



# **Availability And Utilization Of Water, Sanitation And Hygiene In Healthcare Facilities Of Gombe Metropolis, Gombe State, Nigeria**

**Ibrahim Sajo**

**Department of General Education  
College of Education and Legal studies, Nafada Gombe State  
brhmsajo@gmail.com, 08039096602**

## **ABSTRACT**

The study aims to assess the availability and utilization of water, sanitation and hygiene practices being embraced in healthcare facilities of Gombe metropolis Gombe State. The study adopted a descriptive survey design to obtained basic data about the availability and utilization of WASH services in healthcare facilities in Gombe Metropolis with a view to finding its influences on accessibility to; Water, Sanitation and Hygiene. The population of the study was 2630 health workers in public and private health facilities in Gombe metropolis. The sample of this study consists of 347 health workers (laundry unit and cleaners) of healthcare facilities in Gombe metropolis. Yamane (1964) sampling formula was used to determine the sample size of the study, while Bowley proportional allocation technique was used to allocate the sample according to the strata of the population. The instruments for data collection in the study will be a checklist and a questionnaire, the checklist will be used to obtained data on the availability and utilization of WASH services in the healthcare facilities, while the questionnaire will be used to source information about the accessibility to; water, sanitation and hygiene in the facilities. Chi – square, mean, standard deviation and t t- test will be used in the analysis of data and test of hypotheses accordingly. It is anticipated that the influence of accessibility to water, sanitation and hygiene services in healthcare facilities of Gombe metropolis will be established.

**Keywords:** hygiene practices, healthcare facilities, water, sanitation

## **INTRODUCTION**

Access to Availability and Utilization Water, Sanitation and Hygiene (WASH) service in healthcare facilities is crucial to providing quality care. Workers in health care facilities need sufficient quantities of safe water to provide health care services (UNICEF, 2016). Drinking and cooking, hand hygiene, showering and bathing, and a variety of general and specialized medical uses all require reliable supplies of safe water. Water is also essential for cleaning rooms, beds, floors, toilets, sheets and laundry. It is central to patient experiences of health care, as it enables them to remain hydrated, to clean themselves, and to reduce the risk of infections. Families and care-givers also need water to tend to patients and their own needs. Without water, a health care facility isn't a health care facility. Different health care facilities have different water requirements depending on the type of health services offered and the scale of the facility. The quantity and quality of water available, the location and accessibility of water points within the health.

Unsafe management of health care waste presents other health risks as well, exposing health care workers, waste handlers, patients, their families, and the community to preventable infections, toxic effects, and injuries (UNICEF, 2016). Unsafe disposal of needles and syringes, for example, increases risk of injury and presents opportunities for reuse. In 2010, unsafe injections were responsible for as many as

33,800 new HIV infections, 1.7 million hepatitis B infections, and 315,000 hepatitis C infections. Release of pathogens and toxic pollutants including dioxins and furans into the environment through partial incineration presents additional health risks worldwide (WHO 2012).

WASH services are essential for the delivery of basic health care. On average, healthcare associated infection affects at least 7% of hospitalized patients in high-income countries and about 15% of people in low- and middle-income countries (Allegranzi, *et al.*, 2013). Hospitals are the main facilities for the risk of infection during delivery to worry about (Raka and Mulliqi-Osmani, 2012). A major issue to be considered is that access to WASH services is not keeping pace with the increase in population across Nigeria. The WASH NORM II survey covered nearly 25,000 households and assessed more than 4,500 water facilities, more than 2,000 schools and 1,300 health facilities, 1,250 markets and motor parks, and customers of 28 state urban water utilities across the 36 states and the Federal Capital Territory (FCT). This year, two very important modules were added: water quality assessments, and household WASH financial tracking. (WASH Sector Nigeria Emergency Technical Guidance November 2016).

### **Statement Of the Problem**

The consequences of poor WASH services in health care facilities are numerous. Health care associated infections affect hundreds of millions of patients every year, with 15% of patients estimated to develop one or more infections during a hospital stay (Allegranzi 2011). The burden of infections is especially high in newborns. Sepsis and other severe infections are major killers estimated to cause 430,000 deaths annually. The risks associated with sepsis are 34 times greater in low resource settings (Benedetta, *et al.* (2013). Lack of access to water and sanitation in health care facilities may discourage women from giving birth in these facilities or cause delays in care-seeking (Velleman2014).

