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COMPARATIVE ASSESSMENT OF WATER AND SANITATION PRACTICES IN CHOLERA AFFECTED AND NON-CHOLERA AFFECTED COMMUNITIES IN 2011 OUTBREAK IN IBADAN, NIGERIA

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ABSTRACT
The cholera outbreak in Oyo State in year 2011 provided a unique opportunity to understand the factors determining cholera occurrences and how to mitigate it. This study explored the practices related to water hygiene and sanitation among Household Heads (HHs) in Cholera Affected Communities (CAC) and Non-Cholera Affected Communities (NCAC) in Ibadan, Nigeria. A three-stage sampling technique was used to select 400 Household Heads (HHs) each in CAC and NCAC and interviewed using semi-structured questionnaire. Observational checklist was used to assess the surroundings of households and the sanitary conditions of wells and toilets where available. Six Focus Group Discussions (FGDs) were also conducted. Quantitative data were analysed using descriptive statistics and Chi-square test while qualitative data were subjected to thematic approach. Respondents' mean ages were 48.5±11.8 and 47.0±11.5 years in CAC and NCAC respectively. Reported sources of drinking water were sachet water in NCAC (35.3%) compared with well water in CAC (29.3%). In CAC, 27.0% of members of HHs were affected with cholera as against none in NCAC in the 2011 cholera outbreak. Most (79.0%) of the respondents in CAC had a poor knowledge of cholera compared with 53.3% in NCAC. Majority (70.2%) of the respondents in NCAC observed satisfactory water hygiene and sanitation practices compared with only 29.8% in CAC. Observations showed that faecal waste was indiscriminately disposed around the premises in CAC (10.0%) compared with (1.0%) in NCAC. All FGD participants in the CAC identified lack of good drinking water as a major cause of 2011 cholera outbreak in their communities. Knowledge of cholera, water hygiene and sanitation practices and sanitary facilities were poorer in the cholera affected communities compared with non-cholera affected communities. Household heads should be involved in community based health education programme to reduce future cholera vulnerability.

KEYWORDS: Water hygiene, Sanitation, Cholera related practices, Cholera affected Communities, Non-Cholera affected communities.

INTRODUCTION
Cholera is an important public health problem worldwide. Although most cholera infections are not detected, large cholera outbreaks, such as those seen in Haiti, Viet Nam and Zimbabwe in recent years, can re-occur.[1] Industrialized countries have seen practically no cholera cases for over a century because of their good water and sewage treatment infrastructure. However, the causative agents (*Vibrio cholerae* O1 and O139) continue to thrive wherever crowded housing conditions exist and water and sanitation facilities are suboptimal .[1] The results of the study by Merten et al.,[2] in Democratic Republic of Congo revealed that experiences with cholera were generally widespread within the community where (44.0%) reported that a family member had experienced cholera and 8.0% of the people had been affected themselves. All but one respondent considered cholera as potentially fatal without timely and appropriate treatment. In another study by Tasnuva et al.,[3], about 6.0% of the respondents reported that someone in their households suffered from cholera in the last six months before data-collection and 94.0% of the cholera patients were confirmed by pathological tests. The patients sought treatment at home (46.0%) and/or visited local pharmacies (24.0%) while others visited the hospital (30.0%).

In 2009, it was reported that more than 260 people died of cholera in four Northern states.[4] Most of the Northern states of Nigeria rely on hand dug wells and contaminated ponds as source of drinking water. In 2010, 44,456 cases including 1,712 deaths (CFR 3.85%) where 222 LGAs and 18 States were affected were reported, in

2011, 23,377 cases including 742 deaths (CFR 3.17%) where 195 LGAs and 25 State were affected.[5][6]

The 2010 cholera outbreak was the largest epidemic in Nigeria since 1991 when 59,478 cases and 7,654 deaths were reported.[7] The outbreak started from north-eastern border state of Borno and spread to involve 18 of the 36 states of the country.[7]

The study area recorded the highest number of cases of cholera in Ibadan metropolis during the 2011 Cholera outbreak in Oyo State and contaminations of drinking water with pathogens have also been reported in several towns in the State.[8][9][10]

In Ibadan which is the State capital and also the study area, the inner core areas are usually the epicentres of cholera outbreak.[11] Unfortunately successive governments have paid little attention to the provision of safe water supply and provision of sanitary facilities. Therefore, the need to document the knowledge of people within the affected communities with focus on the causes and prevention of cholera as well as water and sanitation practices and compare same with those in non-affected communities can explain better the antecedents of the disease incidence or its absence. This study therefore assessed the knowledge of cholera, and water and sanitary practices among household heads in affected communities and non-cholera affected communities of Ibadan North West Local Government during the 2011 cholera outbreak in Oyo State.

MATERIALS AND METHODS

Study design

The study was descriptive in design. It compared the knowledge of cholera and prevention practices between the cholera affected communities and non-cholera affected communities in 2011.

Description of study area

This study was carried out in Ibadan North West Local Government area of Oyo State. The population is about154, 029 comprising of 75,608 males and 78,619 females.[12] The estimated projection as at 2011 using 3% projection of NPC 2006 is 158,793. It is the smallest local government in Ibadan, occupying 1% of the total Land area of the Metropolis; it has 11 wards with 7 health facilities and 47 private clinic and hospital across the wards of the LGA. The major occupation of the people is trading, in which about two-thirds of the population are engaged. Ibadan North West had the highest number of cases of cholera in the 2011 cholera outbreak that occurred in the State. The area is a mix of urban and rural settlements, most of which have poor road network, unplanned settlements and overcrowded living areas. The major water source in this environment are public wells and most of these wells were not even properly covered, and more than one fetcher was using in fetching water from these wells. There was also a poor waste management in these communities which also made the sanitary condition of the communities to be poor. Majority of people in these communities defecate in the running water source, gutters and bushes within their environment.

Study population

Heads of households in the study area as identified by household members constitute the study population.

Inclusion and exclusion criteria

Respondents who were reported by household to have a key economy power and decision makers were included in this study while respondents who were identified but sick or not willing to participate in the study were excluded.

