



ASSESSING THE HEALTH IMPLICATIONS OF CONTAMINATED DRINKING WATER IN PESHAWAR

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Abstract

This research examines the public health risks associated with unsafe drinking water in the villages of Pirbala, Achini a tehsil in Peshawar District, Pakistan. Using interviews, surveys, and focus group discussions, the study identifies high levels of water contamination and a significant prevalence of waterborne diseases such as diarrhea, hepatitis, and malaria. Approximately 90% of residents depend on unprotected open wells vulnerable to contamination from bacteria, insects, and animal waste. The absence of proper sanitation facilities worsens the situation, while community awareness of safe water practices remains low. The study also highlights the insufficient infrastructure, with only one non-functional water filtration plant available. Many residents also rely on discolored, foul-smelling bore water and experience severe water shortages during the summer. The findings emphasize the need for a comprehensive approach to mitigate this public health issue, including the construction of protected wells, functional water filtration plants, improved sanitation, community awareness initiatives, and increased engagement from both government and non-governmental organizations.

INTRODUCTION

Water, the essential element for sustaining life on Earth, constitutes approximately 3% of the planet's total water resources, of which 2.97% is trapped in glaciers and ice caps. The remaining 0.3% is surface and groundwater available for human consumption. Despite this limited supply, 97% of Earth's water is saline and unsuitable for direct human use (Miller, 1997). Access to clean and safe drinking water is a fundamental human right and a critical component of maintaining good health. Unfortunately, many regions, particularly in developing countries, are facing a severe scarcity of clean water. This situation is expected to worsen in the coming century due

to rapid urbanization, population growth, and climate change (Jackson et al., 2001).

In developing nations like Pakistan, the rapid growth in population, industrialization, and the discharge of untreated wastewater and chemical pollutants into water bodies have led to the contamination of drinking water sources, making them unsafe for human use. The quality of water in these areas is rapidly declining due to deforestation, urban expansion, land degradation, and other factors, resulting in a global water quality crisis, particularly in South Asia, the Middle East, and Africa. In many Asian cities, untreated household and industrial wastewater is contaminating water supplies,



increasing organic and nutrient loads in drinking water (Annachhatre, 2006).

In South Asia, where poor water quality and inadequate sanitation systems are prevalent, over 0.5 million newborn deaths occur annually due to waterborne diseases. Poor water quality is responsible for 26% of all global deaths from infectious diseases, surpassing fatalities from all forms of violence, including war (WHO, 2002; UNEP GEMS/Water Programme, 2008). The residents of slums and rural areas are disproportionately affected by waterborne illnesses due to a lack of access to clean water.

Unsafe drinking water remains a critical public health issue, particularly in rural areas where water supply and sanitation infrastructure are insufficient. Peshawar, a tehsil in Rawalpindi District, Pakistan, is one such area where residents face significant health challenges as a result of contaminated water. This research investigates the impact of unsafe drinking water on human health in the villages of Balawara and Gali Par, focusing on the prevalence of waterborne diseases and the contributing factors to this public health crisis. Peshawar is renowned for its scenic beauty and hilly landscape, but it grapples with significant water management and sanitation problems. A large proportion of residents rely on open wells and boreholes, which are often contaminated by pollutants, leading to widespread health issues. The objective of this study is to quantify the extent of these water-related health issues and to offer recommendations for improving water quality and public health in the region.

The decision to investigate the health impacts of unsafe drinking water in Peshawar is of paramount importance. Access to clean water is a fundamental human right, yet many residents in the region are deprived of this basic necessity, leading to severe health risks. By exploring these issues, this research seeks to raise awareness and advocate for necessary interventions to enhance water quality and safeguard public health. Furthermore, the study provides an opportunity to understand the specific health challenges faced by the community, including the prevalence of

waterborne diseases and their socioeconomic impacts. The findings will help inform practical solutions and policies aimed at improving the well-being and quality of life for the people of Peshawar.

Review of Literature

Community health studies in Pakistan have indicated that poor-quality drinking water is responsible for approximately 50% of diseases and 40% of deaths in the country. A Geographic Information System (GIS) and Water Quality Index (WQI) study conducted by R. Shabbir and S. S. Ahmad (2015) found that nearly half of the bore wells and open wells in Rawalpindi and Islamabad were unsuitable for drinking due to contamination. Waterborne diseases such as diarrhea are a leading cause of death among young children, and approximately one in five individuals suffers from water-related illnesses.

A comprehensive review by M. A. Kahlowan, M. A. Tahir, H. Rasheed, and K. P. Bhatti (2006) highlighted the widespread contamination of water sources in Pakistan due to industrial effluents, agricultural runoff, and inadequate sewage treatment. The study calls for improved monitoring systems, policy reforms, and public awareness campaigns to mitigate the health risks associated with poor-quality drinking water. Recent research has explored innovative community-based solutions, such as local water purification initiatives, to address access to safe drinking water in remote areas (Shoaib, Asad, and Aziz, 2016).

