World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Assessment of access to sanitation in healthcare facilities in Kisangani, democratic republic of Congo

Guy Shilton BAENDO TOFULI MOLANGA [1, *], Arthur Zoé KAZADI MALUMBA [2], Joris LOSIMBA LIKWELA [3], Alliance TAGOTO TEPUNGIPAME [3] and René OLEKO WOTO [2]

[1] *University of Kisangani, Faculty of Public Health, Higher Institute of Medical Techniques of Kisangani.*
[2] *University of Kisangani, Faculty of Sciences (Biotechnology).*
[3] *University of Kisangani, Faculty of Public Health.*

World Journal of Advanced Research and Reviews, 2026, 30(03), 1151-1159

Publication history: Received on 13 May 2026; revised on 09 June 2026; accepted on 11 June 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.30.3.1634

Abstract

Introduction: Sanitation in healthcare facilities is fundamental to preventing healthcare-associated infections, protecting patients and healthcare staff, and improving the quality of healthcare services. This study aimed to assess access to sanitation in healthcare facilities in the city of Kisangani, Democratic Republic of Congo.

Methods: A descriptive and analytical cross-sectional study was conducted in 206 healthcare facilities across the five health zones of Kisangani. Data were collected using a standardized grid based on national Water, Hygiene and Sanitation (WASH) standards and WHO and UNICEF recommendations. Descriptive and analytical analyses were performed at a significance level of 5%.

Results: Only 10.19% of facilities had a secure biomedical waste sorting system, and 34.95% had a functional incinerator. The majority of toilets lacked septic tanks (62.62%), were not separated between patients and staff (66.99%), and were not separated between men and women (83.5%). No facility had toilets adapted for people with reduced mobility. Overall, 70.87% of facilities had poor access to sanitation. Multivariate analysis showed that open waste disposal was the main factor associated with poor access to sanitation (ORa = 6.8; 95% CI: 2.44–19.12; $p < 0.0001$).

Conclusion: Access to sanitation in healthcare facilities in Kisangani remains insufficient and is marked by significant shortcomings in biomedical waste management and sanitation infrastructure. Strengthening waste management systems, improving sanitation infrastructure, and effectively implementing WASH and EHA standards are necessary to guarantee safe and quality care.

Keywords: Sanitation; Healthcare Facilities; Kisangani; Democratic Republic Of Congo

1. Introduction

Access to sanitation in healthcare facilities is essential for quality of care, patient safety, and the prevention of healthcare-associated infections. Water, sanitation, and hygiene (WASH) services are now recognized as fundamental components of effective and resilient health systems (1). The absence or inadequacy of these services in healthcare facilities increases the risk of infectious disease transmission, compromises patient safety, and reduces the effectiveness of medical interventions (2).

* Corresponding author: BAENDO TOFULI MOLANGA Guy Shilton

Globally, despite progress made in recent decades, many health facilities continue to operate with inadequate sanitation. According to the joint WHO/UNICEF report, nearly two billion people use health facilities lacking basic sanitation services, particularly in low- and middle-income countries (3). This situation is especially concerning in sub-Saharan Africa, where health infrastructure remains insufficient and biomedical waste management systems are often inadequate (4).

Sanitation in healthcare settings is not limited to the availability of toilets. It also encompasses the safe management of biomedical waste, wastewater disposal, maintenance of sanitary infrastructure, and accessibility of facilities for vulnerable groups, including people living with disabilities (2,5). According to Adams et al., the inadequacy of these services is a major obstacle to preventing healthcare-associated infections and improving the quality of healthcare services (6).

Several studies conducted in developing countries have highlighted the inadequacies of sanitation infrastructure in health facilities. In Tanzania, Benova et al. reported low sanitation service coverage in health facilities, particularly in rural areas (7). In Ethiopia, Adane et al. observed that less than half of health facilities had sanitation facilities meeting recommended standards, thus exposing patients and healthcare workers to increased risks of infection (8). Similarly, Mulogo et al. in Uganda showed that the lack of adequate sanitation facilities was a major constraint on infection prevention and control in health facilities (9).

