

Water Insecurity and Its Impact on Health: Lived Experiences from Rawalpindi, Pakistan

Muhammad Asif^{1,*}, Bilqees Fatima², Pulsie Handunmali Rupathunga Epa¹ & Muhammad Abbas³

¹School of Public Administration, Department of Sociology, Hohai University 8 Focheng West Road, Jiangning District, Nanjing, 211100, P.R. China

²Department of Anthropology, Quaid-i-Azam University Islamabad, 45320, Pakistan

³Department of Pakistan Studies, National University of Modern Languages Islamabad, 4400, Pakistan

*Corresponding author: School of Public Administration, Department of Sociology, Hohai University 8 Focheng West Road, Jiangning District, Nanjing, 211100, P.R. China

Received: September 9, 2024 Accepted: September 30, 2024 Published: November 1, 2024

doi:10.5296/jsr.v16i1.22243

URL: <https://doi.org/10.5296/jsr.v16i1.22243>

Abstract

Water insecurity, characterized by poor water quality and limited access to safe water, is a leading contributor to health hazards globally, yet its specific impacts remain underexplored in Pakistan. This qualitative study investigates the perceived health consequences of water insecurity in Rawalpindi, Pakistan, focusing on the communities of New Lalazar and Gorakhpur. Using ethnographic methods, including participant observation and semi-structured interviews with 80 purposively sampled individuals, the study uncovers prevalent perceptions of waterborne diseases, primarily gastrointestinal disorders like dysentery, diarrhea, and cholera, alongside dermatological issues such as rashes and itching. The high salt concentration in the local water is believed to cause premature aging symptoms, including grey hair, hair loss, high blood pressure, kidney stones, and excessive phlegm production. Psychological stress stemming from the financial and time burden of securing water further exacerbates the community's challenges. This research highlights the dual impact of physical illness and psychological distress, both intensified by water insecurity in the region.

Keywords: water insecurity, health impacts, water quality, illness, water scarcity, Rawalpindi

1. Introduction

The issue of water security has become a worldwide concern in the 21st century, and it has also become a crucial global challenge. Approximately 80% of the global population is currently experiencing a significant risk to water security due to a dramatic decrease in available water resources (Pahl-Wostl, 2013). Water is an essential requirement for life, yet its characteristics, amount, and ownership can contribute to starvation, infections, stress, and conflicts. In fact, water insecurity has become a pressing issue not only because of its direct impacts on health but also because of its role in triggering conflicts over scarce resources (Chellaney, 2011). Furthermore, water insecurity can exacerbate the pre-existing health disparities experienced by vulnerable populations, particularly women and children. These individuals are responsible for collecting water and are thus more susceptible to physical injuries and illnesses (Jelena et al., 2021). According to a report by Water.org (2021), over 771 million individuals lack access to clean water, and almost 1.7 billion people do not have toilet facilities. As a result, almost 1 million individuals perished as a direct consequence of illnesses induced by dangerous and filthy water (World Health Organization, 2023).

Effective water management at both the individual and government levels can help control waterborne diseases. Water insecurity refers to the inadequate availability of clean, reliable, and inexpensive water for personal and domestic usage (Ferreira et al., 2021). It increases the likelihood of waterborne illnesses and other health complications (Sarkar & Nasreen, 2023). Water security is a growing global concern, and the situation in many parts of Pakistan, including Rawalpindi, is increasingly dire. This research focuses on the daily realities of water insecurity in the Rawalpindi District, specifically in the areas of New Lalazar and Gorakhpur. These localities present a unique case where urban and rural dynamics intersect, leading to varying degrees of water access and quality. New Lalazar, an urban area, receives municipal water supply, albeit inconsistently, while Gorakhpur, a rural area, relies heavily on boreholes, tube wells, and rainwater. The socio-economic landscape of these areas is deeply intertwined with their water security, affecting everything from health to livelihood. The economic consequences of water insecurity are especially severe in agriculture-based regions like Rawalpindi, where reduced water availability exacerbates food insecurity and poverty, as also observed in broader contexts (Hussain et al., 2020).

Water insecurity is not solely determined by a lack of water but is also influenced by inadequate water management and ineffective governance, which are significant contributors to water insecurity (Hoekstra et al., 2018). The water situation in Pakistan is highly precarious. Pakistan is projected to experience water scarcity by the year 2035 (Hassan, 2023). Water insecurity has a detrimental impact on health (Arshad et al., 2023), leading to increased health risks and negatively affecting overall wellness (Tzanakakis et al., 2020).

Water insecurity can be attributed to a multitude of factors. The primary cause of water scarcity is the insufficiency of available water resources to meet the growing demand for water (He et al., 2021; Salehi, 2022). Water scarcity can arise from social factors or be attributed to climate change. The population growth rate is a contributing factor to the increase in water stress, as it leads to a higher demand for water (Belhassan, 2021). The lack

of infrastructure resulting from poor management has led to a decline in the quality of drinking water (Abdulrahman, 2020). Pollution exacerbates water scarcity (Maqbool, 2022). It can also occur when there is an unforeseen increase in demand for new industries or population expansion that exceeds the capacity of existing water and sewerage systems (Chowdhary et al., 2020). Additional capacity for water and sewer systems may solve this issue. The lack of water supply infrastructure and upkeep is a significant contributing cause to the inconsistent provision of water (Ngima, 2015). Furthermore, inadequate sanitation infrastructure not only compromises water quality but also contributes to the spread of waterborne diseases, as highlighted by the United Nations Development Programme (UNDP, 2006).

This study seeks to explore how water insecurity affects the health and psychological well-being of individuals living in water-scarce environments in Rawalpindi. The objective of the research is to offer a comprehensive understanding of the daily experiences of individuals affected by water insecurity, particularly in terms of their medical and psychological well-being. This study can provide valuable insights for stakeholders seeking a deeper knowledge of the medical consequences associated with water insecurity and its influence on public health. The research aims focus on examining and elucidating the perceived medical and psychological effects of water insecurity at the community level in the chosen areas of Rawalpindi District. This study investigates the health problems and disorders that are believed to be linked to the poor quality of water. Additionally, it delves into the psychological stress associated with water scarcity, the act of collecting water, and the unnecessary consumption of water. To understand the broader implications of water insecurity on health, it is essential to first examine the existing literature on this subject. Numerous studies have highlighted the global and regional health impacts of water scarcity, which offer valuable insights into how these challenges may manifest in Rawalpindi. The following section will review relevant literature, focusing on the health consequences of water insecurity across different contexts.

