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Water Supply and Sanitation Coverage in Orsu Local Government Area of Imo State, Nigeria

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Abstract:
Adequate safe water and basic sanitations are very essential for public health and for meeting the SustainableDevelopment Goals. This research used a cross-sectional study to determine the water supply and sanitation coverage in Orsu Local Government Area of Imo State, Nigeria. A 40-item questionnaire and on-site observations was used to elicit information from four hundred (400) households in the study area. Data was analysed using descriptive statistics such as frequency counts and percentages and presented in tables, charts and Figures. Findings from the study showed that 86.5 percent of the households in the study area had access to improved water sources in the rainy season while access reduced to 33 percent in dry season. However, the annual coverage in improved sources of water in the study area was 59.75 percent while the coverage in basic sanitation facilities stood at 78 percent. Findings in this study also showed that 85percent of the respondents walked below 1 km to fetch water in rainy season while 18.75 percent do so in dry season. Hence, an average of 55.88 percent of the respondents walked below 1 km to access water per annum. Findings further revealed that 83.5 percent and 14.75 percent of the respondents spent below 30 minutes to access water in rainy season and dry season respectively. Thus, 49.13 percent of the respondents walked below 30 minutes to access water per annum. The average daily water use in the area was found to be 28.52litres per capita per day. This study thus concludes that the water supply coverage in Orsu Local Government Area (59.75 percent) was below the Millennium Development Goal (MDG) target of 75 percent in water supply, which was to be met by 2015. Therefore, the study recommends that water education practice be encouraged among the residents in the study area. Also, adequate improved water sources like the boreholes, and protected wells should be put in place by the Local Government Authority.

Keywords: *Access, coverage, household, sanitation, water supply*

1. Introduction

Water is an essential part of life on earth. Safe and potable drinking water and satisfactory sanitation services are critical for public health. An anticipated 884 million citizens globally have limited access to safe and adequate source of drinking water (Hrudey & Hrudey, 2007; Global WASH Related Diseases and contaminants, 2012). Contaminated sources of water consumed by the population are responsible for 1.6 million deaths yearly, mostly in children below the age of five years (Hrudey & Hrudey, 2007; Global WASH-Related Diseases and Contaminants, 2012). Roughly, 88 percent of diarrheal diseases in the world are due to consumption of contaminated water and poor hygiene (Global WASH- Related Diseases; 2012). World Health Organization and the United Nations Children's Emergency Fund (UNICEF) reported in the year 2000 that diarrhoea and other diseases that are water-borne are the principal causes of death and illnesses in developing nations of the world. The incidence of diarrhoea can be reduced by up to 30 percent through adequate sanitation and good hygiene especially through hand washing promotion (Ejemot, Nwadiaro, John, Dachi, Martin & Julia, 2015). Water, Sanitation and Hygiene (2012) also stated that about 2.5 billion people globally still have limited access to improved sanitation and in excess of one billion people are completely with no access to any sanitation amenities and are forced to defecate in the open.

Following UNICEF/WHO (2013) standard, a household is considered to have access to a source of drinking water when they can wal k below one kilometre away from their home to get the water and it is possible in theireveryday life for each member of the family to r eliably obtain atleast 20 litres of water. In addition, improveddrinking source of water according to WHO/UNICEF (2000) includes wa ter obtained from any of the sources; public standpipe, borehole, household connections, protected dug well, and rain water collection.

On the other hand, basic sanitationis the affordable cost practice and facility that ensures sanitary excreta and sullage water disposal and includes the following; flush toilet facilities, pit latrines with slab, ventilated improved pit latrines, and water closet (UNICEF/WHO, 2013). Also, having access to an essential sanitation practice includes security of users and seclusion in using the facilities (UNICEF/WHO, 2013).

The Millennium Development Goals (MDGs) that comprised of eight universal health and development targeted by the United Nations emphasized safe and adequate water supply access as a main objective in ensuring environmental sustainability in its seventh goal. Explicitly, the intention was to halve by the year 2015, the percentage of the global citizens that have no sustainable access to safe drinking water and essential sanitation facilities. In 2005, the United Nations launched a scheme named the International Decade for Action Water for Life 2005 to 2015 to further augment the Millennium Development Water Goals. The target of Water for Life initiative was to support a water availability that is sustainable through much emphasis on development based programmes and policies that support a sustainable management of water resources and enhanced hygiene (International Decade, 2012).

