on reducing children's daily exposure to pollution and promoting healthy caregiving practices can also be integrated into existing parenting and ECD programs.

2) Integrate Environmental Health into Early Childhood Development (ECD) Services

Environmental health should become a regular component of ECD services. The Ministry of Health and Family Welfare (MoHFW), Directorate General of Health Services (DGHS), community clinics, ECD practitioners, and NGOs can provide caregivers with simple and age-appropriate advice on safe water use, hygiene, indoor air quality, nutrition, and healthy caregiving practices that support children's overall development.

3) Improve Living Conditions in Urban Disadvantaged Communities

Greater attention should be given to improving environmental conditions in urban disadvantaged areas through cleaner water supplies, improved sanitation, better waste management, and the creation of safer spaces where young children can play and learn. The Local Government Division (LGD), Dhaka City Corporations, Dhaka WASA (DWASA), Department of Public Health Engineering (DPHE), and NGOs can work

together to improve these basic services and reduce children's everyday exposure to environmental hazards.

4) Promote Child-Centered Urban Planning

Urban planning initiatives should consider the developmental needs of young children by reducing pollution near homes, childcare centers, schools, and play spaces. RAJUK, City Corporations, architects, urban planners, the Roads and Highways Department (RHD), and the Ministry of Housing and Public Works (MoHPW) can contribute by expanding green spaces, improving pedestrian and play areas, reducing traffic-related pollution, and creating safer neighborhood environments that support children's growth and development.

5) Enhance Public Awareness Through Multiple Communication Channels

Since television was the main source of pollution-related information in this study, awareness campaigns should continue through television while also expanding to community meetings, schools, healthcare facilities, social media, and local government initiatives. The Ministry of Information and Broadcasting (MoIB), NGOs, media organizations, schools, and local government can work together to reach a wider audience, particularly families living in urban disadvantaged communities

6) Prioritize Children in Environmental Policies

Environmental policies should explicitly recognize young children as one of the groups particularly vulnerable to the effects of pollution. The Ministry of Environment, Forest and Climate Change (MoEFCC), Department of Environment (DoE), MoWCA, and relevant policymakers can promote a child-sensitive approach by integrating environmental protection with early childhood development and ensuring that

children's health and developmental needs are considered in environmental planning and programs.

7) Strengthen Multi-sectoral Collaboration

Addressing pollution-related risks to young children requires coordinated action across the health, education, environment, urban planning, and local government sectors. Government agencies, NGOs, City Corporations, RAJUK, community organizations, and relevant professionals should work together to improve environmental conditions and ensure that children's developmental needs are considered in planning and service delivery.

8) Future Research

Further studies with larger and more diverse samples from urban and rural areas of Bangladesh are recommended to better understand the longer-term effects of environmental pollution on children's development. Universities, research institutions, ECD and public health researchers, environmental scientists, and relevant government agencies can support future research using direct environmental measurements and standardized child developmental assessments alongside caregivers' perspectives.

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Appendix

Research Tools

Thank you very much for your cooperation

CONSENT

I have read and understood the information about this study. I know that my participation is voluntary and that I can withdraw at any time without any consequences. I understand that my information will be kept confidential and used only for research purposes.

I agree to participate in this study.

Participant's Signature/Thumb Impression: _____

Investigator's Signature/Thumb Impression: _____

Date: _____

Survey Questionnaire for Parents and Caregivers on Air and Water Pollution and Child Development among Urban Disadvantaged Children in Dhaka

1 Demographic Information

1. **Name of the participant:** _____
2. **Gender:**
 - ☐ Male
 - ☐ Female
 - ☐ Prefer not to say
3. **Age of the participant:** _____ years
4. **Age of the child (0–8 years):** _____ years
5. **Child's gender:**
 - ☐ Male
 - ☐ Female

6. Educational background:

- ☐ No formal education
- ☐ Primary level
- ☐ SSC
- ☐ HSC
- ☐ Vocational

7. Occupation/Profession: _____

8. Monthly household income (approximate):

- ☐ BDT 8000 – 8999
- ☐ BDT 9000 – 9999
- ☐ BDT 10000 – 10999
- ☐ BDT 11000 – 11999
- ☐ BDT 12000 – 12999
- ☐ BDT 13000 – 13999
- ☐ BDT 14000 – 14999
- ☐ Above BDT 15000

