International Research Journal of Public and Environmental Health Vol.6 (5),pp. 82-88, August 2019
Available online at https://www.journalissues.org/IRJPEH/
https://doi.org/10.15739/irjpeh.19.010

ISSN 2360-8803

Original Research Article

Sources and accessibility of potable water in Yakurr Local Government Area, Cross River State, Nigeria

Received 21 June, 2019 | Revised 13 July, 2019 | Accepted 20 July, 2019 | Published 13 August, 2019

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Globally, a good number of people are still without access to safe and adequate potable water. The study was a descriptive study to identify the sources of potable water and its accessibility in Yakurr Local Government Area, Cross River State, Nigeria. Five communities were selected by simple random sampling. Multi-stage random sampling technique which involved four stages was used to select 410 households and structured questionnaire and observation were used for data collection. The statistical package for social sciences software (SPSS version 20) was used for data analysis and chi-square test employed to establish statistical associations with a p-value of <0.05 at 95% confidence interval considered significant. Results from the study shows that 46.1% of respondents used borehole water as main source of water and there is a significant relationship between the quantity of water used and the number of person per household. Fifty percent of respondents walked below 500m to collect water and 17.3% walked above 1km to collect water. Access to potable water is poor and could affect the general hygiene status of the communities. It was recommended among others that the government should provide adequate water supply. Although improvement had been made, there is still difficulty especially in the rural communities.

Key words: Potable water, sources, accessibility .

INTRODUCTION

Preventing contamination of water supply through the protection of water resources is the first step in any programme to provide safe water to consumers (UNICEF, 2008). World Health Organization data on the burden of disease reported that approximately 3.2% of death (1.8 million) and 4.2% of disability-adjusted-life years (61.9 million) worldwide are attributable to unsafe water, sanitation and hygiene, over 99.8% occur in developing countries, and 90% are of children (WHO, 2004).

Access to clean water supply and good sanitation services enhance sound health, boost socio-cultural development, and promote economic balance. However, the development and incidences of water, sanitation and hygiene challenges among many countries of West Africa and particularly Nigeria has become more obvious in recent times (Olukanni et al., 2014; WHO/UNICEF, 2013).

According to WHO (2015), 319 people in sub-saharan Africa live without adequate access to safe and improved drinking water sources. Studies carried out by Aderibigbe et al. (2008) reported that about 25% of respondents had access to good water supply. The era of the Millennium Development Goals (MDGs) from 2000–2015 had specific targets for improved access to drinking water supply and basic sanitation (WHO/UNICEF, 2015; Alexander et al., 2016).Sub-Sahara Africa failed to meet the MDG target for drinking water, with 32% of the population estimated not to have access to an improved water source at the end of the MDG period and an estimated 102 million people still use surface water (WHO/UNICEF, 2015). Proposed targets and indicators for the Sustainable Development Goals (SDGs) also seek universal access to Water, Sanitation and Hygiene (WASH) in non-household settings, such as schools and health care facilities (Bartram et al., 2014; Cronet al., 2015).

Globally, 663 million people who live without adequate access to improved water sources. While there has been

an improvement, it has been slow and uneven, with 96% of the global urban population using improved drinking water sources in 2015 compared to 84% of the rural population (WHO/UNICEF, 2015). Access to clean and safe water, adequate sanitation, and effective hygiene remains an unyielding challenge and a key public health problem (United Nations Development Programme/United Nations Children's Fund (UNDP/UNICEF) 2015; Garn et al., 2013; Wolf et al., 2014). Poor access to water, sanitation and hygiene result in tremendous human and economic costs and rein forces gender and societal inequalities most notably for women and girls (UNDP, 2006). Inadequate WASH conditions have been reported to reduce educational outcomes in children by contributing to school absenteeism and performance (Alexander et al., 2013).

Cairncross, Bartram, Cumming, and Brocklehurst study (2010, as cited in Akina et al., 2017) reported that Unsafe and insufficient quantity of drinking water, inadequate sanitation, and unimproved hygiene account for 7% of the global burden of disease and 19% of child mortality worldwide. In Nigeria, children under 5 years old have a 38% higher risk of dying from lack of improved sanitation and water sources (Ezeh et al., 2014).

Every public drinking water is ideal to be protected from possible contamination. There are different sources of water supply for public and domestic purposes, and are classified as rainwater, surface water (lakes, rivers and ponds) and groundwater (springs, wells and boreholes). However some of these water sources need protection from potential contaminants which can be achieved through community mobilization, regular inspection, proper maintenance, hygiene promotion and periodic treatment of water to prevent waterborne disease from affecting the community and improve water quality (HEAT, 2007).