Water supply and sanitation coverage reported in Nigeria are among the least in the globe. WHO/UNICEF (2013) reported that the percentage of households with adequate access to an enhanced drinking water source in Nigeria was 61 percent in 2011 while the percentage with access to basic sanitation facilities also in 2011 was 31 percent. The international minimum standard set by WHO (2000) to be met by the end of the year 2015 is 75 percent coverage in water supply and 63 percent sanitation coverage. Nigeria as a country also set her standard of 77 percent coverage in improved water source in 2010. The National Bureau of Statistics (2012) reported that Imo State recorded a water coverage above 75 percent and sanitation coverage of 81.7 percent. But, as at 2013, only 61 percent and 30 percent coverage were achieved in water supply and sanitation respectively in Nigeria despite the effort of the federal government (Nigerian Demographic and Health survey, 2014). This means that water supply and sanitation coverage in Nigeria is still below the international minimum standard. The implication is that the likelihood of water and sanitation related diseases may be high. Hence, this study was carried out with a view to determine if the level of coverage in water supply and sanitation in Orsu Local Government Area of Imo State meet the international minimum standard by determining the proportion of households with improved water source in the study area, proportion of households with basic sanitation facilities, constraints in accessing improved water source and sanitation facilities by households, the per capita water demand in the study area and the proportion of people with self reported health problems that could be related to poor water supply and sanitation coverage in the study area.

2. Methodology

2.1. Study Setting

The study setting was Orsu Local Government Area of Imo State, Nigeria with headquarters in Awo-Idemili. Imo State is one of the 36 states of Nigeria and lies in the South-Eastern part of Nigeria. Its capital and largest city is Owerri. It has an area of 5,100sqkm (2,140sqmiles) with population of 3,934,899 (NPC, 2006) and lies within Latitudes $4^0$45'N and $7^0$15'N and Longitude $6^0$50'E and $7^0$25'E. Orsu Local Government Area has a population of 152,296 people projected to 2015 from 2006 (NPC, 2006). Orsu people are an Igbo sub-group situated at the west of Orlu municipality to the South of Ozubulu, North of Oguta and in general areas around Orlu, Njaba, Ihiala and Nnewi South Local Government area. The Local Government was carved out of Orlu Local Government in 1983 but took off as a full fledge local government council in 1990. It is made up of eleven (11) wards with a general hospital under construction, primary health care facilities spread across all the eleven wards and many other private health facilities.

2.2. Scope of the Study

This research work focused mainly on the rural water supply and sanitation coverage at the household level inOrsu Local Governmen t Area. Major areas concentrated were the source of drinking water, distance moved to fetch water, quantity of water used per capita per day and the time spent to fetch water. Sanitation covers only the use of toilet facilities and excreta disposal in the study area.

2.3. Procedures for Data Collection and Analysis

A cross - sectional study design was employed to determine the level of water supply and sanitation coverage in the study area. A total of 400 structured questionnaires were administered to 400 households (80 questionnaires in each ward) selected for detailed study. Five out of the eleven (11) wards in Orsu Local Government Area were selected using simple random sampling technique. The five wards selected at random for detailed field study includes Okwuetiti, Okwufuruaku ward, Okwuamaraihe ward 1, Orsuihiteukwa ward and Okwuamaraihe ward 2. Communities in the five randomly selected wards were further selected using a simple random sampling technique. Five communities were selected from each ward. Households in different communities were selected using a systematic random sampling technique. The respondents were purposively selected and interviewed and their responses recorded. Mothers constitute the bulk of the respondents chosen for interview at the households since they are more active in domestic activities. Onsite inspection of the drinking water sources and sanitation facilities was used to compliment the data from the respondents using an observational checklist. Secondary data were gotten from the National Population Commission in Orsu Local Government Area and other related literatures.

Data obtained were analyzed using Microsoft Excel 2007 spread sheet and the Statistical Package for the Social Sciences (SPSS) Vers ion 20.0. Results from the study were expressed as descriptive statistics such as frequency counts, and percentages presented in form of tables, charts and Figures. The per capita water demand was calculated by finding the product of population figure in the sampled area and the average daily per capita water consumption.

3. Results and Discussion

Four hundred (400) copies of questionnaires were administered to households within the study area. All the questionnaires were completed and retrieved by the researcher representing a response rate of 100 percent, coded and used for the data analysis. All the respondents were adults with age range of 18 to 80years. Findings from the research revealed that 67 of the respondents representing 16.75 percent were males while 333(83.25 percent) were females. 74.5 percent were married, 5.25 percent single, 4.5 percent divorced while 15.75 percent were widow/widower. Ten (10) percent of the respondents had 1 to 3 household members, 37.5 percent had 4 to 6 members, and 28.75 percent had 7 to 9 family members while 23.75 percent had above 9 family members. The four hundred (400) households that were sampled at random had total household members of 2104 individuals. Educationally, 39.75 percent attended primary education, 26.5 percent were secondary school leavers, and 10.75 percent were educated up to tertiary level while 23 percent had no formal education.

