

Full Length Research Paper

Risk factors associated with cholera outbreak in Bauchi and Gombe States in North East Nigeria

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This study investigated the risk factors associated with cholera epidemic during the 2010 cholera outbreak in some States in Nigeria. Semi-structured questionnaires were administered to consented patients and/or their parents/guardians in Bauchi and Gombe States in North East Nigeria. Few (33.7%) respondents had access to safe and clean drinking water through the pipe-borne system compared to well (47.8%) and river (19.6%). Respondents' means of sewage disposal were: pit/latrine (77.2%); bush (15.2%); and water closet (4.3%). Only 34.8% knew water, food and poor sanitation as transmission routes for cholera. There was a significant gender difference in knowledge of lack of safe and clean drinking water and poor sanitation as contributing factors to cholera infection ($p < 0.05$). Observation showed poor sanitation and food hygiene practices in the communities visited. The results provided insights for planning educational programmes through information, education and communication/behavioral change communication efforts to boost knowledge on cholera in the communities.

Key words: Knowledge, perception, environmental sanitation, health behavior, cholera outbreak, Nigeria.

INTRODUCTION

Cholera remains a global threat to public health and a key indicator of lack of social development (Talavera and Perez, 2009; World Health Organization, 2010). It is an acute enteric infection caused by the ingestion of bacterium *Vibrio cholerae* present in faecally contaminated water or food. It has been classified as re-emerging global threat. The disease is primarily linked to insufficient access to safe, clean water supplies, crowded living conditions and poor hygiene and

sanitation (Kindhauser, 2003; Zuckerman et al., 2007; Sasaki et al., 2008; Penrose et al., 2010; World Health Organisation/UNICEF, 2010). It has a more severe impact in areas where basic environmental infrastructures are disrupted or have been destroyed (World Health Organisation, 2004; 2010).

Having categorized cholera as a water- and food-borne disease transmitted majorly through faecal-oral route, contaminated water is more common as the usual

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transmission route in developing countries such as Nigeria (Sack et al., 2004). The lack of infrastructure to provide amenities such as clean and safe water in many sub-Saharan countries make the population susceptible to cholera (Griffith et al., 2006). The poor practice of excreta disposal and drainage are risk factors of transmission of *Vibrio cholera* through the defecation of infected persons around the home environment that increase its spread through rain water floods that cause contamination of water sources that include shallow wells, rivers and streams (Sasaki et al., 2008).

Every year, mostly African and Asian countries record 3-5 million cholera cases and 100,000-130,000 deaths due to the disease (IRIN Global, 2011). In 2009, a total of 217,333 cases with a case fatality rate (CFR) of 2.25% (4,883 deaths) were reported in 30 African countries alone. Of these, eight countries, including Nigeria accounted for 191,537 cases with a CFR of 2.26% representing 88% of reported cases and deaths from the continent with the CFR in many of these countries higher than the accepted 1% threshold (World Health Organisation, 2010).

In Nigeria, series of outbreaks of cholera have been reported over the decades (Lawoyin et al., 1999; Utsalo et al., 1999; Hutin et al., 2003; Usman et al., 2005; Oguntoke et al., 2009). Outbreaks of the disease have been reported in the country with increasing frequency since the first outbreak in 1970 (Lawoyin et al., 1999).

Behaviors related to personal hygiene and food preparation contribute significantly to the occurrence and severity of outbreaks (Kindhauser, 2003). Health education aimed at behavioral change combined with good surveillance and preparedness, frank reporting and transparent information policy are important in the effective cholera prevention and control (Kindhauser, 2003). It is in the realization of this that it became imperative to investigate the knowledge, perception, health behavior and sewage and waste disposal practices among patients with acute watery diarrhoea as risk factors associated with cholera epidemic. Consequently, during the 2010 cholera outbreak in some States in Nigeria, the Emergency Preparedness Response Research Group of the Nigerian Institute of Medical Research was deployed to the affected States to provide cholera research intervention and humanitarian services with the supply of relief materials. The research component of the intervention entailed both laboratory and social epidemiological studies of the epidemic. This paper is based on social epidemiological data generated from two of the States (Bauchi and Gombe) visited in North East Nigeria.

METHODS

Study design and setting

This study was a cross-sectional description of the knowledge, perception, health behavior and sewage and waste disposal

practices among carers of all patients hospitalised for treatment of acute watery diarrhoea at the Treatment Centre, Abubakar Tafawa Beluwa Teaching Hospital in Bauchi State and at the Mother and Child Care Centre, London Mai Dorowa, Shamaki Ward, Gombe LGA, Gombe State, North East Nigeria sequel to an epidemic outbreak between May and September 2010.