This paper analyzed the sources of potable water and it accessibility in Yakurr LGA. Findings from this study will shed more light on environmental management as a means of breaking the chain of transmission of disease due to inadequate and unsafe water supply and unhygienic practices in the study area, and make recommendations to the appropriate authorities.

MATERIALS AND METHODS

Study Setting

Yakurr Local Government Area is located approximately between latitude $5^0$45' and $5^0$55' north of the equator and longitude 8°11' and 8°20' east of the Greenwich meridian and 120km^2 (75 miles) North West of Calabar, the capital of Cross River State. Yakurr is located within the equatorial forest region of the tropics. The area is characterized by high temperature, rainfall and humidity. It comprises 13 council wards from 9 communities, and the people exhibit a very high degree of social homogeneity with strong political, cultural, religious and linguistic affinity (Okoi-Uyouyo, 2002). They are largely famers, with population of 196,270 persons (NPC, 2006) and land mass of about 4,800 hectare (48km^2).

Study Design

A descriptive study design was undertaken, both quantitative and qualitative methods were used to collect data on the type of toilet facilities available and functional, sources of water supply and hygiene practices in Yakurr Local Government Area, Cross River State, Nigeria.

Study Population

The study respondents were household members in communities within the basic settlements in Yakurr LGA from which information on the sources and accessibility of potable water was sought using the questionnaires. The study also targeted environmental health workers, community health workers, civic/opinion leaders, and village heads, as key-informants using pre-prepared topic guide. Observation checklist was used for qualitative data collection. The total estimated population of the five selected communities was official figures used by the Primary Health Care (PHC) centers in the respective communities. Issues related to water, sanitation

Sample Size Determination

Using the fischer's formula for population above ten thousand

$$n = \frac{Z^2 P(1-P)}{d^2}$$ (Araoye, 2003).

Where n = minimum sample size required

Z = 1.96 (corresponds to 95% confidence level)

P = 50% (proportion with good community hygiene and sanitary practices)

(1-P) = q = 50% (proportion with poor community hygiene and sanitary practices)

d = level of precision = 0.05

$$n = \frac{(1.96)^2 (0.50)(0.50)}{(0.05)^2} = 384$$

Although 384 was the minimum sample size, considering a non-response of 10%, the final sample size of 426 was used to collect data in the study area. Following the UNICEF (1999) Guidelines in the selection of the sample size for observation and interview, which suggest that for cluster of ten communities which are ethnically homogenous, 70 households should be observed for four days and 10 key-informants interviewed. 70 households were observed and 15 key-informants interviewed.

Method of Data Collection

The study involved more than one data collection method in order to have an in-depth understanding of the water sources and accessibility situation in the study area. The study primarily involved self-administration of structured questionnaire to literate subject and investigator administered structured questionnaire for head of households who cannot read and write. Women were commonly identified as household heads as men are at most times outside the house for work. Key-informant interviews were conducted with knowledgeable and prominent civic / local leaders, environmental health

officers, and village heads in the selected communities. Key-informants were interviewed as individuals. Observations were made on water sources using a checklist to verify information obtained from households interviews.

Sampling Techniques

Multistage sampling technique was used in the selection of the study subjects. Based on these, four stages were involved.

Selection of Communities

Stage one was to sample five communities out of the nine communities in the study area which covered 55.6% of the study communities. In this stage, the name of each community was written in a piece of paper, folded, mixed up and five persons each representing a community were asked to pick. The five communities that were picked became the sampled communities for the study.

Selection of Streets

Five streets were selected from each of the five selected communities by simple random sampling. Names of the major street were written on pieces of paper, folded, mixed up and five persons were asked to pick one each. The streets that were picked formed streets that were used for the study. The second, third, fourth, and fifth streets were to be used in case the questionnaire were not exhausted in the first street.

Selection of Houses

Systematic sampling technique was used to select houses for the interview. Applying this technique, the fourth houses were skipped after a house has been sampled. That is every 4th house starting from the first house on the street was picked (1st, 5th, 9th, etc.). This method was preferred because it is efficient and required less time, thus permitting data to be collected from a larger population.

Selection of Household

Having used systematic sampling technique to select houses, in a house where more than one household exist, simple random sampling method was used to select household for the study. Numbers were given depending on the number of households in the building, written in pieces of papers, folded, mixed up, and people were asked to pick based on the number, the household that picked number one (1) was interviewed. A household head was taken as the key respondent and in a household were the household head was not available, an adult that is the most senior was taken as household head. An adult in this case was any body from 18years and above.

Observation Procedure

Observation was done early in the morning, after informing the respondent a day before. The research team sat quietly where they can see the domestic behaviors of household members and note. Each time one of the behaviors on the checklist is seen, the researcher/field assistant note when and where it happened and who did what on a report sheet for four days. The researcher also observes their source of water supply and distance to some of the households.

