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Title: Analysis of Factors Contributing to the Spread of Cholera in Developing Countries (Cholera Diseases in Developing Countries)

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Abstract

Cholera has been endemic in Nigeria since the 1970’s and has resulted in a lot of early death which perhaps could have been avoided.

Objective: This study examines the various factors that contribute to the infection and spread of cholera in Benue state, Nigeria from the period 2008 to 2017. We also propose the Cloud Based Health Management System (CBHMS) for the timely identification and management of cholera in the event of an epidemic.

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Materials and methods: The study used a cluster random sampling in the form of close ended questionnaire to collect data from a sample of 420 participants comprising of farmers, traders, housewives and students, randomly drawn from different locations in Markurdi. Statistical analysis, such as demographic, reliability and descriptive analysis of the collected data was carried out using SPSS and the socio-technical design approach was used in the system development.

Results: The findings from the study shows terrorism, flooding, improper sewage disposal and dirty environment as the main causes for the spread of cholera in Benue State, Nigeria.

Conclusion: The research pinpoints the factors aiding the spread of cholera in Nigeria by directing donor agencies and the government on where to channel their focus and prepare ahead in view of an emergency. The proposed CBHMS will aid will aid early detection/management of cholera in the event of an epidemic.

Keywords: Cholera, Cloud, health, management, system, Nigeria

Introduction

The prevalence of communicable diseases has been ravaging African countries since time immemorial; more so that it has been recorded as one of the major causes of death. Between 2010
and now, there have been a reduction (one percent per-annum) in the number of deaths associated with communicable diseases [1]. However, the World Health Organization (WHO) observed that this is likely to change and the number increased sporadically before 2050. Some of these diseases includes: Small pox, Dengue fever, Rabies, Hantavirus, Hepatitis A & B, measles, HIV/Aids, Cholera, Zika and the most recent of them all is the Ebola virus. While the first world have curtailed some of these diseases, the second and third world are still battling with them. For the sake of clarity, this studies emphasis is on cholera.

Cholera an affiliate of the vibrionaceae family is an intense stomach infection that is caused by eating foods/drinking water that are contaminated by the bacterium Vibrio cholera. Various stereotypes of cholera abound, however, only cholera-genic V.01 and 0139 are known to be responsible for the disease. It’s manifest in the form of diarrhea and result in a very fast dehydration process and death if not treated timely because of its limited incubation time [2]. It has been found that the bacterium can survive in any environment and affect both genders and people of all ages. According to [3] a person could be infected with V. cholera and yet not show any symptom related to it: but between 7 to 14 days of the infection, traces of the bacteria could be found in their feces. Despite these, human attitude and behavior such, as well sanitized environment, proper cooking of food before consumption, well sterilized water and general personal hygiene contribute a great deal to the survival and spread of cholera [4].

Across countries in West Africa, cholera cases have been quite noticeable. Ghana, for example, according to [5] has witnessed about 4,190 cases of cholera resulting in 36 deaths with causes linked to dirty/un-hygienic environment and inappropriate fecal disposal. In Senegal, between 2002 and 2005, there has been about 31,719 reported cases of cholera and 458 reported death, which was largely attributed to adverse of a devastating flood. This record has been the highest so far in the country. In an article published by the Guardian [6] shows the poor rate of fecal waste disposal in Liberia. It is estimated that six out of seven households in Liberia do not have access to a toilet: and the only
source of water available to the people is that gotten from the rivers and streams which perhaps might be contaminated.

In Nigeria, cholera has been on the rise since the 1970’s majorly due to extreme poverty, access to good portable drinking water among other things; which perhaps might be the result of government negligence in embarking on initiatives that will better the lives of the ordinary citizen. The Majority of the people in Benue state, Nigeria are rural dwellers who have little or no access to basic modern facilities hence, the outbreak of diseases is inevitable.

The aim of this study therefore, is to primarily investigate the mitigating factors to which cholera is endemic in Nigeria with the need of establishing a relationship between cholera and peoples willingness to treatment by profiling way(s) in which it can be curtailed; purposing a way that aids early detection and management via remote access. The study will help in determining the trend and pattern of the disease. In that way, government and donor agencies can prepare adequately beforehand for it. Furthermore, the findings from this study could help the government, donor agencies and health care institutions focus their searchlight on areas/persons which are most/likely vulnerable.