Healthcare facilities are often visited for various purposes particularly seeking remedy for ailments, Child delivery or get vaccinated. Yet hundreds of millions of people face an increased risk of infection by seeking care in health facilities that lack basic necessities, including water, sanitation, hygiene, health care waste management and cleaning water, sanitation, and hygiene (WASH) services. Not only does the lack of WASH services in health care facilities compromise patient safety and dignity, it also has the potential to exacerbate the spread of antimicrobial-resistant infections and undermines efforts to improve child and maternal health. Conversely, improving WASH conditions can help establish trust in health services and encourage mothers to seek prenatal care and deliver in facilities rather than at home - important elements of the strategy to reduce maternal mortality (Chenkem *et al.*, (2010). Improving WASH in health care facilities is now beginning to attract the attention of governments, donors and the international public health community. A proposed target of universal basic coverage of WASH in health care facilities by 2030 has been recommended for inclusion in post-2015 UN Sustainable Development Goals.

### **Objectives of the Study**

The main purpose of the study is to assess the extent to which water, sanitation and hygiene practices are being embraced in healthcare facilities of Gombe metropolis Gombe State so as to identify ways for improvement by the health authorities in the area. The specific objectives are as follows:

1. to assess the level of utilization of WASH services in various healthcare facilities of Gombe metropolis
2. to determine the current level of access to water, sanitation and hygiene in healthcare facilities of Gombe metropolis
3. to determine the level of impact of WASH in hygiene practices of healthcare providers in healthcare facilities of Gombe metropolis

### **REVIEW OF RELATED LITERATURE**

The relevant literature for the study will be review under the following sub – headings;

#### **Water, Sanitation and Hygiene**

Adequate water, sanitation and hygiene (WASH) are essential components of providing basic health services. The provision of WASH in health care facilities serves to prevent infections and spread of disease, protect staff and patients, and uphold the dignity of vulnerable populations including pregnant

women and the disabled. Yet, many health care facilities in low resource settings lack basic WASH services, compromising the ability to provide safe care and presenting serious health risks to those seeking treatment (Abebe, *et al.*,2017).

#### **WASH and Health in the 2030 Agenda for Sustainable Development.**

In 2015, the 193 Member States of the United Nations General Assembly unanimously adopted the 2030 Agenda for Sustainable Development, which established 17 SDGs and 169 global targets for development over the 2015–30 period. This ambitious and universal agenda applies to all countries and places an emphasis on ‘leaving no one behind’ and ensuring that gaps in services are identified and progressively eliminated. SDG aims to ‘ensure available and sustainable management of water and sanitation for all’ and includes targets for universal access to safe drinking water, sanitation and hygiene for all by 2030. The term ‘universal’ implies all settings, including households, schools, healthcare facilities, workplaces and public places, and ‘for all’ implies services that are suitable for women, men, girls and boys of all ages, including people living with disabilities. SDG also aims to ‘ensure healthy lives and promote well-being for all at all ages’ and includes a specific target to reduce the burden of disease from unsafe water, unsafe sanitation and lack of hygiene. Other targets call for reducing maternal mortality and under-five and neonatal mortality, all of which are directly impacted by WASH conditions in health care settings. Indeed, countries can only achieve universal health coverage when everyone has access to quality health care services, including health care facilities with basic WASH services. These targets are highly ambitious but also inter-related and mutually reinforcing. In March 2018, the Secretary- General of the United Nations launched a global call to action for WASH in all health care facilities, noting that health care facilities are essential tools in reducing disease, and that without basic WASH, health care facilities can instead contribute to more infections, prolonged hospital stays and preventable deaths, including of mothers and babies.

#### **Water Service in Healthcare Facilities**

Workers in health care facilities need sufficient quantities of safe water to provide health care services. Drinking and cooking, hand hygiene, showering and bathing, and a variety of general and specialized medical uses all require reliable supplies of safe water. Water is also essential for cleaning rooms, beds, floors, toilets, sheets and laundry. It is central to patient experiences of health care, as it enables them to remain hydrated, to clean themselves, and to reduce the risk of infections. Families and care-givers also need water to tend to patients and their own needs. Without water, a healthcare facility isn’t a health care facility. Different health care facilities have different water requirements

