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Environmental Inequity In Punjab: The Impact Of Industrial Pollution On Low-Income Communities In Attock District

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ABSTRACT
The industries are crucial for a country's development, especially with the increasing population. while industries produce useful products, they also generate waste that leads to environmental problems (1). Objectives of the study are, to identify the primary sources of pollution in Attock District, also, to explore the health issues faced by the local community, to determine the level of awareness and knowledge about pollution-related health risks and to assess the perception of industrial pollution among residents. This study focuses on three industrially affected areas in Attock District, which included Pindigheb, Hassanabdal, and Hazro due to their proximity to factories, textile mills, brick kilns, and small-scale workshops. A mixed-methods research design was used in this study, data for this study was collected through questionnaires and semi structured interviews. A simple random sampling technique was used to select 50 participants from the population of residents living near these industrial areas, while 10 participants who lived for years near industries were interviewed to gain deeper insights. Quantitative data was analyzed using SPSS, and qualitative data was analyzed by thematic analysis. The findings of the study indicate that textile mills, brick kilns, and small scale workshops are the primary sources of pollution in Attock, contributing to poor air and water quality. Residents reported that due to pollution they are facing respiratory diseases (Asthma, Chronic Obstructive Pulmonary Disease, Chronic Bronchitis, Lung Cancer) also Skin Disease (Rashes and Skin Irritation, Dermatitis), Gastrointestinal Diseases (Diarrhea, Typhoid, Gastroenteritis) and Mental Health problem (Stress and Anxiety, feeling of Hopelessness) which are particularly common among children and the elderly. The study also revealed a significant level of awareness among residents about the dangers of polluted air and water, though there are gaps in education and reporting mechanisms. The research aligns with Sustainable Development Goals (SDGs) 3 (Good Health and Well-being) and 6 (Clean Water and Sanitation), highlighting the need for urgent intervention to mitigate the environmental and health inequalities in low-income communities disproportionately affected by industrial pollution. The findings are crucial for policymakers and public health professionals aiming to implement effective pollution control measures and improve the quality of life in industrially impacted regions.

Keywords: Environment, environmental degradation, Industrial pollution, Health Impact, Awareness.

INTRODUCTION

The environment encompasses the biotic and physical elements organized into dynamic systems in the universe. This includes water, air, land, and the interrelationships among these elements, as well as their interaction with human beings, other living creatures which includes plants, microorganisms, and property. Every human being has right to live in a hygienic and healthy environment (2). The concept of the environment comes before the concept of nature itself. It is a broad term that refers to the surroundings in which living things, including plants, grow and thrive. This includes elements such as food, water, sunlight, and other natural components that sustain life (3).

The industry is crucial for a country's development, especially with the increasing population. While industries produce useful products, they also generate waste that leads to environmental problems (1). Human activities through urbanization, industrialization, mining, and exploration are at the front of global environmental pollution (4). Chemicals are harmful to human health, which is produces by human activity, are called ecological pollutants. Human activities produced pollutants by contaminating water, air, and soil (5). The industry is polluting both developed and developing countries' environments. During manufacturing, the industry releases certain gases and chemicals that infect pure water and air. It led to certain harmful environmental problems for human health (6). Industrial pollution is considered one of the most important factors which is producing water pollution. Industries release into the water wastes containing chemicals and biological matter that impose high demands on the oxygen in the water (7).

Industrial pollution often leads to public concern and regulatory attention due to the release of a variety of pollutants with potential health effects from large facilities (8). High levels of pollutants in the environment present significant risks to public health, as exposure through various pathways such as inhalation and ingestion can lead to numerous adverse health impacts (9). Environment pollution is a problem and it is likely to influence the health of humans (10). Industrial activities generate waste, and even if production is reduced to zero, pollution cannot be eliminated. To effectively manage all types of waste, industries must take proactive steps toward waste reduction and proper management (11). The release of pollutants makes the environment unbalanced, harmful, and uncomfortable, affecting both the physical and natural environment. This leads to pollution from chemical substances and energy sources. Chemical pollutants and heat energy in the air harm the physical and

natural environment. These pollutants come from industrial processes, including sprays, vapors, toxic gases, solid particles, and smoke (12).

