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Evaluation of Water Supply, Sanitation and Hygiene Facilities in Ekosodin Community of Ovia North-East LGA, Benin City, Edo State, Nigeria

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Abstract

Globally, poor access to improved water and sanitation remains a major contributing factor to high morbidity and mortality rates among the populace. Thus, access to water supply and sanitation is essential for sustainable development. In this study, a cross sectional descriptive survey method was adopted. Data were collected via questionnaires and observational checklist which were designed to extract information on Water, Sanitation and Hygiene (WASH). The data were then, analysed using Statistical Package for the Social Sciences (SPSS Version 26.0). Four hundred and twenty (420) semi-structured questionnaires were administered to households in Ekosodin Community. Three hundred and ninety seven (397) copies were retrieved and thus analysed. Results indicated that 374 (94.2%) households reported having access to water and that borehole was their main source of water supply. Over 130 (32.7%) household reported not treating their water before use. Types of toilet facilities frequently use by households were water closet system (flush toilet) 243 (61.2%) and pit latrine 85 (21.4%). However, households practice open defecation at low levels 6 (1.5%). Solid waste disposal methods mainly adopted by households are: open dumpsite 224 (56.4%) and burning 150 (37.8%). Majority of the households cleaned their water storage containers every six months or annually. Results further revealed that most of the respondents 382 (96.2%) practice hand washing after toilet 82 (20.65%), before cooking 79 (19.89%), before eating 55 (13.85%) and every other time 94 (23.6%) excluding the aforementioned, after cooking, after eating and after handling children's faeces. It was observed that 243 (57.9%) houses have no drainage system, 237 (56.4%) have no waste storage facility, 312 (74.3%) have refuse dumpsite and 354 (84.3%) did not have odour of excreta in the surrounding. It was deduced from this study that households have poor access to adequate WASH facilities/services. Hence, it is recommended that water supply infrastructures, sanitation infrastructures and promotion of hygiene should be enhanced in order to improve access to adequate WASH facilities/services in the community.

Keywords: Facilities, Hygiene, Safe, Sanitation, Sustainable, Water supply

1.0 INTRODUCTION

Access to water supply and sanitation is essential for sustainable development. Although world's population has access to water, however the water that is available in most places is often not safe, sufficiently affordable or available in adequate quantities to meet basic health needs [1]. In 2010, the United Nations General Assembly declared safe drinking water and sanitation as a human right that is crucial for healthy living. Hence, it is considered to be a human right, not a privilege, for every man, woman and child to have access to water supply and sanitation. It is common for many international organisations to use access to safe drinking water and hygienic sanitation facilities as a measure for progress in the fight against poverty, disease and death. Therefore, the General Assembly explicitly called for actions leading to the provision of safe, clean, accessible and affordable drinking water and sanitation for all.

Although progress has been made in the last decade to provide safe drinking water and sanitation to people throughout the world, but there are still billions of people that lack access to these services. According to WHO and UNICEF [2], 91% of the world's population used drinking water from improved sources (58% from a piped connection in their dwelling, plot or yard and 33% from other improved drinking water sources) leaving 663 million people lacking access to an improved source of water. In addition, only 68% of the world's population used improved sanitation facilities with Sub-Saharan Africa and Southern Asia having only 30% and 47%

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respectively common leaving about 2.4 billion people without improved sanitation and about 13% of the world's population live without any form of sanitation and practices open defecation. People who are deprived of improved water and sanitation services do not actually get more opportunities to realise their potentials in the professional arena [3, 4]. It has been reported that unimproved drinking water and sanitation is among the major killer of children globally [3, 4]. In most countries (particularly developing countries) approximately 10,000 people die every day from diseases related to unsafe drinking water and poor sanitation and more people suffer from a range of debilitating illnesses [4, 5]. Safe, clean, affordable and adequate water supply is the most vital prerequisite for the sustenance and maintenance of healthy living. Improvement in water supply and sanitation brings about corresponding improvement in the health of the public [6-9].