In the Democratic Republic of Congo (DRC), the sanitation situation in healthcare facilities remains a concern despite the existence of national Water, Hygiene and Sanitation (WASH) standards. Many healthcare facilities face challenges related to the management of biomedical waste, the lack of adequate wastewater disposal systems, and insufficient sanitation infrastructure that meets international standards (10). This situation compromises the quality of care and hinders the achievement of the Sustainable Development Goals, particularly SDG 3 on health and well-being and SDG 6 on universal access to water and sanitation (11).

In the city of Kisangani, few studies have focused on evaluating access to sanitation in healthcare facilities. Yet, increasing urbanization, population pressure, and the economic constraints faced by healthcare facilities can significantly impact the availability and quality of sanitation services. The production of reliable scientific data is therefore essential to guide the interventions of policymakers and technical and financial partners.

This study aims to assess access to sanitation in healthcare facilities in the city of Kisangani. More specifically, it seeks to describe the available sanitation infrastructure, analyze biomedical waste management practices, and identify factors associated with the level of access to sanitation in healthcare facilities.

2. Methods

2.1. Type and framework of the study

Our study is cross-sectional with an analytical aim and was carried out in the period from July 5 to September 30, 2025.

2.2. Study population

The study population consisted of all 93 health facilities , including 88 health centers and 5 general referral hospitals .

2.3. Data collection

The data were collected using a standardized grid based on national WASH standards and WHO/UNICEF guidelines. The indicators studied were:

- Existence of latrines;
- Type of latrine (hygienic or not);
- Number of latrines per health facility;
- Separation of latrines between staff and patients/visitors;
- Latrines are available for people with reduced mobility.

2.4. Data analysis

Data saved on Kobotoolbox then exported to Kobocollect

- Data entry and cleaning data entered into Excel and imported into STATA 13 for analysis.
- The distribution of categorical variables using proportions and that of quantitative variables using means and their standard deviations if the distribution is symmetrical. [12]
    - And the median and interquartile ranges if the distribution is skewed.
- **Inferential statistics or statistical analysis**
- Descriptive analysis : frequencies, proportions, means and standard deviations for EHA variables.
    - We used bivariate analysis with Pearson's Chi-squared or Fisher's exact test for categorical variables according to their conditions of application:
- Student 's t-test or ANOVA for symmetrically distributed variables or the Wilcoxon or Kruskal -Wallis test depending on their conditions of application.
- All variables that showed an association in bivariate analysis were included in a stepwise backward logistic regression model at the 10% significance level.
- The ORs with their 95% CIs and WALD p-values were presented [18]
- Bivariate analysis : chi- -square to test the association between type of establishment, level of care and access to EHA services.
- Multivariate analysis : logistic regression to identify independent factors associated with adequate access to WASH services.
- Significance threshold : $p < 0.05$.

2.5. **Ethical considerations**

Before the collection, we sought to obtain the necessary authorizations from

- Ethics Committee of the Faculty of Medicine and Pharmacy of the University of Kisangani;
- Head of Provincial Health Division of TSHOPO;
- Chief Medical Officers of 5 Health Zones in the city of Kisangani;
- IT professionals responsible for all social and solidarity economy (SSE) initiatives;
- Verbal informed consent was obtained from the respondents before their participation in the study;
- Anonymity and confidentiality have been guaranteed.