2. Literature Review: Water Insecurity and Its Impact on Health

Water is an indispensable resource, vital for life, cultural practices, and economic activities, with the human body being composed of approximately 70% water. Any alteration in water availability can have profound effects on physiological processes, as well as significant cultural and economic implications (Clarke, 1993). Despite the Earth's vast water resources, only a small fraction is available as freshwater, and even less is accessible for human consumption. The distribution of this precious resource is often inequitable, leading to significant disparities in access to clean water. Over 700 million people worldwide lack access to safe drinking water, and many must travel long distances to obtain water that is fit for consumption (Jackson et al., 2001).

Waterborne diseases are a significant threat to public health, especially in regions where access to clean water is limited. These diseases, primarily caused by pathogens transmitted through contaminated water, include gastrointestinal illnesses such as diarrhea, dysentery,

and cholera. In many developing countries, these diseases are a leading cause of morbidity and mortality, particularly among children under five (Prüss-Ustün et al., 2014). Beyond the immediate symptoms, waterborne diseases have long-term health consequences, such as malnutrition, stunted growth, and cognitive impairments. Furthermore, in regions with high levels of water insecurity, the psychological toll on affected populations can be immense, as seen in studies by Saeed et al. (2022), which explore the socio-economic and psychological impacts of water scarcity.

The spread of waterborne diseases is exacerbated by poor sanitation and hygiene practices. Inadequate sanitation facilities, such as the lack of toilets and proper waste disposal systems, contribute to the contamination of water sources. This contamination often results from improper sewage disposal, agricultural runoff, and industrial waste, introducing harmful pathogens into water supplies (Gleick, 1993). For instance, in regions like Rawalpindi, where borehole water is commonly used, the water is often saline and contains high concentrations of minerals that can cause various health issues, including digestive disorders, hypertension, and skin problems such as dryness and rashes (Cosgrove & Rijsberman, 2000). Moreover, contaminants such as heavy metals and chemicals in water can lead to chronic health conditions, including kidney damage and neurological disorders.

The quality of water is a critical determinant of its impact on health. Safe drinking water must be free from pathogens and harmful chemicals, with acceptable taste, odor, and appearance. However, in many regions, water quality is compromised by pollutants from various sources. Agricultural activities contribute significantly to water pollution through the use of fertilizers and pesticides that runoff into rivers and streams, contaminating drinking water supplies (Gleick, 2002; Postel, 2000). Industrial pollution further compounds the issue, as factories often discharge untreated or partially treated waste into nearby water bodies, introducing toxic substances such as heavy metals, solvents, and chemicals into the water. These pollutants can have severe health impacts, including cancers, reproductive disorders, and developmental defects (Clarke, 1993). Natural sources of contamination, such as arsenic and fluoride, also affect water quality. Long-term exposure to these contaminants can lead to serious health problems, including skin lesions, bone disorders, and neurological damage.

Infrastructure used to deliver water plays a significant role in determining water quality. Aging pipes, poorly maintained distribution systems, and inadequate treatment facilities can all contribute to water quality deterioration. In regions with outdated infrastructure, water often becomes contaminated by rust, chemicals, and microorganisms as it travels through the distribution network, even if the water source is initially clean (Cosgrove & Rijsberman, 2000).

Water insecurity, defined as the lack of reliable access to sufficient, safe, and affordable water for personal and domestic use, has far-reaching implications for public health. It not only increases the risk of waterborne diseases but also leads to insufficient water availability for daily needs, including drinking, cooking, and hygiene (Cosgrove & Rijsberman, 2000). In regions like Rawalpindi, water insecurity is driven by poor governance, inadequate water management, and rapid population growth. The health impacts of water insecurity are

particularly severe for vulnerable populations, including women, children, and the elderly. Women and children often bear the burden of fetching water, a task that can take several hours each day and involve walking long distances, sometimes in unsafe conditions. This physical labor can lead to musculoskeletal injuries, fatigue, and other health problems. The time spent collecting water reduces opportunities for education and income generation, perpetuating cycles of poverty and ill health (Bouwer, 2002). Furthermore, the link between water insecurity and conflict is not just an issue of local governance but also reflects broader geopolitical tensions, particularly in regions where water resources are shared between nations (Chellaney, 2011).

Water insecurity also contributes to psychological stress, particularly in communities where conflicts over water resources are common. The constant worry about securing the next source of water, coupled with the fear of violence or theft while fetching water, leads to chronic stress and anxiety. This stress is exacerbated by the physical toll of carrying heavy containers of water over long distances. Additionally, water insecurity can lead to social tensions within communities, as people compete for access to limited water resources. These tensions can escalate into conflicts, further undermining community cohesion and well-being (World Health Organization, 2017).

Sanitation and hygiene are critical components of water security. Proper sanitation facilities and hygiene practices are essential for preventing the spread of waterborne diseases and ensuring public health. However, in many regions, access to adequate sanitation facilities is limited, and hygiene practices are often compromised by the lack of clean water. In such environments, the risk of disease transmission is high, and outbreaks of diarrheal diseases, cholera, and typhoid are common (Prüss-Ustün et al., 2014). The absence of proper sanitation and hygiene practices significantly contributes to the spread of these diseases, as human waste contaminates water sources, leading to the transmission of pathogens that cause illness.

The economic impact of water insecurity is substantial, particularly in regions where agriculture is the primary source of income. Reduced water availability often leads to decreased agricultural productivity, exacerbating food insecurity and poverty. The economic burden of waterborne diseases further compounds these challenges, as illness reduces productivity and increases healthcare costs, creating a vicious cycle of poverty and poor health (Gleick, 1993). Women and children, who are often responsible for fetching water, are disproportionately affected by water insecurity. The time and physical effort required to collect water from distant sources limit their opportunities for education and income generation, reinforcing gender inequalities and perpetuating cycles of poverty (Bouwer, 2002).

