OPEN ACCESS

Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) | ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Availability of Water, Hygiene, and Sanitation Services in Schools in the Mangobo Commune of Kisangani, DR Congo

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DOI: https://doi.org/10.36348/sjm.2025.v10i07.001 | **Received:** 19.05.2025 | **Accepted:** 26.06.2025 | **Published:** 03.07.2025

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Abstract

Introduction: This study aims to evaluate the water supply system as well as hygiene and sanitation measures in schools. ***Materials and methods:*** It was a descriptive cross-sectional study conducted in ten schools in the commune of Mangobo from October 5 to November 5, 2024. Direct observation was used to collect data based on an observation and interview grid. Entered in Excel, the data were imported into STATA 15 for statistical analyses. ***Results:*** The schools in the private and official networks were dominant. The majority had fewer than 1500 students, fewer than 20 teachers, and more than 20 classrooms. The schoolyards were enclosed with temporary materials. A large number of schools do not have puddles of water in the courtyard and are not littered with waste. However, an average level of classroom maintenance and overall sanitation was observed. All schools had a source of drinking water from the water distribution authority, available in the courtyard in 3/5 of the cases. The establishments had latrines in 3/5 of the cases, the vast majority of which were separated by category with a locking system. Disinfection materials were less available. The overall condition of the latrines was good in the vast majority of cases. Six out of ten schools had handwashing facilities, but water and soap were consistently available in three out of five cases. ***Conclusion:*** It is important to take into account the need and functioning of hygiene and sanitation facilities to ensure sanitary conditions in schools.

Keywords: Water, hygiene, sanitation, school establishment, Kisangani.

I. INTRODUCTION

The installation of adequate water, sanitation and hygiene facilities in schools is essential to achieving the United Nations Millennium Development Goals of universal primary education, promoting gender equality and reducing child mortality. It can also contribute to the achievement of other development goals, in particular those focused on combating major diseases and child mortality. The Millennium Project and the Secretary-General of the United Nations have emphasised the need to implement quick-win measures without delay, and in particular to define the services to be provided to schools and health establishments [1-3].

In 2000, the WHO defined a number of objectives in this respect, notably to provide 80% of primary school pupils with hygiene education and to equip all schools with sanitation facilities and washbasins by 2015 Water Supply and Sanitation Collaborative Council and to ensure that all schools are equipped with sanitation facilities and washbasins by 2015 World Health Organization [4,5].

Many schools are located in communities where there is a high prevalence of disease due to unsafe water consumption, lack of sanitation and poor hygiene, and where child malnutrition and other underlying health problems are common. If every household in the world were connected to a water supply and sewerage system, diarrhoeal diseases would be reduced and days of school attendance could be saved [6].

In Niger, although the progress made in recent years in terms of drinking water supply and access to sanitation is commendable, the country is one of those in the world where the rate of access to WASH services remains low. Between 2017 and 2030, the country aims

to increase the rate of access to basic drinking water services in rural areas from 46% to 100%, the rate of access to basic sanitation services from 13% to 100% and the rate of open defecation from 71% to 0% [7].

Niger's 2017-2021 Economic and Social Development Plan, "A reborn Niger for a prosperous people," confirms the country's determination to make improving access to drinking water, hygiene and sanitation a priority area for development, as set out in its Water, Hygiene and Sanitation Sector Programme adopted in 2017. To achieve these ambitious goals, the government needs to make real strategic changes, including the effective implementation of decentralisation. To this end, the Government has drawn up a four-year transfer plan (2018 - 2021) and is committed to making the transfer of State powers and resources to the communes and regions effective in the areas of education, health, water and the environment [1,8].

In Egypt, a pilot project has identified the following measures to improve the quality of the Ministry of Education's engagement: Develop, with the Ministry of National Education, alternative strategies to ensure the sustainability of the program as an integral part of its strategies. The tenth government financial commission recommended an expenditure of 841 million rupees to equip the large classes of primary schools for girls and mixed classes with sanitary facilities, so that 75% of this type of schools would have toilets by the year 2000; this project was also accepted [2].

