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CHOLERA AND ASSOCIATED RISK FACTORS IN GWAGWALADA AREA COUNCIL, FCT, ABUJA, NIGERIA

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Abstract: **Cholera is an acute diarrheal infection due to ingestion of food or water contaminated by bacterium ''Vibrio *cholera*''. It is endemic in many parts of Nigeria and is often fatal if not treated urgently. This cross-sectional descriptive study was conducted to assess the prevalence and associated risk factors of cholera infection among the inhabitants of Gwagwalada Area Council, FCT, Abuja, Nigeria. A total of 423 stool samples were collected from individual whose ages ranges from 2 to 70 years with mean age of 30 years using multi-stage random sampling technique to determine the prevalence using culture techniques. Social-demographic data were collected using structured self-administered questionnaire. The data collected were analyzed using simple percentages, Odd Ratios and Chi-square analytical methods. Out of 423 samples tested for Cholera, 150(35.5%) were positive, while, the age-related prevalence, was highest in 18-29 year old age group (OR=3.21; P=0.001) with 70.8%, followed by those within the age bracket of 5-10 years (OR=2.12) with 51.4%. The gender-related prevalence was higher in females (OR=2.23; P=0.037) with 42.6%, while, their male counter-parts (OR=1.01) had 27.5% of the infection. Sources of drinking water, educational status, age and gender had significant effects on the prevalence of cholera among the population. There is significant association between gender ($X^2 = 4.33$; $P = 0.037$); age ($X^2 = 53.80$; $P = 0.001$) and Cholera infection in the area. Government should encourage public health campaign, in form of health education, provision of portable water as well as hygiene and sanitation practices to drastically reduce the rate of infection.**

Keywords: **Cholera, Association, Vibrio, Gwagwalada, Abuja, Prevalence.**

1. INTRODUCTION

Cholera is a well-known acute diarrheal disease that is contracted by consuming food or water that has been contaminated by Vibrio cholera (1) and the highly lethal sero-types ''Sero-groups 01 and 0139'' of this bacterium are claimed to be responsible for the diarrheal illness (2). These serotypes are known to produce crucial pathogenic components ''Cholera toxin (CTXAB) and toxin co-regulated pillus (3). Information on the circulating strains in Nigeria is scarce. In Borno and Osun states, cholera epidemics in 2009 and 2010 were traced to a typical el tor and non 01/non 0139 agent (4). Trailing were Bauchi and Gombe states that were home with enterotoxin (CTXA) carrying classical biotype 01 according to 5. Moreso, in the same vain, 6 posited that these pandemic strains contained several different phage types.

Over the past few years, the number of cholera cases reported to WHO has remained high; in 2020, 24 countries reported 323,369 cases and 857 deaths (7), and due to limitations in surveillance techniques and concern over the disease's effects on trade and tourism, many cases are not been reported, which could account for the discrepancies between data and estimates of the disease's burden. According to 8, there are between 1.3 million and 4.0 million cases of cholera worldwide each year, and between 21,000 and 143,000 deaths from it.

In underdeveloped nations, particularly in the tropics and subtropics with high poverty indices, cholera has been discovered to be endemic (9). Moreover, the Middle East, South America and parts of Asia have also revealed same (10). Nigeria, recorded a total of 3,604 cholera-related deaths in 2021 (11) and according to reports, the 2021 cholera outbreak was one of the deadliest in recent memory, since, it primarily impacted children between the ages of 5 and 14 years (11). It is also in history that, Nigeria registered a total of 111,662 suspected cases of cholera emanating from the report that concluded epidemiological cycle, and as a result of government focus on COVID-19 virus pandemic, the case fatality rate was 3.2% higher than it was in preceding four years (12). While, cholera devastated 33 states and the Federal Capital Territory (FCT) in 2021, only three states failed to report suspected cases, the states were Edo, Imo and Anambra all in Nigeria. Approximately, 435 Local Government Areas nationwide were impacted and the most afflicted states in Northern Nigeria were those with flooding and poor sanitation. Poor assess roads to the affected communities, security issues, and open defecation in those regions, lack of portable water in some rural areas and urban slums, insufficient vaccination to cover all LGAs, wards and settlements, inadequate health facility infrastructure, insufficient cholera supplies for the management of cholera such as Ringer's Lactate or insufficient trained case managers in states and poor or insufficient reporting management from states are just a few of the issues that need to be addressed(13, 11). Other factors that contributed to the spread of cholera disease as mentioned were unfavourable living circumstances, lack of sanitation and hygiene services (14).