Pakistan is working on developing both its industrial and agricultural sectors to meet the needs of the local population. However, unsystematic industrialization and urbanization have led to environmental issues related to water, air, and soil resources. These problems are caused by the ongoing discharge of untreated industrial effluents and municipal waste into streams and rivers. (13). Water is the most precious natural resource but we are polluting rivers, lakes, and oceans, we are slowly but surely polluting our planet, where innocent organisms are dying at a very alarming rate (14). In Pakistan, the management and monitoring of drinking water quality are poor. Pakistan lines at number 80 among 122 nations in terms of drinking water quality. Drinking water sources from both surface and groundwater, are contaminated with coliforms, toxic metals, and pesticides throughout the country (15). Furthermore, air pollution has become a major issue in cities, particularly in developing countries, due to industrial activities. This poses a significant environmental fear. The path of air pollution is a result of the intricate interaction between the emission and dispersion of air pollutants from industries and transportation.(12).

In this study the objectives of the study are

1. To Identify the primary source of pollution in Attock District.
2. To Explore the health issues faced by the local community in Attock.
3. To determine the level of awareness and knowledge about pollution-related health risks
4. To assess the perception of industrial pollution among residents.

The Attock District is located between the Indus River and the Khyber Pakhtunkhwa province, which is surrounded by plains, foothills, and a different ethnic groups and societies, each groups are unique in cultures and practices. The Indus River is significantly influencing the agricultural sector through irrigation. The district's beautiful hills and mountains provide splendid views. The study highlights the important health issues which is caused by industrial pollution in the low-income areas of Attock District. It provides data on diseases like skin disorders, respiratory issues, and other infections, especially among elders and children. This data is essential for public health professionals to prioritize medical systems in polluted areas. The study highlights the inequality in the environment in the Attock District, where low-income communities are extremely affected by industrial pollution. The study aligns with the Sustainable Development Goals (SDGs), which are particularly Goals 3 and 6 (clean water and sanitation) and Good Health and Well-Being. By emphasizing the problems with industrial pollution which is affecting human health, the environment, and the economy.

LITERATURE REVIW

The environment is the permanent home of people, animals, and plants in the natural world (16). Pollution is broadly defined to include both environmental harm and economic waste. Our air, land, and water all undergo physical, chemical, and biological changes as a result of pollution. Pollution wastes or degrades raw material resources while affecting human life, the lives of other species, and the quality of living environments and cultural assets (17).One significant contributor to environmental pollution is thought to be industrial pollution. It damages the environment, has a significant financial impact on society, and risks people's health and safety (18). Most people believe that the transportation, energy, and industrial sectors play a significant role in causing urban air pollution and related issues (19). Cities' air quality is becoming worse due to increased traffic, industrialization, population growth, and energy consumption. Particularly in the cities of developed nations, certain air contaminants are excessive and exceed WHO regulations, making it possible to identify significant statistical patterns regarding air pollution (12). Another factor that has a significant chance of causing environmental air pollution through the emission of smoke particles is the smoke opacity of industrial flue gas (12).

The primary potential sources of hazardous wastes in the country are the production and use of industrial chemicals, the accumulated amount of outdated chemicals, and waste from hospitals (20). The idea of preventing pollution in the industrial sector is not particularly novel. Historically, industrial enterprises have used a range of waste reduction strategies to cut production costs and boost profits (17). An essential part of oil and gas production and exploration, waste management has a significant impact on both environmental performance and a company's reputation (21). One of the most crucial aspects of economic development is human health. A thriving workforce is necessary for an economy to grow. A healthy workplace necessitates a healthy environment, which includes wilderness areas, clean water, and recreation (7). The health of residents in developing nations like Pakistan is at risk due to water contamination. The main industries of Pakistan's manufacturing regions pollute the water, which leads to several types of illnesses (22). The environment as a whole, as well as the health of people and animals, are negatively impacted by air pollution. Air pollution is the source of many illnesses that affect human health, including respiratory, neurological, and skin conditions (16)

Protecting the environment is a duty (23). During the last few years, people's awareness of the protection of the environment in society has gradually increased (24). Pollution control has become the primary concern of the environment today (18). Various waste management strategies may be suitable, based on regional requirements, resource availability, and technological capabilities. Site-specific considerations can play a significant role in determining which disposal method is most suited and may offer the greatest environmental benefit at the lowest possible cost in any given region. Common waste disposal options that could satisfy risk-based, legal, and practical requirements are on-site burial, underground injection, and waste disposal (21).