**Geographical description of study area**

Benue state, Nigeria as earlier stated, is predominantly a rural community comprising of 23 local government areas (LGAs) with state capital situated in Makurdi. Otukpo and Gboko being the second largest communities and situated in the middle belt region of Nigeria. The state (figure 1) is bounded by Nassarawa state to the North, Cross River state to the south, Taraba state to the East and Enugu/Kogi state to the West. Geographically, the state lies between longitude 8.75N and latitude 7.33E with a population of 4,253,641 according to the last census of 2006 [7] and a land mass covering up to 34,059 km².

The state has two major rivers (River Benue and River Kastina-ala) along with streams and ponds which serves as the primary and only source of water supply especially to those in rural/remote villages. It is possible that some of these streams/ponds, get dried up during the dry season due to climate change: and when this happens, affected communities are faced with severe water scarcity.
which makes them to source and use water from dirty and un-hygienic environment, thereby exposing them to contaminated/water borne diseases [8]. It is also possible that during the raining season, the rivers, streams and ponds rises above the normal water level, resulting in a flood and spread of vector species as well as cholera.

Figure 1: [here]

Season and pattern of infection in Nigeria
According to the studies of [9], cholera is a climate based disease and findings have shown that the changes in the environment or climate thus indeed influence the spread of cholera. Based on epidemiological observation of various cholera epidemics in Nigeria, it has been seen that the seasonal distribution of the outbreak based on age and gender is not constant [10]. For example, in one of the recent epidemic in an internally displaced person’s (IDP) camp in Borno State, Nigeria in September of 2015, a total of 385 cases and 13 deaths were recorded from a population of 11,384 with an attack rate of 3.4% [11]. On the other hand, from the recent World Health Organization (WHO) report of July 2017, as of June 30 2017, there was an epidemic in Kwara State, Nigeria with reported cases of 1,558 and 11 death with a total of 0.7% fatality rate. Out of these reported cases, 49% were female while 50% were male. Stating that all age groups were found to have been affected from this reported cases [12].

Nigeria has basically two seasons: the raining season and the dry season. The raining season is known to come with a flood which leads to increase in water level a phenomenon which favors the growth and spread of bacteria and some other vector species and cholera; making cholera a seasonal infection, which occurs in the raining season [13]. However, as stated by [14] that climate change can provoke the level of air pollution, thereby increasing the rate of infection: prove true the study of [15] where the authors investigated a cholera epidemic which occurred in the dry season in Calabar, southern Nigeria. More so, it has been stated by [16] that a change in climate directly affects the lives of the poor making vulnerable and susceptible to diseases and infections since they live in an un-sanitized and dirty environment and also made to drink contaminated water. With this, it can be said that the
seasonal distribution of cholera infection does not really apply in Nigeria since the epidemic has been known to occur both in the dry and in the raining season.

**Chronological epidemic of Cholera in Nigeria**
The first ever recorded cases of cholera in Nigeria was in Lagos with 22,931 recorded cases and 2,945 deaths, according to the world health organization (WHO) and subsequently, witnessed in four northern states in the late 1970’s and about two hundred and sixty people were said to have died from the pandemic: with Maiduguri, Jere, Gwoza, Biu and Dikwa local government councils said to be mostly affected [17]. According to the WHO, between 1991 and June 2017, Nigeria has recorded a significant number of deaths as a result of cholera outbreak with the pandemic of 1991 and 2010 which recorded total cases in 59,478 and 7,654 deaths in 1991, 26,240 cases and 1,182 deaths in 2010 respectively being the highest so far [18]. The tabular representation of this chronology of the period of ten years from 2008 to 2017 is seen in Table 1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>59,478</td>
<td>7,654</td>
</tr>
<tr>
<td>2010</td>
<td>26,240</td>
<td>1,182</td>
</tr>
</tbody>
</table>

**Propose Cloud Based Health Management System (CBHMS)**
One of our main goal is to design a cost effective cloud-based health management system that could detect and manage cholera using the socio-technical design methodology, mostly used in the healthcare information design [27] that will be easily affordable and accessible for all considering most importantly developing countries. CBHMS is an envisaged technology, which has not been implemented. The proposed model is expected to enhance the early detection, identification and treatment of cholera in the near future when it is eventually adopted and implemented.