In addition, estimates put it that about 673 million people defecate in public places around the world, but only 46 million do so in Nigeria (13, 1). In 2014, the WHO established Global Task Force on Cholera (GTFCC), with its network, approximately 50 partners engaged in cholera control on a global scale, including the Universities non-governmental organizations and United Nations(1). The GTFCC unveiled a strategic roadmap in 2017 with the goal of eliminating cholera in 2030, the roadmap emphasized early detection, a targeted multi-sectoral approach that focuses on cholera hotspots in different endemic nations to help stop the spread of the disease, and resource mobilization at the local, national and international levels (1).

Numerous states of the federation have seen cholera outbreaks, in 33 states of the federation, including the FCT, the Nigerian Centre for Disease Control revealed 111,064 portable cholera cases and 3604 deaths as of January , 2022. Moreover, 15 claimed that 60 persons died and 698 had contracted the disease in Abuja. In Gwagwalada Area Council, 220 portable cases of Cholera in nine (9) facility were reported (16) as many individuals reside in densely populated area with what appear to be Subpar or poor ''WASH'' practices which may lead to more outbreaks. Despite the inherent problems associated with poor sanitation, inadequate portable water, open defecation, there is paucity of report and documented evidence on the prevalence of cholera infection and associated risk factors in the area. Therefore, the present study was an attempt to assess the prevalence of cholera infection and associated risk factors among the inhabitants of Gwagwalada area council in order to close the gaps, create more awareness ascertain the current status of this infection in the area.

2. MATERIALS AND METHODS

Study Design

This was a cross-sectional descriptive study on the prevalence of Cholera infection and associated risk factors among the inhabitants of Gwagwalada Area Council, FCT, Abuja, Nigeria.

Study Area

Gwagwalada area council is one of the six area councils in the administration of the Federal Capital Teritory (FCT). The council is located between 1 attitude 805515211N, 90113411N and longitude 605113611E, 701113511E (17). It is strategically located close to the heartland of the FCT, within a very fertile agricultural land. It shares boundary with Kwali Area council to the south, Kuje area council to the east, Suleja to North and border town of Izom in the North eastern part. The settlements found within the study area are Gwagwalada town, Kutunku, Dobi, Tunga Gayan, Gwako, Dukpa, Dagiri and Paso, Ibwo, Wumi, Zuba, TungaMaje, Giyabiri, Kwaita, Gurfata, Ashara, Ledi, Giri, Kaida, Kuturu and few others.

The climate of the area council just like most climate in the tropics have a numbers of climate elements in common, most especially the wet and dry season's characteristics.The temperature in the area ranges from 30^{o} C-37^{o} C yearly with the highest temperature in the month of March and mean total annual rainfall of approximately 1,650 mm per annum. About 60% of the annual rains fall during the months of July to September. The area is drained by River Usma and River Gurara

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the major rivers within the study area as well as in the FCT. Gwagwalada the largest settlement in the study area has a population of 23,114 people and is one of the largest satellite town and the third largest urban center in the FCT (17). The area as a whole is located within the northern boundary of the Guinea Savannah. The vegetation shows a slight level of variability comprising shrub savannah vegetation type that covers the Iku-Gurara plains where the study area is located except for the dominance of riparian vegetation on the flood plains of River Gurara and Usma. The vegetation is dominated by species of plants such as Danulio Oliver, Albizia Zygia, Shea butter tree. Agriculture is one of the major economic activities in Gwgwalada area council due to favourable climate and soil characteristics. Most of the indigenous people are engaged in peasant farming, lumbering, pond fishing, livestock farming among others (17).