Pakistan Faces different environmental pollution related to industries, the industrial sector does not follow The security and quality standards due to which country has the adverse impact of pollution (18). The nation's industrial wastewater discharge was estimated to be 6.25 million cubic meters per year in 2010 and is expected to reach 12.50 million cubic meters per year by 2025 (20). Pakistan is the world's fifth most populous country. It is also the most polluted, with poor air quality, scarce water resources, quickly and frequently rising temperatures, and devastating floods and droughts that occur simultaneously (25).

Pakistan's rapid economic and demographic growth is creating serious environmental problems. As a result, pollution levels are going up and natural resources are under stress. The Environment and Urban Affairs Division (EUAD) and the Sustainable Development Policy Institute (SDPI) were established as a result of the introduction of the National Conservation Strategy (NCS). But industrial inefficiencies, antiquated technology, and misguided policies, including energy subsidies and market distortions, keep making pollution worse, especially in sectors like cement, leather, and textiles. To solve these problems, stronger environmental regulations and government involvement are required (Faruqee, 1996). Industry has two perspectives on trash: first, waste is created during the manufacturing processes; second, the majority of industrial products end up as waste after they are consumed. Waste management and reduction at the source have grown in importance globally from an environmental standpoint (Ramay, 2009). Pakistan's National Environmental Quality Standards (NEQS) are a collection of laws designed to prevent pollution and save the environment. The Pakistan Environmental Protection Agency (Pak-EPA) is accountable for applying these regulations, which address a number of issues including noise levels, water quality, and air quality.

The history of policy reply to environmental problems in the post-independence period can be divided into four phases. The first phase from starts from 1947 to 1957 it was a period of environmental negligence. The second phase, which lasted from 1958 to the holding of the United Nations Conference on Human Environment in 1972 in Stockholm, was a period of aphorism, when environmental problems were began in a disorganized way. The third phase starts from 1972 to 2000 which is marked the beginning of a new era during which institutions, policies, and legislation were evolved in protecting environment. The fourth or current phase, from 2000 onwards, marks the beginning of an time during which the environmental institutions matured, a number of policies were developed, environmental monitoring system was established, and an environmental management system was developed (Park, 2013). the government introduced NEAP in 2001, emphasizing poverty alleviation and environmental sustainability. With UNDP support, NEAP produced policies for sanitation, energy conservation, deforestation prevention, and national environmental protection. The National Environmental Policy of 2005 addressed pollution, deforestation, biodiversity loss, and climate change, building on earlier initiatives (Adeuti, 2020). It highlighted the relationship between the environment and other fields such as population, health, and poverty and encouraged sustainable development to raise living standards. Furthermore, in response to the devastating flooding that occurred in 2010 and 2011, Pakistan created a comprehensive climate change policy that places a high priority on water conservation, disaster management, and public awareness-raising. The government implemented NEAP in 2001 with a focus on environmental sustainability and poverty reduction as a response to this. Policies for energy conservation, deforestation prevention, sanitation, and national environmental preservation were developed by NEAP with assistance from the UNDP. Building on previous efforts, the National Environmental Policy of 2005 tackled pollution, deforestation, loss of biodiversity, and climate change. It emphasized the connection between poverty, population, health, and the environment and promoted sustainable development as a means of improving living conditions. In addition, Pakistan responded to the disturbing floods of 2010 and 2011 by establishing a comprehensive climate change policy that places a high priority on water conservation, disaster management, and public awareness-raising (Adeuti, 2020).