Recent disclosure estimated that 98.3 million Nigerians are active internet users. Likewise, the International Telecommunication Union (ITU) 2017 reported that, in per one hundred populations of Nigerians, 75.9% of them are active in mobile-cellular subscription. Suggesting a rise in the usage of mobile–cellular subscription as against 33% observed in 2013 [28].

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Figure 2, depicts the process flow of data/information in the CBHMS. The CBHMS is a web-based system which employs a MySQL database for data storage and PHP to implement front-end/server scripting language. Access to the system is through a single login for each user and platform interface is user specific. The proposed system is generic and is expected to perform real-time on-demand infectious disease such as cholera identification, drug prescription, management and monitoring. It basically consist of three actors, namely, the community health worker (CHW), the patient and the doctor.

The CHW serves as the intermediary between the patient and the doctor. The CHW who is positioned in the community health center (CHC), through an internet enabled device such as a desktop computer, laptops, iPad or mobile phone moves round the community to register patients who do not have access to a computing device or who can neither read nor write. They also take the vital signs of patients shortly before a face to face meeting with a doctor. In addition, the CHW is able to view the medical information of patients as well as view doctor’s appointment schedule.

The patient is the person who suffers from some symptoms of a disease. These symptoms are entered into the system by the patient after having been duly registered to the system and a unique username and password have been assigned. Based on the symptoms of the disease, the system carries out a diagnostic check based on a pre-entered list of diseases in its database and identify the specific disease as well as proffer a solution to the identified disease the patient is suffering from. If not contented with this diagnosis, the patient can go ahead and schedule an appointment with the doctor.

Based on availability and the specialties of doctors, they are assigned automatically by the CBHMS to the patient. The doctor meets the patient through video calling made possible either via Skype, WhatsApp, Facebook or any dedicated, secured social media video calling platforms through the supervision of the CHW. He can view and update a patient medical history as well as prescribed drugs and refer a patient to a particular hospital.

Figure 2: [Here]
An APACHE web server in addition to firewalls is used as a security measure to monitor the activities in the system providing a secured, efficient and extensible server with HTTP services in sync with recent HTTP standards so as to prevent unauthorized access to patients’ data.

Limitations such as the inability of rural dwellers to independently use the system could arise from the use of CBHMS. However, this limitation could be curtailed seeing that there is the HCW to teach and direct users on how the system works. Moreover, password could be easily stolen, considering that most of the users might use mobile phones. Additionally, internet access might not be available, however, users can subscribe to personal internet service from available service providers.

Materials and methods

Study design, setting and participants

This study utilized a cross sectional analysis to investigate and identify the factors aiding the transmission and spread of cholera in Benue State, Nigeria. A cluster random sampling [29] was used for participant selection. The sample size calculation of Yamane 1967 [30] was adopted in determining the sample size of this study. The formula used in this regard is $n = \frac{N}{1 + N(e)^2}$. Where $n$ = sample size; $N$ = population size and $e$ = marginal error. Assuming $e = 0.05$, with 95% confidence level. Substituting the variables will result in: Sample Size $(n) = \frac{N}{1 + N(e)^2}$

$n = \frac{2500}{1 + 2500 (0.05)^2}$

$n = \frac{2500}{1 + 6.25}$

$n = 344.82$

With $n = 344.82$ indicate that at least 344 sample size is required for this survey. However, to arrive at a robust result, 420 participants were recruited for this study. The participants, which were
intimated that their participation is voluntary and that their rejoinder would be treated in confidence were drawn randomly from among farmers, students, housewives, traders among others who had at least a minimum education. So that each and every one of the participants consented to participate before the questionnaire was administered to them. The study was conducted in Benue State, Nigeria, during the Tropical Continental air-mass popularly known as the dry season (October 2017 to April 2018) and the Tropical Maritime air-mass popularly known as the raining season (May –September 2018).

