

Evaluation of access to water in healthcare facilities in the city of Kisangani, The Democratic Republic of Congo

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Abstract

Introduction: Access to safe drinking water is a key determinant of quality of care and patient safety. In low-income countries, many healthcare facilities operate without an adequate water supply. This study aims to assess access to water in healthcare facilities in the city of Kisangani, Democratic Republic of Congo.

Methods: A descriptive and analytical cross-sectional study was conducted in 93 healthcare facilities (88 health centers and 5 general referral hospitals) distributed across five health zones. The variables analyzed were the water source, distance from the source, and collection time. Statistical analyses included the chi-square test with a significance level set at 5%.

Results: Wells and protected springs were the main source of water (54.6%), followed by the REGIDESO public water network (28.9%). However, 16.5% of health facilities used unimproved water sources. A statistically significant association was observed between the health zone and the water source ($\chi^2 = 18.74$; $p = 0.041$). This attests to the significant difference.

Conclusion: Despite the presence of protected water sources in a significant proportion of facilities, persistent shortcomings in access to safe drinking water expose patients and staff to health risks. Targeted interventions are needed to sustainably improve the quality of care.

Keywords: Access to water; Health facilities; Kisangani; WASH

1. Introduction

Safe drinking water is a key determinant of public health and an essential element for the functioning of healthcare facilities. It is necessary for hand hygiene, cleaning and sterilizing medical equipment, preparing medications, and providing comprehensive patient care [1]. The World Health Organization (WHO) emphasizes that the lack of an adequate water supply in healthcare facilities significantly increases the risk of healthcare-associated infections and compromises patient safety, particularly in low- and middle-income countries [2].

In Sub-Saharan Africa, access to safe drinking water in healthcare facilities remains insufficient. According to joint estimates by WHO and UNICEF, a significant proportion of healthcare facilities lack an improved water source or rely

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on intermittent and unsafe sources. This situation is particularly concerning in rapidly expanding urban areas, where population pressure often outstrips the capacity of existing infrastructure [3, 4].

The Democratic Republic of Congo (DRC) faces major structural challenges in the water and sanitation sector. Water infrastructure is often outdated, inadequate, or unevenly distributed, affecting both households and public facilities [5]. The city of Kisangani, capital of Tshopo province, clearly illustrates these difficulties. Despite its strategic location and socioeconomic importance, access to drinking water remains limited in several neighborhoods and health facilities [6, 7].

Access to water, hygiene, and sanitation (WASH) in health facilities in Africa is a major challenge. In the Gombe-Matadi (GMT) and Lemba health zones, 8.3% of health facilities had access to water, but none had access to hygiene or sanitation. Hygiene promotion is rare, with no facilities in GMT and only 20% in Lemba. These findings highlight the need to improve access to WASH in health facilities, particularly in rural areas [8].

In this context, assessing access to water in healthcare facilities in Kisangani is essential for guiding health policies, identifying intervention priorities, and strengthening the resilience of the local health system. Generally, this study aims to systematically analyze water supply sources, their accessibility, and associated constraints in health facilities in the city of Kisangani, in The Democratic Republic of Congo.

2. Methods

2.1. Study Type and Framework

This is a descriptive cross-sectional study conducted in the city of Kisangani, capital of Tshopo Province, located in the northeast of the Democratic Republic of Congo. The city is organized into five health zones: Makiso/Kisangani, Kabondo, Lubunga, Mangobo, and Tshopo, according to the National Health Organization (HPM/ DRC).

2.2. Study Population

The study population comprised all officially recognized health facilities in the city, totaling 93 establishments, including 88 health centers and 5 general referral hospitals. All facilities were included to ensure comprehensive coverage.

2.3. Data Collection

Data were collected using a structured questionnaire administered to the heads of the health facilities (chief physicians of the health zone, registered nurses, or managers). The information collected concerned:

- The main water supply source;
- The distance between the water source and the health facility;
- The time required to collect water.

These variables were studied in accordance with the indicators recommended by the WHO for WASH assessment in health facilities [9].

Water sources were classified into four categories: the REGIDESO public network, wells or protected springs, unprotected springs, and surface water (river).

The data collection period was from June 17 to September 28, 2025.