Contaminated water and poor sanitation are strongly linked to transmission of diseases such as cholera, diarrhoea, dysentery, hepatitis A, malaria, typhoid and polio [9-11]. Individuals are exposed to preventable health risk due to absent, inadequate or inappropriately managed water and sanitation. Globally, 15% of admitted patients in the hospital develop an infection during staying and a large proportion of this percentage is found in developing countries (particularly in low-income countries).It has been estimated that about 829,000 people of which 297,000 are children under 5 years die every year from diarrhoea due to unsafe drinking water, sanitation and hand hygiene [12]. Yet, diarrhoea is largely preventable and the death among children could be avoided every year if these risk factors were addressed. Unavailability of water may impede hand washing practices thereby adding to the likelihood of diarrhoea and other diseases [10]. According to WHO [12], over 220 million people required preventive treatment for schistosomiasis which is an acute and chronic disease caused by parasitic worms contracted through exposure to infested water and poor sanitation. Most notably, large percentage of this population is attributed to Sub-Sahara Africa including Nigeria.

In Nigeria, poor access to improved water and sanitation remains a major contributing factor to high morbidity and mortality rates among children under 5 years [13]. The use of contaminated drinking water and poor sanitary conditions enhanced vulnerability to water borne diseases including diarrhoea which leads to the death of more than 70,000 children under the ages of 5 years annually [13]. About 70% of diarrhoeal and enteric diseases burden is associated with poor access to adequate water, sanitation and hygiene (WASH) and is disproportionately borne by poorer children. Children absenteeism in school and malnutrition are as a result of frequent episodes of WASH related ill-health [13]. It is noteworthy, that only 26.5% of Nigerian's population use improved drinking water sources and sanitation facilities [13]. Also, 23.5 % of the population practices open defecation. It has been reported that about 62% and 72% of Edo State's population (representing 1,346,649 persons and 2,009,566 persons) lack access to safe drinking water and sanitation [14]. Clearly, Edo state is facing a great challenge towards the accessibility of safe drinking water and sanitation. Hence, there is need for continuous assessment of water supply and sanitation facilities in the state for more accurate data in order to provide sustainable water supply and sanitation facilities.

Access to water supply and sanitation promote particularly women to more productive activities, and establishment and maintenance of associated employment to water supply and sanitation services. Indeed, access to water supply and sanitation will help drive progress towards the sustainable Development Goals (SDGs) concerned with poverty, work, economic growth and gender equality. The burden of collecting water and caring for sick relatives due to lack of water supply and sanitation falls mainly on women and girls and as a result, hinders their participation in education. For adolescent girls, the presence of a safe water supply and clean, functioning, private toilet facilities can enhance girls' education [15]. In addition women and girls would have the facilities and knowledge to be able to manage their menstrual cycles in safety and dignity. Girls' education strengthens economies and reduces inequality, it contribute to more stable, resilient societies that give all individuals (including boys and men) the opportunity to fulfil their potentials. Also access to safe water supply and sanitation provide the potential to save the lives of people (who currently die from lack of water supply and sanitation related diseases), reduce child malnourishment and alleviate physical and mental under development. Further, it will help drive progress towards achieving sustainable Development Goal 6 by 2030. Achieving sustainable Development Goal 6 by 2030 requires extra ordinary efforts. Based on this, there is need for more accurate data on WASH in order to provide equitable access to water, sanitation and hygiene services. As the international authority on public health, WHO is leading global efforts to prevent transmission of water borne diseases and as such are called upon to provide support to improve water, sanitation and hygiene. In line with this, there is a growing attention towards WASH in most part of the world (both in urban and rural areas). Although studies have assessed WASH in Nigeria [9, 11, 14, 16], however there are limited studies on WASH in Edo state. In Edo state, study modelled water-sanitation

level relationship [14] based on some selected areas, leaving Ekosodin community with little or no information on water supply and sanitation. Therefore, this study aimed to assess the water supply, sanitation and hygiene facilities in Ekosodin Community of Ovia North-East Local Government Area (LGA), Benin City, Edo State.

