

The Burden of Water Inadequacy on Households in Juba City, South Sudan: A Qualitative Approach

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ABSTRACT

Access to clean and safe water is a fundamental human right and a critical component of public health, yet in Juba City, South Sudan, the situation is dire, with significant portions of the population facing severe water scarcity due to inadequate infrastructure and conflict-driven disruptions. This study investigates the impact of this water scarcity on households in Juba City using a qualitative research methodology. Data were collected through face-to-face interviews, focus group discussions, and key informant interviews with household heads and key stakeholders from various administrative levels in selected *payams*: Munuki, Juba, and Kator. Purposive, convenience, and critical case sampling were used. Thematic content analysis was employed to identify recurring themes and patterns in the data, revealing the profound effects of inadequate access to clean and safe water on health, economic stability, and social cohesion. The study found that households suffer from increased prevalence of waterborne diseases, significant financial burdens, and heightened social tensions, including conflicts within communities and gender-based violence. The study underscores the urgent need for improved water infrastructure, equitable distribution, and sustainable management practices to mitigate these challenges and enhance the quality of life in Juba City, contributing to the broader goals of Sustainable Development Goal 6.

Keywords: Integral approach, drug abuse, substance abuse, social work, Malaysia

1. Introduction

The global water crisis is an urgent concern affecting millions of people worldwide. World Health Organization (WHO) statistics indicate a staggering two billion individuals currently lack access to even a basic safe drinking water service globally (WHO, 2023). From this population, 771 million individuals cannot access even basic drinking water services, that is, water from improved water services. According to the WHO, safe water is free from harmful substances and does not pose a risk to human health (WHO, 2022). To clarify, basic drinking water services refer to access to water from improved sources, provided that the collection time for obtaining water is not more than 30 minutes for a round trip (Gizaw et al., 2022). Improved water sources, on the other hand, are those that are free from pathogens, faecal and priority chemical contamination, encompassing options such as piped water, boreholes, or tube wells, protected dug wells, protected springs, and packaged or delivered water (Aiga, Nomura, Mahomed, & Langa, 2022; Shadabi & Ward, 2022).

Statistics from WHO (2023) show that the universal accessibility of safe drinking water, proper sanitation, and hygiene could thus potentially alleviate 10% of the global disease burden. Studies indicate that numerous deaths from diarrheal diseases can be averted by expanding access to safe drinking water and sanitation (Prüss-Ustün et al., 2019; Aiga et al., 2022). In 2016, for instance, unsafe drinking water and inadequate sanitation contributed to 829,000 deaths, accounting for 60% of all diarrheal fatalities (Prüss-Ustün et al., 2019). Improved sanitation between 2000 and 2016 further led to a 15% drop in diarrheal deaths in Southeast Asia, East Asia, and Oceania, and over a 10% decline globally (CDC, 2023).

Access to clean and safe water is thus a fundamental human right (derived from the right to an adequate standard of living under Article 11(1) of the International Covenant on Economic, Social and Cultural Rights (OHCHR)) and a crucial aspect of achieving SDGs. It was a key milestone of the Millennium Development Goals (MDGs), as target 3 of MDG 7. The United Nations (UN) recognizes the significance of this basic need, placing it at the heart of SDG 6, which seeks to ensure the availability and sustainable management of water and sanitation for all by 2030 (United Nations, 2023). SDG 6 emphasizes universal access to clean water, recognizing its importance for both human well-being and ecosystem health (SDG report, 2023; Ait-Kadi, 2016). It reflects a long-term perspective by aiming to provide clean water not just for the present but for future generations, focusing on equitable access and safeguarding water resources (SDG report, 2023). It embodies principles of equity and social inclusion by targeting marginalized and underserved communities.

Literature indicates that social and economic burdens due to water scarcity are profound. Water scarcity disrupts daily routines and exacerbates social issues. Shimamura et al. (2022) documented the increased burden on girls in Zambia, who spend more time on water-related chores at the expense of education. The studies by Gore et al. (2021) and Boying et al. (2020) further illustrate the social and environmental impacts of water scarcity, including increased pollution and its effects on community health. Goes (2022) and Ajak et al. (2023) emphasize the importance of sustainable water management practices and the detrimental effects of inadequate infrastructure and pollution. In addition, households often spend a substantial portion of their income on water procurement, as seen in the findings of Mallick, Mandal, and Chouhan (2020), who explored the economic impact of water access in India. Emenike et al. (2017) showed that in Nigeria, limited access to government-provided water forces reliance on private sources, increasing costs for households.