Effective water management is crucial for ensuring water security and protecting public health. However, in many parts of the world, water management practices are inadequate, often due to a lack of infrastructure, insufficient investment, and ineffective governance. These issues are exacerbated by rapid urbanization, population growth, and environmental degradation, which place additional pressure on already strained water resources (Cosgrove & Rijsberman, 2000). Improving water management and governance requires a combination

of technical, institutional, and policy interventions. Investments in water infrastructure, such as dams, pipelines, and treatment facilities, are essential for improving water supply and quality. Institutional reforms are also necessary to strengthen the capacity of water management agencies and ensure effective regulation and allocation of water resources. Policy interventions are needed to promote sustainable water use, protect water resources, and ensure equitable and efficient water allocation (Gleick, 1993). The integration of community-based solutions, such as rainwater harvesting and local water management committees, can further enhance resilience to water scarcity, as demonstrated in several regions (UNDP, 2006). While the global and regional studies provide foundation for understanding water insecurity, it is crucial to explore how these dynamics play out in specific local contexts. This research focuses on Rawalpindi, where the realities of water scarcity and its health impacts are deeply felt by residents.

3. Methods and Procedures

The research methodology for this study is underpinned by fundamental ontological and epistemological principles, which are crucial to shaping the inquiry's approach and design (Creswell, 2013). Ontologically, this study is grounded in nominalism, a perspective that emphasizes the importance of understanding social phenomena from the respondents' own attributions and interpretations of their experiences. By adopting this perspective, the study aims to explore the daily realities of water insecurity within a specific local context, rather than relying on statistical or quantitative analyses. This focus on qualitative methods facilitates a more nuanced and comprehensive understanding of the subject matter (Creswell, 2009).

The application of a qualitative research approach allows for an in-depth examination of the lived experiences and viewpoints of individuals affected by water insecurity. The use of qualitative methods aligns with the research goal of uncovering complex social and health impacts that cannot be fully captured through quantitative means. Data collection was carried out through a combination of semi-structured interviews, Focus Group Discussions (FGDs), and participant observation. These methods were chosen to provide rich, contextual insights into participants' daily challenges and perceptions. The research was conducted in two distinct locales: Gorakhpur and New Lalazar, both situated within the Rawalpindi region of Punjab province. New Lalazar represents an urban environment with a diverse socio-economic population, while Gorakhpur, originally a rural area, has experienced significant development and is currently undergoing a transitional phase.

The study utilized purposive sampling to select eighty respondents, with an equal division of forty participants from each locality. Purposive sampling was deemed appropriate because the primary aim was to gain in-depth insights from individuals who had direct experience with water insecurity. This method ensured that participants were specifically selected based on their knowledge and personal encounters with the water crisis, which aligns with the qualitative nature of this research. By targeting individuals who are most affected, the study aimed to gather rich, relevant, and specific data that would address the research questions

regarding the health and psychological effects of water insecurity. To further maintain balance and address potential biases, the sample was stratified by gender, comprising an equal number of males and females from each area—resulting in ten males and ten females from both New Lalazar and Gorakhpur. This stratification ensured a diversity of perspectives, particularly regarding the gendered dimensions of water insecurity, as women often bear a disproportionate burden in water collection and management.

Data collection was conducted through in-depth, open-ended, face-to-face interviews, conducted in Punjabi and Urdu, following a semi-structured format. Each interview lasted approximately 60 to 90 minutes, allowing participants the flexibility to elaborate on their experiences. Field notes were meticulously recorded, and data from the interviews in Urdu and Punjabi were translated into English for analysis to maintain consistency and clarity. The data analysis employed a thematic approach, which involved identifying and categorizing recurring themes and sub-themes. The thematic analysis led to the emergence of four primary themes: Sources of Drinking Water Consumption among Respondents, Perception of Water-Related Health Issues, Prevalence of Water-Related Diseases among Respondents, and Water-Related Stress. These themes were further elaborated through various sub-themes, as detailed in Tables 1, 2, and 3. The study rigorously maintained confidentiality and protected the identities of the participants throughout the research process, ensuring adherence to ethical research standards.

Additionally, a Focus Group Discussion (FGD) was conducted in each research area, involving a total of 14 participants per session. Each FGD lasted approximately fifty minutes and was facilitated by a moderator who guided the participants through a structured discussion on the issue of water insecurity. This method of data collection was designed to capture a broader range of perspectives and foster a collaborative discussion among participants, allowing for the emergence of group dynamics and collective insights that may not surface in individual interviews. With this methodological framework in place, we now turn to the results of the study, which capture the diverse experiences of water insecurity among residents of Rawalpindi. The following section presents the key findings, categorized by major health issues and water-related stressors, as reported by participants.

4. Results

The survey findings indicate that the respondents were ingesting well water, tap water, cooked water, filtered water, and in some cases, mineral water for the purpose of drinking.