Pre-Testing of Instruments for Data Collection

In order to ensure that the data collected was valid; the questionnaire was pre-tested for validity, comprehensiveness, and reliability in Biase LGA of Cross River State.

Ethical Consideration

The research was duly approved by the Cross River State Health Ethics Research Committee (CRSH-REC). This was possible through a written application by the researcher and letter from the head of department to the Paramount ruler of Yakurr LGA. Oral informed consent was obtained from respondents and reassured of the confidentiality of the information that they would provide.

Data Analysis

The completed questionnaires were cross-checked to ensure that the responses were correct and tick properly. The data was coded and analyzed using MS Excel and Statistical Package for Social Sciences (SPSS version 20, 2010).

RESULTS

A total of 426 questionnaires were administered to members of the communities, out of which 410 representing 96.2% response rate were retrieved. The demographic characteristics of respondents as presented in Table 1, shows that 34.2% of respondents fell within the age group of 28-37years while 17.3% were within 48years and above. Approximately 37% of respondents were male while 63.2% were female. 62% of respondents were married and 25.6% were single. Approximately 86.1% of respondents had secondary and tertiary education while 4.1% had no formal education. Majority of respondents (33.7%) were farmers while 5.1% were unemployed. Respondents (96.8%) were Christians while 3.0% practiced traditional religion.

Regarding the number of persons per household, 43% of respondents had one to three persons per household while 1.7% had ten persons or more per household (Figure 1).

Result of the analysis shows that 46.1% of respondents used borehole as their main source of water, while 1.2% and 2.9% used streams and rainwater collection respectively as shown in Table 2. Fifty percent of respondents walked below 500m to collect water and 17.3% walked above 1km to collect water. Regarding water source protection, 73.4% of respondents fenced

Table 1. Demographic characteristics of respondents n=410

Demographic variables	Percentage (%)
Age	
18 – 27	16.1
28 – 37	34.2
38 – 47	32.4
48 and above	17.3
Total	**100**
Sex	
Male	36.8
Female	63.2
Total	**100**
Marital Status	
Single	25.6
Married	62.0
Divorced	5.6
Separated	3.2
Widow/widower	3.6
Total	**100**
Education	
Primary	9.8
Secondary	50.7
Tertiary	35.4
No Formal Education	4.1
Total	**100**
Occupation	
Farmer	33.7
Civil servant	20.7
Trader	16.3
Commercial driver	3.0
Unskilled labourer	8.3
Unemployed	5.1
Others	12.9
Total	**100**
Religion	
Christianity	96.8
Islam	0.2
Traditional religion	3.0
Total	**100**

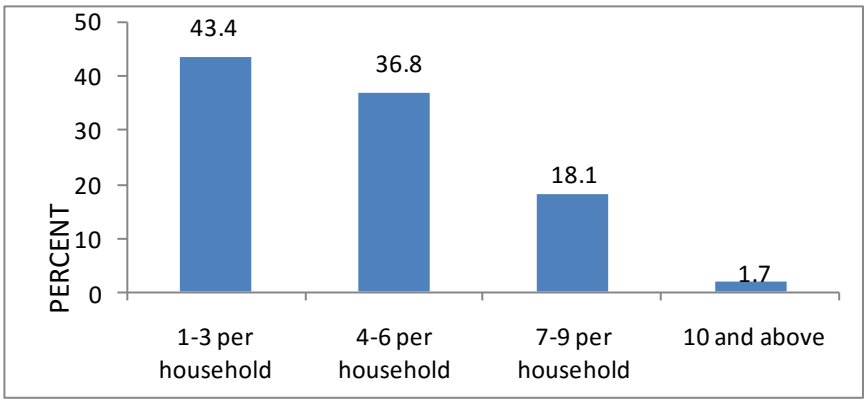

Figure 1: Distribution of respondents by number of persons per household

water source with cement blocks, 16.3% with woods while 10% of respondent's waters source had no protection (Table 3).

Majority of respondents (49.7%) used 40litres of water daily, while about 7.1% used 20litres of water daily. Approximately 51.0% of respondents treat household water by allowing the water to stand and settle, while only 2.2% treat water by boiling. A good number of respondents (91.0%) used vessel with handle to draw water from storage containers while 3.7% draw water through tap (Table 4). There is a significant relationship between the number of persons per household and

Table 2. Distribution of respondents by source of water (n=410)

Variables	Percentage %
Source of Water	
Borehole	46.1
Piped/tap	26.6
Spring	23.2
Stream	1.2
Rainwater Collection	2.9
River	0
Total	**100**

Table 3. Distribution of respondents by accessibility and protection of potable water (n=410)

Variables	Percentage %
Distance From Water Source	
Below 500m	50.0
501 – 1km	12.0
Above 1km	17.3
No Response	20.7
Total	**100**
Water Source Protection	
Fenced with Blocks	73.4
Fenced with Woods/Zinc sheets	16.3
No Protection	10.3
Total	**100**