Data collection tools
A quantitative survey approach was used to gather data from the participants in different locations (High level, Wurukum, Northbank and Wadatta) of Makurdi the Benue State capital. The questionnaire items which were adopted from the studies of [31-32] comprises of both demographic and questions requiring the participants to relate their opinion as it concerns their willingness, awareness and attitude towards cholera infection. The seven-point Linkert scale was used for the rating of the questionnaire, where 1 equals strongly disagree, 2 equals disagree, 3 equals slightly disagree, 4 equals neutral, 5 equals slightly agree, 6 equals agree and 7 equals strongly agree. 420 questionnaires with each consisting of 19 items in total were given out, out of these numbers, 340 of the questionnaires were returned, arriving at 80.9% response rate. However, 40 questionnaires were not used in the final analysis due to blank or incomplete response from some of the respondents. Therefore, only 300 questionnaires were used for the final analysis. Data collection was carried out from the first July to first August 2018. Statistical Package for Social Science (SPSS) version 21 was used in the analysis.

Survey procedure
The authors distributed hard copies of the questionnaires to participants with a covering letter stating the objectives and the necessities of the study. The concept of communicable diseases and cholera was explained to the participant prior to the administration of the questionnaires. To ensure validity of the measuring instruments, the questionnaire was vigorously cross-checked and validated by
professionals in the field of healthcare management (HCM) prior to the administration of the questionnaire. The modifications to the questionnaire which resulted in a valid content was guided by their suggestions. Completed questionnaires were collected the same day from the participants.

**Ethics**
An ethical approval with reference number MOH/STA/204/Vol.1/28 was gotten from the Health Research Ethics Committee of the Federal Republic of Nigeria.

**Results**
This section presents the results and analysis of the survey data used for the study. Each question was examined via a coding scheme that summarized the rejoinders into subjects. First, statistical test was carried out to analyze the data. In general the analysis conducted includes: frequency test for the demographic questions, reliability analysis to determine the Cronbach’s Alpha value of the questionnaire, and a descriptive examination of the survey questions. The outcomes of the demographic data and survey question were further interpreted and evaluated so as to achieve the study objectives, proffer solution and necessary direction for future research purpose.

**Demographic Results**
This section shows the socio-demographic results and analysis of the data collected from the survey. The demographic information presented in Table 2 shows the frequency and percentage of the respondents, which include gender, occupation, and years of experience.

Table 2: [Here]

The results in Table 2 shows the category of the respondents based on gender, where 157 females (that is 52%) participated in the survey, while 143 males (which is 47%) participated in the survey. This ensures a balanced opinion in terms of gender participation. The study also ensures that different categories of individuals were selected as part of the sample from a larger population. This is also to ensure that different individuals were sampled in order to know whether the cholera disease have an
effect on different occupations. The Table also shows the age of respondents, which ranges from 18 to 70+ years.

Reliability Analysis
The questionnaire items for investigating the factors that cause the cholera disease were tested using a statistical test known as Reliability analysis, which is used to calculate the value of the Cronbach’s Alpha of the Likert scale. The Cronbach’s Alpha value is used to measure the internal reliability (that is consistency) of the Likert scale, which is shown in Table 3 below:

Table 3: [Here]

The result in Table 3 shows the Cronbach’s Alpha value as 0.911, which is greater than the recommended threshold value of 0.7, according to the study of [33]. However, researchers have different opinion about the recommended threshold value of the Cronbach’s Alpha. For example, [34] argued that the Cronbach’s Alpha value should be at least 0.6 before it can be considered satisfactory. [35] proposed a value of 0.7, while [36] stated that the Cronbach’s Alpha value should be 0.8 or higher. Therefore, the value obtained by this study (α = 0.911) indicates that it has satisfied all the threshold values mentioned here. This value indicates that the questionnaire items are closely related and are measuring the same subject. In addition, the value shows that the questionnaire is a reliable and a good measuring instrument for the survey.

Descriptive Analysis
The table below shows the results of the summary of the frequency and percentage of the survey data.