2 Knowledge on Air & Water Pollution

1. Have you ever heard of “pollution”?

- ☐ Yes
- ☐ No

2. Where have you learned about pollution? (*Tick all that apply*)

- ☐ Television
- ☐ Radio
- ☐ Internet
- ☐ School
- ☐ Government information/services
- ☐ Friends/Family
- ☐ Other (please specify): _____

3. Have you heard about air pollution?
☐ Yes ☐ No
4. Have you heard about water pollution?
☐ Yes ☐ No
5. Do you think air pollution is a serious problem in your area?
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree
6. Do you think water in your area is safe for children?
☐ Yes ☐ No ☐ Not sure
7. How often is your child exposed to polluted air (dust, smoke, traffic)?
☐ Very often ☐ Sometimes ☐ Rarely ☐ Never
8. How often does your child use potentially unsafe water?
☐ Very often ☐ Sometimes ☐ Rarely ☐ Never
9. What are the main sources of air pollution in your area? (*Multiple answers allowed*)
☐ Vehicle smoke ☐ Brick kilns ☐ Factories ☐ Dust ☐ Others: _____
10. What are the main sources of water pollution in your area? (*Multiple answers allowed*)
☐ Industrial waste ☐ Dirty drains ☐ Garbage ☐ Unsafe water supply ☐ Others: _____
11. Do you think pollution levels have increased in recent years?
☐ Yes ☐ No ☐ Not sure
12. Do you think children are more affected by pollution than adults?
☐ Yes ☐ No ☐ Not sure
13. How serious do you think air and water pollution is in your area?
☐ Very serious ☐ Moderate ☐ Low ☐ Not a problem

3 Knowledge of Pollution-Related Health Risks

1. Do you think unsafe water can cause diseases in children?
☐ Yes ☐ No ☐ Not sure
2. Which health problems do you think are caused by air pollution in children?
(Multiple answers allowed)

☐ Cough/breathing problems ☐ Asthma ☐ Eye irritation ☐ Weak growth ☐

Don't know

3. Which diseases do you think are caused by polluted water? (*Multiple answers allowed*)

☐ Diarrhea ☐ Cholera ☐ Skin disease ☐ Typhoid ☐ Don't know

4. Which of the following health problems can be caused by pollution? (*Multiple answers allowed*)

☐ Cough/breathing problems ☐ Diarrhea ☐ Skin disease ☐ Weak growth ☐

Don't know

3.1 Effect of Air and Water pollution on Early Childhood Development

1. Do you think pollution affects your child's overall development?

☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

2. Has your child experienced frequent illness (e.g., cough, diarrhea)?

☐ Yes ☐ No

3. Do you notice any delay in your child's physical or motor development?

☐ Yes ☐ No ☐ Not sure

4. Do you think pollution affects your child's brain development (thinking, understanding)?

☐ Yes ☐ No ☐ Not sure

5. Does your child show low energy or weakness in daily activities?

☐ Yes ☐ No ☐ Not sure

6. Do you think repeated illness affects your child's growth?

☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

7. Do you think pollution affects your child's language development?

☐ Yes ☐ No ☐ Not sure

8. Do you think pollution affects your child's social interaction (playing, sharing)?

☐ Yes ☐ No ☐ Not sure

9. Does your child face difficulty in physical activities (running, playing)?

☐ Yes ☐ No ☐ Not sure

3.2 Effect on children's Mental Health and Behavior

10. Do you observe behavioral changes in your child (e.g., irritability, restlessness)?
☐ Yes ☐ No
11. Do you think pollution increases stress or discomfort in children?
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree
12. Does your child have difficulty concentrating or staying focused?
☐ Yes ☐ No ☐ Not sure
13. Do environmental conditions (heat, pollution) affect your child's mood?
☐ Yes ☐ No ☐ Not sure
14. Does your child show sign of anxiety or fear relate to environmental conditions?
☐ Yes ☐ No ☐ Not sure
15. Do you think pollution affects your child's emotional development?
☐ Yes ☐ No ☐ Not sure