A study conducted by Sohail et al. (2022) investigated the quality of drinking water and its associated health risks in metropolitan areas of Pakistan. The results indicated that many water samples were of poor quality, necessitating better management of water filtration systems. Public awareness campaigns regarding water quality and health risks can enhance the satisfaction and safety of drinking water in these regions.

The conceptual framework of this research emphasizes the relationship between water quality, exposure pathways, and health outcomes. Contaminated drinking water serves as a primary route for pathogen



transmission, leading to diseases such as diarrhea, hepatitis, and malaria. This framework helps explore how environmental factors, infrastructure deficiencies, and lack of community awareness contribute to adverse health outcomes. The theories related to unsafe drinking water encompass microbiological, epidemiological, environmental, and sociological perspectives.

THEORETICAL FRAMEWORK

Germ Theory of Disease

This foundational theory in microbiology posits that microorganisms, including bacteria, viruses, and protozoa, are the primary causes of many diseases. Unsafe drinking water often contains pathogenic microorganisms that can lead to various waterborne diseases such as cholera, dysentery, and typhoid fever. Understanding the presence and transmission of these pathogens is crucial for preventing disease outbreaks.

Fecal-Oral Route Transmission Theory

This theory describes the transmission pathway of many pathogens found in contaminated water. It highlights the importance of hygiene and sanitation practices in preventing the spread of diseases. Pathogens from human or animal feces can contaminate water sources, and ingestion of this water can lead to infections.

Environmental Health Theory

This broad theory encompasses various factors affecting human health, including water quality, air quality, and exposure to hazardous substances. It emphasizes the interconnections between environmental conditions and health outcomes, advocating for the protection of water resources to prevent diseases and promote overall well-being.

Hydraulic Societies Theory

This sociological theory explores how the control and management of water resources influence societal structures and health outcomes. Societies that invest in robust water management infrastructure tend to

have better public health outcomes. Conversely, regions with poor water management often face higher incidences of waterborne diseases.

Toxicological Risk Assessment Theory

This theory involves assessing the potential health risks posed by chemical contaminants in drinking water, such as heavy metals (lead, arsenic) and industrial pollutants. It includes evaluating the exposure levels, toxicity of the contaminants, and the potential health effects on different populations, especially vulnerable groups like children and pregnant women.

These theories collectively highlight the complex interplay between water quality and human health, emphasizing the need for comprehensive strategies to ensure safe drinking water and protect public health.

Unsafe drinking water is a leading cause of illness and death in developing regions. According to the World Health Organization (WHO), waterborne diseases account for a significant portion of the global disease burden, particularly affecting children. Studies in similar rural settings have shown that poor water quality, inadequate sanitation, and lack of health education are critical factors driving the prevalence of waterborne diseases. In Pakistan, rural areas often suffer from inadequate water management and sanitation infrastructure, exacerbating public health issues.

Research Objectives

This research has following objectives:

1. To assess the quality of drinking water in Balawara and Gali Par villages.
2. To identify the prevalence of waterborne diseases among the residents.
3. To explore the factors contributing to water contamination.
4. To evaluate the community's awareness and practices regarding safe water use.
5. To recommend strategies for improving water quality and reducing health risks.



Methods and Methodology

Study Locale

The study was conducted in Peshawar, a rural area in Pakistan. The main focus areas were two villages within Peshawar: Balawara and Gali Par. These villages were selected due to their known issues with access to safe drinking water, making them ideal for investigating the effects of unsafe drinking water on human health.

Study Design

A cross-sectional study design was used to gather data on the effects of unsafe drinking water on human health in the selected villages.

Sampling Method

The sample was selected randomly to ensure a representative cross-section of the population in Balawara and Gali Par. This method helps to avoid bias and ensures that the results can be generalized to the broader community.

Data Collection Methods

Surveys: I conducted surveys to collect quantitative data on the health effects experienced by residents due to unsafe drinking water. A total of 50 survey responses were recorded. The survey included questions about the types of illnesses experienced, frequency of waterborne diseases, sources of drinking water, and any water treatment methods used.

Interviews: Semi-structured In-depth interviews were conducted with residents to gather qualitative data. The interviews aimed to understand personal experiences and perceptions regarding water quality and health issues. This method provided detailed insights and context that complemented the survey data.

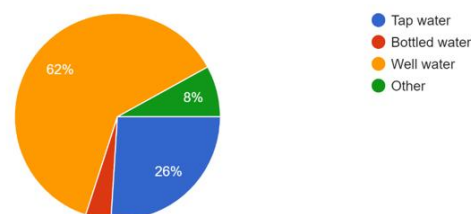
Results and Discussion

Previous research on the impacts of unsafe drinking water on human health in areas like Peshawar has highlighted several challenges and issues. Chronic exposure to contaminated water can also lead to long term health issues such as stunted growth, cognitive impairment,

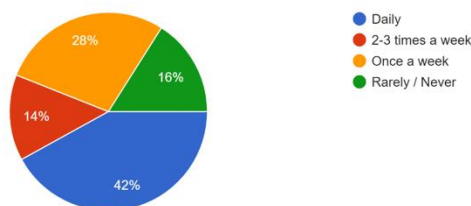
and increased risk of cancer. One of the main challenges identified in previous research is the inadequacy of infrastructure for water treatment and distribution in rural areas like Peshawar. Additionally, socioeconomic factors such as poverty and lack of education often worsen the problem, as communities may not have the resources or knowledge to implement effective water purification methods.