Table 4: [Here]

The results in the Table show the questionnaire items in a coded format, where ATPH means Attitude towards Personal Hygiene; AOCS means Awareness of Cholera Symptoms, WTGT means Willingness to Get Treatment, and finally ATHWF means Access to Healthcare Workers and
Facilities. The Table also shows the 7-point Likert scale from which the responses of the participants were used in making the analysis.

**Analysis of Attitude towards Personal Hygiene**

The results from the analysis shows that 86% of the participants reported washing their hands with soap and water before/after eating or using the toilet. When asked about cooking food, 86% also reported that they make sure the food is cooked thoroughly. The participants were also asked a question whether they wash vegetables and fruits before eating, 75% of the participants answered positively. Similarly, a question was also asked about how cooking utensils are kept, again 75% reported that they keep their cooking utensils clean. Finally, the last question under attitude towards personal hygiene is about keeping flies away from food, the results indicate that 74% of the participants agreed that they make sure the food is covered so as to avoid flies from touching the food.

**Awareness of Cholera Symptoms**

The participants were asked about their level of awareness for symptoms of cholera and what cholera causes to the human body. 75% of the participants reported being aware that the main symptom of cholera is watery diarrhea. When asked about what cholera causes to the human body, 77% of the participants reported that cholera causes fever, 80% reported that they are aware that cholera usually causes stomach or abdominal pain, and 79% reported that they are aware that cholera causes dehydration (that is, loss of body fluid).

**Willingness to Get Treatment**

The participants were also asked some questions regarding their willingness to receive treatment. First, the participants were asked if they will be willing to visit a cholera treatment center in case of becoming infected, about 79% of the participants reported that they will be willing to visit a cholera center to receive treatment. The participants were asked questions about the nature of the treatment they prefer to receive, the results of the analysis showed that 68% uses oral rehydration solution or
sugar salt solution. On the other hand, 68% reported that they prefer to visit a traditional healer for treatment, and 75% reported that they prefer to undergo self-treatment. Finally, 70% reported in the survey that they do not take any treatment.

**Access to Healthcare Workers and Facilities**

The participants were finally asked questions about the availability of access to health care workers and facilities. A question was asked to the participants about the accessibility to the healthcare center for those who are infected. The results show that 69% reported that there is availability of access to the health care center for those who are infected. Also, 70% of the participants reported that there are adequate health care workers who specialize in the treatment of cholera infection. The participants were asked to confirm whether the health care center is close to residential areas or at a far distance, the result indicates that 65% reported that the health care center is at a close proximity to residential areas. Finally, a question was asked about the management of those who are infected, 66% reported that the infected patients are well managed.

**Discussion and Conclusions**

Findings from this study identified some factors that play a significant role in causing the cholera epidemic in the country. These factors include, but are not limited to, terrorism related activities and civil unrest, which prevents people from access to clean water and lack of proper sanitation of the environment. This finding corresponds to the findings of [37] in their study of qualitative assessment of resistance towards cholera intervention in Mozambique, who stated that insecurity, social disequilibrium, and perceived institutional negligence were among the factors that aid the spread of cholera epidemics. Another factor that causes cholera epidemic is flooding, which is caused by heavy rainfall that is prevalent in the areas covered by the case study because there is an inadequate drainage system. This problem usually contaminates the rivers and streams (which is the source of water for most people in the area) with all sorts of dirty items, particles, human and animal waste. This finding is related to the findings of [38] in their study on assessing the knowledge, attitudes and practices regarding cholera preparedness and prevention in South Africa, who identified contaminated water
as a major source of contracting cholera disease. Similarly, lack of proper sewage disposal also has been identified as another causative factor, because people sell and buy food closer to refuse bin, which in turn contaminates the food and water around the area, when people consume these infected foods and water, it causes cholera epidemic. This finding corresponds to the findings of [39] in their study on Geospatial assessment of Cholera in a rapidly urbanizing environment, who stated that waste dump sites affects the environment, which in turn causes the spread of cholera. Another causative factor identified by the study includes dirty environment. Findings from the study also found that people that are infected do not bother to get proper treatment as a result of fear of intimidation or victimization. Others do not get treatment due to lack of financial capability, and poor support from the government.