Ethical considerations regarding fundamental principles, respect for the individual, benevolence, and justice were integrated. They took into account that the subject involved in the investigation is a free and autonomous collaborator and that the privacy of the information they provide will be preserved. [19]

3. Results

Table 1 Access to sanitation in establishments

Variables	**n=206**	**%**
ESS has a medical waste sorting system with 3 receptacles.		
Yes	21	10.19
No	185	89.81
ESS with a functional incinerator		
Yes	72	34.95
No	134	65.05
Number of toilets in the ESS		
Median (P75-P25)	2(2-1)	
A toilet by ESS	119	57.77
Two toilets per ESS	44	21.36
Three toilets per ESS	25	12.14
Four or more of the ESS	18	8.73
Types of toilets at the ESS level		

Toilet flush with septic tank	73	35.44
Toilets without a septic tank	129	62.62
Other (no toilets and toilets in nature)	4	1.94
ESS with separate toilet facilities for patients and service providers		
Yes	68	33.01
No	138	66.99
ESS has separate men's and women's toilets		
Yes	34	16.5
No	172	83.5
ESS has toilets for people with reduced mobility		
Yes	0	0
No	206	100.00
ESS with a secure waste sorting system		
Yes	21	10.19
No	185	89.81
ESS with a functional incinerator		
Yes	129	62.62
No	77	37,38
ESS arranging the garbage holes		
Yes	176	85.44
No	30	14.56
ESS with functional placental holes		
Yes	4	1.94
No	202	98.06
Global access to sanitation for social and solidarity economy (SSE)		
Good access	60	29.13
Limited access	146	70.87

Table 1 presents the sanitation situation in 206 respondents across 93 healthcare facilities surveyed in Kisangani. The results reveal several significant deficiencies in biomedical waste management and sanitation infrastructure.

Regarding medical waste management, only 10.19% of healthcare facilities had a waste sorting system with three receptacles, while 89.81% did not. This situation reflects poor adherence to safe biomedical waste management standards and exposes patients, healthcare staff, and the community to increased risks of contamination.

Regarding sanitation infrastructure, the median number of toilets was two per facility, with more than half of the health establishments (57.77%) having only one toilet. This inadequacy can limit access to sanitation facilities and contribute to hygiene problems in healthcare settings.

Analysis of toilet type shows that 62.62% of social and medico-social establishments (SSEs) used toilets without septic tanks, and 1.94% lacked adequate toilet facilities. Only 35.44% had toilets equipped with septic tanks. This situation poses a potential risk of environmental pollution and the spread of diseases related to unsanitary conditions.

Table 2 Analysis of factors associated with access to sanitation in healthcare facilities

Variables	**Access to sanitation at the level of EES**		**ORb (95% CI)**	**p value**	**Ora (95% CI)**	**p**
	Good n(%)	Low n(%)				
Location						
Urban	153(86,93)	23(13.07)		0.018	NR	
Urban -rural	21(70.00)	9(30.00)				
Membership in the social and solidarity economy						
Private/confessional	123(82.00)	27(18.00)		0.11	NR	
State	51(91,07)	5(8,93)				
Availability of a Functional Incinerator						
Yes	97(75,19)	32(24.81)		< 0.0001**	NR	
No	77(100.00)	0(0.00)				
ESS using the Burning method in a protected pit						
Yes	150(82,42)	32(17,58)		0.025	NR	
No	24(100)	0(0.00)				
ESS using open-air depot						
Yes	113(95,76)	5(4,24)	10(3.5169-34.5801)	<0.0001	6.8(2.4376-19.1200)	<0.0001
No	61(69,32)	27(30,68)	1		1	
ESS with garbage disposal holes						
Yes	155(88.07)	21 (11.93)	1	0.001	1	
No	19(63,33)	11(36,67)	4.3(1.5907-10.9799)		2.3(0.9154-5.9356)	0.076
ESS with a wastewater management system						
Yes	155(100.00)	0(0.00)		<0.0001**	NR	
No	19(37,25)	32(62n75)				

*Pearson's chi-square, **Fisher's exact test, NI =not retained in the model

Furthermore, the majority of facilities did not respect the principles of inclusivity and health confidentiality. Indeed, 66.99% of social and medico-social establishments did not separate patient and staff toilets, while 83.5% did not have separate toilets for men and women. In addition, no facility had toilets adapted for people with reduced mobility.

Regarding waste disposal, 85.44% of ESSs had a garbage hole, but only 1.94% had a functional placenta hole, which indicates poor safe handling of certain specific biomedical waste.