Bauchi and Gombe are adjoining States in North East Nigeria with coordinates of 10°30'N 10°00'E and 10°15'N 11°10'E and projected population of 5.2 million and 2.7 million people respectively based on the 2006 National Population Census (National Bureau of Statistics, 2009; National Population Commission [Nigeria] and MEASURE DHS ICF Macro, 2009). Bauchi and Gombe States are divided into 20 and 11 local government areas (LGAs) and occupy a total land area of 49,119 km² and 18,768 km² respectively (Figure 1). The two States span two distinctive vegetation zones, namely, the Sudan savannah and the Sahel savannah. The two States comprise of many tribal groups who are mainly Hausa, Fulani, Tangali, Tera, Bolewa, and Kanuri with Hausa being the common language. The people of both States are mainly farmers producing both food and cash crops. There are Tertiary, Secondary and Primary health facilities located across the LGAs of each State.

Data collection and analysis procedures

Approval for the work was obtained from the Nigerian Institute of Medical Research Institutional Review Board with the reference number IRB/10/104.

Semi-structured questionnaires were administered to parents/guardians of all the patients receiving treatment at the treatment camps visited following their informed consent. The questionnaires were used to elicit information relating to socio-demographic characteristics, frequency of stooling and vomiting, perceived cause of the disease, sources of drinking water, method of sewage disposal, hand washing practices and extent of community awareness and health education. In addition, in-depth interview was conducted with the Head of the Gombe State Epidemiology Unit. The observation method of data collection was also used and some secondary data in the form of records of reported cases of the disease and deaths from the eleven LGAs of the State were obtained from the Epidemiology Unit of the State Ministry of Health. The investigators who are mainly public health professionals observed the environment of some communities visited in the two States taking into cognizance personal, household and environmental hygiene practices, food hygiene and safety practices and waste (domestic and sewage) disposal practices.

Following the data collection, the questionnaires were screened, edited for clarity, completeness and uniformity of the responses, and then coded. The coded data were entered into the computer using Statistical Package for Social Sciences (SPSS) package version 15. Statistical analyses of the data set included univariate analysis to show the relative frequency distribution of each variable on the questionnaire, and bivariate analyses at a 95% level of significance to examine associations between selected independent and dependent variables relative to the objectives of the study.

RESULTS

Socio-demographic characteristics of respondents

The socio-demographic characteristics of the respondents are presented in Table 1. Of the 92 respondents interviewed, 73 (79.3%) were from Bauchi State while 19 (20.7%) were from Gombe State. Most

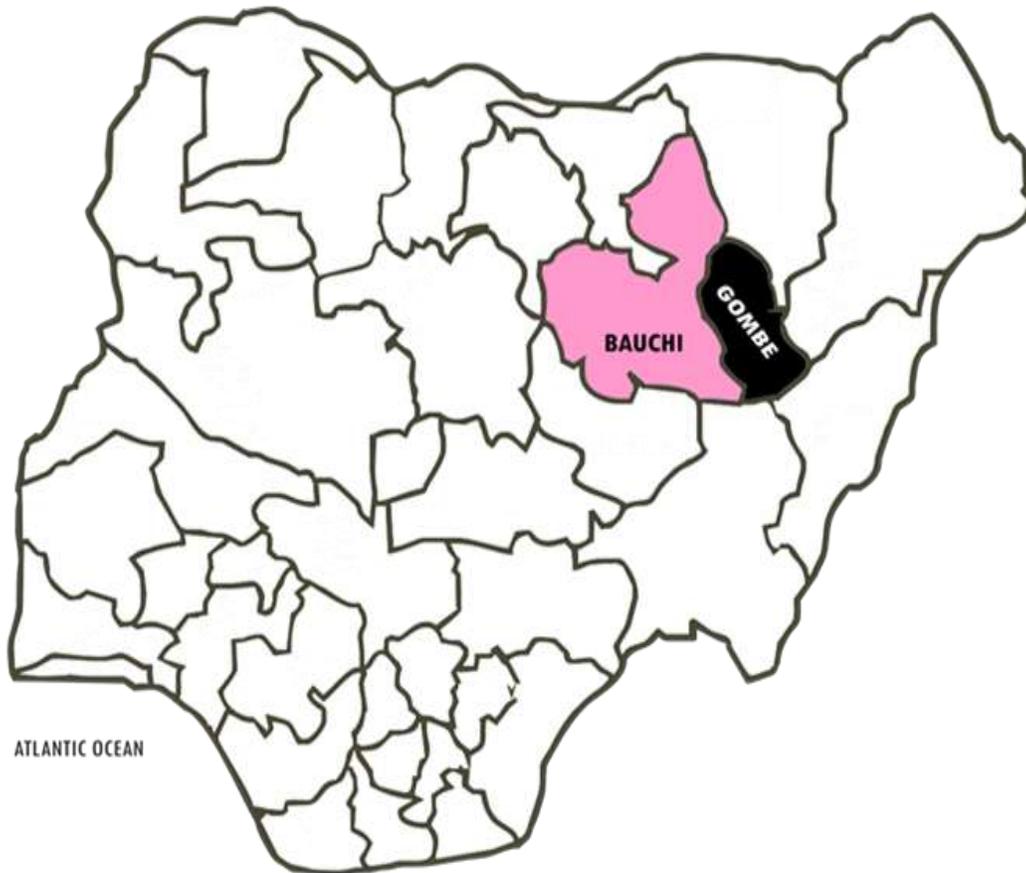


Figure 1. Map of Nigeria showing the location of Bauchi and Gombe States.