#### **Sanitation Service in Healthcare Facilities**

Safe sanitation is a human right. Sanitation services in health care facilities are essential to deliver high quality care that improves the health, welfare and dignity of patients and staff and improves health outcomes. Inadequate sanitation in health care facilities can lead to people not seeking health care when they need it, and can reduce health care professionals’ work satisfaction. Patients may have limited mobility or need adapted infrastructure to facilitate their safe and convenient use of toilets following surgery or childbirth. Faeces are the principal source of bacteria, viruses and parasites that cause diarrhoeal diseases (including cholera and shigellosis) as well as many other infectious diseases. People who are sick shed many more pathogens in their faeces than healthy people. People seeking care in health care facilities often have weakened immune systems and are particularly vulnerable to infection by faecal pathogens.

#### **Hygiene Service in Healthcare Facilities**

Health care workers are the principal target of efforts to improve hand hygiene, since they care for multiple patients and may come into contact with blood and other bodily fluids. However, visitors to health care facilities can also spread pathogens on their hands, and it is important that health care facilities provide handwashing facilities with soap and water at toilets used by patients as well as other visitors who may be tending to patients’ needs. Interventions to improve hand hygiene in health care settings focus on engaging facility leaders and frontline staff, educating health care workers, displaying reminders on posters and improving communications, monitoring practices and providing feedback, and above all

ensuring that health care workers have easy access to soap and water, and/or alcohol-based hand rub (ABHR), and know how to use them effectively.

### **Environmental Cleaning Service in Healthcare Facilities**

Environmental contamination plays a role in the transmission of health care associated infections (HCAI). Some of the pathogens frequently linked with HCAI can survive for months on surfaces such as bed rails, tables and floors. Effective environmental cleaning is a fundamental intervention for infection prevention and control (IPC) and has been shown to significantly reduce the transmission of HCAI. Environmental cleaning refers to the cleaning and disinfection (when necessary) of environmental surfaces (for example, bed rails, call buttons, chairs) and surfaces of non-critical patient care equipment (for example, IV poles, stethoscopes).

### **Types of Health care facility**

Health facilities can range from advanced training hospitals with thousands of staff who perform complex procedures to rural outpatient clinics with only one or two staff who have minimal training and resources. Different types of facilities offer different types of health services, and coverage of WASH and other basic services may differ widely by facility type. National assessments and monitoring systems do not use a consistent classification of facility types but many do record if facilities being assessed are hospitals or not. Accordingly, the JMP has produced estimates separately for hospitals and other types of facilities, classified as non-hospitals.

Primary health care may be delivered in hospitals but, in many cases, patients' first point of contact with the health system is in a smaller health care facility. A wide range of facilities apart from hospitals can offer primary care, but there is not a consistent set of terms to describe these different institutions. These smaller health care facilities may be found in rural, peri-urban or urban settings, and often provide outpatient but not inpatient care. Some of the more commonly used terms for facilities other than hospitals include:

1. Health centre, primary health centre, community health centre
2. Clinic, polyclinic
3. Health post
4. Basic health unit
5. Infirmary
6. Dispensary
7. Specialty clinic (for example, dental, mental health)
8. Physician's office
9. Mobile clinic (for example, vaccination)

## **MATERIALS AND METHOD**

This study adopted a descriptive survey design. Because it aims at assessing the relationship between variables that are dependent (Water, Sanitation and Hygiene) and independent variable (Healthcare facility) through the use of correlation coefficient. This study relates with the design to determine relationship between WASH (the dependent variables) and HCFs (the independent variables) in public and private health institutions in Gombe metropolis.

### **Area Of The STUDY**

Gombe is a capital city of Gombe state, located in the north-eastern part of Nigeria, it is situated at the latitude 10°17' 13.97" N and 11° 9' 58.45" E, longitude Gombe metropolis shares common boundary with Akko Local Government Authority in the South and West; Yamaltu-Deba to the East and Kwami to the North, Occupying an area of about 45km<sup>2</sup>. The metropolis is divided in wards and each the ward can be regarded as community, serving as the seat of admiration of Gombe State as well as the State headquarters. The area has a tropical climate, marked by dry and rainy seasons. The rainy season commences around May and ends in the middle or late October. The rainfall is characterized by a single maximum with a mean total rainfall of 1,113.3mm. The dry season starts in late October and ends in the late April (Adebayo and Tukur, 1999). Maximum temperature in Gombe can reach 38-40 degree

centigrade, around April, while minimum temperature could be as low as 18 degree centigrade between December and early January. Relative humidity in the area is about 26% in the months of January, while February is the lowest; with high relative humidity values of 58, 69, 79, 79, 77 and 66 respectively which could be recorded during the months of May to October, particularly during the months of July and August as a peak, with about 80% relative humidity (Adebayo and Tukur, 1999). Most inhabitants are civil servants, farmers, and traders.