Finally, the overall sanitation assessment shows that only 29.13% of establishments had good access to sanitation, while 70.87% had poor access. These results indicate that the majority of social and solidarity economy (SSE) establishments in Kisangani do not meet the minimum sanitation requirements according to the Water, Hygiene and Sanitation (WASH) standards.

Overall, the report highlights a generally inadequate level of sanitation in healthcare facilities in Kisangani. Key weaknesses include the lack of secure sorting of biomedical waste, insufficient sanitation infrastructure, inadequate excreta disposal systems, and inadequate consideration of the needs of vulnerable populations. These deficiencies can compromise the quality of care, promote healthcare-associated infections, and pose a risk to public health.

Table 2 presents the results of the bivariate and multivariate analysis of factors associated with access to sanitation in healthcare facilities in Kisangani. The objective of this analysis was to identify the determinants likely to influence the level of sanitation observed in health facilities.

The results show that the location of the facility was significantly associated with access to sanitation ($p = 0.018$). Social and solidarity economy (SSE) facilities located in urban areas had a higher proportion of good access to sanitation (86.93%) than those located in urban -rural areas (70.00%). This difference could be explained by better availability of sanitation infrastructure, greater access to financial resources, and more regular monitoring of hygiene and sanitation standards in urban areas. However, this variable was not included in the multivariate model, suggesting that its effect was likely influenced by other factors.

The type of institution (public or private/faith-based) was not significantly associated with access to sanitation ($p = 0.11$). Although public institutions had a higher proportion of good access (91.07%) than private or faith-based institutions (82.00%), this difference was not sufficient to conclude that administrative status had a real influence on the level of sanitation.

The availability of a functional incinerator was significantly associated with access to sanitation ($p < 0.0001$). This observation highlights the importance of biomedical waste treatment facilities in improving the sanitary conditions of healthcare facilities. Indeed, incineration is a recognized method for reducing the biological and environmental risks associated with infectious waste. However, this variable was not included in the final model due to its lack of statistical independence from other factors studied.

Similarly, the use of incineration in a protected pit was significantly associated with better access to sanitation ($p = 0.025$). This practice could help limit the exposure of users and staff to hazardous waste when no modern incineration system is available. However, this association disappeared after adjusting for confounding variables.

Bivariate analysis showed that facilities practicing open-air waste disposal had a significantly higher risk of poor access to sanitation (ORb = 10; 95% CI: 3.52–34.58; $p < 0.0001$). After adjustment in the logistic regression model, this association remained statistically significant (ORa = 6.8; 95% CI: 2.44–19.12; $p < 0.0001$). Thus, healthcare facilities using open-air waste disposal were nearly seven times more likely to have poor sanitation compared to those using more appropriate management methods. This result highlights the crucial role of biomedical waste management in the quality of sanitation in healthcare facilities.

bivariate analysis showed a significant association with access to sanitation (ORb = 4.3; 95% CI: 1.59–10.98; $p = 0.001$). However, after adjustment, this relationship was no longer statistically significant (ORa = 2.3; 95% CI: 0.92–5.94; $p = 0.076$), indicating that this variable is not independent of sanitation.

Finally, the existence of a wastewater management system was strongly associated with better access to sanitation ($p < 0.0001$). All facilities with such a system had good sanitation levels, while a significant proportion of facilities without such a system were classified as having poor access. This result underscores the importance of proper wastewater management in preventing environmental contamination and reducing the risk of healthcare-associated infection transmission.

Multivariate analysis identified open-air waste disposal as the main factor independently associated with poor access to sanitation in healthcare facilities in Kisangani (ORa = 6.8; 95% CI: 2.44–19.12; p < 0.0001). This finding suggests that interventions aimed at improving biomedical waste management, particularly by strengthening collection, sorting, and safe disposal systems, could significantly contribute to improving sanitation conditions in healthcare facilities.