2.4. Data Analysis

Data were entered and analyzed using descriptive statistical tools. Frequencies and percentages were calculated for each variable. The results were presented in tables and graphs to facilitate interpretation and comparison between health zones. Pearson's chi-squared test was used to assess the association between the health zone and water access indicators. The significance level was set at $p < 0.05$.

2.5. Ethical Considerations

Permission to collect data was obtained from the local health authorities (Provincial Health Division). Verbal consent from health facility managers was obtained before administering the questionnaire, and confidentiality of the information was guaranteed.

3. Results

3.1. Distribution of Health Facilities According to Water Supply Source

Table 1 presents the distribution of Health Facilities (HF) by health zone according to their main water supply source.

Table 1 Water Supply Sources in Health Facilities by Health Zone in Kisangani (n = 93)

Water sources	Kabondo (n=17)	Lubunga (n=19)	Makiso/Kisangani (n=21)	Mangobo (n=19)	Tshopo (n=17)	Total n (%)
REGIDESO Tap	5	2	5	8	8	28 (28.9)
Protected wells/springs	10	13	12	9	9	53 (54.6)
Unprotected spring	2	1	2	3	3	11 (11.3)
River/stream	0	3	0	1	1	5 (5.2)
Total	17	19	21	19	17	93 (100)

This table shows that protected wells and springs constitute the main water source for more than half of the health facilities in Kisangani (54.6%). The REGIDESO public water network is the second most used source (28.9%), primarily in urban areas such as Makiso-Kisangani and Mangobo.

However, it is concerning that 16.5% of health facilities (unprotected springs and surface water combined) use water sources with a high health risk, thus exposing patients and staff to waterborne and healthcare-associated infections. This situation reflects insufficient water supply security, particularly in some outlying areas.

3.2. Statistical Analysis of Access to Water

A bivariate analysis was conducted to assess the association between the health zone and the main water source for health facilities. Pearson's chi-square test showed a statistically significant association between the health zone and the type of water source used ($\chi^2 = 18.74$; $df = 12$; $p = 0.041$).

This result indicates that the type of water source varies significantly by health zone. Central urban areas, particularly Makiso/Kisangani and Mangobo, have a higher proportion of health facilities connected to the REGIDESO public water network, while the Kabondo and Lubunga areas rely more heavily on protected wells and springs. This disparity reflects a structural inequality in access to water infrastructure within the city.

The type of water source varies significantly by health zone. Central areas have greater access to the public water network, while peripheral areas rely more on alternative sources.

3.3. Risk of Using Unimproved Sources by Health Zone

Unimproved sources (unprotected sources and surface water) were grouped together to assess the associated health risk.

Health facilities located in peripheral areas had a significantly higher probability of using unimproved sources compared to central areas ($\chi^2 = 9.62$; $df = 4$; $p = 0.047$).

This result highlights the increased vulnerability of peripheral health facilities, where the lack of adequate infrastructure exposes patients and staff to increased risks of waterborne and healthcare-associated infections.

3.4. Graphical Distribution of Water Sources by Health Zone

Figure 1. Water Supply Sources in Health Facilities by Health Zone in Kisangani

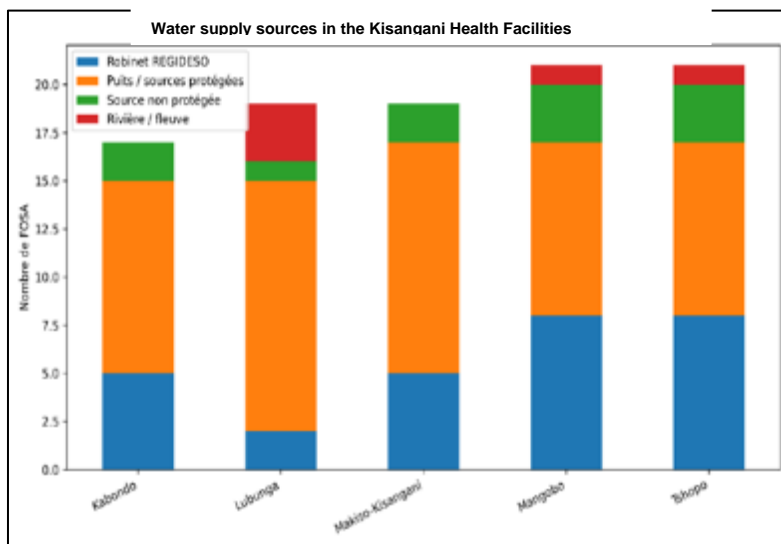


Figure 1 Highlights marked disparities between health zones. The Makiso/Kisangani and Mangobo health zones have a relatively higher proportion of facilities connected to the REGIDESO network, reflecting better coverage of urban water infrastructure