3.1. Proportion of Households with Improved Sources of Drinking Water

Findings from the research showed that access to improved water source in the study area differ with season. In the rainy season, results from the study indicated that 32(8 percent) of the respondents used water from the borehole, 314(78 percent) used rainwater properly harvested and stored in tanks or in different sizes of container, 39(9.75 percent) used streams, while 15(3.75 percent) used water provided by tanker vendors (Figure 1). Hence, the percentage of households with improved water source in the study area is 86 percent in the rainy season comprising those that used rainwater (78 percent) and those that used boreholes (8 percent).

On the sources of water supply in the dry season, 28.25 percent of the respondents used water from boreholes in the dry season, 4.75 percent used rainwater stored during the rainy season in underground tanks, and 56.25 percent used different unprotected sources mainly from streams and ponds while 10.75 percent patronize truck tanker water vendors (Figure 2). So, the proportion of households with improved water source in the dry season in the study area is 33 percent comprising the households that used boreholes (28.25 percent) and those that used rainwater properly harvested and stored (4.75 percent). Therefore, the average annual proportion of households with improved sources of water in the study area is 59.75 percent. The coverage of 59.75 percent in the study area was below the MDGs minimum target of 75 percent and therefore contradicts the reports of National Bureau of statistics (2012) which included Imo State among the 14 states in Nigeria that had drinking water coverage of above 75 percent.

On the distance walked to fetch water in the rainy season, 220(55 percent) walked for less than 500 meters, 120(30 percent) walked between 500 meters to 1 kilometre while 60(15 percent) walked for more than 1 kilometre (Figure 3). Therefore, the proportion of households that walked below 1 kilometre to fetch water in the rainy season is 85 percent comprising 55 percent that walked below 500 meters and 30 percent that walked between 500 meters to 1 kilometre.

Findings revealed also that 83.5 percent of the respondents spent between 0 to 30 minutes to fetch water in the rainy season, 10.25 percent spent between 31 minutes to 1 hour to fetch water, 4.25 percent spent 1 hour to 1:30 minutes, while 2 percent spent above 1:30minutes to fetch water in rainy season (Figure 4). These findings also showed that access to drinking water sources in the rainy season is high due to the availability of rain water.

Consequently, on the distance walked to fetch water in the dry season, 75(18.75 percent) of the respondents walked <1km, 24.75 percent walked between 1 to 2km while 56.5 percent walked for over 2 km (Figure 5). So, only 18.75 percent walked below 1 km in the dry season to fetch water. The finding showed the level of suffering by the inhabitants of the study area to access water in the dry season. However, the average proportion of respondents that walked within the WHO minimum standard of below 1 km to fetch water is 55.88 percent.

On the time spent in the dry season to fetch water, 14.75 percent spent between 0 to 30 minutes, 17.5 percent spent between 30 minutes to 1 hour, 37 percent spent 1 to 2 hours while 30.75 percent spent over 2hours to fetch water in the dry season (Figure 6). Therefore, only 14.75 percent walked below 30minutes to fetch water in dry season. Thus, the average proportion of respondents that walked below 30minutes, which is the WHO minimum standard of time that should be spent to fetch water is 49.13 percent.