**Ethical Consent**

Permission will be obtained from the Gombe state healthcare management board to embark on the study. The healthcare facilities staff will be adequately informed of the study to enable them participate fully. Introductory letter will be served to the facilities management.

**Population of the Study**

The population of the study consists of 2630 staff, which comprised staff of public and private healthcare facilities of Gombe metropolis.

**Table 1. Staff of public and private healthcare facilities of Gombe metropolis.**

Ward	Name of Health facility	Facility Type	Ownership (Public/Private)
Herwagana	Arewa Medical Clinic	Primary	Private
	El-Norf Medical Clinic	Primary	Private
	H/Gana Health Clinic	Primary	Public
	Sunnah Hospital Gombe	Secondary	Private
Jekadafari	Specialist Hospital Gombe	Secondary	Public
	Divine Specialist Eye Clinic	Primary	Private
	Yarma Memorial Hospital	Primary	Private
Dawaki	Gombe Town Mat Clinic	Primary	Public
	Tuberculosis/Leprosy Clinic	Primary	Public
	Doma Medical Hospital	Secondary	Private
Kumbia - Kumbia	Kumbia - Kumbia Mat. Clinic	Primary	Public
Nassarawo	Nassarawo Maternity Clinic	Primary	Public
Pantami	Pantami Health Clinic	Primary	Public
	Pantami Medical Clinic	Primary	Public
	Hamdala Specialist Clinic	Primary	Public
	Salem Medical Clinic	Primary	Public
	Shamaki	Mal. Inna Dispensary	Primary
Shamaki	Tudun Wada Health Clinic	Primary	Public
	Miyetti Medical Clinic	Primary	Private
	Musaba Medical Clinic	Primary	Private
	Tasma Medical Hospital	Primary	Private

**Sample And Sampling Techniques**

Yamane (1967) finite sampling formula was used to draw the sample of 347 respondents from the total population of the healthcare management facilities workers in Gombe metropolis, Gombe state.

**Instrument For Data Collection**

The instrument for data collection in this study is a structured questionnaire that was design and developed by the researcher. The structured questionnaire was divided into sections A, B, C, and D with section A containing the instruction concerning how the questions are to be answered, while section B to D are three sections designed and developed for the respondents based on the research questions. The questionnaire consisted of 9 items, 3 on each section, rated on Likert scale as follows:

Very High Level (VHL)                      5 points

High Level	(HL)	4 points
Moderate Level	(ML)	3 points
Low Level	(LL)	2 points
Very Low Level	(VLL)	1 point

The instrument will be subjected to face and content validity by experts in the college of medical sciences, Gombe state University, it shall also be subjected to field trial in 10 health facilities in Bauchi Metropolis to determine the reliability coefficient of the instrument. The choice of health facilities in Bauchi is because it is outside the study area and also shares similar characteristics with the healthcare facilities in the study area.

**Method Of Data Collection and Analysis**

The data for this research study will be collected by administering copies of the questionnaires to the respondents. The researcher and the help of research assistants will meet the respondents in the healthcare facilities to observe the WASH services therein and administer the questionnaires to the respondents. The data gathered from the study will be analyze using Statistical Package for Social Sciences (SPSS), Chi – square, mean, standard deviation and t- test will be used in the analysis of data and test of hypotheses accordingly. The mean for decision is 2.50 this mean that any item with 2.50 will be accepted otherwise rejected, if t – cal is less that the p – value Ho accepted else rejected.

**RESULTS AND ANALYSIS**

**Data Analysis of Research Questions**

Table 2 reveals the level of utilization of WASH services in the various healthcare facilities of Gombe Metropolis. The mean of 3.64 shows that majority of the respondents washed their hand every day to a very high level. Also mean of 4.06 shows that respondents trimmed their nails regularly at very high level. On the issues of hair dressing, the mean of 3.83 of the respondents trimmed and plaited their hairs regularly at high level. With regards to clothing, the mean of 4.14 shows very high level, as regards to face washing shows the mean of 3.80 in face washing and the mean of 4.16 shows high level bathing every day as opined by the respondents in the study area.