Conversely, the Kabondo and Lubunga zones rely primarily on protected wells and springs, while surface water use is observed almost exclusively in certain health facilities located near the Congo River. These disparities illustrate unequal access to drinking water between health zones, which can affect the quality of care provided.

3.5. Overall Distribution of Water Sources in Health Facilities

Figure 2. Overall Distribution of Water Supply Sources in Kisangani Health Facilities (n = 93)

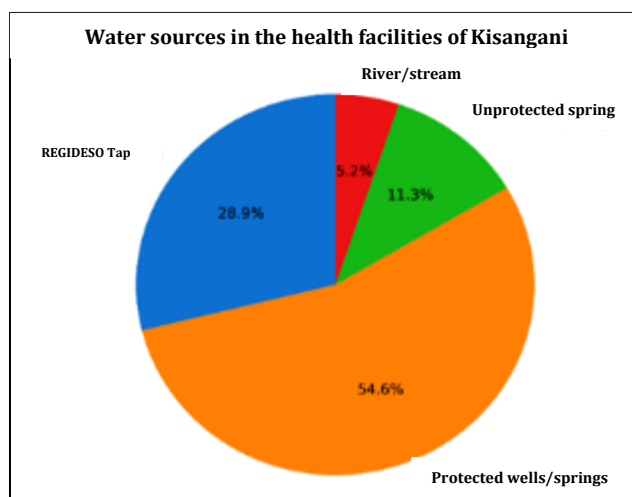


Figure 2 Visually confirms the dominance of protected wells and springs, which account for more than half of the water sources used. However, the combined share of unprotected sources and surface water (16.5%) remains significant and concerning

This situation highlights that, despite a relative improvement in access to improved sources, a considerable number of health facilities still operate without safe drinking water, compromising the minimum WASH standards recommended by the WHO for healthcare facilities.

3.6. Distance between the water source and the health facility

Table 2 Distance of the water source from health facilities in Kisangani

Distance from the source	Kabondo	Lubunga	Makiso/Kisangani	Mangobo	Tshopo	Total n (%)
Within the FOSA perimeter	14	8	12	10	10	56 (60.2)
< 500 meters	2	9	6	5	5	27 (29.0)
≥ 500 meters	1	2	3	2	2	10 (10.8)
Total	17	19	21	19	17	93 (100)

The results indicate that 60.2% of health facilities have a water source located on their premises, which is conducive to hygiene and continuity of care.

However, nearly 11% of health facilities must travel more than 500 meters to access water. This logistical constraint can lead to supply disruptions, limit the availability of water for daily care, and negatively affect the quality of health services, particularly in water-intensive departments such as maternity and neonatal care.

A significant association was observed between the distance to the source and the time it took to collect water ($\chi^2 = 14.29$; $df = 2$; $p < 0.001$). Health facilities with a water source located more than 500 meters away are significantly more numerous in certain areas, increasing the risk of supply disruptions, especially during periods of high clinical activity. This logistical constraint negatively impacts the availability of water for essential care and hygiene practices.

3.7. Water Collection Time

The results show that water collection time is less than 30 minutes in the majority of health facilities. However, in facilities where the water source is remote, collection time frequently exceeds 30 minutes. The analysis showed a significant association between the distance to the source and water collection time ($\chi^2 = 14.29$; $df = 2$; $p < 0.001$).

Prolonged collection time reduces the amount of water available for essential activities and increases the workload of healthcare staff. This situation can compromise basic hygiene practices, such as handwashing, and increase the risk of infection transmission within health facilities.

3.8. Summary of Results

Overall, the results reveal that access to safe drinking water in Kisangani health facilities remains insufficient and unevenly distributed. While progress has been observed through the use of protected sources, the persistence of unsafe sources and the remoteness of some sources pose major challenges to patient safety and public health.