3.3 Effects on Children's Learning Process

16. Does your child miss school or learning activities due to illness or environment?
☐ Yes ☐ No
17. Do you think pollution affects your child's ability to learn or understand?
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree
18. Does your child have difficulty paying attention during learning activities?
☐ Yes ☐ No ☐ Not sure
19. Do environmental conditions make it difficult for your child to study at home?
☐ Yes ☐ No ☐ Not sure

20. Do you think frequent illness affects your child's school performance?

☐ Yes ☐ No ☐ Not sure

4 Parental Perception, Challenges & Solutions

1. How aware are you about the effects of pollution on children?

☐ Highly aware ☐ Moderately aware ☐ Slightly aware ☐ Not aware

2. What challenges do you face in protecting your child from pollution? (*Multiple answers*)

☐ Lack of safe environment ☐ Financial problems ☐ Lack of awareness ☐

Limited services ☐ Others: _____

3. What actions do you take to reduce your child's exposure? (*Multiple answers*)

☐ Safe water use ☐ Staying indoors ☐ Hygiene practices ☐ Healthcare seeking

☐ Others: _____

4. Do you think your efforts are enough to protect your child from pollution?

☐ Yes ☐ No ☐ Not sure

5. What support do you think is needed to protect children from pollution?

☐ Government action ☐ Community awareness ☐ Better services ☐ Clean environment ☐ All of the above

6. Do you think more awareness programs are needed for parents about pollution?

☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

সম্মতি ফর্ম (CONSENT)

আপনার সহযোগিতার জন্য আন্তরিক ধন্যবাদ।

আমি এই গবেষণা সম্পর্কিত প্রদত্ত তথ্য পড়েছি এবং বুঝেছি। আমি জানি যে আমার অংশগ্রহণ সম্পূর্ণ স্বেচ্ছাসেবী এবং আমি যে কোনো সময় কোনো কারণ ছাড়াই অংশগ্রহণ থেকে সরে আসতে পারি। আমি বুঝতে পারছি যে আমার দেওয়া তথ্য গোপন রাখা হবে এবং শুধুমাত্র গবেষণার কাজে ব্যবহার করা হবে।

আমি স্বেচ্ছায় এই গবেষণায় অংশগ্রহণ করতে সম্মত হচ্ছি।

অংশগ্রহণকারীর স্বাক্ষর/অঙ্গুলির ছাপ: _____

গবেষকের স্বাক্ষর/অঙ্গুলির ছাপ: _____

তারিখ: _____

জরিপ প্রশ্নপত্র

ঢাকার নগর সুবিধাবঞ্চিত শিশুদের (০-৮ বছর) বিকাশের উপর বায়ু ও পানি দূষণের প্রভাব সম্পর্কে অভিভাবক ও পরিচর্যাকারীদের জরিপ প্রশ্নপত্র

১ প্রাথমিক তথ্য (Demographic Information)

১. অংশগ্রহণকারীর নাম: _____

২. লিঙ্গ:

☐ পুরুষ

☐ মহিলা

☐ উল্লেখ করতে অনিচ্ছুক

৩. অংশগ্রহণকারীর বয়স: _____ বছর

৪. শিশুর বয়স (০-৮ বছর): _____ বছর

৫. শিশুর লিঙ্গ:

☐ পুরুষ

☐ মহিলা

৬. শিক্ষাগত যোগ্যতা:

☐ কোনো প্রাতিষ্ঠানিক শিক্ষা নেই

☐ প্রাথমিক স্তর

☐ এসএসসি (SSC)

☐ এইচএসসি (HSC)

☐ কারিগরি/ভোকেশনাল

৭. পেশা: _____

৮. মাসিক পারিবারিক আয় (প্রায়):

☐ ৮,০০০ – ৮,৯৯৯ টাকা

☐ ৯,০০০ – ৯,৯৯৯ টাকা

☐ ১০,০০০ – ১০,৯৯৯ টাকা

☐ ১১,০০০ – ১১,৯৯৯ টাকা

☐ ১২,০০০ – ১২,৯৯৯ টাকা

☐ ১৩,০০০ – ১৩,৯৯৯ টাকা

☐ ১৪,০০০ – ১৪,৯৯৯ টাকা

☐ ১৫,০০০ টাকার বেশি

২ বায়ু ও পানি দূষণ সম্পর্কে জ্ঞান (Knowledge on Air & Water Pollution)

১. আপনি কি কখনো “দূষণ” সম্পর্কে শুনেছেন?