Table 2: Level of Utilization of WASH Services in the Various Healthcare Facilities of Gombe Metropolis

S/N	Items	N	Mean	Std. Deviation	Remark
1.	Daily hands wash	346	3.64	1.51	High Level
2.	Regularly nails trim	346	4.06	1.19	High Level
3.	Regularly hair trim	346	3.83	1.09	High Level
4.	Clean clothes worn	346	4.14	.91	High Level
5.	Daily face wash	346	3.80	.95	High Level
6.	Daily bath	346	4.16	.90	High Level
	Grand Mean		3.94	1.10	High Level

The grand mean 3.94 indicated that the level of utilization of WASH services in the various healthcare facilities of Gombe Metropolis is at high level.

Table 4.3 reveals the current level of access to water, sanitation and hygiene in healthcare facilities of Gombe Metropolis. The mean of 4.08 shows high level of accessibility to toilet facilities at health care centres in the study area. On the aspects of location of water source, the mean of 4.29 shows high level on the location of main source of water in the health care centre. As regards to level of ventilation, mean of 4.17 shows high level of ventilation improved in pit latrine in health centres. The level of the presence of flies in healthcare centres has improved high level with mean of 3.84. The level of provision for menstrual hygiene needs with mean 4.24 and the mean of 4.05 on the level of gender base on toilets block is with mean respectively.

Table 3: Current Level of Access to Water, Sanitation and Hygiene in Healthcare Facilities of Gombe Metropolis

S/N	Items	N	Mean	Std. Deviation	Remark
1.	Toilets facilities accessible at HCF	346	4.08	.94	High Level
2.	Level of water source	346	4.29	.89	High Level
3.	Ventilated improved pit latrines	346	4.17	.64	High Level
4.	Presence of flies in improved toilets	346	3.84	.87	High Level
5.	Provision for menstrual hygiene needs	346	4.24	.90	High Level
6.	Gender-based separation of toilet blocks	346	4.05	.87	High Level
	Grand Mean		4.11	0.85	High Level

Table 4 revealed the level of impact of WASH in hygiene practice of healthcare providers in healthcare facilities in Gombe Metropolis. The study revealed that the mean of 4.15 shows the level of functioning of hand hygiene stations were available at all points of care. The mean of 4.20 shows high level of hand hygiene promotion materials clearly visible and understandable at key places. The separation of toilets or latrines for staff and patient showed the mean 3.86. As regard to drinking water, the mean 4.21 showed high level of safe drinking water in the health care centres. The quantity of water availability and sufficiency for all uses in the study area shows very and high level with mean 4.08. Also hand hygiene facility available such as soap and water shows moderate level with mean 3.43 in the respective health centres in Gombe metropolis. However, the grand mean of 3.99 indicated that the Level of impact of WASH in hygiene practices of healthcare providers in Healthcare Facilities of Gombe Metropolis was at high level.

Table 4: The Level of Impact of WASH in Hygiene Practices of Healthcare Providers in Healthcare Facilities of Gombe Metropolis

S/N	Items	N	Mean	Std. Deviation	Remark
1.	Availability of hand hygiene stations	346	4.15	.74	High Level
2.	Visible and understandable hand hygiene materials	346	4.20	.89	High Level
3.	Separation of toilets and latrines for staff and patient	346	3.86	.904	High Level
4.	Portable water for drinking	346	4.21	.83	High Level
5.	Availability and adequacy of water	346	4.08	.92	High Level
6.	Availability of water and soap in addition to hand hygiene facilities	346	3.43	1.23	Moderately High Level
	Grand Mean		3.99	0.92	High Level

## DISCUSSION

The findings from this study revealed that there is proper utilization of WASH services in the various healthcare facilities of Gombe metropolis. This is in line with the view of Adams (2008), who reported that healthcare facilities are recognized by the World Health Organization as environments with a high prevalence of infectious agents where patients, staff, caregivers and neighbors of healthcare facilities are exposed to unacceptable risks of infection if the environmental health is inadequate. Adequate WASH services are essential for the delivery of basic health care. On average, healthcare associated infection affects at an estimate of 7% of hospitalized patients in high-income countries and about 15% of people in low- and middle-income countries (Allegranzi, 2011).