Sample size determination

The sample size determination was calculated based on sample size required to assess respondents knowledge of cholera, and water and sanitation behaviours with 80% power at a 5% level of significance using Lwanga and Lemeshow[13] sample size formula;$n= z^2pq/d^2$

n= sample size

z= the standard normal deviation which corresponds to the 95% confidence level (1.96)

p= estimate of key proportion (50.0% or 0.50).

q- 1-p

d- Degree of freedom (0.05)

$$n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2}$$

=384 each

The sample size was doubled to 800 to accommodate possible non response and generalization of findings.

Sampling procedures

A multistage sampling technique involving five stages was used in selecting respondents for the study.

Stage 1

The Ibadan North West LGA was purposively selected among the 18 LGAs affected with cholera during the 2011 cholera outbreak because it has the highest number of cholera cases among males and females as well as highest number of cholera deaths in the metropolis.

Stage 2

The communities in Ibadan North West were stratified into Cholera affected communities and non-cholera affected communities based on the data obtained from the Ministry of Health. The two groups were further stratified into high and medium density areas to give a ratio of 9:6 and 9:11 for the cholera affected communities and non-affected communities respectively.

Stage 3

Using simple random technique by balloting, 50% of the communities in the high and medium density areas for both the cholera affected communities and non-cholera affected communities were selected to participate in the study giving ratio of 5:3 and 5:6 respectively.

The ratio 5:3 was used to calculate the number of participants interviewed in selected communities in each stratum of high and medium density area of the cholera affected communities giving a figure of 250 and 150 respondents respectively. The ratio 5:6 was also used to calculate the number of participants interviewed in the selected areas in each stratum of high and medium density area of the non-cholera affected communities to give a figure of 181 and 218 respondents respectively. As shown in Table 3.3.

Table 3.3: Number of responded to be interviewed in each stratum

Sr.No.	Cholera Affected Communities	Non-Cholera Affected Communities
1.	**Highly Dense Areas**	
	5/8 x 400 =250	5/11 x 400 =181
2.	**Medium Dense Areas**	
	3/8 x 400 =150	6/11 x 400 =218
3.	Total = 250+150 = 400	Total = 181+218 = 399

The above figures were used to calculate the number of participants interviewed in each selected community in the high and medium density areas of both the cholera affected and non-affected areas. This gives a figure of 50 each in each stratum of the cholera affected communities and 36 each in each stratum of the non-cholera affected communities.

Stage 4

A list of all the houses in all the selected communities were compiled and systematic random sampling technique was used in selecting houses that were used for this study

Stage 5

Simple random sampling was then used to select the respondents' households in each house and recognised heads were enrolled.

Instruments for data collection

Both qualitative (Focus Group Discussion (FGD) and quantitative (questionnaire and observation checklist) methods of data collection were adopted for this study. The study instruments were developed by the researchers based on literature review together with input from health promotion specialist at the Faculty of Public Health, University of Ibadan, Nigeria. Some of the major questions in the FGD guide were causes and signs of cholera, kind of environment that is prone to cholera outbreak, water and sanitation sources in the household and community, diseases associated with poor water and sanitation, hygiene measures practices and how people treat cholera and the types of treatment used during the last cholera outbreak in 2011 in the cholera affected communities. Questionnaire on the other hand was developed by the researchers based on the information obtained from Focus Group Discussion (FGDs). The questionnaire was used to obtain respondents' socio-demographic characteristics, knowledge of the head of households on cholera, and water and sanitary practices. Observational checklist was also developed by the researchers based on information obtained from FGD and was used to diagnosed the quality of the household wells, toilets types and surrounding condition that may be associated with cholera occurrence in cholera affected communities during the 2011 cholera outbreak.

Training of research assistants

Thirteen (13) Research Assistants (RAs) (5 males and 8 females) were recruited and trained on data collection methods, study instruments, ethical issues and objectives of the study for a day including practical session on the instruments administration. Practical session was done in a community (Yemetu) close to venue of the training. The criteria for the selection of research assistants were ability to speak Yoruba language which is the major language in the study area, residents and good background of the study areas, minimum of secondary educational qualification and within the ages of 23-35 years. The RAs participated in the pilot study and were divided into groups where a group has three members and out of which a team leader was appointed for quality control monitoring and supervision of other 2 RAs during data collection and immediate data cleaning of information collected.

Validity of instruments

In order to ensure validity of the study instruments, an in-house pretest was done among health promotion experts in the Faculty of Public Health, University of Ibadan, and homogenous population to that of the sample population. The instruments were also subjected to peer-review at the departmental seminar. Finally, they were translated into Yoruba (the local language of the study area) and back translated to English language for computation and analysis of the study findings.

Reliability of instruments

A pilot study was carried out in Ibadan South West LGA because it has similar characteristics with the study area and is the LGA with second highest cholera cases during 2011 outbreak in Ibadan metropolis. Two FGD were conducted during the pre-test among head of households in Oja-Oba which is one of the cholera affected communities and mothers group in Beere Right which is one of the non-affected communities to help improve on other instrument to be used for the study. Ten percent of the sample size of 800 was used as the number of questionnaire with the observational checklist attached which were 80. Forty each in the cholera affected communities and 40 in non-cholera affected communities. The pre-test result was useful in determining the trend in the responses of respondents,

their level of understanding of the items in the research instruments and the duration of time it took to administer the instruments and also served as an eye opener for further questions that needed to be included or removed from the instruments. The reliability coefficient of the questionnaire was also done by conducting the interview twice with the same child caretaker using the same questionnaire. The reliability was calculated using the Alpha Cronbach's reliability test. The result was 0.8 which was interpreted as being reliable.

Data collection procedure

The researchers together with the research assistants went round all the communities that were selected for the study.