According to the WHO report, significant disparities persist across nations in the accessibility (affordability, availability, quantity, and quality) of clean and safe water (WHO, 2019; 2023). This is evident even as the world nears the 2030 target year by which the SDGs should be achieved. In Latin America, for example, the distribution of water resources is still marred by inadequate sanitation infrastructure in cities, resulting in water contamination and associated health risks, while climate change disrupts water supplies due to shifting precipitation patterns (World Bank, 2023). In the Middle East and North Africa (MENA), arid climates and political tensions exacerbate water scarcity, with limited freshwater sources and population growth adding to the complexity of challenges (United Nations Children's Fund (UNICEF), 2021). Europe and North America, while generally having better infrastructure, face concerns due to ageing systems, pollution from industry and agriculture, and increased water demand associated with climate change. In Oceania, Pacific Island nations confront unique challenges due to their remote locations and susceptibility to climate change. Rising sea levels result in saltwater intrusion into freshwater sources, aggravating safe water scarcity (Sharan, Lal, & Datta, 2021).

The Sub-Saharan Africa (SSA) region grapples with a critical crisis of limited, clean, and safe water that demands global attention. Statistics from WHO and UNICEF indicate that over 319 million individuals in the region lack access to safe drinking water services (UNICEF, 2022). This scarcity is particularly acute in arid and semi-arid regions, exacerbating existing inequalities in access, with rural communities suffering disproportionately. Inadequate infrastructure perpetuates these issues, leaving many countries, including the newly independent republic of South Sudan, without reliable access to clean and safe water sources, leading to unnecessary hardships for affected communities.

While other developing regions seem to be making progress toward achieving SDG 6, post-conflict nations are lagging significantly, particularly concerning clean and safe water supply. The supply of clean drinking water is crucial for primary health care and sustainable development in rapidly urbanizing post-conflict nations (WHO, 2022). South Sudan's status as a post-conflict nation adds a layer of complexity to its clean and safe water challenge. Statistics indicate that in 2020, people using at least basic drinking water services were 40.95% of the total population (WHO, 2023). As the urban population of South Sudan undergoes rapid expansion, it has become evident that basic water services have struggled to keep pace with this growth. Juba City in particular faces challenges in accessing clean and safe water due to the destruction of basic infrastructure as a result of decades of conflict, rapid urbanisation, and the effects of climate change occasioned by four years of consecutive large-scale flooding (Bior, 2018; Gore, Wu & Tang, 2020).

At the national level, only about 50% of South Sudan's population has access to clean water (Khalid, 2021). Inadequate access to clean and safe water has significant implications for households in Juba, the major city of South Sudan. This lack of safe running or piped water especially for domestic consumption affects the health and well-being of Juba's estimated 459,342 residents (InfoNile, 2021; Boying et al., 2021). According to Gore et al. (2020), there is no established water distribution system in Juba city. It is estimated that between 13% and 20% of the residents of Juba city have access to the limited municipal water supplied through a small distribution network, boreholes, and a couple of public water filling stations (Bior, 2018; Boying et al., 2021). Despite stepping in, commercial entities have not managed to fill the gap. Apart from high prices, they draw raw water from the Nile River and distribute it through the use of water trucks or tanks (Boying et al., 2021). This water is usually not treated (Bior, 2018). This means residents of Juba city consume (including drink) dirty and contaminated water. According to a study by Bior (2018), this, to a large extent, is responsible for the frequent outbreak of diseases such as cholera, diarrhoea, typhoid, and other water-borne diseases, leading to the deaths of many people, especially children. In South Sudan, a couple of studies have explored the complex challenges associated with water access, yet significant gaps persist, including failure to explore the broader socio-economic and health consequences of inadequate access to clean water in urban settings. It is imperative to undertake a study to answer the question, what is the effect of inadequate access to clean and safe water on households in Juba City, South Sudan? This study is not only important for addressing a critical humanitarian concern but also aligns with global sustainability goals. Inadequate access to clean water is contrary to SDG 6, which underscores the necessity of ensuring the availability and sustainable management of water for all (SDG Report, 2023).