4.1 Percentage of Sources of Drinking Water Consumption among Respondents.

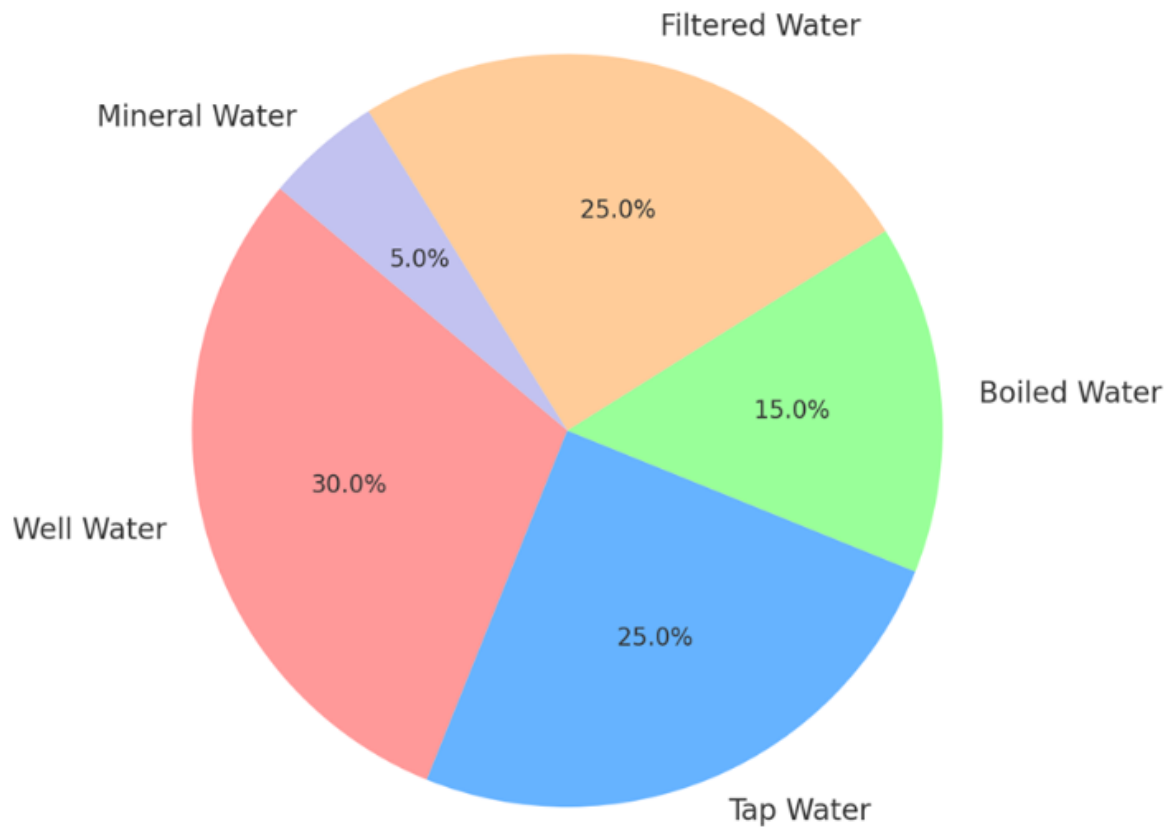


Figure 1. Sources of Drinking Water Consumption among Respondents

Source: Field Survey

The figure 1 above displays the various sources of drinking water consumption among respondents. Within the research sites, participants recorded a diverse range of health ailments, including digestive disorders, dermatological problems, hypertension, renal calculi, and physical injuries that they attributed to the substandard water quality prevalent in the area. Although without medical validation, these perceptions demonstrate the public's belief in the connection between health and water. The following table highlights narratives regarding water related health issues.

4.2 Perception of Water Related Health Issues

Table 1. Perception of Water-Related Health Issues among Respondents

Sub themes	Verbatim
Salty Water	“People have no other choice rather than to drink salty water. This high concentrated water makes gas in the stomach. The water does not help in digestion, constipation is common”.
Digestive disorder	“Our water supply is not good enough to be able to drink, so we suffered from these diseases (dysentery, diarrhea). In summer, the ratio of digestive disorders rises. We feel difficulty in routine work and office work too”.
Grey Hair	“Because of hard water, people look old, before they get old”.
Skin Problems	“Salt, in water was the main cause behind this dryness of skin and eyes.” “Water purchased from water tanker providers produced itching and rashes on their body.”
High Blood Pressure	“High ratio of high blood pressure is common in the New Lalazar and it is due to the salt concentration in water.” “High blood pressure is a common disease in every household, now a day”.
Kidney Stones	“The main cause of kidney stone is salty drinking water. The water has a salty taste. We do not have any other choice to get drinking water, water filter is far away, and mineral water is expensive; so, we use the bore water because it is pure and free from germs”.
Injuries	“My son was carrying large sized water gallons on his motorcycle, suddenly, gallons slipped with motorcycle. He got injuries on his legs and arms. Treatment needs a lot of money.” “A twelve-year-old child was fetching water from the water well; he slipped and fell into well. Fortunately, the well was not deep, and some other villagers were there. They took him out. His legs arms, face injured, and took a couple of months in recovery.” “I was carrying a water cooler upstairs. I slipped and fell downstairs. “I got severe injury in my hip joint and could not walk for more than a month.” “I carried heavy gallons daily to my home. As a result, I got sciatica (pain in the backbone due to disk slip). Doctors recommended complete bed rest. I could not perform my tasks for a month.”

Source: Field Survey

In above table 1, various health conditions perceived to be linked to water insecurity are highlighted. The participants' narratives offer a glimpse into their daily struggles with water quality and its perceived health effects. Salty water, for example, was consistently mentioned as causing gastrointestinal discomfort, specifically gas formation and constipation, affecting participants' ability to digest food properly. Digestive disorders, such as dysentery and diarrhea, were reported to increase during the summer months when water scarcity and contamination likely intensify. These conditions not only compromise physical health but also disrupt daily routines and productivity.

The narrative of premature aging, attributed to hard water, provides insight into the local community's perceptions of water-related health effects. Hard water, with its high mineral content, was frequently mentioned as a cause of skin irritation, resulting in dryness and itching. Hypertension, especially in New Lalazar, was also commonly reported, with participants attributing this to the consumption of saline water. Another critical health outcome reported by participants was kidney stones, which were attributed to the high salt content in the water. In addition to health issues, physical injuries related to water collection, such as sciatica and broken bones, added another dimension to the discussion of water insecurity. The physical toll of transporting water was a significant concern for respondents, as many had experienced accidents while carrying heavy water containers. The following table shows the prevalence of water related diseases among respondents.