Table 4. Distribution of respondents by quantity of water used, household water treatment methods and mode of taking water from container (n=410)

Variable	Percentage (%)
Quantity of water used per household daily	
20litres of jerry can	7.1
40litres of jerry can	49.7
80litres of jerry can	24.9
120litres	11.0
160litres	7.3
Total	**100**
Household Water Treatment Method	
Boiling	2.2
Use of filter	6.3
Alum/Chlorine tablet	2.0
Let it stand and settle	50.5
No Treatment	39.0
Total	**100**
Mode of taking water from container	
Through tap	3.7
Pour out into vessel	1.2
Use vessel with handle	91.0
Use vessel without handle	4.1
Total	**100**

quantity of water available daily (df = 12, p value <0.05)(Table 5).

Observation on the sources of water supply and protection

Table 6 shows results from observations on the sources of potable water available in the studied communities. Regarding the types and number of water sources available, it was observed that 83(56.8%) of the water sources were boreholes, 21(14.4%) were spring water while 39(26.7%) were pipe/tap water. Sixty seven (45.9%) of the water source were protected by blocks fence while 28(19.2%) were protected with wooden

Table 5. Test of relationship between the number of persons in a household and the quantity of water used daily using Chi-square (X^2)

Number of person in a household	Quantity of water used daily						
	20litres	40litres	80litres	120litres	160litres	Total	X^2
1 – 3	29	144	0	0	0	173	
4 – 6	0	59	95	0	0	154	
7 – 9	0	0	8	45	23	76	585.3*
10 and above	0	0	0	0	7	7	
Total	**29**	**203**	**103**	**45**	**30**	**410**	

*df = 12, p<0.05

Table 6. Observed sources and water source protection available in the study area

Source of potable water	Percentage (%)
Borehole	56.8
Spring	14.4
Pipe/tap	26.7
Stream	1.4
River	0.7
Total	100
Water source protection	
Fenced with blocks	45.9
Fenced with woods	19.2
Not fenced	34.9
Total	100

fence.

DISCUSSION

The health and wellbeing of population are directly affected by the coverage of water supply and sanitation (Wolf et al., 2014). Findings of the present study showed that majority of the respondents (46.1%) used boreholes as main source of drinking water. Spring as source of water in the rural communities was used by 23.2% of the households. This agrees with studies carried out by Aderibigbe et al. (2008) who reported that about 25% of respondents had access to good water supply. The findings also agrees with WHO/UNICEF (2015) report that 32% of the population estimated in Sub-Sahara Africa do not have access to an improved water source at the end of the MDG period and an estimated 102 million people still use surface water. Observational assessment using a checklist also confirmed the findings from the questionnaire. It was also noted that most of the boreholes were drilled without supervision or guidelines from regulatory bodies such as Rural Water and Sanitation Agency. Possible consequences of the findings above are water contamination and water-borne diseases. The International Community at the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002, agreed to a target to halve the proportion of people who lack access to basic sanitation and water supply by 2015. Though, various scholars believed that the new sanitation target agreed at the WSSD is realistic and achievable, but still presents significant challenges due to the fact that proposed infrastructure can only be viable if they will have a beneficial and sustainable impact on communities. 4.1% of the households in the study communities relied on rainwater and streams as water sources. Rainwater was used because of the long distance and inequality in distribution of boreholes.

Another reason seems to be lack of economic means to ensure better availability of piped water supply in the area. UNDP/UNICEF (2015) reported that access to clean and safe water, adequate sanitation, and effective hygiene remains an unyielding challenge and a key public health problem.

The highest volume of water used per household daily was 40litres as indicated by 49.7% of respondents. However, there is a significant relationship between the number of persons per household and the quantity of water used. Following the standard for accessibility of potable water as recommended by WHO/UNICEF (2005) that the source should be less than 1km from the point of use and each member of a household should reliably obtain a minimum of 20litres per person, 50% of the studied communities, walked less than 500m to collect water. Distance covered to water source was estimated based entirely on respondents own judgment. This finding is in consonance with Adeleye et al. (2014) that about 74% of the residents of Kpakungu walked below 400m to collect water.

CONCLUSION

Majority of the residents used borehole as their main source of water, and there is a significant relationship between the quantity of water used and the number of person per household. Hence, disease associated with unsafe water, poor sanitation and hygiene practices still constitute the greatest health burden in the studied communities. The government should provide adequate potable water. Although improvement had been made, there is still difficulty considering the distance especially in the rural and semi-urban communities. Finally, further studies on the microbial and physicochemical quality of the identified water sources is recommended in order to known whether such water sources are good for consumption.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this manuscript.

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