☐ হ্যাঁ

☐ না

২. আপনি কোথা থেকে দূষণ সম্পর্কে জেনেছেন? (যা প্রযোজ্য সবগুলোতে টিক দিন)

☐ টেলিভিশন

☐ রেডিও

☐ ইন্টারনেট

☐ স্কুল

☐ সরকারি তথ্য/সেবা

☐ বন্ধু/পরিবার

☐ অন্যান্য (উল্লেখ করুন): _____

৩. আপনি কি বায়ু দূষণ সম্পর্কে শুনেছেন?

☐ হ্যাঁ ☐ না

৪. আপনি কি পানি দূষণ সম্পর্কে শুনেছেন?

☐ হ্যাঁ ☐ না

৫. আপনার মতে, আপনার এলাকায় বায়ু দূষণ একটি গুরুতর সমস্যা?

☐ সম্পূর্ণ একমত

☐ একমত

☐ নিরপেক্ষ

☐ অসম্মত

☐ সম্পূর্ণ অসম্মত

৬. আপনার এলাকায় পানি কি শিশুদের জন্য নিরাপদ বলে আপনি মনে করেন?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৭. আপনার শিশু কতবার দূষিত বায়ুর (ধূলা, ধোঁয়া, যানবাহনের ধোঁয়া) সংস্পর্শে আসে?

☐ খুব প্রায়ই

☐ কখনও কখনও

- ☐ খুব কম
☐ কখনোই না

৮. আপনার শিশু কতবার সম্ভাব্য অনিরাপদ পানি ব্যবহার করে?

- ☐ খুব প্রায়ই
☐ কখনও কখনও
☐ খুব কম
☐ কখনোই না

৯. আপনার এলাকায় বায়ু দূষণের প্রধান উৎসগুলো কী? (একাধিক উত্তর প্রযোজ্য)

- ☐ যানবাহনের ধোঁয়া
☐ ইটভাটা
☐ কারখানা
☐ ধুলাবালি
☐ অন্যান্য: _____

১০. আপনার এলাকায় পানি দূষণের প্রধান উৎসগুলো কী? (একাধিক উত্তর প্রযোজ্য)

- ☐ শিল্প বর্জ্য
☐ নোংরা নালা/ড্রেন
☐ ময়লা/আবর্জনা
☐ অনিরাপদ পানি সরবরাহ
☐ অন্যান্য: _____

১১. আপনার কি মনে হয় সাম্প্রতিক বছরগুলোতে দূষণের মাত্রা বেড়েছে?

- ☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

১২. আপনার মতে, দূষণে কি শিশুরা প্রাপ্তবয়স্কদের তুলনায় বেশি ক্ষতিগ্রস্ত হয়?

- ☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

১৩. আপনার এলাকায় বায়ু ও পানি দূষণকে আপনি কতটা গুরুতর মনে করেন?

- ☐ খুব গুরুতর
- ☐ মাঝারি
- ☐ কম
- ☐ কোনো সমস্যা নয়

৩ দূষণজনিত স্বাস্থ্যঝুঁকি সম্পর্কে জ্ঞান (Knowledge of Pollution-Related Health Risks)

১. আপনার কি মনে হয় অনিরাপদ পানি শিশুদের রোগ সৃষ্টি করতে পারে?

- ☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

২. আপনার মতে বায়ু দূষণের কারণে শিশুদের কোন কোন স্বাস্থ্য সমস্যা হতে পারে? (একাধিক উত্তর প্রযোজ্য)

- ☐ কাশি/শ্বাসকষ্ট
- ☐ হাঁপানি
- ☐ চোখে জ্বালা
- ☐ দুর্বল বৃদ্ধি
- ☐ জানি না

৩. আপনার মতে দূষিত পানির কারণে কোন কোন রোগ হতে পারে? (একাধিক উত্তর প্রযোজ্য)

- ☐ ডায়রিয়া
- ☐ কলেরা
- ☐ চর্মরোগ
- ☐ টাইফয়েড
- ☐ জানি না

৪. নিম্নের কোন কোন স্বাস্থ্য সমস্যা দূষণের কারণে হতে পারে? (একাধিক উত্তর প্রযোজ্য)

- ☐ কাশি/শ্বাসকষ্ট
- ☐ ডায়রিয়া
- ☐ চর্মরোগ

☐ দুর্বল বৃদ্ধি

☐ জানি না

৩.১ বায়ু ও পানি দূষণের প্রভাব শিশুর প্রারম্ভিক বিকাশে (Effect of Air and Water Pollution on

Early Childhood Development)

১. আপনার কি মনে হয় দূষণ আপনার শিশুর সামগ্রিক বিকাশকে প্রভাবিত করে?

☐ সম্পূর্ণ একমত

☐ একমত

☐ নিরপেক্ষ

☐ অসম্মত

☐ সম্পূর্ণ অসম্মত

২. আপনার শিশু কি প্রায়ই অসুস্থ হয় (যেমন: কাশি, ডায়রিয়া)?

☐ হ্যাঁ ☐ না

৩. আপনি কি আপনার শিশুর শারীরিক বা মোটর বিকাশে কোনো বিলম্ব লক্ষ্য করেন?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৪. আপনার কি মনে হয় দূষণ আপনার শিশুর মস্তিষ্কের বিকাশ (ভাবনা, বোঝার ক্ষমতা) প্রভাবিত করে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৫. আপনার শিশু কি দৈনন্দিন কাজে দুর্বলতা বা কম শক্তি অনুভব করে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৬. আপনার কি মনে হয় বারবার অসুস্থ হওয়া আপনার শিশুর বৃদ্ধি ব্যাহত করে?

☐ সম্পূর্ণ একমত

☐ একমত

☐ নিরপেক্ষ

☐ অসম্মত

☐ সম্পূর্ণ অসম্মত

৭. আপনার কি মনে হয় দূষণ আপনার শিশুর ভাষাগত বিকাশে প্রভাব ফেলে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৮. আপনার কি মনে হয় দূষণ আপনার শিশুর সামাজিক মিথস্ক্রিয়া (খেলা, ভাগাভাগি করা) প্রভাবিত করে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৯. আপনার শিশু কি শারীরিক কার্যকলাপে (দৌড়ানো, খেলাধুলা) কোনো অসুবিধার সম্মুখীন হয়?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৩.২ শিশুর মানসিক স্বাস্থ্য ও আচরণের উপর প্রভাব (Effect on Children's Mental Health and Behavior)

১০. আপনি কি আপনার শিশুর আচরণে পরিবর্তন লক্ষ্য করেন (যেমন: খিটখিটে ভাব, অস্থিরতা)?

☐ হ্যাঁ ☐ না

১১. আপনার কি মনে হয় দূষণ শিশুদের মানসিক চাপ বা অস্থিতি বাড়ায়?

☐ সম্পূর্ণ একমত

☐ একমত

☐ নিরপেক্ষ

☐ অসম্মত

☐ সম্পূর্ণ অসম্মত

১২. আপনার শিশু কি মনোযোগ ধরে রাখতে বা একাগ্র থাকতে অসুবিধা অনুভব করে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

১৩. পরিবেশগত অবস্থা (গরম, দূষণ) কি আপনার শিশুর মেজাজে প্রভাব ফেলে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

১৪. আপনার শিশু কি পরিবেশগত অবস্থার কারণে ভয় বা উদ্বেগের লক্ষণ দেখায়?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

১৫. আপনার কি মনে হয় দূষণ আপনার শিশুর মানসিক (আবেগীয়) বিকাশে প্রভাব ফেলে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৩.৩ শিশুর শেখার প্রক্রিয়ার উপর প্রভাব (Effects on Children's Learning Process)

১৬. অসুস্থতা বা পরিবেশগত কারণে আপনার শিশু কি স্কুল বা শেখার কার্যক্রম মিস করে?