Qualitative

Four FGDs were conducted among heads of households comprising of two each in both affected (Ayeye and Idikan) and non-affected (Lekan Salami and Queen cinema) communities and two FGD conducted among mothers comprising 1 each in both affected (Adamasingba) and non-affected (Alekuso) communities, making a total of six FGD sessions conducted during the main study. Prior to the FGD session, the researcher visited the above listed communities where the sessions were conducted and identified possible influencers, mobilized and agreed on date and time for each of the sessions. The sessions were conducted in a suitable environment such as the community town hall, women leader compound and front of family house. Each of the sessions started with an introduction by the moderator with the explanation of the purpose of the study and reassurance of the participants of their confidentiality. Thereafter the session's discussions followed using the designed FGD guide. Each of the sessions lasted for about 50 minutes with two sessions in a day usually one in the morning mainly the mother groups and one in the evening the heads of households group. A total of 4 days were used in conducting the six sessions. Each of the participants were thanked and given incentives such as detergents, powder substance for washing toilets sits and shining pots, water guard and matches box to encourage them to adopt healthy life styles. The discussions were audio taped with the consent of the participants. Tapes were transcribed verbatim in Yoruba and were subsequently translated into English. Spot checks of transcripts and translations were regularly conducted to ensure completeness of the transcription and accuracy of translation.

Quantitative

A total of 400 questionnaires were administered in the eight communities identified to be affected with cholera during the 2011 cholera outbreak, making a total of 50 copies of the questionnaire per community between June and July, 2012. These were administered by three research assistants in a team for each community. Ten copies of the questionnaire were administered in a day per RA. Two RAs and the researchers supervised the teams on a daily bases by spot checking on them. Six days including mop up were used for data collection in cholera affected communities. Four hundred (400) copies of the questionnaire were also administered in eleven non-cholera affected communities, a total of 36 questionnaires were administered in each of the community with two RAs in each team while the researchers did daily supervision. This lasted for seven days including mop up. In all, thirteen days were used in administering of the questionnaire. Observational checklist was used to observe the sanitary conditions, wells and surroundings of the respondents' house.

Data management and analysis

All completed instruments were stored in a place that would be safe from destruction by water or fire and where unauthorized persons would not have access to them. The FGDs were transcribed, sorted, categorized and analyzed thematically. The questionnaires and observation checklist data collection forms were serially numbered and checked for errors and completeness on a daily basis right on the field. Data were sorted, edited and coded by the investigators with the use of coding guide and then counter checked before entry into the computer and analyzed using the Statistical Package for Social Science (SPSS) version 15. Descriptive statistics, t-test and Chi-Square method of analysis were used. A scoring mechanism was adopted to determine household heads level of knowledge of cholera and practices of water and sanitation hygiene. Households head knowledge of cholera and practices related to water and sanitation was measured each on a scale of 9-point. Knowledge scores of ≥ 5 and <5 were classified as good and poor respectively while scores of ≥ 5 and <5 were classified as satisfactory and unsatisfactory practices respectively. In addition, the hypotheses were tested to establish different level of significant relationships between variables.

Ethical considerations

Ethical approval was sought and obtained from the Ethical research committee of Ministry of Health, Oyo State. The study participants (heads of households) voluntarily took part in this study, appropriate information about the research was also provided to the participants with a form requesting for their informed consent. Respondents were treated formally and adequately informed that they could withdraw from the study at any point and all information given by them was only used for research purpose.

Limitations of the study

The study participants were reluctant to allow the inspection of their toilets for fear of criticism. However, effort was made to assure them that the study was strictly confidential and that data obtained from the study would be used to design programmes for their benefit.

RESULTS

Socio-demographic characteristics

Table 4.1 shows the sex gender characteristics of respondents with a higher preponderance of female in-affected (52.0%) and non-affected (67.5%) communities. Educationally, 26.5% of respondents in cholera affected communities and 32.2% non-communities affected communities possess secondary education. In both study areas, in cholera affected and non-cholera affected communities, majority of the respondents are of Yoruba ethnicity (87.8%, 86.0%) and are also married (78.8%, 85.8%) respectively. Out of those who were married, 59.4% in cholera affected and 63.8% in the non-cholera affected communities were in monogamous type of marriage. More than half of respondents in cholera affected communities (58.2%) were Muslims while 51.3% are Christians in non-cholera affected communities. Quite a number of respondents across study areas were into trading profession (69.0%, 62.0%) and were also within 38-57 years of age (57.5%, 58.8%) in affected and non-affected communities respectively (Table 4.1).

Table 4.1 Socio demographic characteristics of respondents

Sr. No	Variables	Cholera Affected Communities		Non-Cholera affected Communities	
		Number	%	Number	%
1.	**Sex**				
	Male	192	48.0	130	32.5
	Female	208	52.0	270	67.5
2.	**Educational qualification**				
	None	94	23.5	74	18.5
	Primary	177	44.2	142	35.5
	Secondary	106	26.5	129	32.2
	Tertiary	23	5.8	55	13.8
3.	**Ethnicity**				
	Igbo	19	4.8	24	6.0
	Yoruba	351	87.8	344	86.0
	Hausa	9	2.1	14	3.5
	Edo	11	2.8	18	4.5
	Delta	10	2.5	-	-
4.	**Marital status**				
	Single	6	1.4	10	2.4
	Married	315	78.8	343	85.8
	Divorced	15	3.8	7	1.8
	Separated	18	4.5	8	2.0
	Widow/widower	30	7.5	24	6.0
	Co-habiting	16	4.0	8	2.0
5.	**Age (Years)**				
	18-37	92	23.0	85	21.2
	38-57	230	57.5	235	58.8
	58-77	78	19.5	80	20.0

Respondents' knowledge of cholera

Seventy nine percent and 53.3% of respondents in cholera affected and non-cholera affected communities respectively had a poor knowledge of cholera. Table 8 shows knowledge of causation of cholera across study areas. In cholera affected communities 40.2% of respondents stated that cholera is caused by dirty environment while 42.6% of those in non-cholera affected communities attributed it to bad water or food (42.6%). Majority of the FGD discussants in cholera affected communities were of the believed that absence of cleanliness in the environment and toilet facilities are some of the causes of cholera. A male discussant from non-cholera affected community specifically said.

'M*ost the causes of the cholera are when there is toilet without cover, when houseflies fly on foods or plates or from air.*

Another discussant non-cholera affected community said.

'During mango season, houseflies are common so when foods are not properly covered, they can contaminate the food.