According to WHO (2013), 36% of the world's population – 2.5 billion people – lack improved sanitation facilities, and 768 million people still use unsafe drinking water sources. Inadequate access to safe water and sanitation services, coupled with poor hygiene practices which, kill and sicken thousands of children every day, and lead to impoverishment and diminished opportunities for thousands more.

The findings from the study revealed that there was access to water, sanitation and hygiene in healthcare facilities of Gombe metropolis. The findings showed that water, sanitation and hygiene (WASH) services include the availability and quality of water, the presence of sanitation facilities, and the availability of soap and water for hand washing. WASH services in healthcare facilities are preconditions for providing health care of good quality (Abrampah, *et al.*, 2017). Yet in low-income countries, these services are not provided in many healthcare facilities, compromising their ability to provide quality care and serious health risks for those who come to the clinic to seek treatment (UNICEF, 2016). The shortage of these services in healthcare facilities has many consequences (Allegranzi, 2011).

The findings also revealed that access to WASH services had significant impact in the hygiene practices of healthcare providers in healthcare facilities of Gombe metropolis. According to UNICEF (2016), the presence of sanitation facilities, and the availability of soap and water for hand washing minimize the risk of infections. Fewtrell, *et al.*, (2005) further revealed that many households still lack safe drinking water. They use unsafe drinking water because either they are not yet reached by an adequate water supply or cannot afford the connection fee or tariff. Having a water source or supply point near the home does not necessarily mean that the water is safe to drink. It may be that the water is not treated at all or is not treated well (e.g. interrupted or irregular chlorination) or that the source is not bacteriologically safe due to groundwater contamination. Arthur, (2012) stated that effective hand hygiene in health care facilities has been the cornerstone of infection prevention and control (IPC) guidelines and practices, and is today considered the primary measure for preventing health care associated infections and the spread of antimicrobial resistance. Health care workers are the principal target of efforts to improve hand hygiene, since they care for multiple patients and may come into contact with blood and other bodily fluids. However, visitors to health care facilities can also spread pathogens on their hands, and it is important that health care facilities provide hand washing facilities with soap and water at toilets used by patients as well as other visitors who may be tending to patients' needs.

## CONCLUSIONS

Based on the objectives of the study, it was concluded that utilization of WASH services in healthcare facilities of Gombe metropolis is at high level. Also, the current level of access to WASH is at high level.

It was concluded that majority of the healthcare facilities had access to improved water sources and sanitation facilities but few had functional hygiene facilities. Majority of the HCFs had a limited WASH service. The WASH service significantly differed across the different levels and ownership of HCF.

It was also concluded that the level of impact of WASH in hygiene practices of healthcare providers in healthcare facilities of Gombe metropolis is at high level. Drinking and cooking, hand hygiene, showering and bathing, and a variety of general and specialized medical uses all require reliable supplies of safe water. Water is also essential for cleaning rooms, beds, floors, toilets, sheets and laundry. It is central to patient experiences of health care, as it enables them to remain hydrated, to clean themselves, and to reduce the risk of infections.



## RECOMMENDATIONS

Based on the result obtained, the following actions are strongly recommended as the way forward for lessening the sanitation situation in the study area

1. It is recommended that a study comprising the determination of water quality at source, when in transit and in storage be undertaken to determine where exactly contamination occurs and factors responsible for the contamination. Furthermore, it is suggested that a detailed study of simple and cheaper water treatments methods, especially, the potential of using solar disinfection to treat water be undertaken.
2. The District Assembly and NGOs operating in the area must collaborate and give more attention to educating the people of the community regarding the need to keep their environment clean and cultivate good sanitation and hygiene practices. The messages should be planned based on the community's characteristics and appreciation of health, sanitation and hygiene. Formal education must also be improved in the area to increase educational status so as to achieve improvement in health behavior. The programme must aim at young heads of households, households with large family size and households whose heads are Christians and Moslems.
3. The District Assembly, Community Water and Sanitation Agencies and NGOs should all help the communities to build household toilet facilities and institute better mechanisms of refuse disposal systems at reduced subsidies. This will reduce the risk of contamination of water in the communities. When this is supported by education to change behavior towards the proper and consistent use of these facilities, the incidence of public health diseases may reduce.

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