The government of the DRC, in its growth and poverty reduction strategy document, aimed to increase the percentage of the population with sustainable access to drinking water from 26% to 40% between 2010 and 2016, from 39% to 52% in urban areas and from 20% to 32% in rural areas, and the number of people with sustainable access to sanitation services, although the Millennium Development Goals target coverage of 71% and 55% respectively for drinking water and sanitation [9].

The 2017-2022 National Strategic Development Plan translates these commitments and thus aims to "ensure equitable access for the entire population to drinking water at an affordable cost, as well as to adequate sanitation and hygiene services." The PNDS thus aims to increase water coverage from 52% to 65% by 2022 and access to sanitation from 21% to 40%. Based on the service levels defined by the sustainable development goals, 33% of the population has access to at least a basic level of water service nationwide, with only 19% in rural areas in 2018 [10].

In the DRC, access to drinking water is also a major problem despite the country being home to the most significant hydrography in Africa. This situation has been observed in rural areas but also increasingly in large cities. According to experts, currently, only 26% of the Congolese population has access to safe water. The lack of drinking water is the root cause of waterborne and diarrheal diseases.

In response to this situation, UNICEF has launched a vast programme called 'Sanitised schools and villages in peri-urban areas'. To date, 1,323 villages have been cleaned up. Environmental sanitation remains a cause for concern. Throughout the country, there is a serious problem of rubbish disposal [10].

The city of Kinshasa alone, for example, produces 5,000 tonnes of waste a day, without any waste disposal or recycling. This contributes to environmental pollution. Faced with this situation of the Congolese population, both public and public schools are not exempt [2].

In a study of water, hygiene and sanitation in primary schools in the provincial city of Kinshasa in the Democratic Republic of Congo, only 33.81% of the schools visited had a drinking water supply, 74.20% of the schools visited had one or more staff responsible for hygiene and sanitation, and only 9.96% had litter bins in the school grounds. On the basis of the above findings, we conclude that primary schools in the City-Province of Kinshasa fall far short of international standards in terms of water, hygiene and sanitation.

Several schools in the town of Kisangani in the province of Tshopo in general, and in the commune of Mangobo in particular, do not meet modern hygiene standards. Some have no latrines, and those that do are unsanitary.

Given the extent of the situation, this study was initiated to help maintain sanitary conditions in schools in order to control infections. The aim was to assess (i) the water supply system in schools and (ii) hygiene and sanitation measures in schools.

II. MATERIALS AND METHODS

Description of study site

The commune of Mangobo is one of the six communes of the city of Kisangani, the capital of the Tshopo province in the DRC.

Study population

The study population consists of the schools in the city of Kisangani, specifically those in the Mangobo commune.

Type and study period

A cross-sectional descriptive study was conducted in the schools of the commune of Mangobo from October 5 to November 5, 2024.

Sampling

We had used the simple random sampling technique for the schools located in the municipality of Mangobo. Due to resource and time constraints, for convenience, we had randomly selected 10 schools.

Inclusion criteria

Included in this study were all the selected schools for which a respondent was available to answer our questionnaire.

Variables of interest

- Identification of the school: affiliation network (private, religious, or official), number of classrooms, organized cycles, number of students, number of teachers and administrative staff, year of establishment;
- Drinking water supply: water source, storage containers, storage capacity, available water volume;
- Number of handwashing stations with availability of water and soap
- Number of toilets, separation by gender and between staff and patients, cleanliness of the toilets
- Presence of large-capacity bins in the yard and well-used
- Wastewater drainage (good or bad)
- General condition of cleanliness of the courtyard: good or bad.

Data collection techniques: The data collection method was based on direct observations using an observation grid and interviews.