A male discussant in cholera affected community said;
'*Because we are not children, it is dirtiness and overfeeding that does cause cholera. By practicing personal hygiene and rain also usually pack all the waste in this area and more so that we are in Gege environment, God is protecting us*'

Other perceived causes of cholera among discussants were bad drinking water, dirtiness and taking of dirty food, odour from dirty or blocked toilet, and dirty environment because some people have the habit of

keeping faeces in their homes and some are extremely dirty. Discussants from cholera non-affected communities' also associated poor drinking water, dirty environment and contaminated food as major causes of cholera. All the discussant specifically said dirtiness causes cholera.

In respect to the signs and symptoms of cholera, 39.2% and 41.7% of respondents from the affected and non-affected communities respectively made mention of vomiting. When asked about the major symptoms of cholera, 34.5% and 30.8% of the respondents in affected and non-affected communities mentioned vomiting and stooling respectively. Focus Group Discussion discussants in both communities also identified constant stooling of watery faeces containing eggs and vomiting as signs and symptoms of cholera and a female discussant in cholera affected community said.

'*If a person start belching like spoilt egg, the person would have been affected with cholera'*

Another male discussant in cholera affected community said,
'If anybody continues to stool and vomit without being stop'

A male discussant from non-cholera affected communities said.

'*When somebody is stooling, having stomach upset and vomiting, it means cholera is gradually coming'*
Other signs and symptoms mentioned by discussants were passing stool uncontrollably, throwing-up, high temperature and stomach ache and dehydration.

When asked about the best way of treating cholera, self-medication (29.8%) and hospital (43.2%) topped the list among the respondents from cholera affected communities and non-cholera cholera affected communities respectively. In respect to how best to prevent cholera, majority of the respondents (93.5%, 98.7%) from the cholera affected communities and non-cholera affected communities affirmed that cholera can be prevented, though the ways of achieving this is different. About a quarter (24.7%) of respondents in cholera affected communities indicated maintaining clean environment while 36.3% from the non-cholera affected communities made mention of drinking clean water. Majority of the FGD discussants in both communities reported that they did not know appropriate treatment for cholera and referral is usually made to a health facility in cases of occurrence of cholera for treatment. A male discussant in cholera affected community said;

'We do not know the treatment used in taking care of this people but we know they were taken to hospital where they got healed.

Another female discussant in cholera affected community said.

'We take the victims to hospital and direct others who do not know the appropriate place'.

A female discussant in non-cholera affected community said.

'*When a person is affected with cholera, sugar salt solution can be given before taking the victim to the hospital'*

Another female discussant from cholera affected community said*:*

'At times we give drugs ourselves so it works for the ailment'.

A discussant from the non-affected community said:
'*People affected could use oral rehydration solution before going for treatment'*

Table 4.2: Respondents' knowledge of cholera

Sr.No.	Variables	Cholera affected communities		Non-cholera affected areas	
		Number	%	Number	%
1.	**Causes of cholera***				
	Air/Odour	96	12.2	30	3.0
	Dirty environment/toilet	316	40.2	147	19.1
	Lack of personal hygiene/bad eating habit	106	27.0	44	5.8
	Bad water/food	215	15.1	328	42.6
	Through flies	32	4.1	123	16.0
2.	**Best signs of cholera***				
	Vomiting	308	39.2	321	41.7
	Stooling	283	36.0	313	40.6
	Weakness	36	4.6	24	3.1
	Hospital knows	6	0.7	3	0.4
	Diarrhea/Loss of weight/Dehydration	101	12.9	63	8.2
	Death/White eyes/stomach ache	31	3.9	20	2.5
3.	**Symptoms of cholera***				

	Vomiting	271	34.5	231	30.0
	Stooling	252	32.1	237	30.8
	Headache/stomach ache	39	5.0	43	5.5
	Diarrhea/Loss of weight/Dehydration	102	13.0	70	16.9
	Weakness/Peal	101	12.9	106	15.1
4.	**Best ways of treating cholera***				
	Hospital knows	57	7.3	333	43.2
	Using herbs	192	24.4	29	3.8
	Self medications	234	29.8	56	7.3
	Medical drugs	39	5.0	142	18.4
	Use of ORS	74	9.4	97	12.6
	Prayers	180	22.8	56	7.3
5.	**Can cholera be prevented?**				
	Yes	374	93.5	380	98.7
	No	19	4.5	5	1.3
6.	**Ways cholera can be prevented ***	**(N=374)**		**(N=380)**	
	Personal hygiene	145	19.4	63	8.3
	Cleaning of the environment	185	24.7	91	12.0
	Eating good food/ Drinking of clean water	161	21.5	225	36.3
	Water treatment	24	3.2	36	4.7
	Through provision of social amenities	25	3.3	79	10.4
	Waste management by government	21	2.8	19	2.5
	Keeping of water and food well	14	1.9	39	5.1
	Educating people about the disease	30	4.0	104	13.7
	God's protection	137	18.4	38	5.0

*Note: * includes multiple responses*

Respondents' reported water and sanitation practices

Figure 1 shows the different sources of water available to households across cholera affected and non cholera affected study communities. About 55.6% of households in non- cholera affected communities use rain water, well water (40.8%) and Sachet water (28.0%) as sources of drinking water. Contrastingly, non-affected areas use borehole (43.5%), tap water (34.5%) and pure water (40.8%) as sources of drinking water. The FGD discussants in cholera affected areas stated non availability of tap water in their communities and a male discussant specifically said:

'We dug wells by ourselves but there is no tap water'

Discussants in non-affected areas revealed that there is availability of tap water in there communities and also there is a strong policy on implementation of sanitation by law enforcement agents in their areas. A female discussant in non-cholera affected community said;

'*At times tap do run, but most times we fetch from the well and water that do run from the gutter. We equally sweep our environment every morning and we treat our water sometimes before drinking with alum, salt, by boiling and by allowing it to settle down before drinking*'

Another male discussant said;

'Women are always called upon to take care of the environment in the morning and evenings'.

Another male discussant said;

'*There are gutters in our area but we take care of it and practice personal hygiene that is why we are not affected with cholera. There is mandatory cleanliness of the environment every week (WAT) and Yes-o do arrest whoever is not complying'*

Another male discussant also said:

'Tap water usually runs because there is water works in this area'.