2. Methods and data

This study adopted a qualitative research methodology. This approach involves the collection and analysis of non-numerical data, often through methods such as interviews, focus group

discussions (FGDs), and observations. Data was collected from the target groups who are adults (18 years old or older) and being the head of the surveyed households as well as other key stakeholders from payam to national levels. The data collection process for this research was designed to ensure the acquisition of high-quality and reliable data. The primary data collection method involved face-to-face interviews conducted by the researchers using semi-structured interview guides. The choice of face-to-face interviews is justified because it allows for real-time clarification of responses and ensures a higher response rate, which is particularly essential when addressing sensitive topics (Sztabiński, 2019) such as access to clean and safe water. For FGDs, the researcher guided discussions involving 6-10 participants, using open-ended questions designed to elicit participants' thoughts and experiences regarding water access and its effect on their well-being. FGDs entailed recordings and detailed notes that were taken during the discussions.

The sampling approach for this research employed purposive sampling, focusing on three specific *payams* (Munuki, Juba, and Kator) in Juba City, South Sudan. In the administrative structure of South Sudan, a *payam* represents the third-lowest level administrative unit, and it has a minimum population size of 25,000 (GOSS, 2023). On the other hand, a *Boma* is the second lowest level administrative unit, after or below the *payam*. This research concentrated on households in these pre-selected *payams* since households are the central units affected by the issue of inadequate, clean, and safe water access in this area. The study utilized convenience sampling to select households that participated in the household semi-structured survey. Convenience sampling targeted a total of 31 households, and the interview stopped when the data saturation point was achieved in the three *payams*. Furthermore, the research applied critical case sampling to target key stakeholders, including government officials from relevant ministries, civil society organizations, community leaders, donors and opinion leaders. Additionally, community leaders from *Boma* and *Payam* levels were targeted via purposive sampling.

In the data analysis process, content analysis, a method for systematically interpreting textual, visual, or audio data to identify themes and patterns, were used to analyze the interview data. The qualitative data collected through interviews underwent thematic analysis, focusing on identifying recurring themes and key concepts in respondents' narratives about water access and the effects of its inadequacy. Open coding was applied to explore responses without predefined categories, enabling the emergence of new and unexpected themes in the data. Thematic content analysis matrix was generated from the content analysis process that was based on the data from household semi-structured in-depth interviews, KII and FGDs which also provided the opportunity for triangulation process. Informed consent was diligently obtained, ensuring participants understood the study's purpose, their role, and potential risks and benefits. Confidentiality was maintained, with personal identifiers removed for anonymity, and rigorous data security protocols were in place.

3. Results and discussions

The broad and significant effects of inadequate access to clean and safe water on households in Juba City are evident. Utilizing both survey data and qualitative insights, the analysis highlights how water scarcity profoundly affects household well-being, health, and socio-economic conditions. The study reveals serious health risks from consuming unpurified water, disruptions to daily routines, and the economic burden of high-water costs. Additionally, it uncovers the social tensions and conflicts that arise from water shortages, the heightened risk of gender-based violence, and the exacerbating impacts of climate change.

One of the primary consequences of inadequate access to clean and safe water in Juba City is the significant health risks posed to its residents. Waterborne illnesses such as cholera, typhoid fever, dysentery, and diarrhoea are prevalent in areas with limited access to clean water. In Juba city, these diseases are linked to severe consequences, particularly for vulnerable populations such as children, the elderly, and individuals with compromised immune systems. The direct consumption of unpurified water and the use of fake water purifiers intensify these health risks. Further, the high salinity of water not only affects agriculture but also poses serious health risks to those consuming it, leading to conditions like kidney stones and failure.

"Of course, the water supplied by the tankers people, they take it direct [from the Nile]. It is not treated, not boiled. They take it from there. From there, you just get those water-borne diseases" (JPFGD-1, Line 49).

"People do not boil the water; they don't use any water guard or any purification for the water. Distilled water? They do not do that. So, that causes water to be unclean and there is no safe water for drinking" (MP08, Line 57).

"The water around Munuki is really salty, and that is why mangoes do not survive here... Also, if we are drawing water from the borehole, the water table in Munuki is very close. So, whatever can be contaminated, and we believe it goes to the borehole" (MP07, Lines 58-62).

The findings highlight the correlation between waterborne diseases and mortality, particularly pointing out kidney failure as a significant consequence of consuming contaminated water. Studies, including Mallick, Mandal, and Chouhan (2020), emphasise the critical role of clean water in preventing diarrhoea among children. Their study in India demonstrated that access to improved sanitation and clean drinking water significantly reduces the prevalence of diarrheal diseases among children. Also, Lin, Yang, and Xu (2022) indicated that waterborne diseases, including diarrhoea, are prevalent in regions with inadequate water treatment and sanitation facilities.

