



Assessment of Sanitation and Water Supply Coverage in a Rural Community of Kogi State, Nigeria

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Authors' contributions

This work was a collaborative work of all authors. Author MIA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MAA and RED managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

In order to assess the sanitation and water supply coverage in a rural community of Kogi State, Nigeria as a knowledge base for the actualization of the Sustainable Development Goals 6.1 and 6.2, a cross-sectional study was carried out amongst 325 household heads in Oforachi community using the quantitative method of data collection. The Field survey was carried out between October and December, 2017. All households who gave consent to participate in the study were included while those who declined consent were excluded. The results were presented using descriptive statistics (frequencies, percentages, means and standard deviations) while, student's t-test was used to assess whether the household's choice of water source is connected to the nearness of the source to them or not. This was done at 95% Confidence Level using STATA/SE 13.1 Statistical Software. The results showed that 34.77% of the households had improved sanitation facilities,

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17.23% had unimproved facilities while 48 percent defecate in the open fields and bushes. More so, only 43.74% of respondents used water from the central boreholes while, the remaining 56.26% drink water from the River. The *P*-value ($P = .87$) and the 95% confidence interval (-0.0826748 to 0.0703671) obtained suggest that a relationship exist between the closest water source to the households and their choice. The study recommends that Community-Led Total Sanitation (CLTS) be triggered within the community to reduce the open defecation extent while efforts should be made by stakeholders to increase the availability of safe water supply.

Keywords: CLTS; Oforachi; rural water supply; sanitation; SDGs.

1. INTRODUCTION

There is a consensus of opinions that good sanitation and clean water are basic human rights yet they remain beyond the reach of many rural communities in Sub-Saharan Africa [1]. The Sustainable Development Goals (SDGs) 6.1 and 6.2 are unambiguous in the call to ensure availability and sustainable management of water and sanitation for all by 2030 [2] yet the attainment of this goal still remains a major challenge for sub-Saharan Africa [3,4].

While 6.6 billion people or 91% of the global population was reported to have access to improved water supply in 2015, the access in Sub-Saharan Africa still stood at 68% only ahead of Oceania leaving about 32% without access to improved water supply [5]. The report on sanitation is even worse as only 30% of Sub-Saharan Africa has access to improved sanitation facilities leaving about 70% without access [5]. As a result of the limited access to sanitation facilities, people in rural communities resort to indiscriminate open defecation which has the tendency of contaminating their surface water sources [6,7].

With 2030 drawing very close, the attainment of these targets will require accurate unbiased information on the current sanitation coverage, the extent of open defecation within the rural communities as well as the quantity, quality and reliability of the existing sources of rural water supply [8].

This study was therefore carried out to assess the rural water supply and sanitation coverage within Oforachi Community as a base for the attainment of the SDGs 6.1 and 6.2.

2. MATERIALS AND METHODS

2.1 Study Area

This study was conducted at Oforachi Community in Igalamela/Odolu Local

Government Area of Kogi State, Nigeria covering Oforachi Ward I and II (Fig. 1). It lies between latitude 7°06' N and 7°09' N and longitude 6°49' E and 6°57' E. The land within the study area is predominantly used for agriculture. The community is made up of nine (9) human settlements [9].

2.2 Study Design

This study was a cross-sectional study conducted among 325 household heads in Oforachi Community between September and October 2016 using quantitative methods of data collection.

2.3 Inclusion and Exclusion Criteria

The study population included all household heads or the representatives who have been resident within the community for a minimum of ten years and consented to participate in the study, a household being a group of people living under the same roof and eat from the same pot. All household heads or representative who declined consent and scattered houses within the suburbs such as 'Fulani settlements' were excluded from the study.

2.4 Sample Size Determination and Sampling Technique

The sample size was estimated using sample size estimator developed by The Research Advisors [10] for different Population sizes and different levels of confidence based on the method (Eq. 1) of Krejcie and Morgan [11].

$$n = \frac{X^2 NP(1 - P)}{d^2(N - 1) + X^2 P(1 - P)} \quad (1)$$

Where,

n = Sample Size
 X^2 = The table value of chi-square for 1 degree of freedom at the desired confidence level.

- N = The population size
- P = The population proportion
- d = The degree of accuracy expressed as a proportion

A sample size of 320 was estimated at 99% level of confidence and 5% degree of accuracy from the total 616 households in the community. This was rounded up to 325 for easy proportional distribution within the settlements that comprise the community.