Data analysis techniques

The collected data were entered into a data entry form using Excel software and then exported to STATA 15 for analysis, where they were summarized in the form of frequency tables and graphs. The description of the sample was done using proportions for categorical variables. Evaluation of the level of water availability: presence of a potable water source on the plot and/or water storage. Satisfactory hygiene measures: presence of water and soap at all handwashing points. Satisfactory sanitation measures: clean toilets, separated by gender and between staff and students, good solid waste management, proper sewage drainage.

Ethical considerations

Before going into the field, we had received research authorization from the Faculty of Medicine and Pharmacy and approval from the school authorities. Participation in the study was voluntary and anonymity was guaranteed from data collection to the dissemination of results, including analysis.

III. RÉSULTS

Identification of educational institutions

Table 1: Identification of schools in the Mangobo municipality

Variables N=10	Modalities	Staff	%
Membership status	Private	4	40
	Confessional	2	20
	Official	4	40
Total number of students	≥ 1500	4	40
	< 1500	6	60
Total number of boys	≥ 100	2	20
	< 100	8	80
Total number of girls	≥ 500	6	60
	< 500	4	40
Total number of teachers	≥ 20	4	40
	< 20	6	60
Total number of personnel	≥ 25	5	50
	< 25	5	50
Total number of rooms	≥ 20	6	60
	< 20	4	40

It appears from this table that schools in the private and official networks were dominant; the majority of schools had fewer than 1500 students, with fewer than 100 boys and more than 500 girls, fewer than 20 teachers, and more than 20 classrooms.

General information

Table 2: General Information on the Infrastructure and Sanitary Conditions of Schools in the Mangobo Commune

Variables	Modalities	Staff	%
Existence of a fence	Yes	10	100
Type of materials	Temporary	2	20
	Definitive	8	80
Presence of water puddles	Yes	4	40
	No	6	60
Presence of waste	Yes	4	40
	No	6	60
Type of waste (n=4)	Papers and bags	4	100
Maintenance of classrooms	Bad	1	10
	Average	6	60
	Good	3	30
Overall sanitation level	Average	7	70
	Good	3	30

This table shows us that all the visited schools have enclosed schoolyards, the majority of which are made of temporary materials. A large number of schools do not have water puddles in the courtyard and are not littered with waste, except for the presence of paper and waste in less than half. However, an average level of classroom maintenance and overall sanitation was observed.

Water supply

Table 3: Water Supply in Schools in the Mangobo Commune

Variables	Modalities	Staff	%
Water supply source	Yes	10	100
Types of supply sources	Faucet	10	100
Availability of drinking water in the yard	Yes	4	40
	No	6	60
Sufficiency of water to meet needs	Yes	9	90
	No	1	10
The quality of the water	Yes	10	100
	No	0	0
Drinking water treatment	Yes	2	20
	No	8	80
If yes, which method	Chlorine	1	10
	solar disinfection	1	10

All schools had a source of drinking water from the water distribution authority, available in the courtyard in 3/5 of the cases. 1/5 of the schools treated the water. Hygiene and sanitation

Excreta elimination system

Table 4: Distribution of schools according to their excreta disposal system

Variable N=10	Modalities	Staff	%
Availability of latrines	Yes	10	100
	No	0	
Types of latrines	Traditional	2	20
	Improved	2	20
	With flush and siphon	6	60
Presence of water in the latrines	Yes	7	70
	No	3	30
The latrines are separated by gender	Yes	10	100
	No	0	0
Separate latrines for teachers and students	Yes	9	90
	No	1	10
Teachers' latrines separated by gender	Yes	5	50
	No	5	50

Latrines preserve privacy	Yes No	10 0	100 0
Type of protection	Door Curtain	9 1	90 10
Locking of latrines	Yes No	10 0	100 0
Disinfection materials	Yes No	3 7	30 70
If yes, what type?	Soap Chlorine Detergent soap	3 1 1	30 10 10

The table above shows that 3/5 of the schools evaluated had latrines, which were siphon latrines; almost all of the schools had toilets separated by sex, between teachers and pupils, preserving privacy and with a locking system. Disinfection equipment was less available.