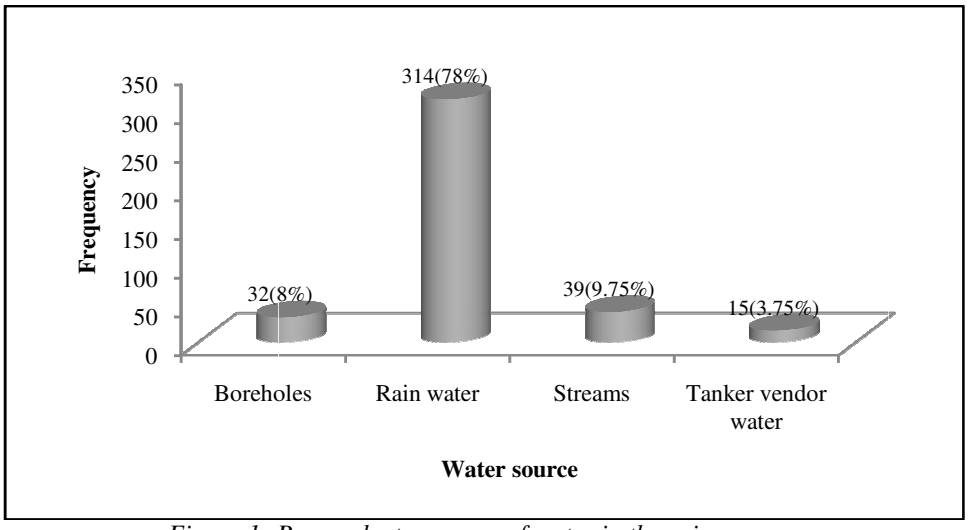

Figure 1: Respondents sources of water in the rainy season

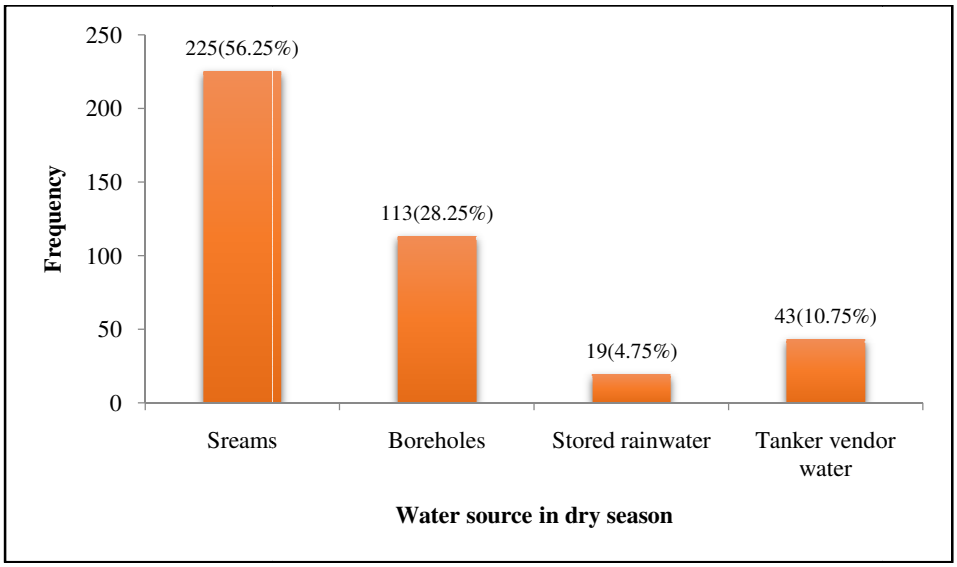

Figure 2: Sources of water used by the households in the dry season

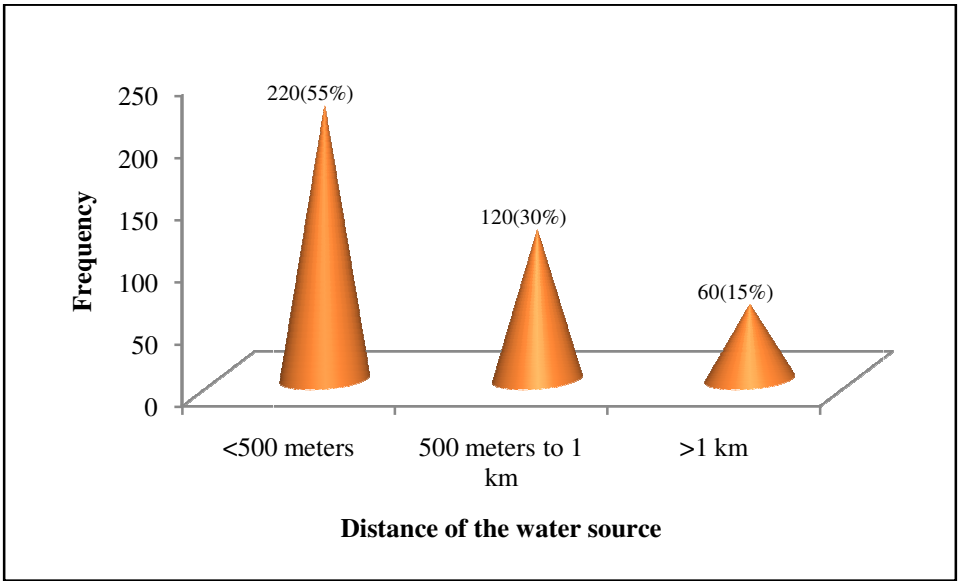

Figure 3: Distance walked by the respondents to fetch water in the rainy season

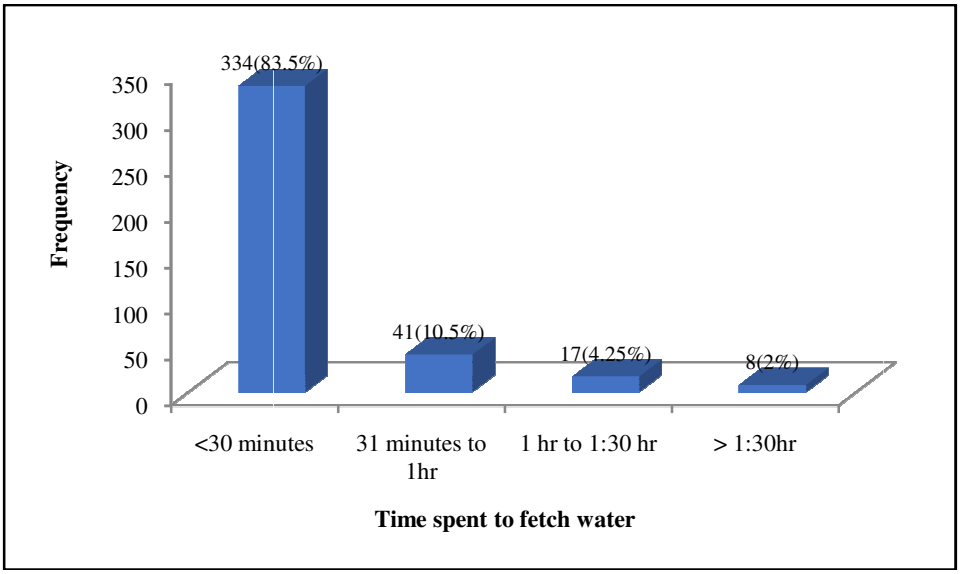

Figure 4: Time spent to fetch water by the respondents in the rainy season

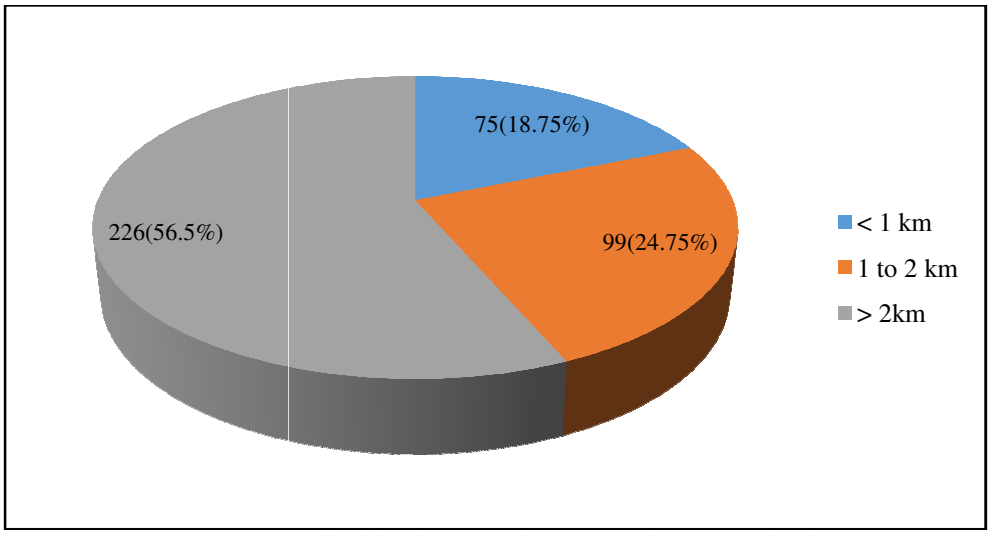

Figure 5: Distance walked by the respondents to fetch water in the dry season

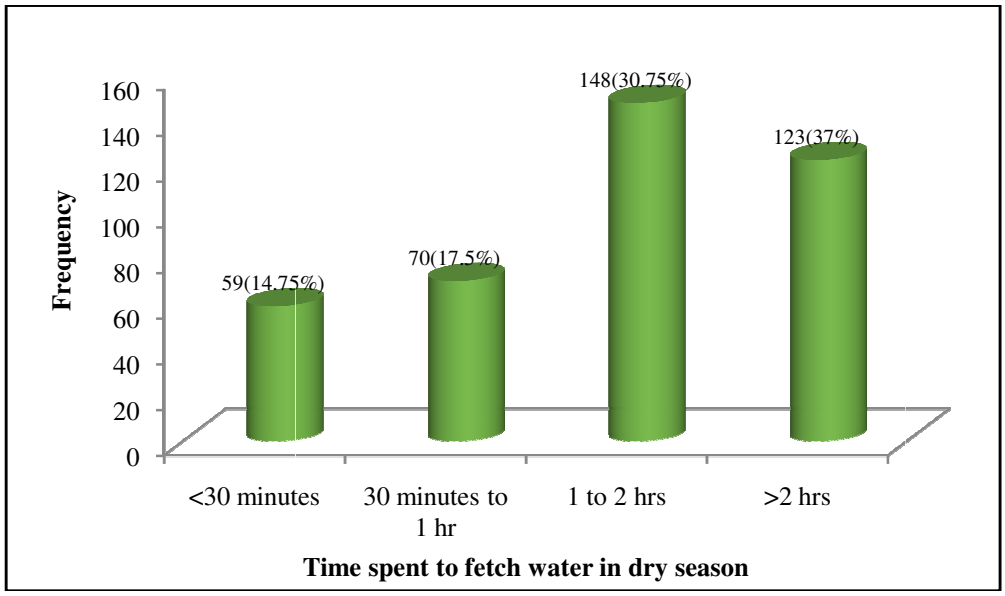

Figure 6: Time spent to fetch water by the respondents in the dry season

3.2. Proportion of Households with basic Sanitation Facilities

On the type of sanitation facility available for the households in the study area, findings revealed that 12.25 percent of the respondents used pour flush system, 57.5 percent used pit latrine with cover, 2.25 percent used ventilated improved pit latrine, 2 percent used open pit latrine/others, 6 percent used cistern flush toilet system (water closet) while 20 percent have none. Therefore, a total of 78 percent of the respondents used basic sanitation facility in the area comprising those with pour flush toilet facility, pit latrine with cover, ventilated improved pit latrines and water closet. The findings indicated that the study area recorded basic sanitation coverage that is above the MGDs minimum target of 63 percent and therefore supports the reports by the National Bureau of Statistics (2012) that Imo State had basic sanitation