This study will provide additional information on water supply, sanitation and hygiene in Edo state which will assist the government to provide sustainable water supply, sanitation and hygiene services in the state.

2.0 MATERIALS AND METHODS

2.1 Study Area

Ekosodin community is situated east of Isihor in Ovia North-East Local Government Area (LGA) of Edo State (see Figure 1). Ovia North-East LGA has its headquarters in Okada town; it has an area of 2,301 square kilometres [17]. It is located along the longitude 5^{o} 45^{1} and 6^{o} 15^{1} east and latitude 5^{o} 15^{1} and 6^{o} 45^{1} north of the central province of Edo state. The main river, Ovia River flows through all the communities in the LGA [17]. Ovia North East is situated in Benin City (see Figure 2) and Benin City is located within the rainforest zone of Nigeria with mean annual rainfall of between 1500mm to 2500mm and the mean monthly temperature varying from 25°C to 28°C [18]. The Benin Region is underlain by sedimentary formation of the South Sedimentary Basin [19] and it constitute part of the Benin formation which is made up of over 90% massive, porous, coarse sand with thick clay/shale interbeds having high groundwater retention capacity [20]. The geology is generally marked by top reddish earth, composed of ferruginized or literalized clay sand [19]. Benin City has two distinct seasons. These are the wet (rainy) season and the dry season. The rainy season occurs between the months of March and October with a short break in August. The dry season on the other hand lasts from November to February with dry harmattan winds between December and February, but with the effect of global warming and climate change, rains have been observed to fall irregularly almost in every month of the year with double peak periods in July and September. Ekosodin community has an estimated population of 7000 [21] as estimated by 2006 census by National Population Commission [22]. This population was projected by 543.2% using geometric method to year 2022 to be 45,000 people.

2.2 Data Collection and Analysis

The Data used for this study were collected via questionnaires using a cross sectional descriptive survey method and an observational checklist. A multi-stage sampling technique was used to constructively administer a total of 420 technically designed, pre-tested, semi-structured questionnaires to households in Ekosodin community.