☐ হ্যাঁ ☐ না

১৭. আপনার কি মনে হয় দূষণ আপনার শিশুর শেখা বা বোঝার ক্ষমতাকে প্রভাবিত করে?

☐ সম্পূর্ণ একমত

☐ একমত

☐ নিরপেক্ষ

☐ অসম্মত

☐ সম্পূর্ণ অসম্মত

১৮. আপনার শিশু কি শেখার সময় মনোযোগ দিতে অসুবিধা অনুভব করে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

১৯. পরিবেশগত অবস্থা কি আপনার শিশুর বাড়িতে পড়াশোনা করা কঠিন করে তোলে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

২০. আপনার কি মনে হয় বারবার অসুস্থ হওয়া আপনার শিশুর শিক্ষাগত পারফরম্যান্সকে প্রভাবিত করে?

☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৪ অভিভাবকদের দৃষ্টিভঙ্গি, চ্যালেঞ্জ ও সমাধান (Parental Perception, Challenges & Solutions)

১. শিশুদের উপর দূষণের প্রভাব সম্পর্কে আপনি কতটা সচেতন?

- ☐ অত্যন্ত সচেতন
- ☐ মাঝারি সচেতন
- ☐ সামান্য সচেতন
- ☐ সচেতন নই

২. আপনার শিশুকে দূষণ থেকে রক্ষা করতে আপনি কী কী চ্যালেঞ্জের সম্মুখীন হন? (একাধিক উত্তর প্রযোজ্য)

- ☐ নিরাপদ পরিবেশের অভাব
- ☐ আর্থিক সমস্যা
- ☐ সচেতনতার অভাব
- ☐ সীমিত সেবা/সুবিধা
- ☐ অন্যান্য: _____

৩. আপনি আপনার শিশুর দূষণের সংস্পর্শ কমাতে কী কী পদক্ষেপ গ্রহণ করেন? (একাধিক উত্তর প্রযোজ্য)

- ☐ নিরাপদ পানি ব্যবহার
- ☐ ঘরের ভেতরে থাকা
- ☐ স্বাস্থ্যবিধি মেনে চলা
- ☐ চিকিৎসা গ্রহণ করা
- ☐ অন্যান্য: _____

৪. আপনার কি মনে হয় আপনার নেওয়া পদক্ষেপগুলো আপনার শিশুকে দূষণ থেকে রক্ষা করার জন্য যথেষ্ট?

- ☐ হ্যাঁ ☐ না ☐ নিশ্চিত নই

৫. আপনার মতে শিশুদের দূষণ থেকে রক্ষা করতে কী ধরনের সহায়তা প্রয়োজন?

- ☐ সরকারি উদ্যোগ
- ☐ কমিউনিটি সচেতনতা

☐ উন্নত সেবা/সুবিধা

☐ পরিচ্ছন্ন পরিবেশ

☐ উপরোক্ত সবগুলো

৬. আপনার কি মনে হয় অভিভাবকদের জন্য দূষণ বিষয়ে আরও সচেতনতা কর্মসূচি প্রয়োজন?

☐ সম্পূর্ণ একমত

☐ একমত

☐ নিরপেক্ষ

☐ অসম্মত

☐ সম্পূর্ণ অসম্মত

Consent Form

Study Title

Parental Perspectives on the Effects of Air and Water Pollution on Early Childhood Development among Urban Disadvantaged Children in Dhaka

About the Study

I am conducting this study as part of my Master's degree at the Institute of Educational Development, BRAC University. The main purpose of this research is to explore how parents understand environmental pollution, particularly air and water pollution, and how they perceive its effects on the growth and overall development of young children. This study will help provide insights into both the challenges families face and the ways they try to protect their children in polluted environments.

Why You Are Being Asked to Participate

You are being invited to take part in this study because you are a parent or caregiver of a child aged 0–8 years. Your experiences, knowledge, and opinions are valuable, as they will help us better understand real-life situations faced by families living in urban disadvantaged areas.