Another discussant said

'We are surrounded by well, the number of well around here is up to six. There is also tap water but if it does not run we will buy pure water and we treat our water before drinking with alums, water guards, by boiling and sieving etc and we do cover our drinking water and hands our children to wash their hands before eaten to prevent disease. There are so many gutters in our area but we take care of it and practice personal hygiene that is why we are not affected with cholera'.

Table 4.3 shows the frequency distribution of observational findings which revealed that 23.5% and 19.0% of respondents in cholera affected and non-cholera affected communities respectively had well as their source of water. Among these, 86.1% sourced water from public well, 13.8% from private well in cholera affected communities while 60.5% and 39.5% source water from public and private wells respectively in non-cholera affected communities. The conditions of the well in both communities were also considered. It was observed that 16.8% and 20.8% of the wells in cholera affected and non-cholera affected communities had cover respectively. In cholera affected communities, out of (16.8%) wells that had covers, majority of these well covers were made of trail (41.8%), plank (40.3%) and

zinc (25.4%) while eleven (16.4%) are made of metal, unlike in non-cholera affected communities where out of the 20.8% wells with covers made of metal (68.7%) and zinc (31.3%). Furthermore, 0.5% and 5.0% of respondents' sourced water from borehole in cholera affected and non-cholera affected communities respectively. Also, the sampled respondents from cholera affected and non-cholera affected communities who soured water from pipe-bone treated water called 'tap' were 5.0% and 3.3% respectively. Further observation on the well reveals that wells with cracked and/or broken structures were found more in cholera affected communities (75.5%) than non-cholera affected communities (9.2%), also, presence of stagnant water 1 meter close to the well are rampant in the formal (71.3%) than the latter (7.9%). Half (50.0%) water pool and gutter (21.3%) were observed in cholera affected communities compared to non-cholera affected communities where only (7.9%) of water pool were observed.

Table 4.4 shows the respondents' sources of drinking water in both communities. Well water (29.2%) was the major source of drinking water in the affected areas as compared with pure water (35.2%) in non-affected areas.

For the purposes of washing, majority of respondents across both study groups use well water (62.8% affected & 65.5% non affected). The same trend was observed for respondents' source of water for bathing (64.8% & 65.5%) respectively. For cooking, 63.0% of respondents in affected areas and 49.3% in non-affected areas use well.

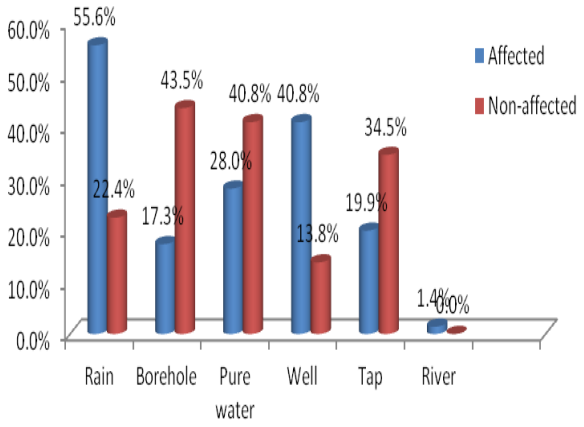

Fig. 1: respondents' sources of water.

Table 4.3: Observed household water and sanitation practices.

Sr. No.	Variable	Cholera Affected Communities		Non-cholera Affected Communities		X^2	P-value
	Questions	**N**	**%**	**N**	**%**		
1.	**Well present in the premises** Yes No	 94 306	 23.5 76.5	 76 324	 19.0 81.0	2.420	0.120
2.	**Category of Well** Private Well Public Well No Available Well	 13 81 306	 3.3 20.3 76.5	 30 46 324	 7.5 11.5 81.0	14.625	0.000
3.	**Type of water source/Bore hole** Yes No	 2 398	 0.5 99.5	 12 388	 3.0 97.0	0.821	0.365
4.	**Type of water source/Tap** Yes No	 14 391	 3.5 97.0	 13 387	 3.3 96.8	0.748	0.387
5.	**Type of water source/Well** Yes No	 96 306	 23.5 76.5	 76 324	 19.0 81.0	2.420	0.120
6.	**Well with cover** Yes No	 83 11	 88.3 11.7	 67 9	 88.2 11.8	0.001	0.978
7.	**Type of cover material** Metal Trail Plank Zinc	 11 28 27 17	 13.3 33.7 32.5 20.5	 52 0 0 15	 77.6 0.0 0.0 22.4	81.023	0.000
8.	**Well fully covered** Yes No	 16 67	 19.3 80.7	 54 13	 80.6 19.4	56.009	0.000
9.	**Well structure cracked or broken**	71	75.5	7	9.2	74.442	0.000

10.	Yes No	23	24.4	69	90.8		
	Present of stagnant water that is 1m close to the well Yes No	 67 27	 71.3 28.7	 6 70	 7.8 92.1	68.901	0.000
11.	**Number of water pool** 2 1 Gutter	 26 21 20	 6.5 5.3 5.0	 0 6 0	 0 1.5 -	11.138	0.004
12.	**Grave present in the premises** Yes No	 114 286	 28.5 71.5	 103 297	 25.8 74.3	0.765	0.382
13.	**Gradient of grave** 15m 0.5 9m 6m 2m	 10 8 15 6 7	 21.7 17.5 32.6 13.0 15.2	 22 0 5 0 0	 81.5 0.0 18.5 0 0	27.412	0.000

Table 4.4: Respondents' Water Sources and Sanitation Practices.