4. Discussion

This study reveals that only 10.19% of healthcare facilities (HCFs) had a biomedical waste sorting system with three receptacles. This proportion remains low and reflects a significant deficiency in the safe management of medical waste. Similar results were reported by Adams et al., who emphasize that poor biomedical waste management is one of the main weaknesses of healthcare systems in low-income countries (1). The WHO estimates that nearly 15% of waste produced in healthcare facilities is hazardous and requires specific treatment to avoid the risk of contamination to staff, patients, and the environment (2).

Regarding waste disposal infrastructure, only 34.95% of facilities had a functional incinerator. This situation is comparable to that observed in Uganda by Mulogo et al., who reported insufficient equipment for the safe disposal of biomedical waste in public health facilities (3). The lack of functional incinerators encourages the use of inappropriate waste management methods, which can increase environmental and health risks.

The study also shows that the median number of toilets was two per facility, while more than half of the health facilities (57.77%) had only one toilet. These results reflect a lack of basic sanitation infrastructure and are consistent with the observations of Cronk and Bartram, who showed that many health facilities in low- and middle-income countries have an insufficient number of sanitation facilities to meet the needs of users (4).

Furthermore, 62.62% of the toilets observed lacked septic tanks. This finding is concerning because inadequate excreta disposal systems are a significant source of environmental contamination. Similar findings were reported in Tanzania by Benova et al., where many health facilities used sanitation systems that did not meet recommended sanitation standards (5).

The majority of facilities lacked separate toilets for patients and staff (66.99%) or for men and women (83.5%). Furthermore, no facility had toilets adapted for people with reduced mobility. These findings demonstrate a weak consideration of equity and inclusion in health infrastructure. They corroborate the recommendations of the WHO/UNICEF Joint Monitoring Programme (JMP), which advocates for the availability of accessible, safe, and population-friendly sanitation facilities in health facilities (6).

Finally, overall access to sanitation was considered poor in 70.87% of health establishments. This situation reflects the persistent challenges faced by health systems in developing countries. According to the WHO/UNICEF global report, nearly one in five health facilities worldwide still lacks basic sanitation services, with particularly marked disparities in sub-Saharan Africa (7).

4.1. Factors associated with sanitation

- Bivariate analysis showed that several factors were associated with access to sanitation, including the location of the establishment, the availability of a working incinerator, the use of burning in a protected pit, the existence of garbage pits, and the presence of a wastewater management system.
- Establishments located in urban areas had better sanitation conditions than those located in urban -rural areas (p = 0.018). This difference could be explained by greater availability of infrastructure and financial resources in urban areas. Similar results were reported by Cronk and Bartram, who observed significant inequalities between urban and rural establishments in several African countries (4).
- The existence of a wastewater management system was also significantly associated with better access to sanitation (p < 0.0001). This observation aligns with WHO recommendations that consider safe wastewater management an essential component of WASH standards in healthcare facilities (2).
- After adjusting for confounding variables, only open-air waste disposal remained significantly associated with poor access to sanitation (ORa = 6.8; 95% CI: 2.44–19.12; p < 0.0001). Facilities using this method were nearly seven times more likely to have poor sanitation compared to those using more secure waste management methods.
- This result is consistent with the work of Prüss-Ustün et al., who demonstrated that the uncontrolled disposal of biomedical waste promotes vector proliferation, environmental contamination, and the transmission of

healthcare-associated infections (8). Similarly, the WHO emphasizes that open dumping of medical waste poses a major threat to public health and the environment, particularly in resource-limited countries (2).

Thus, the results of this study highlight the importance of strengthening biomedical waste management systems, improving health infrastructure and effectively applying Water, Hygiene and Sanitation standards to improve the quality of care and reduce health risks in healthcare facilities in Kisangani.

5. Conclusion

The aim of this study was to assess access to sanitation in healthcare facilities in the city of Kisangani. The results show that sanitation remains a major challenge in the majority of the healthcare facilities surveyed.