Cleanliness of facilities

Table 5: Distribution of schools by cleanliness of facilities

Variables	Modalities	Staff	%
General appearance of latrines	Good Bad	8 2	80 20
Faecal matter deposited in the pit	Yes No	3 7	30 70
Faecal matter around the pit	Yes No	3 7	30 70
Existence of anal cleansing equipment	Yes No	5 5	50 50

The table above shows that the general appearance of the latrines in the schools evaluated was good in the vast majority of cases, faecal matter was not deposited correctly in the pit, giving an unclean appearance, and anal cleansing equipment was present in half the cases.

Hand washing devices

Table 6: Distribution of schools according to hand-washing facilities

Variables	Modalities	Staff	%
Existence of a hand-washing facility	Yes No	6 4	60 40
Type of hand-washing facility	Washbasin Bucket	4 2	40 20
Device located near latrines	Yes No	1 5	10 50
Availability of water in containers	Yes No	5 1	50 10
Availability of soap or other washing product	Yes No	5 1	50 10

This table from our study shows that 6 out of 10 schools had a hand-washing facility dominated by the washbasin, and almost all of them were located far from latrines, although soap and water were available at all times in 3/5ths of cases.

IV. DISCUSSION

The study showed that schools in the private and official networks were dominant; the majority of schools had fewer than 1,500 pupils, including fewer than 100 boys and more than 500 girls, fewer than 20 teachers and more than 20 classrooms.

In terms of general information on schools, this study showed that all the schools visited had fenced school grounds, the majority of which were made of temporary materials. A large number of schools have no puddles in the courtyard and are not littered with rubbish, except for the presence of paper and rubbish in less than half of them. However, an average level of classroom maintenance and overall sanitation was observed.

In fact, in a study carried out in schools in the city of Kinshasa province in the Democratic Republic of Congo, the results showed that 74.20% of the schools visited had staff (one or more agents) in charge of

hygiene and sanitation, while 25.80% did not. Dustbins in the school grounds existed in only 9.96% of cases and were therefore absent in 90.04% of cases. The above constant leads us to consider that the schools in the city of Kinshasa were far from international standards in terms of hygiene and sanitation. The main threat facing schools in Kinshasa was heavy rain and flooding, which accounted for 40.14%, followed by bad human practices such as poor waste management and anarchic construction, which accounted for 16.29% of the study.

On the subject of water supply, it was observed that all schools had a source of drinking water from the water distribution board, available in the courtyard in 3/5ths of cases, while 1/5th of schools treated water. These results differ from those of the same study in the city of Kinshasa, where only 33.8% of schools have water points, compared with 66.18% that do not.

Worldwide, 29% of schools do not have a basic drinking water supply, a situation that affects 546 million schoolchildren. One in three primary schools and one in four secondary schools do not have a basic drinking water supply.

According to UNICEF, when schools are supplied with clean water or equipped with toilets and hand-washing soap, children benefit from a healthy learning environment, and girls are more likely to attend school when they are menstruating.

Children who learn safe water, sanitation and hygiene habits at school reinforce positive behaviours that last within their families and communities.

However, millions of children go to school every day in unhygienic learning environments, where there is no drinking water, no proper toilets and no soap for hand washing.

With regard to hygiene and sanitation in schools, the survey showed that 3/5 of the schools evaluated had latrines, which were siphon latrines; almost all the schools had toilets separated by sex, between teachers and pupils, to ensure privacy, with a locking system. Disinfection equipment was less available.

However, the general appearance of the latrines in the schools evaluated was good in the vast majority of cases, with faecal matter not being deposited correctly in the pit, giving an unclean appearance, and anal cleansing equipment being present in half the cases.

Overall, 6 out of 10 schools had a hand-washing facility dominated by the washbasin, almost all of which were located far from latrines, but where soap and water were available on a permanent basis in 3/5ths of cases.