A multi-stage sampling technique was used in this study. Igalamela/Odolu LGA was first purposively selected out of 21 LGAs in Kogi state being the LGA with the longest history of flooding. This was followed by the selection of Oforachi Wards I and II (out of 10 political wards in the LGA) being the two wards that makeup

Oforachi Community on the basis of its accessibility and organisation relative to a few other communities which are quite dispersed, scattered and difficult to access. Finally, 325 households were randomly but proportionately selected from the selected ward. Household listing and enumeration was done to a total of 222, 62, 12, 99, 148, 12, 12 and 12 respectively for Oforachi, Okobu, Caterpillar, Atanegoma, Agwoko, Ojokuta, Ojoyibo, Ojuwo and Camp out of which 116, 32, 7, 20, 52, 77, 7, 7 and 7 were respectively selected. A consented household head was sampled and in the event that he or she declined, the next contiguous household was sampled. Computer generated list of random numbers from Minitab 14.2 statistical software was used to select the respondents for each of the settlements in this study.

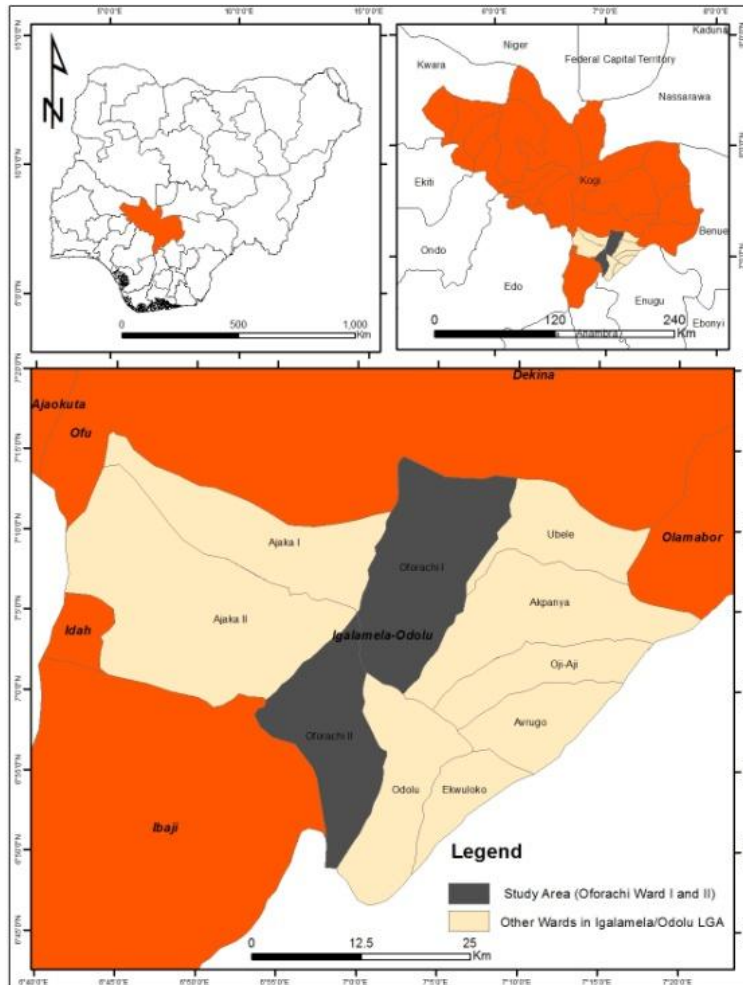


Fig. 1. Map of study area
 Adapted from the Administrative Map of Nigeria [12,13]

2.5 Preparation for Data Collection

Reconnaissance visits were made to the District Head and the Village Head to intimate them on the research and solicit for their support. The sources of water supply in the community were also identified at this stage.

2.6 Data Collection and Management

Data collection in this study was accomplished using a three-part semi-structured interviewer-administered questionnaire. The first section was used to collect data on the socio-demographic characteristics of respondents including the coordinates of the households the second was used to collect information on the availability of sanitation facilities in the households while the last section was used to collect information on the households' sources of drinking water supply. The coordinates of the households and boreholes within the community were obtained directly using a Garmin hand-held Global Positioning System receiver model GPSmap 78sc. The coordinates were used to estimate the distance of the households from the river and the respective boreholes using ArcGIS 10.2.2 software. A research team comprising of two Community Health Extension Workers (CHEW), two primary school teachers and one National Youth Service Corps (NYSC) member was constituted and trained for data collection. The data collection instruments were pretested in Idah LGA prior to the commencement of the study. Ethical clearance was sought and obtained from the Postgraduate committee of the Department of Water Resources and Environmental Engineering, Ahmadu Bello University, Zaria. Verbal informed consent was obtained from all the respondents with confidentiality and anonymity of their responses assured.