The descriptive analysis highlighted several significant deficiencies, including the limited availability of secure biomedical waste sorting systems, an insufficient number of functioning incinerators, a limited number of toilets, the frequent absence of septic tanks, and a lack of accessible sanitation infrastructure for people with reduced mobility. Furthermore, the majority of facilities lacked separate toilets for men and women, as well as separate facilities for patients and healthcare staff. Overall, 70.87% of facilities had poor access to sanitation, reflecting low compliance with national Water, Hygiene and Sanitation (WASH) standards and international WASH standards.

Analysis of associated factors revealed that several variables influenced access to sanitation. However, after adjusting for confounding factors, open-air waste disposal emerged as the primary independent determinant of poor access to sanitation. Facilities using this practice had an almost seven times higher risk of poor access to sanitation compared to those employing more secure biomedical waste management methods.

These results confirm that the quality of sanitation in healthcare facilities largely depends on the existence of an effective biomedical waste management system and adequate sanitation infrastructure. Improving these services is essential for preventing healthcare-associated infections, protecting the environment, and ensuring quality care for populations.

In light of these findings, it is essential to increase investment in sanitation infrastructure, improve biomedical waste management systems, promote the effective implementation of WASH and EHA standards, and establish regular monitoring and evaluation mechanisms in healthcare facilities. Such actions will significantly contribute to improving the quality of care and reducing health risks in the city of Kisangani and throughout the Democratic Republic of Congo.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

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

References

[1] World Health Organization , UNICEF. Water, sanitation , hygiene , waste and electricity services in health care facilities . Geneva: WHO; 2023.

[2] World Health Organization . Guidelines on sanitation and health . Geneva: WHO; 2018.

[3] World Health Organization , UNICEF. Global progress report on WASH in health care facilities . Geneva: WHO; 2022.

[4] Cronk R, Bartram J. Environmental conditions in health care facilities in low- and middle- income countries. Int J Hyg Environ Health . 2018; 221(3):409-422.

[5] World Health Organization . Minimum requirements for water, sanitation and hygiene in health care facilities . Geneva: WHO; 2019.

[6] Adams J, Bartram J, Chartier Y, Sims J. Water, sanitation and hygiene standards for health care facilities . Geneva: WHO Press ; 2008.

[7] Benova L, Cumming O, Gordon BA, Magoma M, Campbell OMR. Where there is no toilet : water and sanitation environments of domestic and health care settings in Tanzania . PLoS One. 2014; 9(1):e87907.

[8] Adane M, Mengistie B, Kloos H, Medhin G, Mulat W. Sanitation facilities and hygiene practices in Ethiopian health facilities . BMC Health Serv Res . 2017; 17(1):1-10.

[9] Mulogo EM, Matte M, Wesuta A, Bagenda F. Sanitation facilities in health care institutions and their implications for infection prevention in Uganda. BMC Public Health . 2018; 18:1141.

[10] Ministry of Public Health, Hygiene and Prevention. Collection of standards and guidelines relating to Water, Hygiene and Sanitation services in healthcare facilities in the DRC. Kinshasa; 2023.

[11] Cronk R, Bartram J. Environmental conditions in health care facilities in low- and middle- income countries. Int J Hyg Environ Health . 2018; 221(3):409-422.

[12] Benova L, Cumming O, Gordon BA, et al. Where there is no toilet : water and sanitation environments of domestic and health care settings in Tanzania . PLoS One. 2014; 9(1):e87907.

[13] WHO/UNICEF Joint Monitoring Program (JMP). *Progress on WASH in Health Care Facilities* . Geneva/New York; 2022.

[14] World Health Organization , UNICEF. *Global Progress Report on WASH in Health Care Facilities* . Geneva; 2022.

[15] Prüss-Ustün A, Bartram J, Clasen T, et al. Burden of disease from inadequate water, sanitation and hygiene . Too Med Int Health . 2014; 19(8):894-905.

[16] United Nations. Transforming our world: the 2030 Agenda for Sustainable Development . New York: United Nations; 2015.