(16.3%) of the respondents were traders [11.0% Bauchi vs. 36.8% Gombe] and students [13.7% Bauchi vs. 26.3% Gombe] respectively. Similarly, Table 1 shows that a larger proportion of the interviewed respondents affected by the cholera outbreak were females, never married, and had little or no formal education. Their ages ranged from 16 years to 57 years with an average age of 32 years [31 years Bauchi vs. 29 years Gombe] and a median age of 35 years [35 years Bauchi vs. 36 years Gombe].

The ages of the patients ranged from 1 year to 60 years with an average age of 17.7 years [17.4 years Bauchi vs. 20.6 years Gombe] and a median age of 15.0 years [17 years Bauchi vs. 15.0 years Gombe]. Their age distribution is: children under five years (23.9%); adolescents aged 13 to 24 years (23.9%); and adults aged 25 years and above (34.8%).

The condition of living of the patients as described by the respondents showed that they live with a range of 1 to 7 persons in a household. Those from Gombe State were found to live with an average of 5 persons and a median of 6 persons in a household compared to an average and median of 4 persons respectively among those from Bauchi State.

Respondents' perceived onset of infection among patients

When the respondents were asked about the food or drink taken by the patients twenty-four hours before the onset of diarrhoea, most (41.2%) did not know what was eaten while 27.2% mentioned *Tuwo* (corn meal) as displayed in Table 2.

Overall, the date of onset of diarrhoea in virtually all the patients, according to the respondents ranged from 1 to 2 days prior to the interview date. The reported frequency of stooling ranged from 1 to 27 times in the last twenty-four hours preceding the interview with an average of 8 times and a median of 7 times. The frequency of vomiting of the patients ranged from 0 to 20 times in the last twenty-four hours preceding the interview with an average of 4 times and a median of 3 times.

Knowledge of and perceived causes of cholera among respondents

The results of the survey showed that a small proportion (44.6%) of those interviewed correctly mentioned lack of

Table 1. Socio-demographic characteristics of respondents.

Socio-demographic characteristics	Bauchi number (%)	Gombe number (%)	Total number (%)
Age (in years)			
15-24	7 (9.6)	3 (15.8)	10 (10.9)
25-34	11 (15.1)	5 (26.3)	16 (17.4)
35-44	28 (38.3)	7 (36.8)	35 (38.0)
45-54	19 (26.0)	3 (15.8)	22 (23.9)
55+	81 (1.0)	1 (5.3)	9 (9.8)
Total	73 (79.3)	19 (20.7)	92 (100.0)
Sex			
Male	31 (42.5)	8 (42.1)	39 (42.4)
Female	42 (57.5)	11 (57.9)	53 (57.6)
Total	73 (79.3)	19 (20.7)	92 (100.0)
Marital status			
Never married	36 (49.3)	8 (42.1)	44 (47.8)
Married	36 (49.3)	9 (47.4)	45 (48.9)
Widowed	1 (1.4)	2 (10.5)	3 (3.2)
Total	73 (79.3)	19 (20.7)	92 (100.0)
Religion			
Christianity	2 (2.7)	1 (5.3)	3 (3.2)
Islam	71 (97.3)	18 (94.7)	89 (96.7)
Total	73 (79.3)	19 (20.7)	92 (100.0)
Education			
No formal	20 (27.4)	5 (26.3)	25 (27.2)
Quoranic	12 (16.4)	3 (15.8)	15 (16.3)
Primary	12 (16.4)	5 (26.3)	17 (18.5)
Secondary	7 (9.6)	4 (21.1)	11 (12.0)
Tertiary	1 (1.4)	1 (5.3)	2 (2.1)
No response	21 (28.8)	1 (5.3)	22 (23.9)
Total	73 (79.3)	19 (20.7)	92 (100.0)
Occupation			
Farming	5 (6.8)	1 (5.3)	6 (6.5)
Trading	81 (1.0)	7 (36.8)	15 (16.3)
Civil servant	-	2 (10.5)	2 (2.2)
Student	10 (13.7)	5 (26.3)	15 (16.3)
Unemployed	10 (13.7)	1 (5.3)	11 (12.0)
Housewife	81 (1.0)	1 (5.3)	9 (9.8)
No response	32 (43.8)	2 (10.5)	34 (37.0)
Total	73 (79.3)	19 (20.7)	92 (100.0)

safe and clean water for drinking, poor sanitation and food contamination as the routes through which cholera infection could be transmitted. On the contrary, a large proportion (50.0%) either did not know or had misconceptions such as overcrowding, fever, hot weather and fate of God (Allah) as the causes of the disease.

The distribution of the respondents' perceived causes of cholera infection, according to State is displayed in Figure 2.

Statistical test using Chi square showed gender difference in knowledge of lack of safe and clean water for drinking [25.0% males vs. 5.4% females] ($p < 0.05$) and

Table 2. Food eaten by patients 24 h before the onset of diarrhoea according to respondents.