The study revealed alarming levels of water contamination and a high prevalence of waterborne diseases in both villages. Key findings include a high incidence of diseases such as diarrhea, hepatitis, and malaria, affecting a significant portion of the population. Approximately 90% of residents rely on open wells for their water needs, which are unprotected and allow contaminants like bacteria, insects, and animal waste to enter. There is a severe lack of proper sanitation facilities, further contributing to water source contamination. Some statistical data from surveys are as follow:

How do you primarily source your drinking water?
50 responses

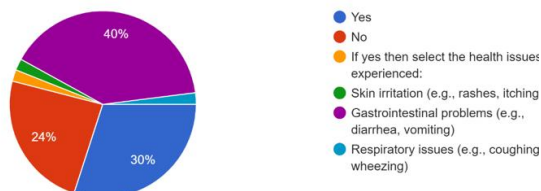


How often do you drink tap water in a week?
50 responses

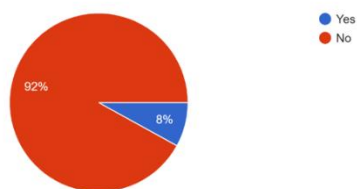




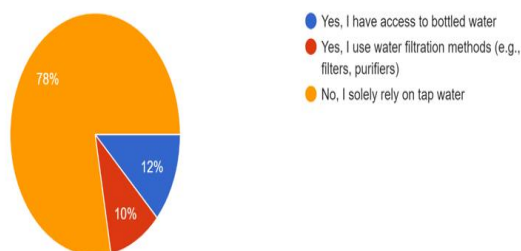
Have you or anyone in your household experienced any health issues in the past year that believe may be related to water consumption?
50 responses



Have you ever received any official information or warnings about the quality of tap water in Kori Sattian?
50 responses



Do you have access to alternative sources of clean drinking water apart from tap water?
50 responses



As shown in the figures, almost 60% residents of Peshawar completely rely on well water. They consume it daily. As a result each household is experiencing health issues. 70% people are being affected in each household, 40% are having gastrointestinal issues such as diarrhea, vomiting, malaria etc while 30% are having skin issues, respiratory issues.

Community awareness about the importance of safe drinking water is extremely low, with many residents not boiling or treating water before consumption. Additionally, the presence of only one non-functional filtration plant in the entire Tehsil highlights the inadequate infrastructure for water purification. Some residents use bore water, which is often not fully transparent and sometimes smells bad, and during summer, water wells dry up completely, forcing people to fetch water from miles away.

The study concludes that unsafe drinking water in Peshawar is a major public health issue, leading to widespread diseases and compromised quality of life. Addressing this problem requires a multi-faceted approach, including constructing protected wells and functional water filtration plants, implementing proper sanitation facilities to prevent water contamination, conducting awareness campaigns to educate residents on safe water practices, and strengthening the role of governmental and non-governmental organizations in providing resources and support for water and sanitation projects.

CONCLUSION

The study concludes that unsafe drinking water in Peshawar is a major public health issue, leading to widespread diseases and a compromised quality of life. Addressing this problem requires a multi-faceted approach. First, infrastructure development is essential, including the construction of protected wells and functional water filtration plants to ensure a safe water supply. Second, improving sanitation facilities is crucial to prevent water contamination from human and animal waste. Third, community education campaigns are needed to raise awareness about safe water practices, such as boiling water and using clean containers. Finally, the involvement of both government and non-governmental organizations is vital to provide the necessary resources and support for water and sanitation projects. These combined efforts are essential to improving the health and well-being of the residents of Peshawar.

RECOMMENDATIONS

To improve the water quality and health outcomes in Peshawar, the following recommendations are made:

1. Install Protected Wells and Filtration Plants: Construct and maintain protected wells and efficient water filtration plants to provide clean drinking water.
2. Enhance Sanitation Infrastructure: Develop proper sanitation facilities to reduce water contamination from human and animal waste.



3. Community Education Programs: Implement education programs to raise awareness about the importance of boiling water, using clean containers, and other safe water practices.
4. Regular Water Quality Testing: Establish a routine for testing water quality to monitor contamination levels and take timely corrective actions.
5. Government and NGO Collaboration: Encourage collaboration between the government and non-governmental organizations to fund and implement water and sanitation projects.
6. Emergency Water Supply Plans: Develop contingency plans for water supply during droughts or well-drying periods, ensuring access to safe drinking water year-round.

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