The country's northern region is home to District Attock. With Chakwal to the south, Mianwali to the west, Rawalpindi to the east, and KPK to the north and west, it is surrounded by an area of 6857 km². There are six Tehsils in it: Jand, Attock, Fatehjang, Hazro, Pindigheb, and Hassan Abdal. It comprises 455 settlements and 72 union councils. The primary means of subsistence is farming. Farm-related mulching contributes further to the plastic pollution problem. There are six Municipal Committees and one District Council in the district, which is composed of 71 Union Councils. The government has decided to outsource the solid waste management of the District Attock to Rawalpindi Waste Management Company (RWMC). RWMC will be in charge of collecting garbage that is separated into different categories and recycling any biodegradable materials. Since there are no major producers in the district, the policy's emphasis is now on consumers, collectors, and recyclers. Large-scale customers, collectors, and recyclers are likewise absent from the region; yet, a few small-scale vendors do business there.

Attock Refinery Limited (ARL) is exceptional, employing essential waste management techniques in accordance with National Environmental Quality Standards (NEQS), including minimization, recycling, reuse, and appropriate disposal. These initiatives demonstrate ARL's dedication to corporate social responsibility (CSR) in addition to being in line with governmental regulations. ARL's strategy conserves resources and encourages reuse, which is advantageous to the economy and the environment. By recovering valuable commodities like furnace fuel oil, reusing water, and selling scrap, ARL makes money off of waste and helps save a lot of money (Ramay, 2009).

Several programs are being carried out in Attock, Pakistan, to fight pollution and advance environmental sustainability. To improve the green space and lower air pollution, local government agencies and community organizations are actively working in tree planting projects. These activities are a component of programs which are the Billion Tree Tsunami project. Waste management techniques are improving. These initiatives pursue to encourage recycling and moderate the quantity of garbage disposed in waste dumps. To increase the perception of local people understanding about sustainable practices and environmental protection, educational activities play essential role. So therefore, it is really important to continue the struggles to control pollution in Attock and also in other areas of Pakistan. Government agencies and non-governmental organizations (NGOs) should work together to provide more information and conduct awareness campaigns to help people to get better understand on how to reduce their exposure to pollution and protect their health.

METHODS AND MATERIALS

This study employed a mixed method research design to explore the health issues faced by the local community in Attock and also to Identify the primary source of pollution in Attock District. Also the study objective is to determine the level of awareness and knowledge about pollution-related health risks and also to assess the perception of industrial pollution among

residents. The study was conducted in Attock District, specifically targeting three industrially affected areas which are, Pindigheb, Hassanabdal, and Hazro. These areas were chosen due to their proximity to factories, including textile mills, brick kilns, and small-scale workshops known for contributing to severe environmental pollution.

In this study simple random sampling technique was used to select 50 participants from the population of residents living near these industrial areas and self-developed questionnaire was distributed among them, and interview was conducted with ten participants, ensuring diversity in gender, age, and occupation to capture a broad range of perspectives on the pollution problem. Each participant had lived in the affected area for several years, allowing them to provide detailed insights into the long-term health and environmental consequences of industrial activities. The random sampling method ensured an unbiased selection of individuals, giving the study credibility by representing the wider population. Data was collected through questionnaire and semi-structured interviews was conducted to allow participants to freely express their views while ensuring that key research areas were covered. Interviews were conducted in the Urdu language to ensure full comprehension and engagement. Interviews were audio-recorded (with participant consent), transcribed verbatim, and anonymized to protect participant identity. The interview data were analyzed using thematic analysis and quantitative data was analyzed through SPSS version 23. Strict ethical rules were observed to in order to ensure the privacy and rights of study participants. Before the interviews, all participants provided their informed consent, ensuring that they understood the goal of the study and that they might withdraw at any moment. Confidentiality was used to maintain participant privacy in all gathered data.

FINDINGS

Primary Sources of pollution in Attock District

1. Textile Mills

Textile mills are considered as the major contributors to industrial pollution in Attock region. These mills release polluted wastewater into local water sources, which is polluting rivers and streams that is used for drinking water and also for irrigation. The release of pollution from industries contain heavy metals and chemical which damage water quality and affect soil fertility in agricultural lands. The polluted water has causes different health problems for residents. Additionally, the air is also polluted due to high levels of particulate matter and other pollutants from the mills, making it difficult to breathe. The emission of harmful gases from the burning of fossil fuels like coal and oil by these mills contributes to air pollution and the degradation of air quality.