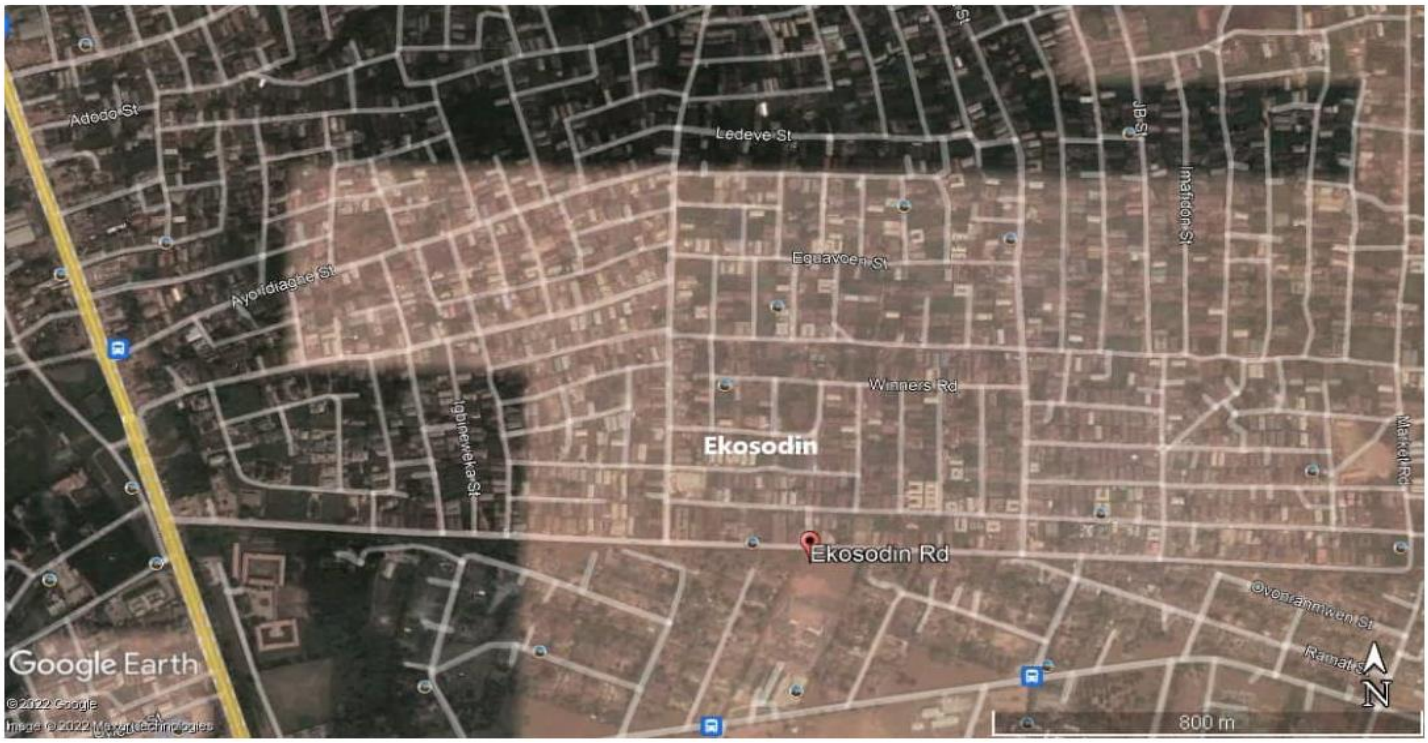

Figure 1: Map of Ekosodin in Ovia-North East LGA, Benin City, Edo State (Source [23])