coverage of 81.7 percent. Those households who do not have toilet facility at home when asked on their place of defecation, 12 percent of the respondents said they defecate in the nearby bush or farm land, while 8 percent used neighbours' facilities.

On the method of waste water disposal, 13.5% used open drainage, 2.6 percent disposed through the septic tanks system while 84 percent disposed by pouring out waste water within the compound.

On the method of faeces disposal by households when their toilet facility is filled up, 18.25 percent said they used pit, 0.5 percent disposed by emptying into drainage system, 7.5 percent does so by employing the services of trucks evacuators while 53.75 percent disposed by covering with sand and constructing new one. The implication of unsanitary waste water disposal is the likelihood of waste water finding its way to the underground tanks and contaminating them.

On the distance walked to defecate, 63.5 percent walked for less than 100 meters, 20.25 percent walked for 100 to 200 meters while 16.25 percent walked for above 200 meters to defecate. The method of drinking water storage comprises the use of clay pot 23 percent, 46 used various sizes of plastic containers, 17 percent used underground tanks, while 14 percent used various sizes of overhead tanks (Table 1).

Variable	Number of respondents (N=400)	Percentage
Types of toilet facilities		
Pour flush	49	12.25
Simple pit latrine with cover	230	57.5
VIP Latrine	9	2.25
Open pit/others	8	2
Cistern toilet	24	6
None	80	20
Place of defecation by respondents without toilet facilities		