2. Brick Kilns

Due to the usage of coal and other inferior fuels, brick kilns in places like Hassanabdal are dishonorable for producing dense smoke. The air quality is greatly impacted by these kilns' massive emissions of sulphur dioxide, nitrogen oxides, and particulate matter. The traditional kilns release black carbon, a dangerous atmospheric pollutant that has been connected to serious respiratory problems in both the surrounding community and kiln workers. Pollution from brick kilns also negatively affects the surrounding soil, leading to reduced crop yields and is harming the livelihoods of farmers who depend on agriculture. There has been a noticeable reduction in emissions and an improvement in air quality in the regions where zigzag kilns have been installed. Furthermore, these kilns use less fuel, which lowers running costs for kiln owners and increases their long-term sustainability. But because of the initial expenditures, many kiln owners have been unwilling to adopt cleaner technology, which has resulted in a delayed rate of adoption. while a result, residents continue to experience health problems while traditional kilns continue to operate. Results have been unequal throughout the region as a result of inconsistent implementation of regulations.

5. **Small-Scale Workshops (Karkhanay)**

The small-scale workshops which are known as karkhanay, in Attock City plays a significant role in pollution. These workshops are using outdated equipment and ineffective processes, which is releasing toxic gases and particulate matter into the air. The use of fossil fuels in these workshops are creating problem. These karkhanay are responsible for releasing harmful gases such as carbon monoxide, volatile organic compounds, and dust particles which are contributing to smog formation and polluting the air quality. The government has issued guidelines for these karkhanay, and efforts have been made to move the most polluting workshops to less populated areas. Some workshops have installed basic filtration systems to reduce emissions, but these efforts are really slow. Most karkhanay continue to work without following to environmental rules. The filtration systems that have been installed are often insufficient. The overall impact on the environment and public health remains minimal, and the community continues to suffer.

HEALTH ISSUES FACED BY THE LOCAL COMMUNITY IN ATTOCK.

1. Respiratory Diseases:

Participants stated that Air pollution from textile mills, brick kilns, and small-scale workshops has significantly increased respiratory problems among residents IN District Attock. The high levels of gasses which includes sulfur dioxide (SO_2) and nitrogen oxides (NO_x) are responsible for chronic conditions such as:

i. **Asthma**: Residents, especially children stated that they are suffering from frequent asthma attacks due to exposure to polluted air. The thick smog emitted from brick kilns and textile mills exaggerates this condition.
ii. **Chronic Bronchitis**: most of the participants shared about the diseases chronic bronchitis. Prolonged exposure to air pollutants leads to inflammation of the bronchial tubes, causing persistent coughs and chest pain. Chronic bronchitis has been reported at higher rates in communities living near Karkhanay and brick kilns.
iii. **Chronic Obstructive Pulmonary Disease (COPD)**: Many adults, especially those working in or living near industries, report shortness of breath and chronic coughs, symptoms commonly associated with COPD.

iv. **Lung Cancer**: Although less frequently reported, continuous exposure to toxic fumes has the potential to increase the risk of lung cancer, particularly among older residents and workers exposed to hazardous air for extended periods.

2. Skin diseases

Participants stated that they are facing several skin diseases. Water pollution from untreated wastewater discharged by textile mills has led to a variety of skin ailments. Many residents, particularly those who use polluted water for bathing or laundry, suffer from:

i. **Rashes and Skin Irritation**: Direct contact with contaminated water leads to frequent skin irritations, rashes, and itching. Many residents reported that their skin would become inflamed after whish their faces or coming into contact with polluted water.
ii. **Dermatitis**: Continued exposure to chemicals and heavy metals in water causes chronic skin conditions such as dermatitis, which presents as inflamed, itchy, and swollen skin.

3. Gastrointestinal Diseases:

Residents of the Attock district shared that they are facing Gastrointestinal issues. The contamination of local water sources with nitrates, heavy metals, and other toxic chemicals has resulted in a surge in waterborne diseases. The following gastrointestinal issues are commonly reported:

i. **Diarrhea**: Many residents, especially children, suffer from diarrhea due to the drinking of polluted water. Poor water quality is a major contributor to high child mortality rates in the region.
ii. **Typhoid**: The polluted water has led to a rise in typhoid cases in Attock District, with many residents reporting fever, abdominal pain, and other symptoms of this bacterial infection.
iii. **Gastroenteritis**: Stomach inflammation, accompanied by nausea, vomiting, and abdominal pain, is also a common complaint from participants, particularly after consuming food prepared with contaminated water.

