

CLEAN WATER, HEALTHY LIVES: INVESTIGATING THE IMPACTS OF UNSAFE DRINKING WATER ON HUMAN'S HEALTH IN KOTTLI SATTIAN

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ABSTRACT

This study investigates the impacts of unsafe drinking water on human health in the villages of Balawara and Gali Par in Kottli Sattian, a Tehsil in Pakistan's Rawalpindi District. Through interviews, surveys, and focus group discussions, this exploratory research reveals alarming levels of water contamination and a high prevalence of waterborne diseases such as diarrhea, hepatitis, and malaria. Approximately 90% of residents rely on unprotected open wells, which are prone to contamination by bacteria, insects, and animal waste. The lack of proper sanitation facilities exacerbates this issue, and community awareness about safe drinking water practices is extremely low. The inadequate infrastructure is highlighted by the presence of only one non-functional filtration plant in the entire Tehsil. Additionally, some residents use bore water, which is often discolored and malodorous, and face severe water shortages during the summer months. The study concludes that addressing this public health crisis requires a multi-faceted approach, including the construction of protected wells and functional water filtration plants, improved sanitation facilities, community education campaigns, and increased involvement of governmental and non-governmental organizations to provide the necessary resources and support for water and sanitation projects.

Keywords: Water quality, drinking water, human health, waterborne diseases, Kottli Sattian.

INTRODUCTION

The most important liquid for sustaining life on Earth is water. Only 3% of water is fresh water, with 2.97% being made up of glaciers and ice caps, and the remaining 0.3% being surface and ground water that may be used by humans. Approximately 97% of water is found in oceans and is unfit for human use (Miller, 1997). Safe drinking water is both a fundamental human right and a necessary for good health. Many regions of the world already have limited supplies of fresh water. It will become much more restrictive in the upcoming century as a result of urbanization, population growth, and climate change (Jackson et al., 2001). Unfortunately, due to rapid population growth, industrial expansion, disposal of waste water and chemical effluents into canals and other water

sources, and other factors, the drinking quality of water in developing nations (like Pakistan) is constantly becoming contaminated and dangerous for human use. Recent estimates show that while the amount of water available is rapidly declining due to increased urbanization, deforestation, land degradation, and other factors, the quality of the water is also declining in developing countries of South Asia, the Middle East, and Africa.

As a result, untreated household and industrial waste water discharged into these resources is causing an increase in organic and nutritional material in drinking water in many Asian cities (Annachhatre, 2006). The situation is made worse in South Asia, where inadequate sanitation and low water quality cause more than 0.5 million newborn deaths annually

in addition to other health risks. An estimated 26% of all deaths worldwide are attributed to infectious diseases produced by pathogenic bacteria, and more people die each year from poor water quality than from all types of violence, including war (WHO, 2002; UNEP GEMS/ Water Programme, 2008). Slum dwellers were disproportionately affected by waterborne illnesses due to a lack of access to safe and clean water.

Unsafe drinking water is a critical public health issue affecting millions worldwide, particularly in rural areas with inadequate water supply and sanitation infrastructure. Kottli Sattian, a tehsil in the Rawalpindi District of Pakistan, is one such area where residents face severe health challenges due to contaminated drinking water. This research explores the impacts of unsafe drinking water on human health in the villages of Balawara and Gali Par, focusing on the prevalence of waterborne diseases and the underlying factors contributing to this public health crisis.

Kottli Sattian is known for its picturesque landscapes and hilly terrain. Despite its natural beauty, the area suffers from severe water management and sanitation issues. Most residents rely on open wells and boreholes for their water needs, which are frequently contaminated by pollutants, leading to widespread health problems. This study aims to understand the extent of these issues and provide recommendations for improving water quality and public health in the region.

Choosing the topic of investigating the impact of unsafe drinking water on human health in Kottli Sattian is crucial for several reasons. Firstly, access to safe drinking water is a fundamental human right, yet many residents in Kottli Sattian are deprived of this basic necessity, leading to significant health risks. By shedding light on this issue, we can raise awareness and advocate for necessary interventions to improve water quality and protect public health. Additionally, studying this topic provides an opportunity to understand the specific health challenges faced by the community, including the prevalence of waterborne diseases and their socioeconomic impacts. Through research and analysis, we can identify practical solutions and policies to address the problem, ultimately contributing to the well-being and prosperity of the people in Kottli Sattian.

REVIEW OF LITERATURE

Community health studies have indicated that approximately 50% of diseases and 40% of deaths in Pakistan are caused by low-quality drinking water. Due to overuse of groundwater, almost half of the samples from Geographic Information System and Water Quality Index (R. Shabbir and S. S. Ahmad 2015) research of bore wells and open wells in Rawalpindi and Islamabad were of low quality for drinking. Water-borne diseases like diarrhea are said to be the main cause of death for young children, and every fifth person has some kind of ailment or disease brought on by contaminated water.