4. Discussion

This study highlights structural and functional deficiencies in access to safe drinking water in health facilities in the city of Kisangani. Although more than half of the facilities use protected sources, a significant proportion continue to rely on unimproved sources, posing a major health risk.

The statistically significant association between the health zone and the water supply source underscores the existence of marked geographical disparities. Central areas benefit more from the REGIDESO public water network, while peripheral areas remain dependent on alternative solutions that are often less secure. These results are consistent with those reported by the WHO and UNICEF [10], which indicate that health facilities located in peripheral urban areas are more likely to lack reliable access to safe drinking water [11, 12]. The use of unprotected sources and surface water observed in some health facilities is particularly concerning. Several studies have demonstrated that the lack of safe drinking water in healthcare facilities is associated with an increase in healthcare-associated infections, particularly in maternity and neonatal units. In a context like Kisangani, where the burden of infectious diseases remains high, this situation constitutes a major obstacle to improving the quality of care [13, 14, 15].

Access to water and sanitation in hospitals in the Democratic Republic of Congo is a major public health challenge. Although hospitals have potable water supply systems, water quality and hygiene in healthcare facilities are often inadequate. Hospitals face challenges such as faulty supply systems and irregular water deliveries [17]. The Ministry of

Public Health has emphasized the importance of developing a national roadmap to improve access to water, sanitation, and hygiene in hospitals. Actions such as developing biomedical waste management plans and scaling up incinerators are being undertaken to improve these services. Despite progress, challenges remain in ensuring sustainable and functional access to these services in hospitals, both in the public and private sectors [10].

The lack of water, hygiene and sanitation services would not only compromise the ability of health facilities to provide quality care but would also expose staff, patients and visitors to a considerable risk of infection and potentially death [18]. At the local level, several hospitals are indeed facing problems with access to water: faulty supply systems and irregular water deliveries due to boreholes that sometimes don't operate at full capacity. Hygiene and sanitation conditions are also deplorable [19, 20].

According to UNICEF, healthcare staff had to fetch water from outside the center and bring it back to meet the patients' basic needs. "It was serious, and I was ashamed of the situation," adds the head nurse, who didn't know what to do to ensure the patients' health and dignity in the Walikale health centers in the Democratic Republic of Congo. Access to clean water and proper hygiene in schools, villages, and health centers in the eastern regions of the Democratic Republic of Congo is extremely limited. This situation facilitates the spread of disease. The various health zones are not adequately prepared or equipped to deal with the spread of epidemics. Improving water, hygiene and sanitation in healthcare facilities promotes the reduction of nosocomial infections and contributes to improving the quality of care [21, 22].

The distance to the water source and the time required for collection also appear to be determining factors. Healthcare facilities with remote water sources face an increased risk of supply disruptions, which limits the availability of water for daily clinical activities [16]. This operational constraint reduces the effectiveness of hygiene practices and increases the workload of healthcare staff, potentially contributing to burnout. From a public health perspective, these findings support an integrated WASH (Water, Sanitation and Hygiene) approach in healthcare facilities, including the expansion of the public water network, the installation of safe boreholes, the implementation of water storage and treatment systems, and the strengthening of local governance. The integration of WASH into provincial health development plans is essential to ensure the safety of care and achieve universal health coverage goals [23].

5. Conclusion

Access to safe drinking water in healthcare facilities in the city of Kisangani remains insufficient and unevenly distributed. Despite the presence of protected water sources in a significant proportion of healthcare facilities, the use of unprotected sources and the remoteness of some sources constitute major obstacles to the quality and safety of care. Targeted investments and improved planning of water infrastructure are essential to guarantee universal access to safe drinking water in healthcare facilities.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there is no conflict of interest in conducting this study.

Statement of informed consent

"Informed consent was obtained from all individual participants included in the study."

Author contributions

Guy-Shilton BAENDO TOFULI MOLANGA designed the study and collected data from health facilities. Alliance TAGOTO TEPUNGIPAME, Artur-Zoé KAZADI MALUMBA and Joris LOSIMBA LIKWELA performed data processing and results analysis, and Raymond ASSANI RAMAZANI handled text processing and formatting.

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