4.3 Prevalence of Water Related Diseases among Respondents

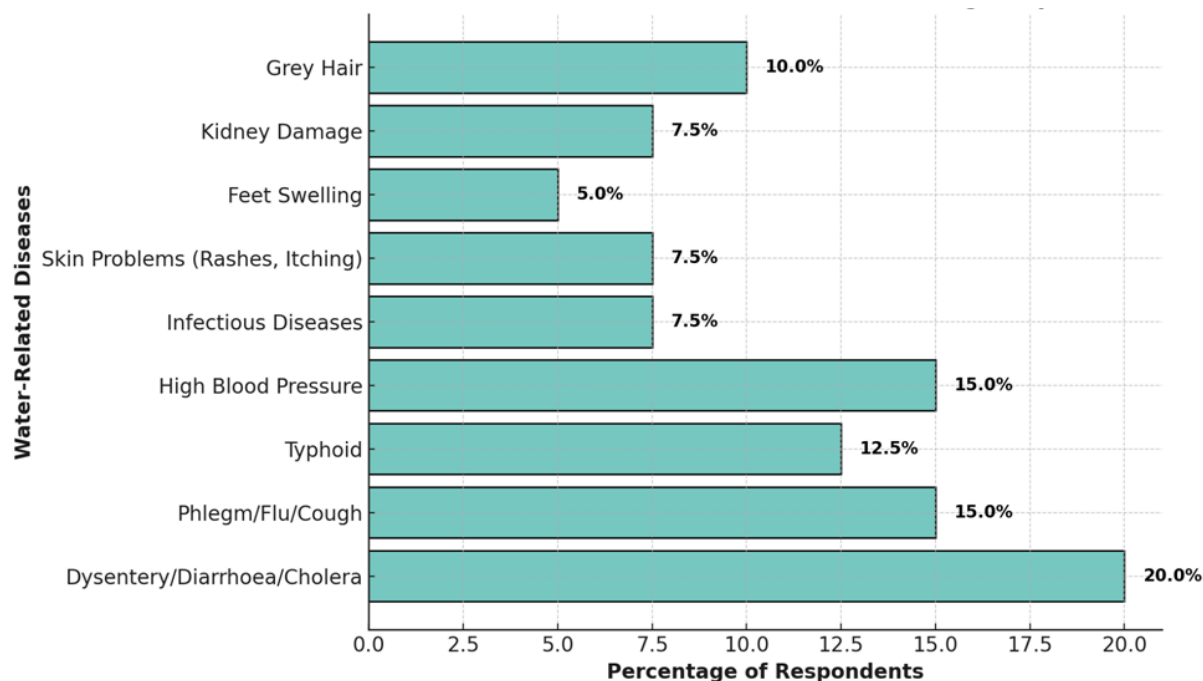


Figure 2. Prevalence of Waterborne Diseases among Respondents

Source: Field Survey

The figure 2 above underscores the widespread nature of waterborne diseases among the participants. A significant proportion of respondents reported gastrointestinal illnesses, such as dysentery, diarrhea, and cholera, affecting approximately 20% of the population. Respiratory conditions, including phlegm, flu, and cough, were reported by around 15% of respondents, indicating a potential link between water quality and compromised immune responses. Typhoid, affecting 12.50% of the participants, pointed to bacterial contamination in the local water supply. Skin diseases, such as rashes, itching, and other dermatological issues, affected 7.50% of respondents, further emphasizing the impact of poor water quality.

4.4 Water Related Stress

Table 2. Psychological Stress Factors Due to Water Insecurity

Sub Themes	Verbatim
Due to water supply	<p>“We get worried and upset when the water level in our homes gets low, or there is no water in our homes”.</p> <p>“We cannot sleep well, because we need to keep a check over water supply”.</p> <p>“Water supply is only a name; water emanates drop by drop”.</p> <p>“I feel worried everyday due to water scarcity”.</p>
Using filtration plants	<p>“I have to collect drinking water from the near water filtration plant, early in the morning, if I do not manage to reach on time; I have to wait for more than half an hour for my turn. My children get late from school. This results in fights with my wife and affects the relationship.”</p> <p>“It takes a lot of time, to collect water from the filtration plant because it is not near to our home.”</p> <p>“I live on the third floor of the building, so it is very difficult for me to carry water upstairs.”</p>
Water wastage	<p>“Sometimes I get angry with the family members, on the extra use of water.”</p> <p>“I frighten my children by saying there is a punishment for wastage of water, in the day hereafter”.</p> <p>“When I have to buy water tanker, and I don’t have money, I fight with family over the misuse of water”.</p> <p>“My brother’s wife uses a lot of water, all the time her children are bathing, this makes my wife fight with her over wasting water, as I pay the water bill”.</p>

Source: Field Survey

The narratives in table 2 illustrate the psychological toll that water insecurity imposes on individuals and families. The constant concern over water supply disrupted sleep patterns and

induced chronic stress for participants. Fear of running out of water or not having enough for daily needs led to significant anxiety, affecting both mental and emotional well-being.

The experiences shared by participants regarding the use of filtration plants further highlight the socio-economic dimension of water-related stress. Long wait times at filtration plants not only disrupted daily routines but also led to domestic tensions. The delays in water collection often resulted in family disputes, as respondents reported conflicts over the impact on school or work schedules. The frustration over water wastage further underscored the economic pressures tied to water access, with several participants describing intra-household conflicts over water use and expenses. These results reveal the widespread health and psychological impacts of water insecurity on the Rawalpindi population. To better understand these findings in a broader context, the following discussion compares these local experiences with those documented in global research, highlighting both commonalities and unique challenges specific to this region.

5. Discussion

The World Health Organisation (WHO) and United Nations Children's Fund (UNICEF) have highlighted that inadequate water quality has severe repercussions on human health (World Health Organization, 2017). Elevated levels of contaminants like arsenic are linked to cardiovascular diseases, skin problems, and other serious health conditions (Rahaman et al., 2021). This study's findings align with this assertion, as participants from Rawalpindi reported numerous health issues, including hypertension, gastrointestinal disorders, and skin ailments, attributed to the poor quality of their water supply. Similar health challenges associated with poor water quality have been noted in other regions of Pakistan, where the presence of heavy metals and saline water exacerbates public health concerns (Hussain et al., 2020).