The study findings identified some key lessons which are essential for enhancing the prevention and control of cholera. Firstly, although the seasonal distribution of cholera infection does not apply in Nigeria, the time of outbreaks and geographical distribution is however predictable. Secondly, there exists substantial evidence on the menace and protective dynamics of the transmission of cholera; taking into cognizance inhibiting factors such as consumption of contaminated water, un-hygienic environment and inappropriate disposal of waste products are all possible routes for the transmission of cholera. Thirdly, the proper and adequate availability of information and people awareness regarding the mode and pattern of cholera transmission can help reduce the occurrence of cholera infection and death.

Sequel to these findings, we believe the following recommendations can enhance the prevention, management and control of the spread of cholera infections. Considering the connotation that exists amid cholera transmission and the intake of contaminated food, addressing the ways in which food/drinks are handled is of a crucial objective. Hence, there is a need for the implementation of environmental and food regulation standards, in order to uphold high hygiene practices of food. In addition to this, strengthening the need of food and water safety as well as ensuring that food handlers and traders undergo basic hygiene trainings to lessen the menace of cholera infections [40].
By using the various available channels such as television, radio, social media, etc. could create awareness and enlighten the public regarding the menace of cholera infection as well as, enhance the significance of food, personal and environmental hygiene. Furthermore, the development and implementation of a computerized mechanism for the identification of cholera and its readiness and response are required in order to make sure that the cholera outbreak is detected timely and responses is provided promptly as well. The proposed CBHMS could offer this valuable support when it is implemented in the future.

Moreover, the World Health Organization (WHO) has recommended that, alongside the preventive measures presently in use, there should be the immunization of all people living in a geographical area where cholera is susceptible and endemic. This, of course, will go a long way in preventing new cholera infections. Additionally, the use of oral vaccines has also been seen to offer a temporary defense of about 85-90% across all age collections between 4-6 months after immunization. However, stakeholders in the healthcare sector must agree on the choice of cholera vaccines to be used, and such choice, should be steered by the availability of necessary logistics and facilitating conditions not forgetting to address the political effects and scopes of the vaccines [41].

The study is limited by geographic scaling in that it was conducted in one country and considered just one state. Hence, there is a need for future studies which scope could be increased to include more countries and fill any gap that might not have been covered by the present study. However, the limitation notwithstanding, factors which contribute to the spread of cholera were adequately investigated and identified.
List of figures

Figure 1: Map of Benue State

Figure 2: CBHMS process flow diagram
References

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33. Gliem JA, & Gliem RR. Calculating, interpreting, and reporting Cronbach’s alpha reliability coefficient for Likert-type scales. Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.
Table 1: Cholera Epidemic in Nigeria for the period of 10 years

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>Total reported cases</th>
<th>Total reported death</th>
<th>CFR (%)</th>
<th>Causes</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Zamfara, Bauchi, kano, katsina, Benue Borno</td>
<td>1,7854</td>
<td>429</td>
<td>2.4</td>
<td>Improper sewage disposal</td>
<td>[19]</td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td>260</td>
<td>96</td>
<td>3.27</td>
<td>Excretes of infected persons washed by rain into wells and ponds. Improper sewage disposal washed by rain to wells and ponds.</td>
<td>[18]</td>
</tr>
<tr>
<td>2010</td>
<td>Bauchi, kastina, Yobe Taraba, Jigawa, FCT, Osun, Gombe, Borno, Kaduna, Rivers, Cross River, Plateau, Benue</td>
<td>26,240</td>
<td>1,182</td>
<td>4.5</td>
<td></td>
<td>[20–21]</td>
</tr>
<tr>
<td>2011</td>
<td>Osun, plateau Bauchi, Kaduna, Benue</td>
<td>22,454</td>
<td>715</td>
<td>3.2</td>
<td></td>
<td>[18]</td>
</tr>
<tr>
<td>2013</td>
<td>Benue</td>
<td>80</td>
<td>12</td>
<td>-</td>
<td>Inadequate access to Medicare.</td>
<td>[22]</td>
</tr>
<tr>
<td>2014</td>
<td>Bauchi, Ebonyi, FCT, Kano</td>
<td>35,996</td>
<td>20</td>
<td>3.3</td>
<td>-</td>
<td>[23]</td>
</tr>
<tr>
<td>2015</td>
<td>Rivers, kano, Ebonyi, Anambra</td>
<td>2,108</td>
<td>97</td>
<td>4.7</td>
<td>-</td>
<td>[24]</td>
</tr>
<tr>
<td>2016</td>
<td>Lagos</td>
<td>45</td>
<td>6</td>
<td>-</td>
<td>Consumption of a staple food</td>
<td>[25]</td>
</tr>
</tbody>
</table>
Table 2: Socio-demographic results of the data (n = 300)