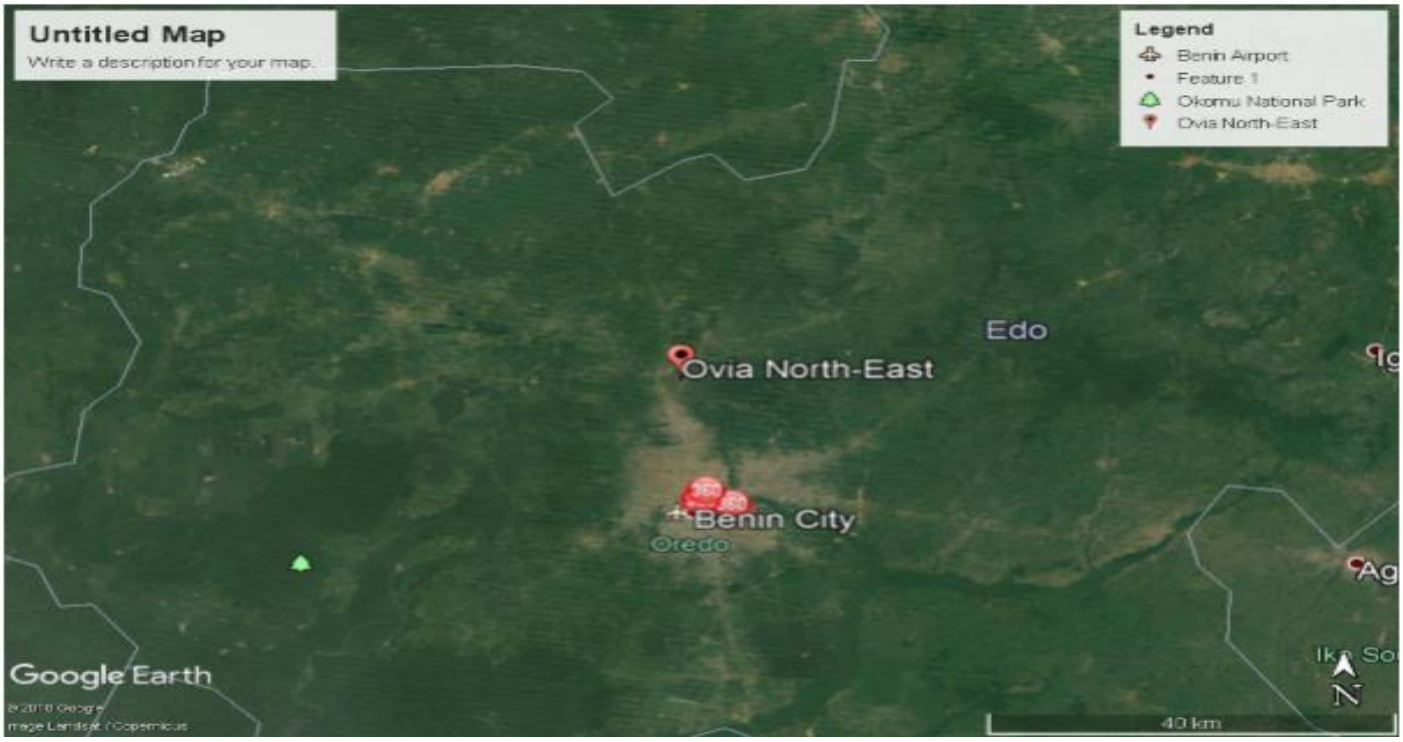

Figure 2: Location of Ovia-North East LGA in Benin City, Edo State, Nigeria (Source [23])

An observational checklist was used to conduct an assessment of the availability, maintenance and use of WASH facilities in the study area About 15% of the questionnaire was ascertained for validity using Face Validity Method and reliability (using Cronbach's Alpha Statistics). Cronbach's alpha is a measure used to assess the reliability, or internal consistency, of a set of scale or test items and it normally ranges between 0 and 1 [24]. The questionnaires were structured to captured Socio-demographic, Water Supply, Sanitation and Hygiene Characteristics. Three hundred and ninety seven (397) completed copies of questionnaires were retrieved (estimated sample size). Hence, three hundred and ninety seven (397) copies of questionnaires were analysed. The retrieved questionnaires and Cronbach's alpha reliability were analysed using Statistical Package for the Social Sciences (SPSS, version 26.0, 2018) and results were presented using descriptive tables. The sample size used for the study was determined using Yamane's formula [25]:

$$n = \frac{N}{1 + N(e^2)} \quad (1)$$

Where: n = Sample size, N = Population under study
e = Margin error=0.05

3.0 RESULTS AND DISCUSSIONS

The results obtained from the study are presented in Table 1 to 5. Table 1 shows Cronbach's Alpha for reliability of questionnaire, Table 2 shows the socio-demographic characteristics of respondents, Table 3 shows source of water supply, water storage and water treatment for households, Table 4 indicates toilet facilities/hand washing practice/solid waste management, and Table 5 indicates assessment of water supply, sanitation and hygiene facilities in household.

From Table 1, the statistics of more than 70% revealed by the Cronbach's Alpha Statistics suggested that the questions in the questionnaire are all similar and relevant to the subject matter of the survey. Hence, it implies a very good questionnaire. Of the 420 questionnaires administered to households, 397 were retrieved (estimated sample size) for analysis giving a response rate of 100%.

Table 1: Cronbach's Alpha for Reliability of Questionnaire

Cronbach's Alpha	No. of Items
0.716	23

Table 2: Socio-demographic Characteristics of the Respondents (n=397)

Variables	Number of respondents	Percentage
Sex		
Male	271	68.3
Female	126	31.7
Total	397	100
Age		
18 – 25	134	33.8
26 – 34	121	30.5
35 – 44	89	22.4
45 and above	53	13.4
Total	397	100
Marital status		
Single	168	42.3
Married	193	48.6
Divorce	8	2.0
Widow/widower	28	7.1
Total	397	100
Type of household		
Family	216	54.4
Non-Family	181	45.6
Total	397	100
Household head		
Male Head	322	81.1
Female Head	75	18.9
Total	397	100
Household Size		
Less than 5	148	37.3
Between 5 and 15	162	40.8
Above 15	87	21.9
Total	397	100
Educational status		
No formal education	33	8.3
Primary	12	3.0
Secondary	65	16.4
Tertiary	268	67.5
Adult education	19	4.8
Total	397	100
Occupational Status		
Civil servant/public workers	52	13.1
Private workers	40	10.1
Self employed	94	23.7
Unemployed	140	35.3
Farmer	20	5.0
Business/trader	51	12.8
Total	397	100

Table 2 revealed that majority of the respondents 271 (68.3%) were male, 134 (33.81%) were aged between 18-25years, 193 (48.6%) were married, 216 (54.4%) were family household with 322 (81.1%) male household heads and 162 (40.8%) household size of between 5 and 15, 268 had tertiary education and 140 (35.3%) were unemployed.

