IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN: 0795-073X eISSN: 2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

Risk assessment of sanitation practices and socio-cultural risk factors for incidence of cholera outbreak in Ilorin Metropolis, Kwara State, Nigeria

K. O. Laro[1], M.A. Abdrashid, E.A Makinde & N.A Saka
Department of Geography and Environmental Management, University of Ilorin, Ilorin, Kwara State, Nigeria.

Abstract: Healthy living devoid of illness is determined by the extent at which adequate sanitation was held in high esteem. The Kwara State Ministry of Health identified six major waterborne diseases that threaten the health of the inhabitants of the state. Out of these six diseases cholera plays a major role. This study examined household sanitation practices with a view to identifying the spatial pattern of risk based on socio-cultural risk factors for incidence of cholera in the study area. Structured questionnaire and personal observations were used to garner field data. A total of 400 copies of questionnaire were used as sample. Data were analyzed using tables and T-test. Results revealed that there is paucity of sanitation facilities in the study area. Results also revealed that out of the eight socio-cultural risk factors examined; only consumption of raw fishes without cooking was not mentioned. Based on this, the spatial pattern of socio-cultural risk factors for cholera incidence was mapped. The study concluded that sanitation practices were poor in Ilorin metropolis, and there exist socio-cultural risk factors for incidence of cholera outbreak in the study area. Therefore, this study recommended that; government, environmental and health stake-holders should harmonize efforts in enforcing sanitation, organize cholera vaccination programs and curtail the indiscriminate defecation and urination into the water bodies so as to regulate the spread of cholera in Ilorin.

Keywords: Cholera, Risk assessment, Sanitation, Socio-cultural factors

Introduction

Poor sanitation is said to be one of the reasons for the outbreak of different diseases at household and community levels in the world. One of the well-known diseases associated with poor sanitation is cholera. Cholera remains a significant threat to the global public health. WHO (2013) estimated that there are between 3-5million cholera cases and 100,000-120,000 deaths annually. In 2013, 129,064 cases were reported worldwide with 44% of such cases in Africa. Cholera is an acute diarrhea infection caused by the ingestion of food or water which has been contaminated with the bacterium (*vibro cholerae*). Cholera is one serious pathogenic disease that can emerge as a result of many risk factors like poor sanitation practices, unsafe water supply, bad or lack of food preservation techniques, population density and many other socio-environmental determinants of health (WHO, 2013). Natural disaster such as earthquake, tsunami, floods, volcanic eruption and landslide has been reported to contribute to the heightened risk of cholera outbreak by disrupting normal balance of nature (Jutla, 2017). The symptoms of cholera such as watery diarrhea can begin as soon as few hours or as long as five days. Diarrhea indirectly, through malnutrition, leads to long term effects on child growth and development (Wardlaw et al., 2010). The causative organism thrives in aquatic environment of any extent especially when this environment is contaminated. WHO (2020) reported that sub-Saharan Africa is one of the regions with the highest cholera burdens where about 24% (1,080,778 of the 4,426,844) cholera cases were reported between 2010 and 2019. Thus, cholera remains the leading cause of death in sub-Saharan Africa.

The prevalent risk in many countries has a high risk of occurrence in the rural area and the peri-urban slums where risk factors for cholera such as dearth of water supply, poor drainage network, low access to sanitation facilities and poor sanitation practices are acute. Sanitation according to the Joint Monitoring Programme (JMP) refers to one that separates "human excreta from human contact" in a hygienic manner (e.g. flush toilet, ventilated improved pit latrine (VIP), piped sewer systems, composting toilets, and septic systems) (WHO/UNICEF JMP, 2017). Examples of unimproved sanitation are: pit latrines without a slab and bucket or hanging latrines. Iheke (2010) described sanitation as the process of keeping places clean and hygienic especially

[1] Corresponding author: K.O. Laro, laro.ko@unilorin.edu.ng

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

by providing a sewage system and a clean water supply. According to a study by Mara et al. (2010), 2.6 billion people in the world lack adequate sanitation. In fact, 15% of the world's population (more than 1 billion people) have no facilities at all and still defecate in open areas (Waldman et al. 2013). Sanitation practices especially that of the developing countries are is of a dire concern requiring extreme attention. This is because the lack of adequate sanitary activities contributes to about 10% of the global disease burden, causing mainly diarrheal diseases (Mara et al. 2010).