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Category</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>143</td>
<td>47.7</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>157</td>
<td>52.3</td>
</tr>
<tr>
<td>Occupation of respondents</td>
<td>Farmers</td>
<td>48</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>Students</td>
<td>74</td>
<td>24.7</td>
</tr>
<tr>
<td></td>
<td>Traders</td>
<td>82</td>
<td>27.3</td>
</tr>
<tr>
<td></td>
<td>Housewife</td>
<td>50</td>
<td>16.7</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>46</td>
<td>15.3</td>
</tr>
<tr>
<td>Age of respondents</td>
<td>18 – 30</td>
<td>53</td>
<td>17.7</td>
</tr>
<tr>
<td></td>
<td>31 – 43</td>
<td>56</td>
<td>18.7</td>
</tr>
<tr>
<td></td>
<td>44 – 56</td>
<td>82</td>
<td>27.3</td>
</tr>
<tr>
<td></td>
<td>57 – 69</td>
<td>56</td>
<td>18.7</td>
</tr>
<tr>
<td></td>
<td>70+</td>
<td>53</td>
<td>17.7</td>
</tr>
</tbody>
</table>

N = frequency of occurrence

Table 3: Reliability analysis for Cronbach’s alpha value

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.911</td>
<td>0.912</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 4: Frequency-Percentage of survey analysis

<table>
<thead>
<tr>
<th>Questions</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Slightly disagree</th>
<th>Neutral</th>
<th>Slightly agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATPH1</td>
<td>7(2.3%)</td>
<td>15(5.0%)</td>
<td>16(5.3%)</td>
<td>4(1.3%)</td>
<td>58(19.3%)</td>
<td>105(35.0%)</td>
<td>95(31.7%)</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th>ATPH1</th>
<th>ATPH2</th>
<th>ATPH3</th>
<th>ATPH4</th>
<th>ATPH5</th>
<th>ATPH6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0(0%)</td>
<td>3(1.0%)</td>
<td>5(1.7%)</td>
<td>11(3.7%)</td>
<td>3(1.0%)</td>
<td>9(3.0%)</td>
</tr>
<tr>
<td>2</td>
<td>0(0%)</td>
<td>12(4.0%)</td>
<td>7(2.3%)</td>
<td>12(4.0%)</td>
<td>12(4.0%)</td>
<td>11(3.7%)</td>
</tr>
<tr>
<td>3</td>
<td>0(0%)</td>
<td>15(5.0%)</td>
<td>31(10.3%)</td>
<td>15(5.0%)</td>
<td>41(13.7%)</td>
<td>32(10.7%)</td>
</tr>
<tr>
<td>4</td>
<td>0(0%)</td>
<td>11(3.7%)</td>
<td>30(10.0%)</td>
<td>9(3.0%)</td>
<td>16(5.3%)</td>
<td>26(8.7%)</td>
</tr>
<tr>
<td>5</td>
<td>1(0.3%)</td>
<td>7(2.3%)</td>
<td>73(24.3%)</td>
<td>70(23.3%)</td>
<td>85(28.3%)</td>
<td>116(38.7%)</td>
</tr>
<tr>
<td>6</td>
<td>1(0.3%)</td>
<td>12(4.0%)</td>
<td>82(27.3%)</td>
<td>100(33.3%)</td>
<td>108(36.0%)</td>
<td>98(32.7%)</td>
</tr>
</tbody>
</table>

ATPH: attitude towards personal hygiene
AOCS: awareness of cholera symptoms
WTGT: willingness to get treatment
ATHWF: access to health care workers and facilities