The results of a study carried out in Niger showed that the rate of access to WASH services in this country is low. The country's ambition was to reduce the rate of open defecation from 71% to 0% between 2017 and 2030, which explains the lower rate of use of sanitation facilities in Niger than in DR Congo, particularly in Kisangani.

This means that unsuitable hygiene practices are catastrophic for infants and young people, and represent a major cause of mortality for children under the age of 5. They are also detrimental to the health of school-age children, who spend much of their day at school.

Indeed, for children to wash their hands, they inevitably need to be provided with hand-washing facilities. Surprisingly, the location and number of these facilities in schools are not prescribed by school health legislation or guidelines. Even the Guide to the Design of Facilities in Elementary Schools merely mentions the importance of effectively and appropriately designing the number and location of taps and plumbing, taking into account the level of use in each school, which is rather vague. However, it suggests installing hand-washing facilities close to classrooms, near the door leading to the school health room from the outside, and between the playground and the entrance to the school building. The Guide also calls for separate hand-washing facilities for the toilet area [11]. prevention [18]. Concerted efforts by government, civil society and non-governmental organisations are needed to meet this challenge through resource allocation, health promotion and localised hand hygiene campaigns [19].

Limitations of the Study

This study has certain limitations :

- The paucity of similar articles on the subject found during the literature review at country and regional level meant that it was not possible to establish a comparison on this scale.
- As a cross-sectional descriptive study, it was not possible to establish a causal relationship between the factors associated with access to water, hygiene and sanitation in schools in the Mangobo commune, and there are limits to its generalisability. Nevertheless, it provides a basis for more detailed (analytical) studies.

V. CONCLUSION

This study looked at the availability of water, hygiene and sanitation services in schools in the Mangobo commune of Kisangani.

The general aim of the study was to help maintain healthy conditions in schools to control infections. Secondly, we assessed (i) the water supply system and (ii) hygiene and sanitation measures in schools. At the end of our investigations, we arrived at the following main results:

- The majority of schools had fewer than 1,500 pupils, including fewer than 100 boys and more than 500 girls, fewer than 20 teachers and more than 20 classrooms.
- All the schools visited had fenced school grounds, most of which were made of temporary materials. A large number of schools have no puddles in the courtyard and are not littered, except for the presence of paper and rubbish in less than half of them. However, there was an average level of classroom maintenance and overall sanitation.
- All of the schools had a source of drinking water from the water board, available in the courtyard in 3/5ths of cases. 1/5th of schools treated water.
- The schools evaluated had latrines, 3/5 of which were siphon latrines; almost all the schools had toilets separated by sex, between teachers and pupils, preserving privacy with a locking system. Disinfection equipment was less available.
- The general appearance of the latrines in the schools evaluated was good in the vast majority of cases, but faecal matter was not deposited correctly in the pit, giving an unclean appearance, and anal cleansing equipment was present in half the cases.
- In all, 6 schools out of 10 had a hand-washing facility dominated by the washbasin, and almost all of these were located far from latrines, although soap and water were permanently available in 3/5ths of cases.

Acknowledgements: We sincerely thank the head teachers of the schools visited for their collaboration in this study.

Authors' Contributions and Responsibilities:

All authors attest to their compliance with the criteria of the International Committee of Medical Journal Editors regarding their contribution to the article. All authors contributed to the conduct of this research and to the drafting of the manuscript.

They have all read and approved the final version: Bithumitho Piracel Espérance: conceptualisation, methodology and original writing; Kaisala Komba César: survey; Avia Watu Antoine David: software; Bofele Ngama Tonton: data preservation; Bosilelo Boboliki Bouclé: preparation of the original draft; Kuda Mbuya Héritier: formal analysis; Ependja Towaka Antoine: supervision, writing and editing.

Declaration of interests: The authors declare that they have no interests.

Funding: This research did not receive any specific funding from public, commercial or not-for-profit funding bodies.

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