Food eaten by patients before onset of diarrhoea	Number (%)
Tuwo (corn meal)	25 (27.2)
<i>Kunu</i> (Guinea corn beverage)	8 (8.7)
Fruits	1 (1.1)
Breastmilk and water	1 (1.1)
Pap (porridge)	5 (5.4)
Rice and stew	9 (9.8)
Roasted corn	1 (1.1)
<i>Fura</i> (street-vended home-made cow milk)	2 (2.2)
Egg	1 (1.1)
<i>Talia</i>	1 (1.1)
Don't know	38 (41.2)
Total	92 (100.0)

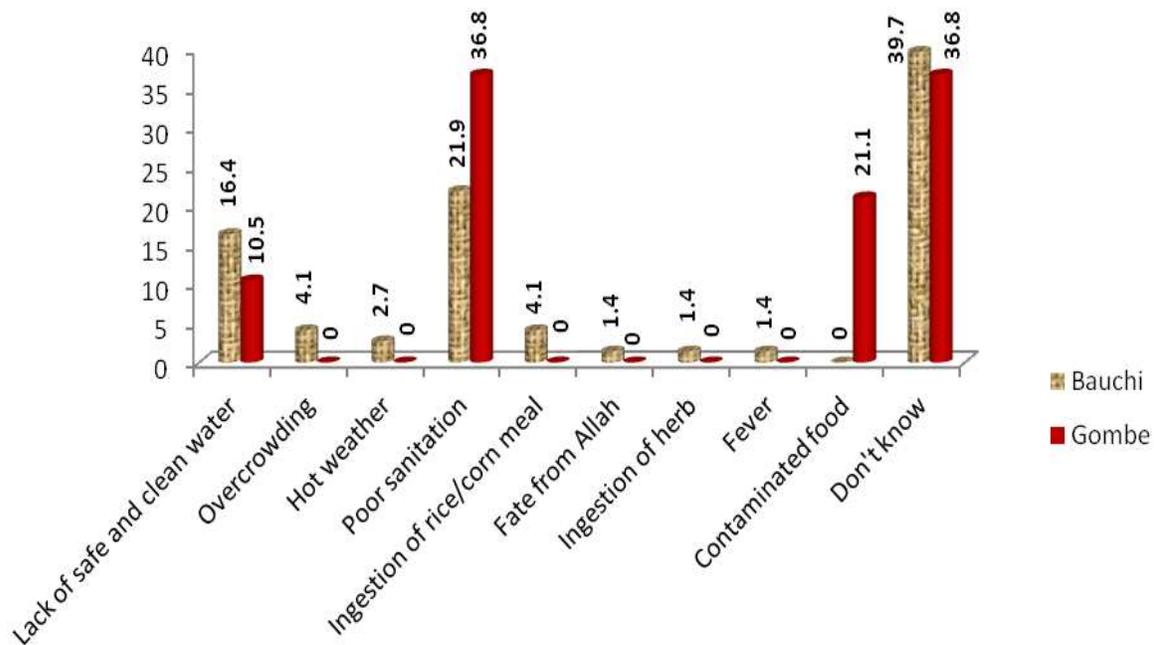


Figure 2. Perceived causes of cholera infection among respondents according to State.

poor sanitation [27.8% males vs. 19.6% females] ($p < 0.05$) as possible causes of cholera infection.

Sources of drinking water

On the sources of drinking water, the majority of the respondents had access to well (47.8%), river (19.6), rain water (4.3%) and pond (2.2%) as their main sources of water for drinking and other domestic use. On the contrary, only 33.7% had access to safe and clean drinking water through a pipe-borne system and

borehole. This is unlike 22.2% who access their drinking water from the well and water-vending trucks. Figure 3 illustrates the distribution of the sources of drinking water mentioned by the respondents according to their State.

Preventive measures taken against cholera infection among respondents

When asked if any preventive action is taken against cholera infection during the outbreak, a very few (18.5%) of the respondents [64.7% Bauchi vs. 35.3% Gombe]