Sr. No	Variables	Cholera affected communities		Non-cholera affected communities	
		Freq	%	Freq	%
1.	**Sources of drinking water** Pure water Rain water Tap Borehole Well	 80 103 51 68 117	 20.1 25.8 12.8 17.1 29.2	 141 24 95 121 19	 35.2 6.0 23.8 30.2 4.8
2.	**Most used of washing water** Well Rain Borehole Tap	 251 61 70 18	 62.8 15.2 17.5 4.5	 262 22 81 35	 65.5 5.5 20.2 8.8
3.	**Most used of bathing water** Well Rain Borehole Tap	 259 67 61 13	 64.8 16.8 15.2 3.2	 262 22 81 35	 65.5 5.5 20.2 8.8
4.	**Most water source for cooking** Borehole Well Tap Rain	 65 252 57 26	 16.3 63.0 14.2 6.5	 134 197 64 5	 33.5 49.3 16.0 1.2
5.	**Types of toilet facility** Pit latrine/dug hole Bucket system (pit, river and water closet) VIP latrine/water closet Bush/stream Community public toilet	 173 52 69 38 68	 43.3 13.0 17.2 9.5 17.0	 167 16 195 5 17	 41.8 4.1 48.8 1.0 4.3
6.	**Toilet utilization category** Members of household only With other households in a compound With more than one compound	 50 146 204	 12.5 36.5 51.0	 122 185 93	 30.5 46.3 23.2

sanitation facilities used by the respondents

i. toilet facilities

Observational findings revealed that 41.0% and 55.5% of respondents in cholera affected and non-cholera affected communities respectively had toilets. Many (69.5%) and 45.0% of the respondents in cholera affected and non-cholera affected communities respectively were using public toilet. Furthermore, it was obvious that 30.8% and 25.5% of respondents in cholera affected and non-cholera affected communities respectively were using pit latrine while 8.3% and 25.5% of residents in cholera non-cholera affected and cholera affected communities respectively were using water closet toilet. It was also observed that 63.4% and 80.0% of toilets in cholera affected and non-cholera affected communities respectively were at least 15 meters away from the source of water (well) (Table 4.5). It was also observed that feaces were indiscriminately disposed around premises in cholera affected communities as show in plate 9.

Table 4.5: Observed toilet facilities in cholera affected and non-cholera affected households.

Sr. No.	Variable	Cholera Affected Communities		Non-Cholera Affected Communities			
	Observational Questions	**N**	**%**	**N**	**%**	**X^2**	**P-value**
1.	**Toilet present in the premises**						
	Yes	164	41.0	222	55.5	16.841	0.000
	No	236	59.0	178	44.5		
2.	**Category of Toilet**						
	Private Toilet	50	30.5	122	55.0	22.856	0.000
	Public Toilet	114	69.5	100	45.0		
3.	**Type of toilet source/VIP**						
	Yes	8	2.0	10	2.5	0.227	0.634
	No	392	98.0	390	97.5		
4.	**Type of toilet source/Pit Latrine**						
	Yes	123	30.8	112	28.0	0.729	0.393
	No	277	69.3	288	72.0		
5.	**Type of toilet source/water closet**						
	Yes	33	8.3	102	25.5	42.426	0.000
	No	367	91.8	298	74.5		
6.	**Toilet at least 15m away from well**						
	Yes	45	11.3	48	12.0		
	No	26	6.5	12	3.0	4.362	0.000
7.	**If No, comment: indicate Distance from well**						
	9m	7	1.8	5	1.3		
	11m	10	2.5	0	0.0	6.278	0.043
	6m	9	2.3	7	1.8		
8.	**Toilet has roof superstructure**						
	Yes	95	23.8	162	40.5	9.596	0.002
	No	69	17.3	60	15.5		
9.	**Toilet cover present**						
	Yes	145	36.3	204	51.0	1.316	0.251
	No	19	4.8	18	4.5		
10.	**Type of cover material**						
	Plank	35	8.3	52	13.0		
	Zinc	13	3.3	0	0.0		
	Basin	12	3.0	18	4.5		
	Water closet plastic cover	17	4.3	85	21.3		
	Iron pan	18	4.5	34	8.5		
	Plastic container cover	11	2.8	15	3.8	98.851	0.000
	Bowl	9	2.3	0	0.0		
	Trail	4	1.0	0	0		
	Stone	26	6.5	0	0		
11.	**Toilet hole fully covered**						
	Yes	54	13.5	174	43.5	86.405	0.000
	No	91	22.8	30	7.5		
12.	**Toilet structure cracked or broken**						
	Yes	81	20.3	35	8.8		
	No	83	20.8	187	46.8	50.731	0.000

13.	**Toilet structure needs cleaning** Yes No	104 60	26.0 15.0	23 199	49.8	120.26 0	0.000
14.	**Flies present in the toilet** Yes No	109 55	27.3 13.8	44 178	11.0 44.5	85.767	0.000

ii. disposal of refuse by households

Households in cholera affected communities (42.0%) and non-cholera affected communities (53.3%) areas engage the services of government's refuse collectors for disposal of refuse. Some of the respondents (32.8%) in cholera affected communities also dump refuse along drainage (Figure 2).

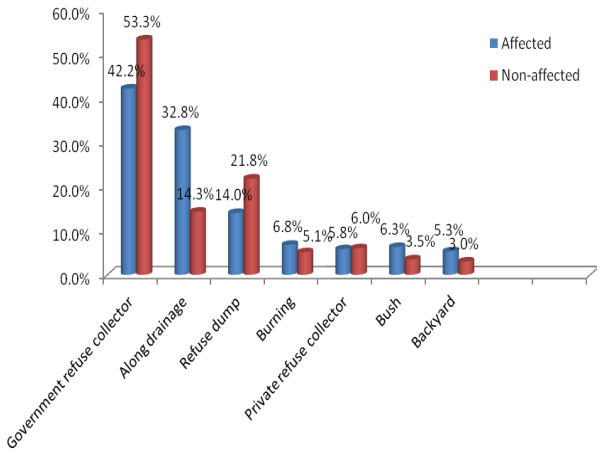

Figure 2: areas of disposal of refuse by households.

iii. respondents' water hygiene practices

Table 4.6 shows the water hygiene practices across household's affected and non-affected with cholera. About 32.3% and 34.0% of respondents in cholera affected and non-cholera affected communities respectively have container for storing water and about 26.4% of respondents in affected areas dip between 2-5 cups in to their water storage containers while 40.2% of respondents in non-cholera affected communities dip just one cup into water storage containers. Enquiry about respondents' treatment of water shows that about 49.9% and 46.5% (cholera affected and non-cholera affected communities) of respondents do treat their water. Of the substances used in treating water, 47.3% and 33.2% of respondents across study areas respectively mentioned salt/alum among others. About 56.2% and 69.5% of respondents respectively treat their water always. Also, 73.5% and 58.6% of respondents change their water once within 1-3 weeks. Moreover 88.6% and 86.3% of respondents across study areas have waste bins in their households respectively.