Table 3: Sources of` Water Supply, Water Storage and Water Treatment for Households

Variables	Number of respondents	Percentage
Have access to potable water		
Have access	374	94.2
Do not have access	23	5.8
Total	397	100
Source of water supply		
Public stand pipe	60	15.1
Borehole	280	70.5
Protected well and spring	9	2.3
Rainwater	38	9.6
Tanker	6	1.5
Others	4	1.0
Total	397	100
Distance of water source (public stand pipe, borehole, protected well and spring) from premises		
1 – 10m	267	67.3
11 – 20m	94	23.7
Above 20m	36	9.1
Total	397	100
Method of water storage used in household		
Plastic container (Gee Pee Tank, Drum, Bucket, etc.)		
Metal container (tank , drum, bucket, etc.)	270	68.0
Clay pot		
Reservoir well	37	9.3
Others	7	1.8
Total	79	19.9
	4	1.0
	397	100
Frequency of cleaning water storage container		
Do not clean at all		
Every week	33	8.3
Every two weeks	109	27.5
Every three weeks	94	23.7
Other times (six months or annually)	14	3.5
Total	147	37.0
	397	100
Method of water treatment		
Coagulation (use of alum)	56	14.1
Filtration	45	11.3
Sedimentation	9	2.3
Chlorination	87	21.9
Boiling	52	13.1
No treatment method	130	32.7
Others	18	4.5
Total	397	100

From Table 3, results revealed that 374 (94.2%) respondents have access to portable water from borehole been their major source of water supply as identified by 280 (70.5%) respondents. This clearly confirms the report by WHO [26] that large number (about 75%) of urban population in Nigeria is served with portable water supply. In terms of distance of water source (public stand pipe, borehole, protected well and spring) from premises,

majority of the respondents 267 (67.3%) indicated that the distance from their premises to water source covers the range between 1-10m. Also, 270(68%) respondents reported that they store water in plastic containers, 147 (37%) respondents indicated that they clean their water storage container every six months or annually. This indicates poor hygiene practice among households. Cleaning water storage container is paramount to avoid water contamination which in turn prevents the transmission of diseases. Thus, water storage containers should be cleaned on a regular basis [27]. Although 130 (32.7%) respondents claimed that they do not treat water before usage, but 87 (21.9%) respondents indicated that they use chlorination method to treat their water for household uses. This result is in agreement with that of [11] and [28] where majority of the households surveyed did not treat their water before use. It is deduced from this result that, although majority of the respondents have access to water from boreholes, but they do not subject this water to treatment before usage. This may be attributed to lack of water treatment plant in Ekosodin Community which might be linked to the fact that the populace (respondents) may have already considered the source of water safe for drinking (e.g. borehole with submersible water pump) [29].

However, chlorination was the most adopted method of water treatment in household. This method is the most popular method of water treatment in urban areas due to easy access of water treatment chemicals. Although groundwater may contain low level of impurities and as such requires less or no treatment [30], however increased population, urbanization and industrialization have been attributed to increased anthropogenic activities which have been identified as a major source of pollution of water bodies [31]. It has been shown that anthropogenic activities in all sectors impact and alter the natural water cycle and subsequent groundwater quality. These alterations can largely affect the environment and human health [32]. Hence, there is need for a water treatment plant in Ekosodin community.