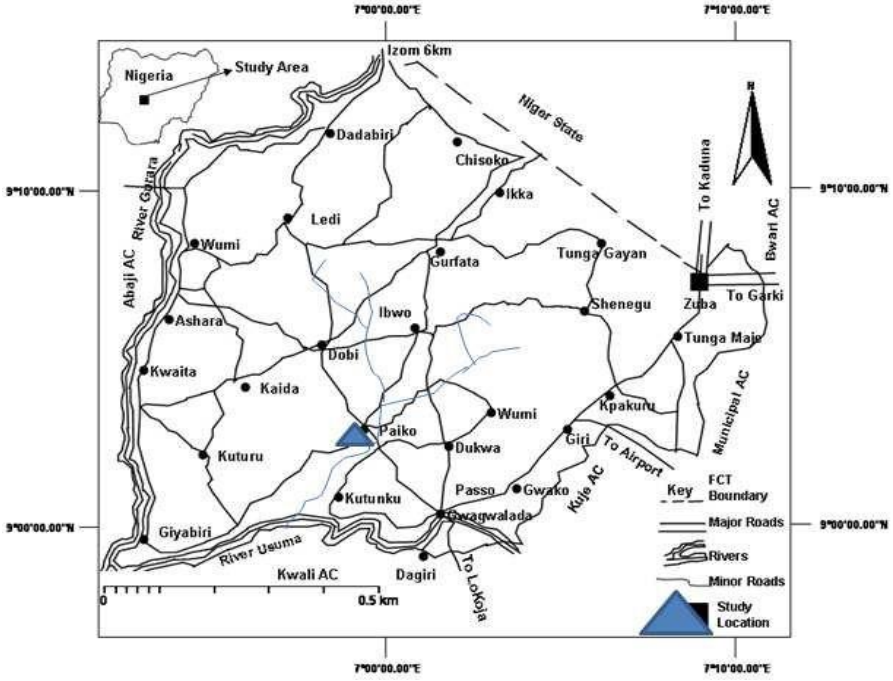

Fig 1: Map of Gwagwalada Area Council (17)

Study population

This comprised of all the inhabitants of Gwagwalada Area council, FCT, Abuja, ranging from 2 years to 70 years.

Ethical Clearance

This was obtained from Federal Capital Territory Administration (FCTA) Health Research Ethics Committee with approval number FHREC/2022/01/151/03-08-22, while, oral informed consent was obtained from the participants after explaining the details of the study to them and benefits derivable from participation, before specimen collection and issuance of questionnaires. Their confidentiality were assured as the questionnaires did not carry the names of the respondents .

Study Criteria

Inclusion Criteria

Individuals 2 years to 70 years who have lived in Gwagwalada Area Council for up to 2 years

Exclusion Criteria

Inhabitants who are below 2 years and have not lived in Gwagwalada Area Council, FCT, Abuja.

Sample Size Determination

A suitable sample size of 423 inhabitants aged 2 years and 70years was chosen using the formula .n = $Z^2 P (1-P)/d^2$ according to 18 with a confidential interval of 95% and marginal error or precision of 5%, hence, sample size was calculated using $n = Z^2 P (1-P)/d^2$.