2.7 Statistical Analysis

Simple descriptive statistics were used to examine the socio-demographic characteristics of respondents, the availability of sanitation facilities and sources of drinking water supply while students' t-test was used to examine whether there is a relationship between the distance of the households from the source of their drinking water and their choice of that source at 95% Confidence level. Student's t-test is one of the most commonly used techniques for testing a hypothesis on the basis of a difference between sample means. It simply determines a

probability that two populations are the same with respect to the variable tested. The P-value at specified confidence level is often used alongside the confidence interval to determine if the observed difference is likely due to chance. STATA/SE statistical software version 13.1 was used for the statistical analysis at 95% confidence interval. $P < .05$ was considered statistically significant.

3. RESULTS AND DISCUSSION

3.1 Socio-Demographic Characteristics of Respondents

The socio-demographic characteristics of the respondents are presented in Table 1. A majority 53.85% of the respondents were from Oforachi Ward I while the remaining 46.15% were from Oforachi Ward II. Similarly, 72% were males while 28% were females. With respect to the age distributions of respondents, 1.85% were between 26-30 years, 5.85% between 31-35 years, 16.62% between 36-40 years while a majority 246 75.69% were above 40 years. Furthermore, 85.85% of the respondents were married while 2.15% and 12% were divorced and widowed respectively. The respondents with primary education and Adult education each constituted 27.7% of the total number of respondents while those with Secondary and Tertiary Education constituted 26.5% and 18.2% respectively. Respondents are predominantly farmers constituting 63.4% of the total respondents, 17.9%, 12.3% and 4.3% were civil servants, traders and craftsmen respectively while minority 2.2% were involved in other occupations not listed in the options. More so, 38.5% of the respondents had spent between 31-40 years in the community, 32.6% for more than 40 years and 18.5% between 21-30 years while 10.5% had spent 11-20 years. Finally, 8.62%, 44.62%, 18.77%, 15.69% and 12.31% had respective family sizes of 1-5, 6-10, 11-15, 16-20 persons.

A summary of availability of sanitation facilities as well as the extent of open defecation in the community is presented in Table 2.

Table 2 shows that 169(52%) of the total respondents had a toilet facility available in their households while 156(48%) respondents had no form of faecal disposal facilities. Among the respondents with a faecal disposal facility in their households, 34(20.12%), 56(33.14%),

25(14.79%), and 54(31.95%) had simple pit latrine with cover, simple pit latrine without cover, VIP latrine and water closet respectively. All respondents with no form of faecal disposal facility in their households resort to defecating in the open fields and bushes.

Moreover, Sanitation coverage in the study area is represented in Table 3. The results in Table 3 shows 34.77% of all the households had improved sanitation facilities, 17.23% had unimproved sanitation facilities while 48 percent are involved in open defecation.

Table 1. Socio-demographic characteristics of respondents

Description	Number of respondents	Percentage
Ward		
Oforachi I	175	53.85
Oforachi II	150	46.15
Total	325	100.00
Gender		
Male	234	72.00
Female	91	28.00
Total	325	100.00
Age (Years)		
26-30	6	1.85
31-35	19	5.85
36-40	54	16.62
Above 40	246	75.69
Total	325	100.00
Marital status		
Married	279	85.85
Divorced	7	2.15
Widowed	39	12.00
Total	325	100.00
Highest education		
Primary	90	27.69
Secondary	86	26.46
Tertiary	59	18.15
Adult Education	90	27.69
Total	325	100.00
Occupation		
Farming	206	63.38
Trading	40	12.31
Civil Servant	58	17.85
Craftsman	14	4.31
Others	7	2.15
Total	325	100.00
Length of stay in community (Years)		
11-20	34	10.46
21-30	60	18.46
31-40	125	38.46
Above 40	106	32.62
Total	325	100.00
Family size (Persons)		
1-5	28	8.62
6-10	145	44.62
11-15	61	18.77
16-20	51	15.69
Above 20	40	12.31
Total	325	100.00