Table 4.6: Water hygiene practices among respondents in cholera affected and non-cholera affected communities.

Sr. No.	Variables	Cholera Affected Communities		Non-Cholera affected Communities	
		Number	%	Number	%
1.	**Container for storing of water***	**(N=371)**		**(N=353)**	
	keg	45	35.4	36	55.4
	Bucket with cover	40	31.5	23	35.4
	Drum with cover	9	7.1	3	4.6
	Clay pot	24	18.9	2	3.1
	Basin	3	2.4	1	1.5
	Dispenser	6	4.7	-	-
2.	**Dedicated number of cup(s) usually used in drawing water from storage containers**	**(N=342)**		**(N=296)**	
	1 storing cup/jug	60	17.5	142	48.0
	2-5 cups	98	28.7	88	29.7
	6-12 cups	77	22.5	36	12.2
	1-3 bowls	48	14.0	24	8.1
	Any container	59	17.3	6	2.0
3.	**Treat water before drinking**	**(N=366)**		**(N=352)**	
	Yes	185	50.5	164	46.5
	No	181	49.5	188	53.3
4.	**Substance used in treating water***	**(N=274)**		**(228)**	
	Salt/alum	175	63.9	109	47.8
	Boiling/sieving/covering/washing of container/safe	77	28.1	78	34.2
	Kan for/charcoal/kerosene	5	1.8	4	1.7
	Water guard/medicine	17	6.2	37	16.3

5.	**How often is water treated**	**(N=183)**		**(N=162)**	
	Always	104	56.8	114	70.4
	Occasionally	79	43.2	48	29.6
6.	**Waste bin in the house**				
	Yes	353	88.2	345	86.2
	No	47	11.8	55	13.8
7.	**Type of waste bin***	**(N=396)**		**(N=363)**	
	Sack/nylon bag/cotton	259	65.4	227	62.5
	Bucket/bowl/basin/drum	81	20.5	81	22.3
	Plastic basket	56	14.1	55	15.2
8.	**Waste bin covers***	**(N=397)**		**(N=374)**	
	No cover	274	69.0	242	64.7
	Cotton/nylon/sack bag	61	15.4	53	14.1
	Bucket/basin/bowl/drum	41	10.3	42	11.2
	Plastic basket	21	5.3	37	10.0
9.	**Emptying of waste bins**	**(N=352)**		**(N=345)**	
	Always	137	38.9	185	53.6
	Occasionally	215	61.1	160	46.4
10.	**Practice score**				
	0-4	323	82.0	219	55.5
	>4	77	18.0	181	44.5
11.	**Practice category**				
	Not satisfactory practices (0-4)	323	82.0	219	55.5
	Satisfactory practices (above 4)	77	18.0	181	44.5

*Note: * includes multiple responses*

In addition, figure 3 shows the different activities carried out by respondents after using the toilet across study areas. About 79.0% and 85.5% of respondents across cholera affected and non-cholera affected communities wash their hands after using the toilet.

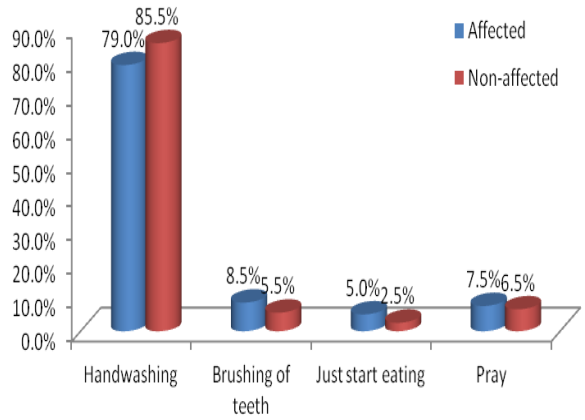

Figure 3: activities carried out by respondents after using the toilet across study areas.

association between respondents' level of knowledge on cholera and community of residence

The result of the test of difference between level of knowledge across cholera affected and non-cholera affected communities is presented in table 4.7. It was observed that there was statistically significant association ($p<0.05$). More (79.0%) respondents in cholera affected communities had a poor knowledge of cholera compared with their counterpart in non-cholera affected communities (53.3%). More respondents (46.7%) in non-cholera affected communities also have a good knowledge of cholera compared with their counterpart in cholera affected communities (21.0%).

Table 4.7: Difference in the level of knowledge of cholera across cholera affected and non-cholera affected communities.

Sr. No.	Communities	Knowledge level		
		Poor n (%)	Good n (%)	Total n (%)
1.	Affected	316 (79.0%)	84 (21.0%)	400 (50.0%)
2.	Non Affected	213 (53.3%)	187 (46.7%)	400 (50.0%)
3.	**Total**	529 (66.1%)	271 (33.9%)	800 (100.0%)

Chi Square (X^2) = 59.20; Degree of freedom = 1; P<0.0001

Association between respondents' practices towards cholera prevention in both cholera affected and non-cholera affected communities

The result of the association between respondents' practices towards cholera prevention in both cholera affected and non-cholera affected communities is presented in table 4.8. It was observed that there was statistically significant association (P<0.05). More respondents (45.3%) in non-cholera affected communities have a satisfactory practice towards cholera prevention compared with their counterpart in cholera affected communities (19.3%).

Table 4.8: Association between respondents cholera prevention practices in affected and non affected communities.