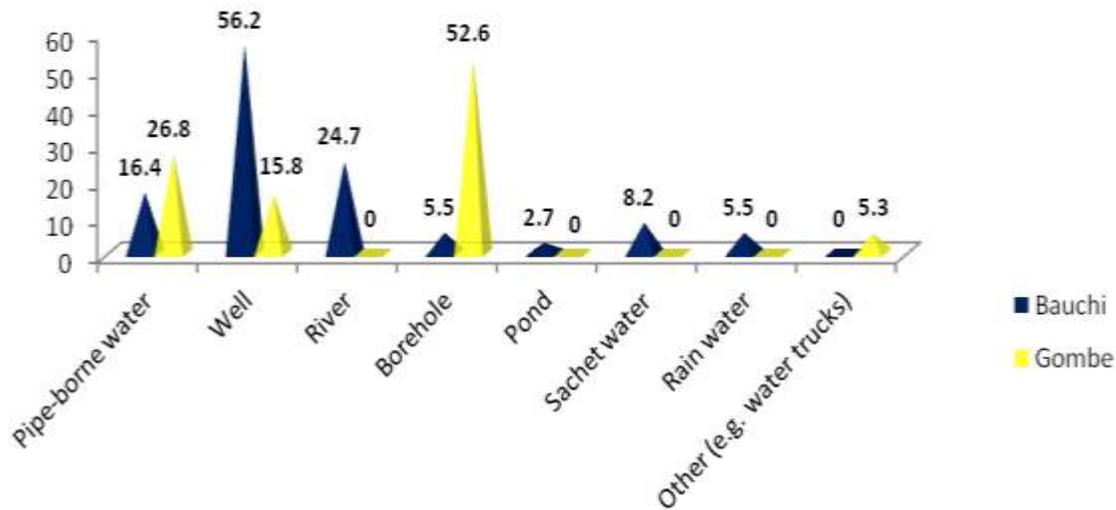


Figure 3. Sources of drinking water in respondents' communities.

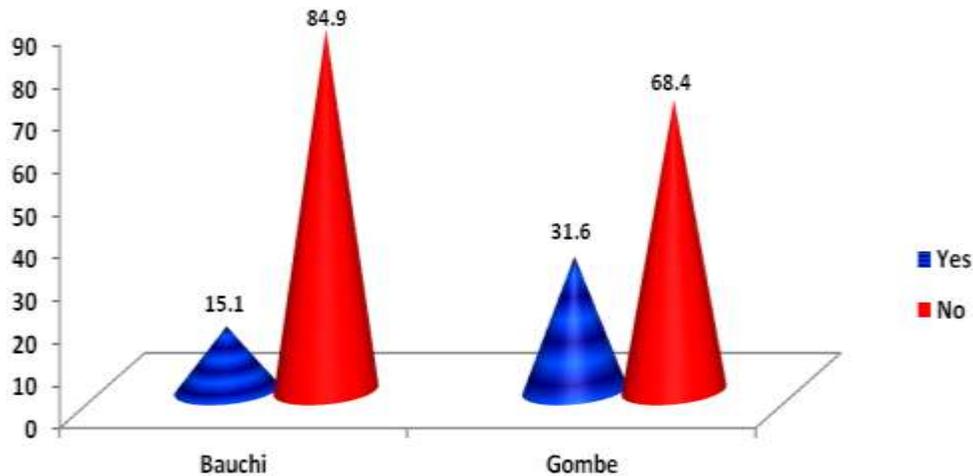


Figure 4. Responses on whether any preventive measure is taken against cholera infection or not.

were affirmative in their response. More respondents in Gombe State reported taking preventive action than those from Bauchi State as illustrated in Figure 4. The different preventive measures mentioned included taking antibiotics (17.6%), regular sanitation and good hygiene (17.6%), regular hand washing with soap (5.9%), boiling of water (5.9%). Statistical test using Chi square suggests that gender may not be a major determinant of health seeking behavior of taking preventive action against cholera infection among the two groups ($p > 0.05$).

Environmental sanitation, sewage and waste disposal practices

Observation of the environments of some communities

visited in the two States showed poor hygiene, sanitation and food hygiene and safety practices.

The poor sewage disposal practices were demonstrated by the respondents interviewed in the States visited as most of them reported using the pit/latrine (77.2%), open field (bush) (15.2%) and bucket (3.3%) to dispose their faeces. Only a very few (4.3%) use water closet.

Similarly, poor disposal of domestic wastes was exhibited by most respondents interviewed. Half (50.0%) of the respondents pointed out that they dispose their domestic wastes directly into the bush while, 34.8% dispose theirs into pits dug around their homes. Other methods of waste disposal mentioned included: public waste disposal bins (6.5%); burning (2.2%); dump into the river (2.2%); and others (1.1%). Three (3.2%) of the respondents were undecided in their response as