4. Mental Health problem

Although not frequently highlighted, environmental degradation and constant health struggles have impacted the mental well-being of the residents. Respondents especially those with chronic illnesses or whose children are frequently ill, reported that:

i. **Stress and Anxiety**: participants shared that they are worried about their health and the lack of clean resources leads to elevated levels of stress and anxiety.
ii. **Feeling of Hopelessness**: Participants expressed that the ongoing cycle of pollution and illness, along with ineffective government intervention, leads to a feeling of hopelessness among affected families.

Through quantitative data, researcher analyzed the data through SPSS and the means score and percentage shows the level of awareness and knowledge about pollution-related health risk and also the perception of industrial pollution among residents. The Questionnaire was based on five Likert scale, 5 indicating strongly agree, 4 Agree, 3 Neutral, 2 Disagree and 1 Strongly Disagree.

Table 1: Perception of pollution

Perception of pollution	1	2	3	4	5	
	F (%)	F (%)	F (%)	F (%)	F (%)	Mean
The air quality in my area is poor due to industrial activities.	3 6.0	1 2.0	4 8.0	28 56.0	14 28.0	3.98
I often smell unpleasant smells caused by factory emissions.	1 2.0	2 4.0	3 6.0	14 28.0	30 60.0	4.40
I can visibly see the pollution coming from factories in my area.	1 2.0	1 2.0	7 14.0	39 78.0	2 4.0	3.80
Factories near my community discharge waste into local water bodies.	1 2.0	10 20.0	2 4.0	19 38.0	18 36.0	3.86
The environment in my area has deteriorated significantly due to industrial pollution.	3 6.0	7 14.0	13 26.0	11 22.0	16 32.0	3.60

The data shows in table 1, the levels of perception regarding pollution in Attock. The highest mean of 4.40 indicates that respondents are most aware of unpleasant smells caused by factory releases, suggesting that smells from industrial activities are a prominent concern. Moreover, respondents stated that, the air quality due to industrial activities are poor, and the mean score is 3.98. Similarly, the visibility of pollution from factories has a mean of 3.80, indicating that many respondents can see the pollution in their environment. The perception of factories discharging waste into water bodies has a mean of 3.86, showing that respondents recognize this as a significant issue. Lastly, the mean of 3.60 for environmental deterioration suggests that while residents do perceive industrial pollution as contributing to environmental degradation.

Table 2: Awareness and Knowledge

Awareness and Knowledge	1	2	3	4	5	
	F (%)	F (%)	F (%)	F (%)	F (%)	Mean
I am aware of the health risks associated with polluted air from factories	1 2.0	1 2.0	4 8.0	33 66.0	11 22.0	4.04
I understand the dangers of drinking or using polluted water from nearby factories.	1 2.0	1 2.0	1 2.0	18 36.0	29 58.0	4.46
I am informed about ways to reduce exposure to pollution in my area.	1 2.0	1 2.0	14 28.0	18 36.0	16 32.0	3.94
There are educational programs in my community that raise awareness about industrial pollution.	4 8.0	6 12.0	10 20.0	19 38.0	11 22.0	3.54
I know how to report pollution-related incidents to local authorities.	5 10.0	4 8.0	14 28.0	13 26.0	14 28.0	3.54

Table 2 shows, The mean scores for awareness and knowledge indicate a strong understanding of the dangers of pollution. The highest mean of 4.46 shows that most respondents are highly aware of the dangers of drinking polluted water. Awareness of health risks from polluted air also scores high, with a mean of 4.04, showing broad knowledge in this area. The mean score of 3.94 suggests that many respondents are informed about ways to reduce exposure to pollution, although there is need for improvement. Educational programs and knowledge of reporting pollution-related incidents both have lower means of 3.54, indicating that there are fewer resources in these areas. Overall, the data shows high awareness of pollution risks but highlights gaps in education and reporting mechanisms.