In Nigeria, the infection is endemic and outbreak is not unusual. In the last quarter of 2009, it was speculated that more than 260 people died of cholera in four northern states. The disease, once occurred, rapidly spread to other places especially areas with people of poor sanitary attitudes coupled with inadequate water supply. In developing countries like Nigeria, people are disproportionately affected by cholera and other water-borne diseases not only because of the dwindling sanitation infrastructure but also the lack of or low disaster preparedness system and negligence to many risk factors. Over the years, the poor environmental sanitation condition has contributed significantly to the high prevalence of communicable diseases in the country (Federal Ministry of Environment, 2005). Lee (2004) asserted that there is a link between water, sanitation and disease in the human society.

Sanitation practices especially at the household level in Kwara state is at a worrisome condition. According to Kwara State Ministry of Health (2012) cholera, typhoid, onchocerciasis, schistosomiasis, diarrhea and trypanosomiasis are the six major waterborne diseases in the state. On 7th of June 2017, the Nigeria Federal Ministry of Health notified WHO of an outbreak of cholera in Kwara State (NCDC, 2017). The number of cases and deaths subsequently increased from the first week of May, as at 14th June 2017, a total of 1,178 suspected cases and nine deaths (case fatality rate 0.8%) have been reported (NCDC, 2017). According to WHO (2017), four local governments which were affected in the state include Ilorin West (508 cases), Ilorin East (303 cases), Ilorin South (96 cases) and Moro (37 cases) as at 23rd of June 2017. Between 1st of May and 30th of June 2017, suspected cholera cases in Kwara were reported from five local government areas; Asa (18), Ilorin East (450), Ilorin South (215), Ilorin West (780) and Moro (50) (WHO, 2017). The above picture of cholera disease in Ilorin and its environs worries the mind. In the light of the above, this study seeks to assess sanitation practices and socio-cultural risk factors for incidence of cholera in Ilorin, Nigeria. This study will therefore provide an understanding of people's sanitation practices and the socio-cultural risk factors for cholera incidence in Ilorin and to suggest mitigation measures and strategies to reduce or eliminate their occurrence.

The study assesses the state of sanitation and socio-cultural risk factors for incidence of cholera in Ilorin metropolis. This is with a view of identifying hotspot areas for the incidence of cholera and providing mitigation measures and strategies to reduce or eliminate their occurrence in Ilorin. However, to achieve this aim, the specific objectives are to; identify households' sanitation facilities in Ilorin metropolis; examine the variation in households' sanitation practices in the study area; examine socio-cultural risk factors for the incidence of cholera in the study area and to identify the spatial pattern of risk for cholera incidence based on socio-cultural risk factors in the study area.

Study Area

Ilorin, the administrative capital of Kwara state, is positioned between latitude 8° 241N and 08° 381N of the equator, and longitude 4° 261E and 04° 371E of the Greenwich meridian, and has a land mass extent of about 12km. It lies in the middle belt region of Nigeria. According to Adedibu (1980), the situation of the city between the dry North and the wet South of Nigeria gave Ilorin the apt description as the "gate way" between the North and the South of the country. The city, lies along Lagos-Kaduna highway, it is 306km from Lagos, 600km from Kaduna and about 500km from Abuja, the Federal Capital of Territory. The climate of Ilorin is tropical under the influence of the two trade winds (north-east and south-west trade winds) prevailing over the country. The city of Ilorin experiences rainy and dry climatic seasons.

The rainy season is between March and November and the annual rainfall varies from 1000mm to 1500mm, with the peak between September and early October (Tunde et al., 2013). In the town, the onset of tropical continental air mass is the beginning of dry season. Also, the mean monthly temperature is generally high throughout the year (Ajibade, 2002). Rainfall condition in Ilorin exhibits greater variability both temporarily and spatially. The mean annual rainfall has been estimated to be 1318mm. It normally starts in April and ends in October; however, the rainfall intensity, frequency and amount vary from month to month.