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A prevalence rate of 50% was chosen, margin of sampling error or precision was set at 5% with 95% confidence interval;

n= sample size ;Z=1.96 (statistical constant); P = 50 %(0.5) previous prevalence ; d = 5% (0.05) marginal error. Using the formula thus;

n = (1.96)2 x 0.5 (1- 0.5) / $(0.05)^2$ = (3.8416 x 0.25)/ 0.0025 = 1.9604/0.0025 = 384 + 38.6(attrition) = 422.576 = 423

Sampling Technique

Multi stage random sampling was adopted in order to ensure a good representation of the target population of the study population. Gwagwalada Area council with an estimated population of 157,770 people according to 2006 population census and a current projection of over one million people in 2022 constitute ten wards which include Zuba ,Ibwa, Dobi, Kutunku, Tunga Maje, Gwako, Paikonkore, Ikwa, Quarters and Central. In each of these wards different villages were randomly selected. In each of this village, different houses which form the sampling unit were randomly selected. In these houses all persons aged 2 years and 70years were used for the study. Self-structured questionnaires were equally given to the participants to ascertain their socio demographic data and the risk factors associated with cholera

Instrument for Data Collection

(i) 423 Self structured questionnaires

(ii) Laboratory tests to culture and isolate the vibrio cholera

LABORATORY Test MATERIALS

(i)Sterile wide mouthed clean bottle for stool sample collection

(ii)Swab stick for rectal swab if stool sample is not possible

(iii)Alkaline peptone water(with PH 8.6)

(iv)Thiosulphate citrate bile salt sucrose Agar (TCBS)

(v)Incubator

(vi)Oxidase reagent

PEPARATION OF THIOSULPHATE CITRATE BILE SALTSUCROSE (TCBS)AGAR

(i)Suspend 88.1gm of dehydrated medium in 1 liter of distilled or deionized water

(ii)Slowly bring to boiling, stiring with constant agitation until complete dissolution

(iii)Do not auto clave

(iv)Cool to 50°c and pour into sterile petri plates. The agar-plate has a shelf life of 3-5 days after preparation

ISOLATION OF VIBRO CHOLERA

(i) Inoculate freshly collected stool sample not more than 2 hours old directly into thisosulphate citrate bile salt agar that was prepared

(ii) Incubate at 35^0 C to 37^0 C for 24hours.

(iii) Read the culture plate. Result A characteristic flat yellow colonies 2 – 3mm in diameter is diagnostic of vibro cholera

(iv) Sub culture V cholera growth to a nutrient agar

Incubate for another 24 hours then perform oxidase biochemical reaction to rule out other non- vibrio species particularly enterobacteriacea.

METHOD OF DATA ANALYSIS

Data collected was analysed using statistical package for social science (SPSS) version24. A descriptive statistics was used to evaluate socio demographic details, while, Odd Ratios and Chi square test were used to study relationship and associations between these variables, $p<0.5$ was considered statistically significant.

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3. RESULTS

The participants totaling 423 selected in this study filled out the questionnaires on associated risk factors, and all (100%) submitted their faecal samples for laboratory analysis for the presence or absence of Vibrio cholera infection. The socio-demographic details of participants and cholera infection were as stated below (Table.1 and Figure.1). Out of 423 participants in the age range of 2 years to 70 years and mean age of 30 years that participated, 47.3% were males, while, 52.7% of them were females. A total of 150(35.5%) of the participants had Vibrio cholera infection. The females were more infected (42.6%;OR=2.23;P=0.037) than their male counterparts who had 27.5%(OR=1.01) infection rate. In the age-related prevalence, there were more infections (70.8%) in the 18-29 years age-group(OR=3.21;P=0.001), while, 5-10 years age group recorded an infection rate of 51.4%(OR=2.12;), as 2-5years group had 23.0%; 11-17 years age-cohort had 10.0%; followed by 30-39 years age-group with 9.7% infection rate; 40-49 years age-group recorded 7.1% and 60-70 years had 6.7% infection rate. The least infection rate of 5.0% was recorded by 50-59 years age-group.