Table 4: Toilet Facilities/ Hand washing Practice/ Solid Waste Management

Variables	Number of respondents	Percentage
Present of toilet facilities		
Yes	383	96.5
No	14	3.5
Total	397	100
If NO, alternative place of defecation for households without toilet facilities		
Bush	6	1.5
Neighbour's latrine/ water closet	3	0.8
Polythene bag	1	0.3
Prefer not to say	4	1.0
Missing system	383	96.5
Total	397	100
If YES, type of toilet facility used in Household		
Pit latrine		
Swat flush latrine	85	21.4
Water closet system	53	13.3
Bucket	243	61.2
Missing system	2	0.5
Total	14	3.5
	397	100
Number Of Toilet Facilities In Household		
Below 3		
3 and above	188	47.4
Missing system	206	51.9
Total	3	0.8
	397	100

Variables	Number of respondents	Percentage
Existence of and washing practice among household		
Available		
Not available	382	96.2
Total	15	3.8
	397	100
Period when hand washing is usually practice		
Before cooking		
After cooking	79	19.89
Before eating	19	4.78
After eating	55	13.85
After going to toilet	8	2.01
After handling children's faeces	82	20.65
After daily activities	7	1.76
Every other time	53	13.35
Total	94	23.67
	397	100
Method of hand washing practice		
Water only	86	21.7
Water and soap or detergent	300	75.6
Hand sanitizer	11	2.8
Total	397	100
Method of solid waste disposal among household		
Open dumpsite		
Burning	224	56.4
Throwing	150	37.8
Others	19	4.8
Total	4	1.0
	397	100
Regular/ periodic disposal of solid waste		
Yes		
No	392	98.7
Total	5	1.3
	397	100

From Table 4, results showed that majority of the respondents 383 (96.5%) have toilet facilities. Water closet system was commonly reported among respondents 243 (61.2%), followed by pit latrine 85 (21.4%). This result is in contrast with that of [11] and [16] who reported that pit latrine and pour flush toilet were mostly used in household. This may be influenced by the predominant use of pit latrine and pour flush toilet in rural, semi-urban and urban areas due to their low cost of construction and maintenance. About 206 (51.9%) respondents indicated that they have more than 3 toilets in their houses while 188 (47.4%) have less than 3 toilets in their houses. Of the 14 (3.5%) respondents who indicated that they do not have toilet facilities in their houses, bush 6 (1.5%) was indicated as the major alternative place of defecation for households. This implies that households practice open defecation at low level. Open defecation is a leading cause of diarrheal death, the global death toll which stands at around 6,000 a day comprises mostly of young children [33].Thus, open defecation should be discouraged.

Table 4 also revealed that majority of the respondents 382 (96.2%) practice hand washing after toilet 82 (20.65%), before cooking 79 (19.89%), before eating 55 (13.85%) and at every other time 94 (23.67%) excluding the aforementioned, after cooking, after eating, and after handling children's faeces. This may be influence by households' awareness of good hygiene practices and roles in reducing the spread of diseases. This finding contradicts that of [11] and [16] where hand washing was mainly practice after eating. It may be that households in Ekosodin community lack a good awareness of hand washing practice at critical times. The dominant method of hand washing practise as indicated by the respondents was with water and soap or detergent 300 (75.6%) while

86 (21.7%) indicated that they wash their hands with water only and 11 (2.8%) indicated that they wash their hands with sanitizers. This is an indication that households have a good awareness of proper hand washing practice. The finding contradicts with that of [11, 16, 29] where hand washing practice among households was poorly reported. Regular, appropriate hand washing is one of the best ways of preventing the spread of infectious diseases and can save millions of lives annually [34]. According to Zwane and Kremer [35], hand washing with water and soap is one of the most effective measures against infectious diseases which can reduce the incidence and prevalence of these diseases [36, 37]. Hand washing with water mechanically removes pathogenic agents and thus reduces the number of microbes on the hand in most situations [37, 38].