Sr.No.	Community	Practices		
		Satisfactory	Non- Satisfactory	Total
1.	Affected	323 (80.8%)	77 (19.3%)	400 (100.0%)
2.	Non Affected	219 (54.8%)	181 (45.3%)	400 (100.0%)
3.	**Total**	542 (67.8%)	258 (32.3%)	800 (100.0%)

Chi Square (X^2) = 61.878; Degree of freedom = 1; P<0.0001

Association between respondents' level of education and practices towards cholera prevention

The result of the association between respondents' level of education and practices towards cholera prevention is presented in table 4.9. It was observed that there was statistically significant association (P<0.05). Few respondents (46.2%) with tertiary education had a non-satisfactory practice towards cholera prevention compared with their counterpart who had secondary school certificate and below (64.3%).

Table 4.9: Association between respondents' level of education and practices towards cholera prevention.

Sr.No.	Level of Education	Practices		
		Satisfactory	Non-Satisfactory	Total
1.	None	135 (80.4%)	33 (19.6%)	168 (100.0%)
2.	Primary	220 (69.0%)	99 (31.0%)	319 (100.0%)
3.	Secondary	151 (64.3%)	84 (35.7%)	235 (100.0%)
4.	Tertiary	36 (46.2%)	42 (53.8%)	78 (100.0%)
5.	**Total**	542 (67.8%)	258 (32.3%)	800 (100.0%)

*Chi Square (X^2) = 30.400; Degree of freedom = 3; P value = 0.*000

Association between respondents' level of knowledge and practices towards cholera prevention

The result of the association between respondents' level of knowledge and practices towards cholera prevention is presented in table 4.10. It was observed that there was statistically significant association (P<0.05). More respondents (50.2%) who had good knowledge of cholera had a satisfactory cholera prevention practices compared with their counterpart who had a poor knowledge (23.1%).

Table 4.10: Association between respondents' level of knowledge and practices towards cholera prevention.

Sr.No.	Level of knowledge	Practices		
		Satisfactory	Non-satisfactory	Total
1.	Poor	407 (76.9%)	122 (23.1%)	529 (100.0%)
2..	Good	135 (49.8%)	136 (50.2%)	271 (100.0%)
3.	**Total**	542 (67.8%)	258 (32.3%)	800 (100.0%)

Chi Square (X^2) = 60.331; Degree of freedom = 1; P value = 0.000

DISCUSSIONS

Majority of the respondents in this study were within 38-57 years of age. This is an indication that the study population is adult. Many of the respondents in both communities are females suggesting that household headship is changing from male orientation to more of female. This is not in-line with NDHS report which showed that households in Nigeria are predominantly headed by men (81 percent) and less than one in five (19 percent) are headed by women. However, it was also concluded that female-headed households are more common in urban areas (21percent) than in rural areas (19 percent) and the study area is an urban area. The preponderance of Yoruba ethnic group among respondents is largely due to the study site being predominately inhabited by the Yoruba. More than half of the respondents were Muslims probably reflecting preponderance religion in this study area. Most respondents had primary school education reflecting low level of education in the study area. Majority of the respondents were from monogamous families and this typical of most urban areas in Nigeria.[14]

In this study, more than half of the respondents in both communities had a poor knowledge of cholera. This is similar to the finding of Tasnuva et al.,[3] Most of the respondents stated that cholera is caused by dirty environment and bad water or food similar to the finding by Merten et al.,[2] Majority of the FGD discussants in cholera affected communities attributed absence of environment cleanliness and toilet facilities to cholera causation. This is similar to Merten et al.,[2] findings. However, Tasnuva et al.,[3] survey respondents attribution was more on eating unprotected or rotten food and drinking unsafe water to cholera causation. Majority of the FGD discussants in both communities in the current study identified constant stooling of watery faeces containing eggs and vomiting as signs and symptoms of cholera. This is similar with the finding of the qualitative study by Tasnuva et al.,[3] Thus prolonged existences of these symptoms which cause loss of large amounts of fluid and salts, if not promptly and adequately treated, can lead to severe dehydration causing and death within hours. It has been reported that case fatality rate (CFR) if untreated may reach 30–50 per cent.[15] Most of the respondents in this study considered medication and hospital treatment as major treatment strategies for cholera. This is in accord with Merten et al.,[2] Most of the respondents identified maintaining clean environment and drinking of clean water as ways for preventing cholera. This is in agreement with the study by Tasnuva et al.,[3]

Some households in cholera affected areas reportedly use rain water, well water and pure water as sources of drinking water while household in non-cholera affected communities reported using borehole, tap water and pure water as sources of drinking water. Similar findings also reported by Tasnuva et al.,[3] in which two-thirds of their respondents used safe water for drinking and household purposes. Sigrid, Natalie and Christine[16] in their study also revealed that their respondents used tap and bottled water for drinking. The FGD discussants in cholera affected areas stated non availability of tap water in their communities. This is similar to the study by Tasnuva et al.,[3] Less than half of households in both communities use latrine for defecation and most commonly used toilet facility are community built toilets in affected areas and water closet in non-affected areas. In addition, most toilets in cholera affected and non-affected communities (63.4% and 80.0%) were at least 15 meters away from the source of water (well). This is similar to the findings of Sigrid et al.,[16] This is also in-line with NPC and ICF Macro[12] results where it was reported that seven in ten households (73 percent) use non-improved facilities (69 percent in urban areas and 75 percent in rural areas). Among households with improved toilet facilities, flush toilets (to pipe sewer system, to septic tank, or to pit latrine) are mainly found in urban areas and are used by 18 percent of households (4 percent in rural areas).[12] Furthermore, more households in cholera affected communities dump refuse along drainage compared with non-cholera affected. Sigrid et al.,[16] in their study reported that trash was seen within five paces of 89.8% of homes of people affected with cholera. The study also found a strong association between level of education and prevention practices. Only few respondents who had tertiary education had a non-satisfactory practice towards cholera prevention compared with their counterpart who had secondary school certificate and below. Education is primarily important and is related to knowledge and practice.[3]

CONCLUSION

This study has shown that the cholera affected communities are characterised by poor knowledge of the disease low level of water hygiene and sanitation practices and sanitary facilities compared with non-affected communities. Community based health education should emphasise satisfactory water hygiene and sanitation practices in both communities to reduce future cholera vulnerability. It is also essential to secure funds for printing of information, education and communication materials; and the distribution of key hygiene messages on radio or similar mass media.

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