The multilevel analysis of risk factors of cholera infection among the participants ranging from 2-70 years in Gwagwalada Area Council showed that cholera infection was strongly associated with age, gender, level of education, source of drinking water, defecation habits, eating raw-vegetables ,unwashed fruits and hand washing habits before meals

TABLE 1: socio- demographic details

Variables	Frequency (%)
Gender	
Male	200(47.3)
Female	223(52.7)
Age-groups	
2-5	65(15.4)
5-10	70(16.6)
11-17	50(11.8)
18-29	120(28.4)
30-39	55(13.0)
40-49	28(6.6)
50-59	20(4.7)
60-70	15(3.6)

Table.1: Out of 423 participants in the age range of 2 years to 70 years and mean age of 30 years that participated, 47.3% were males, while, 52.7% of them were females.

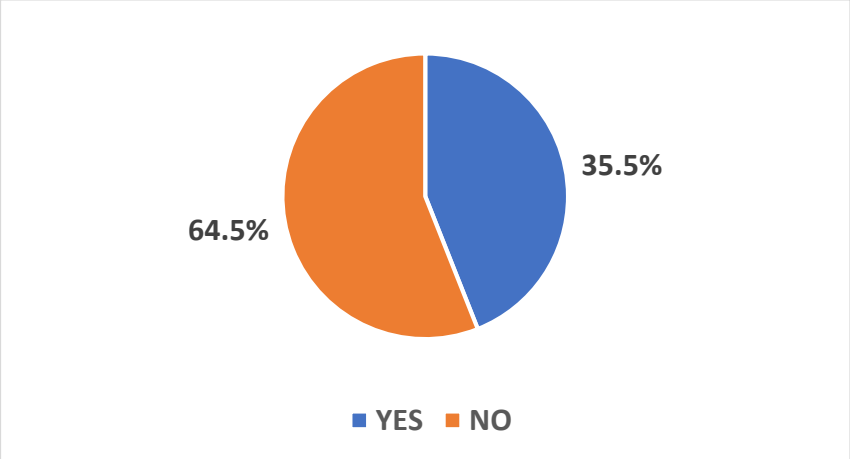

Figure 1 show that Prevalence of cholera infection in Gwagwalada Area Council was 35.5%

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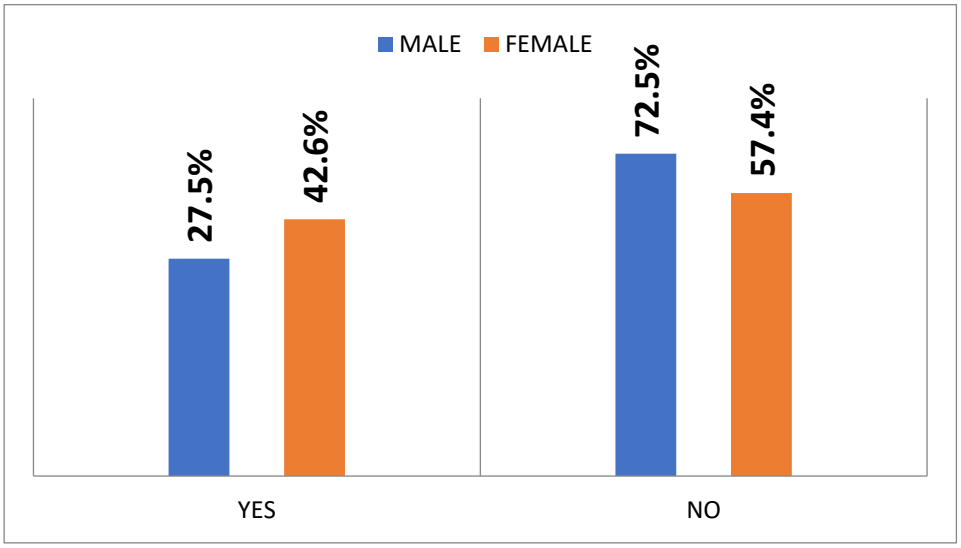

Figure 2 showed that 42.6% of those infected were females compared to male with infection rate of 27.5%.