What You Will Do

If you agree to participate:

- You will be asked a series of questions about your experiences, understanding, and views regarding pollution and child development
- The session will take approximately 20–30 minutes

- You may skip any question that you do not feel comfortable answering
- With your permission, notes may be taken during the discussion to ensure accuracy

Risks

There are no known risks involved in participating in this study. The questions are not intended to cause any discomfort. However, if at any point you feel uneasy, you are free to stop the discussion or skip questions.

Benefits

You may not receive any direct personal benefit from participating in this study. However:

- Your responses will contribute to a better understanding of how environmental pollution affects young children
- The findings may help inform policies, programs, and awareness initiatives aimed at improving child health and development
- This research may also support future studies and interventions in similar communities

Privacy and Confidentiality

- All information you provide will be kept strictly confidential
- Your name or any identifying details will not be included in any reports, publications, or presentations
- Data will be stored securely and will only be accessed by the researcher for academic purposes
- Your responses will be used only for this research and related academic work

Use of Information in the Future

Some of the data collected in this study may be used in future research or publications. However, your identity will always remain anonymous, and no personal information will be shared.

Voluntary Participation

Your participation in this study is entirely voluntary:

- You are free to decide whether or not to participate
- You may withdraw from the study at any time without giving any reason
- There will be no negative consequences for choosing not to participate or for withdrawing
- If you withdraw before completing the study, your information will not be used

Contact Information

If you have any questions, concerns, or would like more information about this study, you are welcome to contact the researcher at any time.

Consent Statement

I have read (or been explained) the information above. I understand the purpose of the study and what I need to do. I know that my participation is voluntary, and I can withdraw at any time.

I agree to participate in this study.

Participant's Name: _____

Signature/Thumbprint: _____

Date: _____

Researcher's Name: _____

Signature: _____

Date: _____

সম্মতিপত্র (Consent Form)

গবেষণার শিরোনাম

ঢাকার নগর বঞ্চিত এলাকার শিশু (০-৮ বছর)-এর প্রাথমিক বিকাশে বায়ু ও পানি দূষণের প্রভাব সম্পর্কে অভিভাবকদের
দৃষ্টিভঙ্গি

গবেষণা সম্পর্কে

আমি ব্র্যাক বিশ্ববিদ্যালয়ের ইনস্টিটিউট অব এডুকেশনাল ডেভেলপমেন্ট (BRAC IED)-এ আমার মাস্টার্স ডিগ্রির অংশ
হিসেবে এই গবেষণা পরিচালনা করছি।

এই গবেষণার মূল উদ্দেশ্য হলো অভিভাবকরা পরিবেশ দূষণ—বিশেষ করে বায়ু ও পানি দূষণ—কীভাবে বোঝেন এবং এটি
শিশুদের বৃদ্ধি ও সামগ্রিক বিকাশে কী প্রভাব ফেলে বলে মনে করেন তা জানা।

এই গবেষণার মাধ্যমে পরিবারগুলো কী ধরনের সমস্যার সম্মুখীন হয় এবং তারা কীভাবে তাদের শিশুদের সুরক্ষা দেওয়ার
চেষ্টা করে—তা সম্পর্কে গুরুত্বপূর্ণ ধারণা পাওয়া যাবে।

আপনাকে কেন অংশগ্রহণের জন্য অনুরোধ করা হচ্ছে

আপনাকে এই গবেষণায় অংশগ্রহণের জন্য অনুরোধ করা হচ্ছে কারণ আপনি ০-৮ বছর বয়সী একটি শিশুর অভিভাবক বা
যত্নদাতা।

আপনার অভিজ্ঞতা, জ্ঞান এবং মতামত আমাদের বাস্তব জীবনের পরিস্থিতি বুঝতে সাহায্য করবে।

আপনাকে কী করতে হবে

আপনি যদি অংশগ্রহণে সম্মত হন:

- আপনাকে দূষণ ও শিশু বিকাশ সম্পর্কে কিছু প্রশ্ন করা হবে

- সময় লাগবে প্রায় ২০–৩০ মিনিট
- আপনি যেকোনো প্রশ্ন এড়িয়ে যেতে পারবেন
- আপনার অনুমতি নিয়ে আলোচনা চলাকালীন নোট নেওয়া হতে পারে

ঝুঁকি (Risks)

এই গবেষণায় অংশগ্রহণে কোনো পরিচিত ঝুঁকি নেই।

প্রশ্নগুলো এমনভাবে করা হয়েছে যাতে কোনো অস্বস্তি না হয়।

তবে আপনি যদি কোনো সময় অস্বস্তি অনুভব করেন, তাহলে আপনি আলোচনা বন্ধ করতে বা প্রশ্ন এড়িয়ে যেতে পারবেন।

উপকারিতা (Benefits)

এই গবেষণায় অংশগ্রহণ করে আপনি সরাসরি কোনো ব্যক্তিগত উপকার নাও পেতে পারেন। তবে:

- আপনার মতামত শিশুদের উপর দূষণের প্রভাব বুঝতে সহায়তা করবে
- এই গবেষণার ফলাফল নীতি, কর্মসূচি ও সচেতনতা বৃদ্ধিতে সহায়ক হতে পারে
- ভবিষ্যতের গবেষণা ও কার্যক্রমেও এটি সহায়তা করবে

গোপনীয়তা (Privacy and Confidentiality)

- আপনার দেওয়া সব তথ্য সম্পূর্ণ গোপন রাখা হবে
- আপনার নাম বা পরিচয় কোনো রিপোর্ট বা প্রকাশনায় উল্লেখ করা হবে না
- তথ্য নিরাপদভাবে সংরক্ষণ করা হবে এবং শুধুমাত্র গবেষণার কাজে ব্যবহার করা হবে
- আপনার তথ্য শুধুমাত্র এই গবেষণার উদ্দেশ্যে ব্যবহৃত হবে

ভবিষ্যতে তথ্য ব্যবহার

এই গবেষণায় সংগৃহীত কিছু তথ্য ভবিষ্যতের গবেষণা বা প্রকাশনায় ব্যবহার করা হতে পারে।

তবে আপনার পরিচয় সম্পূর্ণ গোপন রাখা হবে এবং কোনো ব্যক্তিগত তথ্য প্রকাশ করা হবে না।

স্বেচ্ছায় অংশগ্রহণ (Voluntary Participation)

- এই গবেষণায় অংশগ্রহণ সম্পূর্ণ স্বেচ্ছাসেবী
- আপনি অংশগ্রহণ করবেন কিনা তা আপনার নিজস্ব সিদ্ধান্ত
- আপনি যেকোনো সময় কোনো কারণ ছাড়াই অংশগ্রহণ বন্ধ করতে পারবেন
- অংশগ্রহণ না করলে বা মাঝপথে ছেড়ে দিলে কোনো ধরনের ক্ষতি হবে না
- আপনি মাঝপথে অংশগ্রহণ বন্ধ করলে আপনার তথ্য ব্যবহার করা হবে না

যোগাযোগের তথ্য (Contact Information)

এই গবেষণা সম্পর্কে কোনো প্রশ্ন বা উদ্বেগ থাকলে, আপনি গবেষকের সাথে যেকোনো সময় যোগাযোগ করতে পারেন।

সম্মতির বিবৃতি (Consent Statement)

আমি উপরের তথ্যগুলো পড়েছি (অথবা আমাকে বুঝিয়ে বলা হয়েছে)।

আমি গবেষণার উদ্দেশ্য এবং আমার করণীয় সম্পর্কে বুঝতে পেরেছি।

আমি জানি যে আমার অংশগ্রহণ সম্পূর্ণ স্বেচ্ছাসেবী এবং আমি যেকোনো সময় অংশগ্রহণ বন্ধ করতে পারি।

আমি এই গবেষণায় অংশগ্রহণ করতে সম্মত।

অংশগ্রহণকারীর নাম: _____

স্বাক্ষর/অঙ্গুলির ছাপ: _____

তারিখ: _____

গবেষকের নাম: _____

স্বাক্ষর: _____

তারিখ: _____