One of the primary findings in this research was the prevalence of gastrointestinal disorders, which participants associated with the consumption of salty water. During the summer months, when water scarcity worsens, participants reported a rise in digestive issues such as dysentery and diarrhea. This aligns with global studies showing that waterborne diseases intensify during periods of scarcity and contamination (Prüss-Ustün et al., 2014). The presence of kidney stones, reported by many participants as being caused by salty drinking water, mirrors findings from other studies where high salt concentrations in water were linked to the development of nephrolithiasis (WWF Pakistan, 2007). Furthermore, Saeed et al. (2022) highlighted that in arid and mountainous regions, where access to clean water is limited, the socio-economic impact is further compounded by the health risks associated with contaminated drinking water. These risks are particularly acute in rural areas dependent on groundwater, which is often polluted or saline.

Skin problems, including rashes and dryness, were also frequently mentioned by participants, who believed these conditions were related to hard water. The findings here are consistent with broader studies that have shown a connection between poor water quality and skin

irritation, especially when water contains high levels of minerals (Cairncross et al., 2010). In rural areas, perceptions regarding the poor quality of drinking water and its impact on health have been widely documented, with communities often associating water-related illnesses such as gastrointestinal issues and skin conditions with polluted or saline water sources (Ali & Akhtar, 2015). Additionally, the study by Rosinger et al. (2021), which linked high salt consumption in water to hypertension, supports the local observations made in New Lalazar, where high blood pressure was reported as a common health problem. These health issues underline the vital need for access to clean and safe drinking water, which is currently lacking in both urban and rural areas of Rawalpindi.

Beyond physical health, the psychological toll of water insecurity was clearly evident in this study. Participants expressed stress and anxiety over the inconsistent water supply, the time-consuming task of collecting water, and the financial burden of purchasing it. This emotional strain, which disrupted sleep and strained relationships, is consistent with global research on water insecurity, which often highlights its psychosocial impact (Aihara, Shrestha, & Sharma, 2016). The prolonged waits at filtration plants and the physical effort required to carry water, particularly for those living in multi-story buildings, further compounded the stress.

In communities like Gorakhpur, where reliance on boreholes and tube wells is common, the time and labor associated with water collection were significant. Similar studies have highlighted the economic consequences of water insecurity, with individuals sacrificing time that could otherwise be spent on education or income-generating activities (Collins et al., 2019). This study also found that water scarcity often led to changes in agricultural practices, with farmers switching to less water-intensive crops. This shift, while necessary, reduces both income and food security, particularly for low-income households, reinforcing the socio-economic vulnerability caused by water insecurity.

The governance and management of water resources in Rawalpindi were identified as critical factors exacerbating the water crisis. Poor infrastructure and inadequate water management policies were frequently cited as contributing to the community's water challenges. These findings are consistent with prior research indicating that inadequate leadership, corruption, and poor infrastructure are major barriers to equitable water access (Frumkin et al., 2017; Khan, 2009). In New Lalazar, for example, participants reported frequent interruptions in municipal water supply, while in Gorakhpur, residents relying on private wells faced shortages during peak demand periods. Such experiences are mirrored in global research, which identifies water governance as a key determinant of water security (Wutich & Brewis, 2014).

The Sustainable Development Goals (SDGs), particularly the objective to ensure universal access to clean and affordable drinking water (United Nations, 2019), are far from being met in the study area. The findings highlight the inadequacies in both infrastructure and governance that contribute to water insecurity in Rawalpindi. The government must invest in water treatment plants, pipeline replacements, and the construction of new water storage facilities. Without these critical improvements, the health and socio-economic well-being of

the population will continue to deteriorate. Household-level interventions, such as promoting rainwater harvesting and the use of affordable water filtration systems, are essential to mitigate the immediate impacts of poor water quality.

The financial and emotional costs of securing water in Rawalpindi are disproportionately borne by the most vulnerable, particularly women and children, who are responsible for water collection. Research has shown that when water collection tasks are onerous, they negatively impact women's health and limit their economic and educational opportunities (Aihara, Shrestha, & Sharma, 2016). In this study, participants reported injuries caused by carrying heavy water containers, adding to the overall physical toll of water insecurity. These physical injuries reflect a common theme in global studies, which document the burden of water collection on physical health, particularly in regions with inadequate infrastructure (Gleick, 2002).

The role of corruption and poor governance in aggravating the water crisis was also evident in the findings. Corruption has been shown to undermine effective water management, leading to unequal distribution and inflated costs (Salihu, 2021). This study supports these claims, with participants frequently citing instances where corruption and mismanagement led to water shortages and financial burdens. Addressing these issues requires more than just infrastructure improvements; it demands significant reforms in governance to combat corruption and ensure transparent, efficient management of water resources. Future research should aim to further investigate the link between water insecurity and mental health, as well as explore long-term solutions to improve water access and quality in vulnerable communities.

6. Conclusion

This study explored the lived experiences of water insecurity and its perceived effects on health in the Rawalpindi District of Pakistan. The findings indicate that water insecurity has significant implications for both physical and mental well-being. Gastrointestinal disorders, such as dysentery and diarrhea, along with hypertension, kidney stones, and respiratory ailments, were among the most commonly reported health issues. Additionally, dermatological conditions such as rashes and skin dryness were prevalent, reflecting the direct impacts of poor water quality. Beyond physical health, the study also revealed the profound psychological distress caused by the physical burden of fetching water and the financial strain of securing clean water supplies.

The research underscores the urgent need for improvements in water management infrastructure to address the widespread health impacts of water insecurity. This includes the modernization of municipal water systems, the promotion of alternative water sources such as rainwater harvesting, and the implementation of household water treatment technologies. Equally critical is the need for governance reforms to ensure equitable access to water, combat corruption, and improve water distribution in both urban and rural areas.

To address these challenges, community-based interventions—such as local water

management committees and public education on water conservation—should be prioritized. These strategies, combined with sustainable practices like solar-powered desalination and grey water recycling, are essential for mitigating the public health risks associated with water insecurity in Rawalpindi and similar regions. Further research is recommended with a broader scope and larger sample size to validate these findings across different regions. Additionally, future studies should focus on exploring the long-term psychological impacts of water insecurity and identifying cost-effective, scalable solutions to improve water access and quality in vulnerable populations.