Table.2: Prevalence of Vibrio cholera infection among the Inhabitants of Gwagwalada Area Council/ Socio-demographic characteristics/Multilevel Analysis of Risk Factors of cholera infection among the inhabitants.

Variables	No Exam	No Positive (%)	No Negative (%)	OR	X^2	P-value
Gender						
Female	223	95(42.6)	128(57.4)	2.23	4.33	0.037
Male	200	55(27.5)	145(72.5)	1.01		
Age						
2-5	65	15(23.0)	50(76.5)	1.21		
5-10	70	36(51.4)	34(48.6)	2.12		
11-17	50	5(10.0)	45(90.0)	0.92		
18-29	120	85(70.8)	35(29.2)	3.21	53.8	0.001
30-39	55	5(9.1)	50(90.9)	0.89		
40-49	28	2(7.1)	26(92.9)	0.88		
50-59	20	1(5.0)	19(95.0)	0.76		
60-70	15	1(6.7)	14(93.3)	0.81		
Education levels						
None	115	56(48.7)	59(51.3)	2, 34		
Primary	110	43(39.1)	67(60.9)	1.92	47.52	0.002
Secondary	100	31(31.0)	69(69.0)	1.78		
Tertiary	98	20(20.4)	78(79.6)	1.01		
Source of drinking water						
Boreholes	54	23(42.6)	31(57.4)	2.13		
Tap water	77	12(15.6)	65(84.4)	0.91		
Wells	53	30(56.6)	27(43.4)	2.98		
River or Stream	44	32(72.7)	12(27.3)	3.52	67.6	0.001
Water vendor	60	28(46.7)	32(53.3)	2.32		
Water satchets	70	17(24.3)	53(75.7)	1.56		
Bottled water	65	8(12.3)	57(87.7)	0.79		
Defecation habits						
Open field	190	89(46.8)	101(53.2)	2.32	5.7	0.003
Latrine	233	61(26.2)	172(73.8)	1.57		
Eating raw vegetables &unwashed fruits						
Yes	210	95(45.2)	115(54.8)	2.10	11.7	0.002
No	213	55(25.8)	158(74.2)	1.71		
Handwashing habit before meal						
Always	243	57(23.6)	186(76.5)	1.20	8.7	0.001
Sometimes	180	93(51.7)	87(48.3)	2.89		

Table.2: multilevel analysis of risk factors of cholera infection among the participants ranging from 2-70 years in Gwagwalada Area Council showed that cholera infection was strongly associated with age, gender, level of education, source of drinking water, defecation habits, eating raw-vegetables, unwashed fruits and hand washing habits before meals.

4. DISCUSSION

In underdeveloped nations, particularly in the tropics and subtropics with high poverty indices such as Nigeria, cholera has been discovered to be endemic (9). The Middle East, South America and portions of Asia have also reported same (10). This has been a very great concern and a health problem especially in the tropics, and the difficulty in trying to get the solution and prevention has equally been met with brick-wall. In this assessment of Vibrio cholera infection and associated risk factors among the inhabitants of Gwagwalada Area Council, FCT, Abuja, the outcome obviously showed a high prevalence ($p<0.05$) of cholera infection among the inhabitants. This may be similar in patterns of this infection among inhabitants in Nigeria of similar environmental conditions (19) and other countries, especially those in the tropics (9, 10).