Inadequate access to clean and safe water results in significant challenges related to sanitation services in Juba City. Poor sanitation facilities, including the lack of proper toilets and sewage systems, further compounded the health risks associated with water inadequacy. Without access to proper sanitation, households are forced to resort to unsafe practices such as open defecation, which can contaminate water sources and contribute to the spread of waterborne diseases. The poor state of sanitation facilities not only affects the health of the community but also their dignity and security. Participants observed that,

"We do not have enough toilets. We have just a few, and the rest are using the bushes. This leads to [water] contamination" (JPFGD01, Line 61).

"The women are very much affected because we do not have enough toilets. We go out at night. This is not safe" (KP02, Line 74).

Additionally, allergies and other skin irritations are common among residents who are forced to use polluted water. Another participant shared,

"My children always have skin rashes because the water we use is dirty. We do not have a way to clean it properly" (JP04, Line 87).

The disruption caused by inadequate access to clean and safe water extends across various aspects of daily life in Juba City. It affects household chores, personal hygiene, and the overall well-being of family members, leading to increased time wastage, health issues, and economic burdens. Participants emphasized that the lack of water affects the quality of food prepared, leading to a decline in appetite and overall food satisfaction. Additionally, the need to fetch water from distant sources consumes a significant amount of time that could be spent on other productive activities. Further, the delays in attending to household chores due to water scarcity also disrupt family routines.

"Yeah, you cannot go to work on time. They affect nearly everything, actually. Sometimes your wife wants to wash, but there is no water to wash." (MP08, Line 59).

"Fetching water takes a lot of time, especially for women who are responsible for cooking and cleaning. This reduces the time they can spend on other important tasks" (JP07, Line 98).

"On days when there is no water, the preparation time for children increases, leading to missed school buses and subsequent delays in getting to work" (JPFGD-1, Line 8).

The high cost of living due to inadequate access to clean and safe water significantly impacts households in Juba City. Families are forced to allocate a substantial portion of their income to purchase water and related resources, which affects their overall financial stability and quality of life. The disparity in pricing further affects the affordability of water for many households, forcing them to allocate a substantial portion of their income to secure clean water. Gomez, Perdiguero, and Sanz (2019) found that inadequate access to safe water negatively affects health, productivity, and overall human welfare. Their study highlights that households in poorer countries often resort to purchasing water from private vendors at high costs, which strains their financial resources and limits their economic opportunities.

The WHO (2023) emphasizes that inadequate water access contributes to economic instability by increasing healthcare costs and reducing productivity. The economic burden of treating waterborne diseases and the lost income due to illness or time spent fetching water undermines economic stability and growth. Some participants shared their experience of relying on neighbours for water when they could not afford to buy it.

"For us here, the price is not similar to those from Munuki. The water tankers will get more money from supplying water to other areas than they can get here" (MPFGD-1, Line 18).

"In my area, before tap water, when we had no money, we went to neighbours where we would access the water" (MPFGD-1, Line 56).

The challenges of long queues at water points and delays in water supply not only consumes valuable time and energy but also created stress and health risks for the affected households. In Juba city, the issue of long queues at water points is a significant problem for many residents.

The waiting time can be extensive, consuming a large part of the day for those tasked with fetching water. The early morning rush to secure a spot in the queue disrupted daily routines and left less time for other essential activities.

"We have to wake up very early to queue at the water points because if you go later, the line is too long, and you might not get water" (JP01, Line 22).

"Sometimes we spend hours just waiting for our turn to fetch water. The queues are very long, and if you are not patient, you might leave without water" (KP02, Line 18).

The threat of gender-based violence and attacks on women and girls while fetching water underscores the broader issues of insecurity and gender inequality. The lack of safe access to clean water not only endangers the physical safety of women and girls but also restricts their socio-economic opportunities and impacted their mental health. In particular, the vulnerability of women and girls occurs in various forms of gender-based violence, including physical and sexual assault. In an empirical study by Zvobgo and Do (2020), observed that competition for water resources often leads to conflicts within communities. The lack of reliable water supplies intensifies these tensions, leading to disputes that can escalate into violence, further affecting the mental well-being of individuals involved.

The need to travel long distances to access water sources in Juba City exposes women and girls to unsafe environments where they are at risk of attacks. The lack of safety during water collection trips is a severe concern for many families, as it places women and girls in dangerous situations. In Ethiopia, a study by Belay et al. (2022) revealed that in regions with limited drinking water services, households often had to travel significant distances to fetch water. The crowded conditions at water points also increased the likelihood of harassment and assault.