Table 2. Summary of sanitation facilities in the study area

Description	Number of respondents	Percentage
Availability of toilet		
Available	169	52.00
Not Available	156	48.00
Total	325	100.00
Type of toilet		
Simple Pit Latrine with Cover	34	20.12
Simple Pit Latrine without Cover	56	33.14
VIP Latrine	25	14.79
Water Closet	54	31.95
Total	169	100.00
Alternative faecal disposal method		
Open Fields/Bushes	156	100

Table 3. Sanitation coverage within the study area

Improved sanitation facility		Unimproved sanitation facility		Open defecation extent	
Type	Frequency	Type	Frequency	Type	Frequency
Water Closet	54	Simple Pit	56	Open	156
VIP Latrine	25	Latrine without cover		Fields/Bushes	
Simple Pit Latrine with cover	34				
Total	113		56		156
Percentage	34.77		17.23		48.00

The results of the drinking water supply coverage of Oforachi, on the other hand, are presented in Table 4. The study identified Ofu River and borehole as the two principal sources of household drinking water supply within the study area. Ofu River is a perennial River that flows all year round as such makes water available for the community throughout the year. In an interview with the Village head, it was gathered that Ofu River is the oldest source of water supply in the community and served as the sole source until the recent development of the borehole. The borehole was constructed and reticulated to three serving points within the community and has since been an alternative water supply source for the community.

More so, the results in Table 4 show that Ofu River is the closest water source to 182 (56%) households while the remaining 143 (44%) households had a borehole as the closest water source to them. Meanwhile, 53(16.31%) are within 100m distance from the nearest borehole, 51(15.69%) are within 100 – 200 m from the nearest borehole, 98(30.15%), 102(31.38%) are within 500m – 1km from the nearest borehole while 21(6.46%) were within more than 1km from the nearest borehole. This probably explains why

56.62% of the households still drink from the River notwithstanding the availability of boreholes. The explanation for this can be seen in the results of the student's t-test presented in Table 5.

The *P*-value ($P = .87$) and the 95% confidence interval (-0.0826748 to 0.0703671) as well as *t*-value ($t(324) = -0.1579$) presented in Table 5 suggest that there is no significant difference in the scores of water source (1.43 ± 0.496) and the closest source to households (1.44 ± 0.497). This implies that a relationship exists between the closest water source to the households and their choice. In order words, the choice of the households' water source is influenced by the closeness of the source to them relative to the other source. This means that more boreholes within smaller distances from the households will be required.

The results obtained in this study shows a similar trend with the studies of Okon et al. [6] carried out in the rural upland and coastal communities of Akwa Ibom state, Nigeria. They reported that about 53.33% of households within the coastal communities in the state have no form of faecal disposal facilities thus resorted

Table 4. Summary of drinking water supply sources in the study area

Description	Number of respondents	Percentage
Water source		
Ofu River	184	56.62
Central Borehole	141	43.38
Total	325	100.00
Closest source to households		
Ofu River	182	56.00
Borehole	143	44.00
Total	325	100.00
Distance from nearest borehole (Meters)		
Less than 100	53	16.31
100 – 200	51	15.69
200 – 500	98	30.15
500 – 1000	102	31.38
Greater than 1000	21	6.46
Total	325	100.00

Table 5. Results of the comparison of household water with distance

Variable	Mean±SD	95% confidence interval	t-value	df	P-value
Water Source	1.43 ± 0.496	-0.0826748 to 0.0703671	-0.1579	324	0.87
Closest Source to Household	1.44 ± 0.497				

to defecating either in the open bushes or open rivers and streams. According to Alagidede and Alagidede [14] the major problems facing the Nigerian rural environments, are linked to public health, such as contamination of drinking water and insufficient or non-existent Sanitation infrastructures. This implies that, with a majority 56.62% of the households relying on the River for their household water supply and the 48% involved in open defecation (sometimes within close proximity to the river), the threat to public health is high, thus requiring urgent attention of policymakers and stakeholders to take proactive and urgent steps to curb this threat to public health. One of such proactive steps will be the establishment of Community Led Total Sanitation (CLTS) within the community.

4. CONCLUSION

The results obtained in this study have shown that only 34.77% of the entire community has improved sanitation facility while 17.23% have unimproved facilities in their households with open defecation extent still standing at 48% of the entire community. Only 43% of the community used an improved water source for their household water needs while a majority 56% depend on the river water for their consumption. The high open defecation extent puts this 56 percent at great risk of water related diseases. The study therefore recommends the

triggering of Community Led Total Sanitation (CLTS) within the community while stake holders increase efforts in meeting the water supply needs of the community.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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