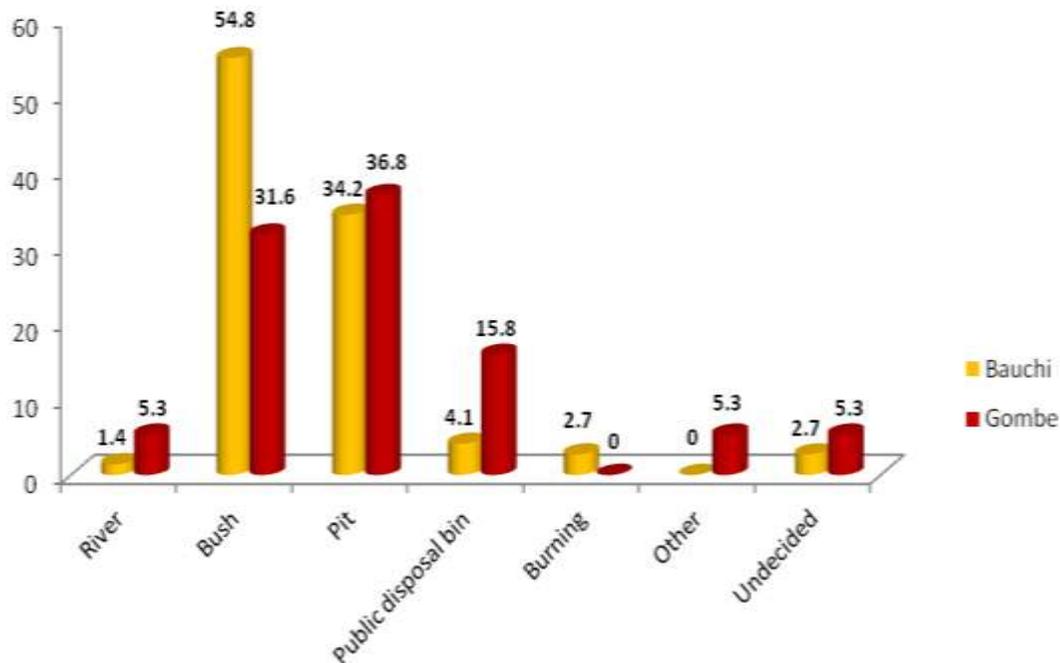


Figure 5. Methods of waste disposal mentioned by respondents according to State.

illustrated in Figure 5.

Respondents' hand washing practices

It is encouraging that more (52; 56.5%) of those interviewed in the States [57.5% Bauchi vs. 52.6% Gombe] adopted good hand washing practice of washing their hands with water and soap after using the toilet. On the contrary, 40 (43.5%) reported washing their hands with only water after toilet use.

Ways through which cholera infection is perceived to spread

The respondents had poor knowledge of cholera can spread in the community. Overall, only a few (34.8%) correctly mentioned water, food and poor sanitation as the transmission routes through which cholera spreads in vulnerable communities. More than half of the respondents (52.2%) did not know how cholera spreads in the community while some had misconceptions such as perceived act of divination (7.6%), hot weather (2.2%), fever (2.2%) and proximity of hospital to home (1.1%).

Awareness of any public health education on how to prevent cholera among respondents

About 52.0% of the respondents [56.2% Bauchi vs. 36.8% Gombe] had not heard or seen any public health

education programme on the cause, mode of transmission and preventive measures against cholera in their communities by the health authorities while about 48.0% had a contrary view as presented.

There was a gender difference between the respondents on the awareness of any community or public health education efforts on the cause, mode of transmission and how to prevent cholera by the health authorities as statistical test using Chi square showed that more males (63.9%) were more likely to be aware than the females (35.7%) ($p < 0.05$).

The opinions of respondents on how to curb future outbreak of cholera are presented in Table 3. The opinion of most respondents in Bauchi State is regular vaccination of people against cholera in vulnerable communities. On the other hand, most of those in Gombe State opined that adequate provision of safe and clean water for drinking and other domestic use is the perceived effective way of curbing the outbreak of cholera in their communities.

Epidemiological mapping of cholera outbreak in Gombe State

With no secondary data obtainable in Bauchi State, secondary data obtained from the Epidemiology Unit of Gombe State as presented in Table 4 showed that only two of the eleven local government areas (LGAs) had no cases of the disease while the remaining nine LGAs had reported cases and deaths from the disease.

In-depth interview with the Head of the Gombe State

Table 3. Respondents' opinion on how to curb the outbreak of cholera according to State.

Respondents' opinion on how to curb the outbreak of cholera	Bauchi (n=73) Number (%)	Gombe (n=19) Number (%)
Provision of safe and clean water	46 (21.9)	8 (42.1)
Good housing facilities	20 (27.4)	4 (21.1)
Women empowerment	14 (19.2)	2 (10.5)
Regular vaccination	21 (28.8)	1 (5.3)
Adequate toilet facilities	3 (4.1)	--
Good personal and food hygiene	2 (2.7)	1 (5.3)
Better drainage system	1 (1.4)	--
Divine intervention	2 (2.7)	2 (10.5)
Good environmental hygiene	5 (6.8)	5 (26.3)

Table 4. Reported cases of cholera in Gombe State for weeks 17-35 2010 (May-September 2010).

LGA	Population	Cases	Deaths	Attack rate/100,000	Case fatality rate (CFR)
Akko	383,219	266	14	69.4	5.3
Balanga	241,089	608	23	252.2	3.8
Billiri	229,287	11	2	4.8	18.2
Dukku	235,011	0	0	0.0	0.0
Funakaye	267,788	0	0	0.0	0.0
Gombe	303,986	752	44	247.4	5.9
Kaltungo	169,920	84	7	49.4	8.3
Kwami	221,522	5	1	2.3	20.0
Nafada	156,740	8	1	5.1	12.5
Shongom	171,866	10	2	5.8	20.0
Yamaltu/Deba	289,522	254	19	87.7	7.5
Total	2,669,949	1,998	113	74.8	5.7

Source: Epidemiological Unit, Gombe State Ministry of Health, September 2010.