This result, 35.5% is consistent with earlier reports in Nigeria (20; 21; 19; 22; 23 & 25) indicating that cholera infection is endemic and is a common disease among communities in poor resource societies in this country and elsewhere. The overall prevalence of 35.5% observed in this study is high and constitute a major health threat in the Area. It is high when compared with the works of 22; 23 and 25, who variously reported, 3.9%; 9.0% and 2.0% respectively. This result, however, is low when compared with those of 20; 21 who revealed 41.0% in Ilorin; 75.0% in Brass and 42.0% in Ogbia Sagbama all in Bayelsa State. Nonetheless, the result corroborates the reports of 19 and 21 who revealed 30.0% in Andoni Community, Rivers State and 40.0% in Yenegoa, Bayelsa State respectively. Moreso, the gender analysis of this work showed that females (42.6%; OR = 2.23;P=0.037) were more infected than their male counterparts who had infection rate of 27.5% (OR = 1.01), this could be as a result of lower economic status in females as opposed to high status in males and is in accordance with the reports of 19 and 20 who in their respective works posited that females were more infected than their male counterparts. In supporting this, 24 posited that high socio-economic status reduces the risk of contracting cholera infection. It is, however, not in agreement with that of 25, who revealed 3.8% rate among male folks and 0.0% in their female counterparts in their study termed‘’ Immunochromatographic detection of Vibrio cholera 01 and 0139 antigens among patients with diarrhea in hospitals in Jos, Plateau State, Nigeria’’.

The relatively high rate of cholera infection in this survey, may not only be as a result of educational status of the participants *($x^2 = 47.52$; $p = 0.002$)* but could also be attributed to other factors like source of drinking water *($x^2 = 67.60$; $p = 0.001$)* and poor environmental sanitation. Others may include personal hygiene and living standards of the population. The study showed that gender*($x^2 =$; $p = 0.037$)*; age *($x^2 = 53.80$; $p = 0.001$);* educational level of the participants *($x^2 = 47.52$; $p = 0.002$);* source of drinking water *($x^2 = 67.6$; $p = 0.001$)* ; Defecation habits*($x^2 = 5.7$; $p = 0.003$)*; eating of raw-vegetables and unwashed fruits (*$x^2 = 11.7$; $p = 0.002$*) and handwashing habit before meals *($x^2 = 8.7$; $p = 0.001$)* were the factors associated with cholera infection among the inhabitants of Gwagwalada Area Council and this is consistent with the reports of 26, 25 and 27 and other reporters (21;19).

The relationship between the age of the study population and Cholera infection is as shown in table 1; there was a high prevalence of cholera infection (70.8%, OR = 3.21;P=0.001) in the age group of 18-29 years, while, the 5-10 year age bracket had 51.4% (OR = 2.12); as 2-5 year group recorded 23.0% with OR of 1.21. Moreso, 11-17year age group had infection rate of 10.0% (OR = 0.92); 30-39 year age group recorded infection rate of 9.1% (OR = 0.89) as 40-49 year age range had 7.1% (OR = 0.88), while, 60-70 years’ group and 50-59 year age range had 6.7% (OR= 0.81) and 5.0% (OR = 0.76) respectively. This is not in agreement with the works of 20, that revealed 83.3% infection rate among 31-40 year age group in Andoni Community in River State. It, however, corroborates with that of 25, who had 10.0% prevalence among the 41-50year age cohort in Jos Plateau State. These disparities in the infection rates could be attributed to differences in sample sizes, age groupings, environmental conditions and educational attainments. It is noteworthy that high prevalence recorded among the age group of 18-29 years in Gwagwalada Area Council could be as a result of the fact that this age range has a large population of unmarried youths that could be patronizing food vendors along the streets, while, that among 5-10 year age cohort could be due to unhygienic environments as they go about as sheep without shepherd and are uncared for.

5. CONCLUSION

In conclusion, the total prevalence of 35.5% of cholera infection and favourable associated risk factors established in the study area, are very serious threats to the lives of the inhabitants of Gwagwalada Area Council, FCT, Abuja, Nigeria.

6. RECOMMENDATION

It is therefore, timely for the Nigerian Center for Disease Control and FCT Public Health Department to intensify efforts in the areas of public health enlightenment programmes in form of health education in order to create more awareness among the inhabitants, provide portable water as well as encourage hygiene, sanitation practices and discourage open defecation to drastically reduce the rate of infection.

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