"We have to walk very far to get water, and it is not safe. There have been cases of women being attacked on their way to the water points" (JP01, Line 75).

"The water points are always crowded, and there is a lot of pushing and shoving. Sometimes, men take advantage of the chaos to harass women" (KPF GD-1, Line 48).

"My daughter is afraid to go to school because she has to pass by the water point, and there have been many cases of harassment there" (JP02; 34).

Discrimination in water distribution is a significant issue that faces Juba City, contributing to unequal access to clean and safe water among different communities. This discrimination often manifests in the form of biased water distribution practices that favour certain areas or groups over others. The inequitable access exacerbates existing socio-economic disparities and leaves marginalized communities struggling to secure sufficient water supplies. The perception of favoritism in water distribution fuels resentment and distrust among community members.

"The water trucks often go to certain neighbourhoods more frequently than others. It feels like some areas are prioritised while others are neglected" (KP04, Line 19).

"We see the water trucks going to the wealthier parts of the city first. By the time they come to our area, there is very little water left, and sometimes we do not get any at all" (JP05, Line 27).

This sense of injustice deepens the divide between different socio-economic groups and undermines social cohesion. The discriminatory practices in water distribution also lead to conflicts within communities, as people vie for limited resources.

"When the water trucks come late or do not come at all, it causes fights. People feel like they are being mistreated, and it creates a lot of tension" (JP03, Line 45).

One more critical consequence of inadequate access to clean water is the escalation of conflict within households and communities, further intensifying the challenges faced by both. Within households, inadequate access to clean water leads to conflicts among family members as they compete for limited water supplies to meet their daily needs. These conflicts manifest in various forms, ranging from verbal altercations to physical confrontations.

"There are always arguments in the house about who used more water and who left the tap running. It creates a lot of tension" (JP05, Line 42).

Moreover, at the community level, water scarcity intensifies rivalries and disputes among community members. As access to clean water diminishes, communities are compelled to resort to alternative, often unsustainable sources, leading to intensified tensions along ethnic, tribal, or communal lines. In Juba City, where historical grievances and ethnic divisions persist, inadequate access to water serves as a catalyst for inter-community conflicts, intensifying underlying socio-political tensions.

"Sometimes, when the water trucks come, there are fights because everyone wants to be served first. It gets very chaotic" (KP02, Line 25).

"Water is a big issue here, and it often causes fights between different communities. People are already stressed, and this just makes things worse" (JP03, Line 38).

These disputes over water resources further exacerbate existing tensions and can lead to broader conflicts. According to a study by Zvobgo and Do (2020), competition for water resources mostly leads to conflicts within communities. The lack of reliable water supplies intensifies these tensions, leading to disputes that can escalate into violence. The adverse effects of water scarcity extend beyond immediate confrontations, permeating various aspects of household well-being. Heightened stress levels and anxieties arising from water-related conflicts contribute to deteriorating mental health outcomes among community members, further destabilizing households and impeding their ability to cope with broader socio-economic challenges.

4. Conclusions

The study highlights severe impacts on health, economy, and social structures for households. Health issues such as cholera, typhoid, and skin diseases are prevalent due to contaminated water, with poor hygiene exacerbating these problems. Economically, households face high living costs, spending large portions of their income on purchasing water and additional expenses like

charcoal for boiling. This financial strain is compounded by expensive medical care, reduced productivity, and disruptions to daily activities. Socially, long queues at water points, delays, and distribution inequities lead to significant strain, causing conflicts within families and communities. The elderly are particularly affected, and the physical safety of women and girls is jeopardized when fetching water, exposing them to risks of attacks. Inadequate sanitation facilities further disrupt daily routines, affecting personal hygiene, cooking, and educational activities.

The environmental burden includes drought-related effects, frequent flooding, and soil erosion, which impact road infrastructure and complicate water access. The study underscores the urgent need for improved water infrastructure, equitable distribution, and sustainable water management practices in Juba City. Addressing these issues is critical to enhancing residents' quality of life and achieving SDG 6 on clean water and sanitation for all.

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Conflict of Interest

The authors declare no conflict of interest in this study.

Ethics Statement

Free and informed consent of the participants or their legal representatives was obtained, and the study protocol was approved by Universiti Sains Malaysia.

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