Epidemiology Unit showed that the first case of the outbreak was reported in Bambam Ward, Balanga LGA of the State in week 17. Coincidentally, the first series of rainfall started in the same week 17 of the year 2010 across the State. It was in week 18 that reports of cases were received from other three LGAs namely: Akko, Gombe and Kaltungo. The Head of the Gombe State Epidemiology Unit pointed out that, '*Human and water samples collected from Bambam Ward of Balanga LGA and tested at the State Specialist Hospital tested positive for Vibrio cholerae isolates.*'

As at Week 35 (5th September 2010), nine of the eleven LGAs of Gombe State had reported Cholera outbreaks. The LGAs most affected included: Gombe (752 cases), Akko (266 cases), Yamaltu/Deba (254 cases), and Balanga (608 cases). With all State health workers on strike, surveillance activities were shut down after Week 35, with no reporting of cases.

DISCUSSION

Taking responses of the respondents on the ages of their

hospitalised relations/wards with acute watery diarrhoea at the treatment centres into cognizance, children aged 1-5 years were found most affected alongside adolescents aged 13-24 years by the epidemic. This finding of more cases of infection among children under five years is similar to that of a previous study in which it was attributed to interfamilial spread through family contacts under similar unhygienic circumstances that characterized the study areas (Sasaki et al., 2008). This finding perhaps simply affirms the results of the 2008 and 2013 National Demographic and Health Surveys in the country which showed that children of this age group are more prone to diarrhoeal diseases and that children of this age group in the North East zone of the country are more susceptible to episodes of diarrhoeal diseases than children of same age in other zones of the country (National Population Commission and MEASURE DHS ICF Macro, 2009; National Population Commission (NPC) [Nigeria] and ICF International, 2014). The finding that no child under one year was seen to be affected among those surveyed is similar to the finding of an earlier study on cholera outbreak in Ibadan, South-West Nigeria (Lawoyin et al., 1999).

The high case fatality rates (CFRs) reported in many of the LGAs of Gombe State as shown in the secondary data from the Epidemiological Unit of the Gombe State Ministry of Health in Table 4 is of serious concern as the CFRs for each of the affected LGAs and the State as a whole are higher than the WHO accepted 1% threshold (World Health Organisation, 2010). This perhaps cannot be unconnected to the limited access to proper health care for the most vulnerable people, limited capacity of the surveillance system to trigger a timely response to the epidemic outbreak and insufficiencies in a State's health care system which contributed to the agitation that culminated into the prolonged strike action by the State health workers at the time of the epidemic.

The first case of the outbreak reported in Gombe State following the onset of the first series of rainfall in week 17 of 2010 validates the notion that rainfall is often one of the precursors to cholera outbreaks in vulnerable areas (Sasaki et al., 2008; IRIN Global Health, 2011; IRIN Plus News, 2009). It is suggested that a reliable forecasting system that would monitor rainfall patterns needs to be developed to trigger pre-emptive measures such as the mobilization of public health teams or emergency vaccination efforts to prepare for any outbreak in vulnerable areas such as the communities studied in Bauchi and Gombe States. It therefore becomes imperative to establish an early warning surveillance system, including mechanisms for the rapid investigation of rumors and suspected outbreaks, and organized workshops for capacity building in case management and epidemic preparedness as successfully implemented in Somalia with assistance from WHO and some non-governmental organizations following the 1995-2000 seasonal outbreaks and in Peru following 1991 outbreak (Kindhauser, 2003). The multi-sectoral Epidemic Preparedness and Response (EPR) approach that has contributed to the reduction in case fatality rates over the years need be strengthened and sustained as emphasized by the finding of a study that examined the factors associated with recurrent cholera epidemics and the management of the epidemics and health outcomes in Kano State of Northern Nigeria (Usman et al., 2005). The EPR will be facilitated with sufficient pre-positioned, medical supplies such as rapid diagnostic test kits for diarrhoeal disease, ringers lactate, antibiotics, oral rehydration salt (ORS) packets, water testing kits and aquatabs for water treatment for better case management by the States.

The State health workers' strike action at the time of the survey, which depleted the capacity to give meaningful treatment to patients as only volunteer corps mainly constituted by students from the State School of Health Technology and some members of any religious organization calls for concern about the quality of care provided to affected patients at the treatment camps. Since the capacity of the volunteer corps is inadequate, government should provide documented guidance at the

treatment camp sites for the volunteer corps to improve patient management/treatment. In the future, efforts need be made by the non-striking senior Medical Consultants in the State Ministry of Health provide some medical supervision at the treatment camp sites under such similar circumstance.

There is a need to emphasize that the observed gap in the surveillance system as it relates to the cholera outbreak in Gombe State for about two weeks preceding the survey period compromised the disease notification and reporting system and would have resulted in inaccurate and incomplete surveillance data in the State due to under-reporting of new cases which has remained a problem as emphasized by WHO (World Health Organisation, 2010). Effective public health interventions such as adequate case management, improved environmental management, and adequate use of oral cholera vaccines all depend on an accurate surveillance data that would inform policy and programmes.