DISCUSSIONS

Environment is an important political, social, cultural, and economic issue affecting countries and regions worldwide (26). The findings of this study reveal a distressing reality the low-income communities in Attock District are disproportionately affected by industrial pollution, with serious consequences for their health and environment. According to a previous study, the majority of industries in Pakistan discharge their wastes into the environment untreated, which has negative impacts on both the land and the water (Jehan & Ullah, 2018), In Attock the air and water contamination caused by textile mills, brick kilns, and small-scale workshops (karkhanay) has led to a public health crisis, making worse existing vulnerabilities in these disadvantaged areas. The study revealed a significant issue, the clear connection between environmental degradation and health inequalities in the region. Low-income communities lack the infrastructure and resources necessary for protecting themselves from the resulting pollution, in addition to being located close to polluting enterprises. This unequal exposure to environmental risks supports a vicious cycle that results in common health concerns like gastrointestinal disorders, skin ailments, and chronic respiratory diseases. According to previous study, Water pollution is one of the significant causes of health problems in human beings (15). The high levels of harmful pollutants found especially near brick kilns and textile mills, are leading to an increase in chronic respiratory conditions. Children and the elderly are suffering from diseases such as asthma, bronchitis, and other severe respiratory issues. According to a study, almost 9.0 million early deaths in 2019 were recognized to pollution. Of these, 6.7 million deaths were caused by air pollution, including both household and ambient air pollution, while 1.4 million premature deaths were attributed to water pollution (27). Participants stated that these communities bear the burden of chronic illness due to limited healthcare access, and lack of sufficient support or treatment options (28). Problems related to children's environmental health in Pakistan include cholera because of poor hygiene, respiratory disease due to pollution, exposure to pesticides, diarrhea, occupational hazards as a result of child labor, etc. Moreover, the contamination of local water sources with nitrates, heavy metals, and untreated industrial wastes has increased different diseases, particularly in children. Conditions such as diarrhea and typhoid are prevalent, further straining the already limited healthcare infrastructure. According to a previous study, the increasing pollution of drinking water sources in Pakistan the resulting health problems(15). Another study stated that Air pollution contributes to the global burden of disease, with exposure to fine particulate matter of diameters smaller than 2.5 μm ($PM_{2.5}$) being identified as the fifth-ranking risk factor for humanity globally (29). The mental health of residents has also been affected by the constant exposure to pollution and illness. Many community members report high levels of stress and anxiety, particularly regarding the health of their children. According to a previous study, the emission of particulate matter leads to significant environmental issues and has severe public health implications. Every year, it causes 85,000 to 200,000 additional deaths, over 100,000 heart attacks, and nearly nine million cases of asthma (30). In the study, The highest mean of 4.40 indicates that respondents are most aware of unpleasant smells caused by factory releases, suggesting that smells from industrial activities are a prominent concern, but still they are facing health issues, which shows that people are helpless about their situation. The perception of factories discharging waste into water bodies has a mean of 3.86**,** showing that respondents recognize this as a significant issue. Educational programs and knowledge of reporting pollution-related incidents both have lower means of 3.54, indicating that there are fewer resources in these areas.

The government is making efforts to control the system in Attock District to reduce its environmental impact. For instance, guidelines have been issued for workshops, and there have been attempts to relocate the most polluting workshops to less populated areas. Additionally, the government has implemented regulations that require brick kilns to adopt cleaner technologies, such as zigzag kilns, which are designed to reduce emissions. While a small percentage of kiln operators have followed these rules, the majority still utilize traditional, environmentally harmful practices. These actions, such as installing

simple filtering systems, are mostly useless. The study's findings highlight how urgently significant policy changes that address these communities' health and environmental concerns are needed. The government must reinforce the enforcement of environmental regulations, especially in areas with high industrial activities. Additionally, the community-led environmental monitoring programs should be established to empower citizens to report violations and activist for change. These programs, in collaboration with local NGOs can provide real-time data on pollution levels and create pressure for fast action. The government should also invest in mobile health clinics and provide sponsored healthcare to directly address the health issues caused by pollution, offering instantaneous relief to affected communities.

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