Nearby bush/farmland	48	12
Neighbours facility	32	8
Methods of waste water disposal		
Open drainage	54	13.5
Septic tanks system	10	2.6
Within compound	336	84
Methods of faeces disposal		
Pit	73	18.25
Emptying into drainage	2	0.5
Truck evacuators	30	7.5
By covering with sand	215	53.75
Distance walked to defecate		
<100meters	254	63.5
100 to 200meters	81	20.25
>200meters	65	16.25
Methods of drinking water storage		
Use of clay	92	23
Jerican	184	46
Underground tanks	68	17
Various overhead tanks	56	14

Table 1: Proportion of households with basic sanitation facilities

3.3. Per Capita Water Demand in the Area

Findings of this study indicated also that there is a disparity in the quantity of water used by households between the rainy season and the dry season. In the dry season, findings revealed that 14.75 percent of the respondents used less than 4 jericans (80litres) of water per day, 25.25 percent used 5 jericans (100litres), 28.75 percent used 6 jericans (120litres) per day while 38 percent used above 6 jericans (>120litres) of water per day. The average quantity of water used per capita per day in the dry season is calculated by dividing the total volume of water used by households in a day in dry season (48,000 liters) by the total number of individuals in the 400 households covered (2104). That is, total number of jericans of water used by households in a day is 2400 times 20liters = 48,000litres (each jericans = 20 litres) = 48,000liters divided by 2104 individuals = 22. 814l/c/d. Therefore, the volume of water used per capita per day in the dry season = 22.814 l/c/d.