7. Suggestions and Recommendations

Addressing the water insecurity crisis in Rawalpindi requires a multifaceted approach that integrates improvements in infrastructure, reforms in governance, community-driven initiatives, and the adoption of technological solutions. One of the most urgent steps is to modernize the water distribution system, particularly in urban areas like New Lalazar. The existing infrastructure is outdated, resulting in inconsistent water supply and contamination risks. Replacing old pipelines, upgrading water treatment plants, and constructing additional storage systems would ensure a more reliable and clean water supply, mitigating the spread of waterborne diseases and reducing health risks.

In rural areas like Gorakhpur, where reliance on groundwater and rainwater is high, promoting rainwater harvesting systems is a practical and sustainable solution. Government-supported initiatives to install household and communal rainwater collection systems could significantly reduce dependence on unreliable groundwater sources, particularly during dry seasons. This would also provide a more sustainable source of water for domestic use, addressing both the quantity and quality issues faced by the residents.

Reforming water governance is another critical area that needs immediate attention. Strengthening regulatory frameworks and establishing transparent, accountable bodies to monitor water quality, distribution, and pricing will be essential for managing resources equitably. These bodies should focus on preventing illegal water extraction and ensuring that water is distributed fairly, especially to the most vulnerable populations. Public-private partnerships (PPP) could play a crucial role in this regard, encouraging private sector investment in water supply projects. Incentivizing private companies through tax breaks or subsidies for projects like desalination or water filtration systems can bring in the expertise and funding needed to address water scarcity.

Involving the community in water management is also essential for creating sustainable solutions. Establishing local water management committees made up of residents and officials can help oversee water usage, monitor water quality, and promote conservation practices. Educational campaigns on water conservation, hygiene, and health, delivered through schools and community organizations, could significantly reduce water wastage and improve public awareness of water security issues. Empowering local communities to take ownership of water management ensures long-term success.

Lastly, adopting low-cost technological solutions could provide immediate relief to many households. Installing small-scale desalination plants and greywater recycling systems in areas with saline groundwater can help provide clean drinking water. Distributing gravity-based water filters to households dependent on boreholes will also help improve water quality and reduce the incidence of waterborne diseases. These technologies, particularly those that do not require electricity, offer affordable and sustainable solutions in resource-limited settings. By focusing on these actionable recommendations, Rawalpindi can make significant strides toward reducing water insecurity, improving public health, and ensuring a sustainable water supply for all residents.

References

- Abdulrahman, S. A. (2020). Water shortage in GCC countries: Transferring water from Iraqi Kurdistan Region. *International Journal of Environmental Studies*, 77(2), 191-207. <https://doi.org/10.1080/00207233.2019.1690335>
- Aihara, Y., Shrestha, S., & Sharma, J. (2016). Household water insecurity, depression, and quality of life among postnatal women living in urban Nepal. *Journal of Water and Health*, 14(2), 317-324. <https://doi.org/10.2166/wh.2015.166>
- Ali, H., & Akhtar, M. S. (2015). Peoples' perception about poor quality of drinking water and its impact on human health in rural areas of tehsil Samundri, Pakistan. *International Journal of Science and Research*, 4, 523-528.
- Arshad, M. D., Iqbal, N., & Ashraf, M. (2023). From crisis to sustainability: Managing aquifer recharge in Pakistan. Pakistan Council of Research in Water Resources (PCRWR) Islamabad.
- Belhassan, K. (2021). Water scarcity management. In *Water safety, security, and sustainability: Threat detection and mitigation* (pp. 443-462). Springer International Publishing. https://doi.org/10.1007/978-3-030-76008-3_19
- Bouwer, H. (2002). Integrated water management for the 21st century: Problems and solutions. *Journal of Irrigation and Drainage Engineering*, 128(4), 193-202. [https://doi.org/10.1061/\(ASCE\)0733-9437\(2002\)128:4\(193\)](https://doi.org/10.1061/(ASCE)0733-9437(2002)128:4(193))
- Cairncross, S., Hunt, C., Boisson, S., Bostoen, K., Curtis, V., Fung, I. C., & Schmidt, W. P. (2010). Water, sanitation, and hygiene for the prevention of diarrhoea. *International Journal of Epidemiology*, 39(suppl_1), i193-i205. <https://doi.org/10.1093/ije/dyq035>
- Chellaney, B. (2011). *Water: Asia's new battleground*. Georgetown University Press. <https://doi.org/10.1355/cs34-2j>
- Chowdhary, P., Bharagava, R. N., Mishra, S., & Khan, N. (2020). Role of industries in water scarcity and its adverse effects on environment and human health. In *Environmental concerns and sustainable development: Volume 1: Air, water, and energy resources* (pp. 235-256). https://doi.org/10.1007/978-981-13-5889-0_10

- Clarke, R. (1993). *Water: The international crisis*. Earthscan Publications Ltd.
- Collins, S. M., Mbullo Owuor, P., Miller, J. D., Boateng, G. O., Wekesa, P., Onono, M., & Young, S. L. (2019). "I know how stressful it is to lack water!" Exploring the lived experiences of household water insecurity among pregnant and postpartum women in western Kenya. *Global Public Health, 14*(5), 649-662. <https://doi.org/10.1080/17441692.2018.1521861>
- Cosgrove, W. J., & Rijsberman, F. R. (2000). *World water vision: Making water everybody's business*. World Water Council.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Sage Publications.
- Creswell, J. W. (2013). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. W. Ross MacDonald School Resource Services Library.
- Ferreira, D. C., Marques, R. C., & Gonçalves, J. (2021). Investment in drinking water and sanitation infrastructure and its impact on waterborne diseases dissemination: The Brazilian case. *Science of the Total Environment, 779*, 146279. <https://doi.org/10.1016/j.scitotenv.2021.146279>
- Frumkin, H., Bratman, G. N., Breslow, S. J., Cochran, B., Kahn, P. H., Lawler, J. J., Wood, S. A. (2017). Nature contact and human health: A research agenda. *Environmental Health Perspectives, 125*(7), 075001. <https://doi.org/10.1289/EHP1663>
- Gleick, P. H. (1993). *Water in crisis: A guide to the world's fresh water resources*. Oxford University Press.
- Gleick, P. H. (2002). Dirty water: Estimated deaths from water-related diseases 2000-2020. *Pacific Institute Research Report*.
- Hassan, G. (2023). Improving sustainable groundwater management: A case study of managed aquifer recharge in Punjab, Pakistan.
- He, C., Liu, Z., Wu, J., Pan, X., Fang, Z., Li, J., & Bryan, B. A. (2021). Future global urban water scarcity and potential solutions. *Nature Communications, 12*(1), 4667. <https://doi.org/10.1038/s41467-021-25026-3>
- Hoekstra, A. Y., Buurman, J., & Van Ginkel, K. C. (2018). Urban water security: A review. *Environmental Research Letters, 13*(5), 053002. <https://doi.org/10.1088/1748-9326/aaba52>
- Hussain, S., Malik, S., Cheema, M. M., Ashraf, M. U., Waqas, M., Iqbal, M., & Afzal, H. (2020). An overview on emerging water scarcity challenge in Pakistan, its consumption, causes, impacts, and remedial measures. *Big Data in Water Resources Engineering, 1*(1), 22-31. <https://doi.org/10.26480/bdwre.01.2020.22.31>
- Jackson, R. B., Carpenter, S. R., Dahm, C. N., McKnight, D. M., Naiman, R. J., Postel, S. L.,