(M. A. Kahlowan, M. A. Tahir, H. Rasheed, and K. P. Bhatti 5, 2006) conducted a comprehensive review of water quality assessment studies in Pakistan, highlighting the persistent challenge and potential solutions. The review underscores the widespread contamination of water sources across the country due to industrial effluents, agricultural runoff, and inadequate sewage treatment. The study emphasizes the urgent need for improved monitoring systems, policy interventions, and public awareness campaigns to mitigate the health risks associated with unsafe drinking water. Recent studies have sought to explore innovative strategies for improving water quality and mitigating health risks in Pakistan. (M. Shoaib, M. J. Asad, S. Aziz et al. 20, 2016) investigated the efficacy of community-led water purification initiatives in remote villages, demonstrating the potential of grassroots interventions to address the challenges of access to safe drinking water at the local level.

The recent study by (Sohail MT, Ehsan M, Riaz S, Elkaeed EB, Awwad NS and Ibrahim HA 2022) on Investigating the Drinking Water Quality and Associated Health Risks in Metropolis Area of Pakistan examined public knowledge of water quality and health risk assessment in Islamabad, Pakistan. After calculating the water quality index, it was discovered that the majority of the low-quality samples were dangerous. Islamabad's installed filtration plants need to be properly supervised. Circulating government reports on the state of water quality through print, digital, and broadcast media can improve public satisfaction. The results of this study, which was conducted in Islamabad, Pakistan, may be applied to this city as well as to other comparable areas.

The conceptual framework focuses on the relationship between water quality, exposure

pathways, and health outcomes. Contaminated drinking water serves as the primary exposure pathway for pathogens causing diseases such as diarrhea, hepatitis, and malaria. This framework helps to explore how environmental conditions, infrastructure deficiencies, and lack of community awareness contribute to adverse health outcomes.

Unsafe drinking water is a significant global health issue, and several theories have been developed to understand its impact on human health. These theories range from microbiological and epidemiological frameworks to broader environmental and sociological perspectives. Here are some key theories related to human health and unsafe drinking water:

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 Kottli Sattian, a rural area in Pakistan. The main focus areas were two villages within Kottli Sattian: 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

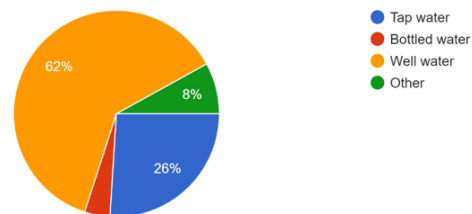
Previous research on the impacts of unsafe drinking water on human health in areas like Kottli Sattian has highlighted several challenges and issues. Chronic exposure to contaminated water can also lead to long term health issues such as stunted growth, cognitive impairment, and increased risk of cancer. One of the main challenges identified in previous research is the inadequacy of infrastructure for water treatment and distribution in rural areas like Kottli Sattian. 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

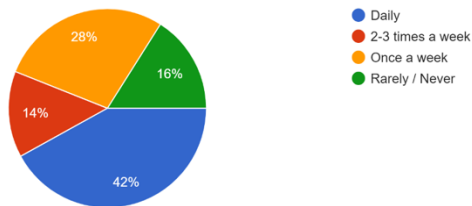
diseases in both villages. Key findings include a high incidence of diseases such as diarrhea, hepatitis, and malaria, affecting a significant portion of the population. Approximately 90% of residents rely on open wells for their water needs, which are unprotected and allow contaminants like bacteria, 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:

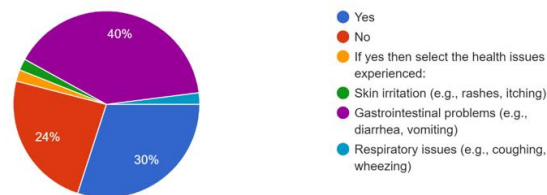
How do you primarily source your drinking water?
50 responses



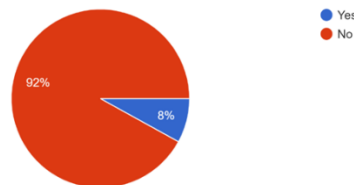
How often do you drink tap water in a week?
50 responses



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

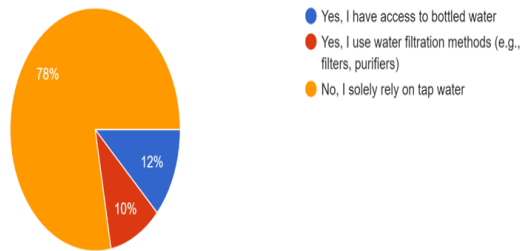


Have you ever received any official information or warnings about the quality of tap water in Kottli Sattian?
50 responses



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 Kottli Sattian 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 Kottli Sattian 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 Kottli Sattian 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 Kottli Sattian.

RECOMMENDATIONS

To improve the water quality and health outcomes in Kottli Sattian, 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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