In the rainy season, however, 3.25 percent of the respondents used less than 4 jericans (80litres) of water per day, 19.25 percent used 5jerican(100litres) per day, 24.5 percent used 6 jerican (120litres) per day while 53 percent used above 6 jericans (>120litres) per day. The total number of jerican of water used per day by the 400 households covered were 3600 jericans in the rainy season. Therefore, the average per capita water use per day is 3600 jericans x 20 liters divided by the total number of family members in the 400 households sampled (2104) = 72,000litres/2104 individuals. = 34.221l/c/d. Hence, the per capita water use per liter per day is 34.22l/c/d in the rainy season. However, the average annual water use per capita per day in the study area stood at 28.52l/c/d. This means that an individual need 28.52 litres of water per day in the study area to satisfy his daily needs of drinking, washing and hygiene. This figure is above the WHO minimum standard of 20 l/c/d.

Variables	Number of respondents (N = 400)	Percentage
Quantity of jerican(20ltrs) of water used in the dry season		
<4 jericans(<80litres)	59	14.75
5 jericans(100litres)	101	25.25
6 jericans(120litres)	115	28.75
>6 jericans(>120litres)	152	38
Quantity of jerican(20ltrs) of water used in the rainy season		
<4 jericans(<80litres)	13	3.25
5 jericans(100litres)	77	19.25
6 jericans(120litres)	98	24.5
> jericans(>120litres)	212	53
Prize of water per jerican		
5 naira	15	3.75
10 naira	278	69.5
15 naira	61	15.5
20 naira	46	11.5

Table 2: Per capita water demand in the study area

3.4. Constraints in Accessing Adequate Water and Sanitation Facilities

Findings from the survey also indicated that among the factors hindering the respondents from accessing water was money 37.25 percent, 35.75 percent of the respondents said distance, 14.5 percent lack trust in the water available while 12.5 percent said time factor (Table 3). When asked if government or community organizations provide water for the communities, 120 respondents representing 30 percent of the respondents said they are provided with water while 70 percent said otherwise. Also, among the 30 percent respondents who agreed that Government provided them water, when asked on the reason for not using it, 15 percent said that they are not using it because it is not operational, 3.5 percent of the respondents do not use it due to distance, 1.25 percent do not use it due to time factor, 8 percent do not due to overcrowding while 2.25 percent lack trust in it (Table 3).

Variables	Number of respondents (N=400)	Percentage
Factors hindering access to water		
Money	149	37.25
Distance	143	35.75
Lack of trust in the available water	58	14.5
Time	50	12.5
Reason for not having toilet facility		
Farmland/bush nearby	18	4.5
Lack of space	9	2.25
Money	30	7.5
Have another toilet in neighbourhood	23	5.75
Whether Govt. provide water supply		
Yes	120	30
No	280	70
Reason for not using Government provided water		
Not operational	60	15
Distance	14	3.5
Time	5	1.25
Overcrowding	32	8
Distrust	9	2.25

Table 3: Constraints in accessing improved water and sanitation facilities

3.5. Proportion of Households with Self-Reported Health Problems that Could Be Related to Poor Water Supply and Sanitation in the Study Area

Findings of this study revealed that the water and sanitation related diseases suffered in the last 6 months by the respondents were diarrhoea 81 percent, scabies (3 percent), none from schistosomiasis and guinea worm diseases (dracunculaisis) while other diseases recorded 16 percent in the past 6 months. On the cases of diarrhoea in the last three months, 37 percent of the households have had one to two cases, 14.25 percent had 3 to 4 cases, and 8 percent had above four episodes while 21.75 percent have not had any case of diarrhoea in the past 3 months. When asked on the person who suffered from diarrhoea more often, 15.5 percent of the respondents said adults while 84.5 percent said children often suffer from diarrhoea.

On the place of seeking for medical care when any household member has diarrhoea or other water related illnesses, 25.5 percent of the respondents said health centre, 21.75 percent patronize traditional healers, 6.25 percent visit various religious homes, while 46.5

percent visits a nearby patent medicine shops. On whether they have recorded any death ever from diarrhoea, 2.75 percent of the respondents answered yes while 97.25 percent said otherwise (Table 4)