- & Running, S. W. (2001). Water in a changing world. *Ecological Applications*, 11(4), 1027-1045. [https://doi.org/10.1890/1051-0761\(2001\)011\[1027:WIACW\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2001)011[1027:WIACW]2.0.CO;2)
- Jelena, M., Janine, S., Bischof Meierhofer, R., Shrestha, A., & Inauen, J. (2021). The physical burden of water carrying and women's psychosocial well-being: Evidence from rural Nepal. *International Journal of Environmental Research and Public Health*, 18(15), 7908. <https://doi.org/10.3390/ijerph18157908>
- Khan, F. (2009). Water governance and corruption in Pakistan. In *Running on empty* (pp. 2025-2040).
- Maqbool, N. (2022). *Water crisis in Pakistan: Manifestation, causes, and the way forward* (No. 2022: 60). Pakistan Institute of Development Economics.
- Ngima, W. P. (2015). *Impacts of water shortage in Githurai Ward, Kiambu County, Kenya*. Scientific Research Publishing.
- Pahl-Wostl, C. (2013). Water in the anthropocene: New perspectives for global sustainability. *Current Opinion in Environmental Sustainability*, 5(6), 635-641. <https://doi.org/10.1016/j.cosust.2013.11.011>
- Postel, S. (2000). *Last oasis: Facing water scarcity*. W. W. Norton & Company.
- Prüss-Ustün, A., Bartram, J., Clasen, T., Colford, J. M., Cumming, O., Curtis, V., & Bonjour, S. (2014). Burden of disease from inadequate water, sanitation, and hygiene in low-and middle-income settings: A retrospective analysis of data from 145 countries. *Tropical Medicine & International Health*, 19 (8), 894-905. <https://doi.org/10.1111/tmi.12329>
- Rahaman, M. S., Rana, A. K. M. M., Biswas, S. K., Islam, A. R. M. T., Kabir, S., & Rahman, S. H. (2021). Groundwater contamination with arsenic in Bangladesh: Contemporary scenarios, effects, and challenges for sustainable development. *Environmental Pollution*, 268 (B), 115474. <https://doi.org/10.1016/j.envpol.2020.115474>
- Rosinger, A. Y., Bethancourt, H., Swanson, Z. S., Nzunza, R., Saunders, J., Dhanasekar, S., & Pontzer, H. (2021). Drinking water salinity is associated with hypertension and hyperdilute urine among Daasanach pastoralists in Northern Kenya. *Science of the Total Environment*, 770, 144667. <https://doi.org/10.1016/j.scitotenv.2020.144667>
- Saeed, M. A., Murtaza, G., Ali, S., Aziz, H., Albeshr, M. F., Mahboob, S., & Sajjad ur Rehman, M. (2022). Assessment of drinking water quality and associated socio-economic impacts in arid mountainous regions. *Sustainability*, 14(19), 12567. <https://doi.org/10.3390/su141912567>
- Salehi, M. (2022). Global water shortage and potable water safety: Today's concern and tomorrow's crisis. *Environment International*, 158, 106936. <https://doi.org/10.1016/j.envint.2021.106936>
- Salihu, H. A. (2021). Corruption: An impediment to good governance. *Journal of Financial Crime*, 29(1), 101-110. <https://doi.org/10.1108/JFC-11-2020-0235>

- Sarkar, M., & Nasreen, M. (2023). Water insecurity and poverty. In *Coastal disaster risk management in Bangladesh: Vulnerability and resilience* (pp. 1-22). Springer. <https://doi.org/10.4324/9781003253495-7>
- Tzanakakis, V. A., Paranychianakis, N. V., & Angelakis, A. N. (2020). Water supply and water scarcity. *Water*, 12(9), 2347. <https://doi.org/10.3390/w12092347>
- UNDP. (2006). *Human development report 2006: Beyond scarcity: Power, poverty, and the global water crisis*. United Nations Development Programme. Retrieved from <http://hdr.undp.org/sites/default/files/reports/267/hdr06-complete.pdf>
- Water.org. (2021). The water crisis: Shortage problems & solutions. *Water.org*. Retrieved from <https://water.org/our-impact/water-crisis/>
- World Health Organization (WHO). (2017). Don't pollute my future! The impact of the environment on children's health. World Health Organization. Retrieved from <https://www.who.int/publications/i/item/9789241510263>
- World Health Organization (WHO). (2023). Drinking-water. *WHO*. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/drinking-water>
- Wutich, A., & Brewis, A. (2014). Food, Water, and Scarcity: Toward a Broader Anthropology of Resource Insecurity. *Current Anthropology*, 55(4), 444-468. <https://doi.org/10.1086/677311>
- WWF Pakistan. (2007). Pakistan's water at risk: Water and health related issues and key recommendations. Freshwater & Toxics Programme, Communications Division, WWF Pakistan.

Acknowledgments

Not applicable.

Authors contributions

Not applicable.

Funding

Not applicable.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Macrothink Institute.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

Open access

This is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.