The findings of the present study, suggested that a high proportion of the respondents demonstrated poor hand washing habits by washing their hands with only water after toilet use was very high predisposing factor in transmission of diarrhoea-causing agents including cholera infection through the faecal-oral route.

The outbreak of the disease in the States could be attributed to transmission through faecally contaminated water following the onset of rainfall in week 17 when the first case of the disease was reported. The complicity of the situation is explained where the people practice poor method of sewage disposal as many those interviewed used the bush for open defecation and pit system, indulged in poor hand washing practice after toilet use and many drinks unsafe water from the wells and rivers. This is possible considering the fact that the incubation period of the infection is very short (Kindhauser, 2003). This is because new outbreaks can occur sporadically anywhere that water supply; sanitation, food safety, and hygiene are inadequate as observed in many of the places visited. The greatest risk occurs in over-populated communities and settings characterized by poor sanitation, unsafe drinking-water, and increased person-to-person transmission. This perhaps explains the high proportion of children affected among those surveyed having possibly been exposed to the diarrhoea-causing agents through the use of contaminated water combined with unhygienic practices in food preparation and the disposal of excreta and domestic wastes (Sasaki et al., 2008; National Population Commission and MEASURE DHS ICF Macro, 2009). Therefore the need for coordinated stakeholders' activities to improve the physical and environmental health conditions of the people such as the construction of deep well facilities. This can be achieved through collaboration between the Ministry of Health, Ministry of Environment, Ministry of Works, Ministry of Finance and the local government authorities.

The finding that the majority of the respondents depend on wells as their major source of domestic water corroborates the finding of a study of association of waterborne disease morbidity pattern and water quality in parts of Ibadan, Nigeria reported by Oguntoke et al., (2009).

The poor community awareness and health education on the cause of the disease, how it spreads and how to prevent its transmission as demonstrated by a large number of the patients and parents/guardians interviewed should be a cause for concern. This could perhaps be responsible for the high incidence of the disease.

Therefore a need to complement epidemic preparedness and response with prevention in order to avert outbreaks by expanding access to improved sources of drinking-water and sanitation. This can be achieved through advocacy and embracing simple and inexpensive methods of domestic water disinfection and storage and by working with communities to encourage behavioral change to diminish the risks of infection as recommended by earlier studies and advocated by WHO (World Health Organisation, 2010; Sasaki et al., 2008; Shultz et al., 2009).

Improvements in water supply and storage, sanitation, hygiene and food safety practices, proper waste management and community awareness through improved communication and public information to dispel the misconceptions about the cause of cholera infection, how it spreads and how to prevent infection by the Ministry of Health will go a long way in contributing to curbing outbreak of cholera.

Measures for the prevention of cholera should consist of the provision of clean water and maintenance of environmental sanitation and personal hygiene by populations who do not yet have access to basic services. Health education and good food hygiene are equally important. At the community level, people need to be educated and reminded of basic hygienic behaviors, including the necessity of systematic regular hand-washing with soap after defecation and before handling food or eating as pointed out by earlier studies (Curtis and Cairncross, 2003; Dubois et al., 2006) as well as safe preparation and conservation of food. Through public health education and hygiene promotion, communities can be encouraged to take action to protect themselves from outbreaks of cholera. Appropriate media such as radio, television and or posters should be involved and used in disseminating health education messages. Community and religious leaders considering the power they wield and their charismatic influence in their domains should also be associated with social mobilization campaigns. This can be achieved with the collaboration between the Ministry of Health and the Ministries of Information and Education.

It needs be emphasized that people in the communities, particularly those in Bauchi State who take antibiotics as chemo-prophylaxis to prevent cholera infection as shown in Table 4 should be educated that

this practice has no effect on the prevention and spread of cholera, rather it is inimical to the bacterial culture and could have adverse effects by increasing the antimicrobial resistance.

The need and regular use of oral cholera vaccines as suggested by some of the respondents as one of the strategies of preventing future recurrence of cholera outbreaks in Table 3 cannot be over emphasized as an additional public health tool to improve cholera control activities in high-risk areas such as Bauchi and Gombe States. The importance of careful planning and preparation for mass delivery of oral cholera vaccines to vulnerable populations during outbreaks cannot be over emphasized.

Conclusions

The findings of the study showed poor sanitation and food hygiene practices in communities of the States visited. These factors could possibly be attributed to the outbreak of cholera in the States. The results provide insights for planning educational programmes and show that information, education and communication/behavioral change communication (IEC/BCC) programmes are needed to boost knowledge about cholera in the communities across the studied States. The implications of the key findings of the study on possible causes of outbreaks of cholera in the States suggest the need to advocate and embrace simple and inexpensive methods of domestic water disinfection and storage for use, intensify public health education discouraging open defecation by emphasising its dangers and encourage improved sanitation and regular hand washing particularly after using the toilet in the communities emphasising the benefits. People need to take the potentially encouraging step of taking preventive measures against the disease at the individual, household and community levels which would eventually transcend the whole States.

Conflict of Interests

The authors have not declared any conflict of interests.

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