Variables	Number of respondents (N=400)	Percentage
Disease suffered in the last 6months		
Diarrhea	324	81
Scabies	12	3
Schistosomiasis (Bilherzia)	0	0
Dracunculiasis(Guineaworm)	0	0
Others	64	16
Cases of diarrhea recorded by households in the last 3months		
1 to 2	148	37
3 to 4	57	14.25
>4	32	8
None	87	21.75
Person most affected by diarrhoea disease		
Adults	62	15.5
Children	338	84.5
Place of seeking for treatment		
Health centres	102	25.5
Traditional healers	87	21.75
Religious house	25	6.25
Nearby Chemist (Patent Medicine Shop)	186	46.5
Deaths recorded from diarrhoea and other water related diseases		
Yes	11	2.75
No	389	97.25

Table 4: Self-reported health problems that could be related to poor water supply and sanitation

3.6. Observational Results in the Study Area

From the investigation, it was observed that proximity of the water source plays a significant role in the choice of water used by the households in the study area as mostly those respondents who live close to the stream water source at Orsuihiteukwa ward mostly utilize the water source. Also, among those who have underground water tanks in their home for the collection and storage of rain water, it was observed that many of the households do not channel the water from the house roofs directly to the water tanks rather the water is allow to flow on the ground carrying along with it some hazardous substances into the water tanks as seen in the Figure below (Figure7). The underground tanks where proper channeling was done via pipes into the tanks, it was also observed that the rope and bucket for lifting out the water from the tanks were not always kept clean as they are kept exposed on the ground after each use and later reused again to lift water from the underground tanks (Figure8). This act can reintroduce pathogens into the tanks even when the water in it is clean and safe.

Figure 7: Underground water tanks used in storing rain water collected in an unsanitary manner

Figure 8: Underground water tank with proper water channeling in one of the households in the study area

More so, while observing the method of water collection process by the respondents, it was discovered that most household members especially children and women have the practice of climbing the headwalls of the underground tanks before they can fetch water and by so doing, dirty water spills from their legs into the water tanks. The spills water may be another source of contamination even when the rain water is catched or channeled into the tanks in a sanitary manner.

It was observed also that only three water projects (boreholes) were built by the government in the whole Local Government council. Out of these three water projects, one situated at Ekeubahaeze market square which is meant to serve over 25 communities is not operational for over 10years now (Figure 9). Also, the two remaining boreholes (one situated at the Government Development Centre in Eziawa and the other situated just opposite the council secretariat) apart from not being enough for the communities, also supplies water to the villages only once in a week and sometimes does not supply for months. However, the Local Government official interviewed attributes this to lack of fund to buy diesel to power the generators. This resulted to a long queue to fetch water by the inhabitants whenever the boreholes are supplying. These factors have also made the citizens to divert to other sources of water supply or spending much money to buy water from the few households who have boreholes and who also sell their water in some cases at ₦20 per 20liters jerican.

However, the researcher also observed that most households have one type of toilet facility or another but some of those having pit latrine does not meet the World Health Organization standard of convenient, comfort and safety as some of them are sited far from the house and with offensive odour. Some does not have roof over them, some do not have slabs while some that have slabs were not firmly constructed and the toilet holes are kept open (Figure10). This act can be dangerous to human being as snakes and other dangerous animals may inhabit the toilet system. Also, flies that feed on the faeces in the toilets may contaminate water and foods leading to the spread of diseases.

Figure 9: A non-operational water project located at Ekeubahaeze market square Awo Idemili in the study area

Figure 10: Unsafe toilet facility in one of the households sampled in Orsu Local Government Area

4. Conclusion

This research paper has tried to ascertain the level of coverage in water supply and sanitations facilities in Orsu Local Government Area of Imo State, Nigeria. The results obtained have explicitly shown that the coverage in water source (59.75 percent) is below the international minimum standard of 75 percent targeted to be achieved at the end of 2015. Although the findings of this study revealed access to basic sanitation in the study area (78 percent), there is still appreciable percentage of households without basic sanitation facilities forcing them to defecate in the open which demands for government intervention to tackle the menace through adequate awareness campaign.

In other to ensure maximum access to improved water supply and sanitation coverage and reduce the possibility of water related diseases in the study area, this study proffers the following recommendations:

(i) Since the findings have shown that the water supply coverage in the study area is below the minimum standard which means that the possibility of water related diseases will be high, authority concerned should take adequate measure to solve the problem.

(ii) Water provision technology like hand pump, solar or wind driven water provision technology should be put in place in strategic locations in the area.

(iii) Proper monitoring, repair and maintenance of the existing water projects in the council area should be carried out to ensure steady water provision.

(iv) Mass awareness campaign should be carried out and sustained in the area of water treatment at household level as well as water storage and collection processes to avoid water related diseases.

(v) Large surface water bodies like Oguta Lake and other rivers around should be utilized and water treatment plant put in place to ensure the treatment and distribution of safe water to households.

(vi) Households should be enlightened on the implications of open defecation.

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