Further, it was observed from the results (Table 4) that majority of the respondents 392 (98.7%) dispose their waste regularly at open dumpsite 224 (56.4%), by burning 150 (37.8%) and by throwing into the bush 19 (4. 8%). This result is in consonance with the findings from previous studies where it was reported that majority of the households dispose their waste at open dumpsite [11, 39]. The common use of open dumpsites in developing countries due to low budget for waste disposal and non-availability of trained manpower [40] may account for such practise. Open dumping of waste is an inappropriate and uncontrolled waste disposal method that poses various threats to public health and adversely affects the environment [41, 42]. Thus, it is imperative for households to adopt best practices for waste management.

Table 5: Assessment of Water Supply, Sanitation and Hygiene Facilities in Households (n = 420)

Type of housing	No of respondents	Percentage
Mud	77	18.3
Mud plastered with cement	92	21.9
Block	237	56.4
Wooden made	14	3.3
Total	420	100
Presence of drainage system		
Available	177	42.1
Not available	243	57.9
Total	420	100
Sanitary condition of drainage		
Sanitary	119	28.3
Unsanitary	301	71.7
Total	420	100
Availability of waste storage facility		
Available	183	43.6
Not available	237	56.4
Total	420	100
Sanitary condition of waste storage facility		
Sanitary	157	37.4
Unsanitary	263	62.6
Total	420	100
Type of toilet facility available		
Pit latrine with cover	50	11.9
Pit latrine without cover	35	8.3
Swat flush	54	12.9
Water closet system	273	65.0
No toilet	8	1.9
Total	420	100
Sanitary condition of toilet facility		
Sanitary	253	60.2
Unsanitary	167	39.8
Total	420	100
Location of bathing facility		
Outside the house	79	18.8

Type of housing	No of respondents	Percentage
Inside the house	341	81.2
Total	420	100
Sanitary condition of bathing facility		
Sanitary	241	57.4
Unsanitary	179	42.6
Total	420	100
Availability of water supply		
Available	279	66.4
Not available	141	33.6
Total	420	100
Status of water source		
Improved	278	66.2
Unimproved	142	33.8
Total	420	100
Present of refuse dumpsite		
Present	312	74.3
Absent	108	25.7
Total	420	100
Odour of excreta in the surrounding		
Present	66	15.7
Absent	354	84.3
Total	420	100

Results from assessment of water supply, sanitation and hygiene facilities in households as presented in Table 5 shows that of 420 household surveyed, 237 (56.46%) houses were majorly constructed with blocks, 243 (57.9%) houses have no drainage system, 237 (56.4%) houses have no waste storage facility, 273 (65%) houses mostly have water closet system (flush toilet), 341 (81.2%) houses have bathroom inside, 278 (66.2%) houses have access to improved water source, 312 (74.3%) houses have refuse dumpsite and 354 (84.3%) houses did not have odour of excreta in the surrounding. These results indicated that households have poor access to adequate WASH facilities/services. Poor WASH increased vulnerability to water-borne diseases, including diarrhoea which have been reported to leads to deaths of more than 70, 000 children under five years annually [13]. Drainage systems are important key in urban life, absence of which can lead to the formation of stagnant pools that provide breeding sites for disease vectors or indiscriminate disposal of household wastewater probably contained pathogens that can become groundwater pollution sources and or flooding that damage water supply infrastructures and domestic water source contamination. Lack of effective waste disposal can contaminate ecosystems and contribute to disease pandemics. Improved access to WASH facilities/ services can reduce the prevalence of diseases and contribute to a safe and healthy environment and such should be considered in Ekosodin community.

4.0 CONCLUSION AND RECOMMENDATION

The study found that Ekosodin community have poor access to adequate WASH facilities/services, especially those related to water treatment, toilet and waste management. Poor hygiene practice was observed among households; poor maintenance of water storage containers and hand washing practice at indiscriminate times. Hence, a community-based intervention program needs to be carried out to educate the populace of Ekosodin on maintenance of water storage containers and hand washing practices with emphasis on hand washing practices at critical times. Subsequently, increase in access to water supply infrastructures, sanitation infrastructures and promotion of hygiene will help improve access to adequate WASH facilities/services in the community. This will help to drive progress towards sustainable development goals' (SDGs) concerning water and sanitation (SDG 6).

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