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

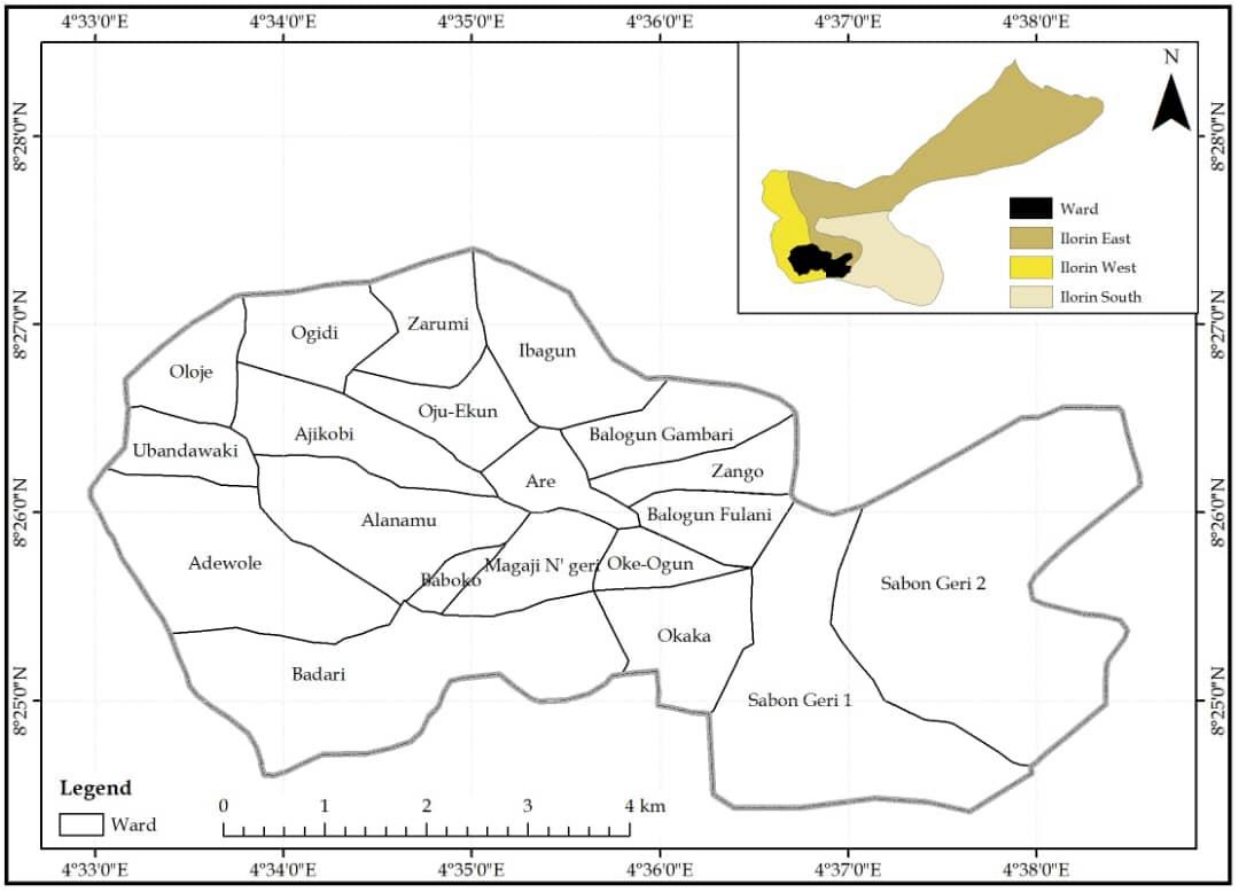

Figure 1: The study area (Source: Office of the Surveyor General, Kwara State, 2017)

The dry season is characterized by cold and dries due to harmattan (Adedayo & Ifabiyi 1999). The vegetation of Ilorin is derived savannah with riparian vegetation along river banks. Olorunfemi (2011) stated that the vegetation, in most parts, is guinea savanna interspersed by trees of different species. The vegetation of Ilorin is characterized by scattered tall trees shrubs of between the height of 10 and 12 feet (Ajibade, 2008). Some of the trees include Acacia, Baobab and Akee-apple.

Materials and Methods

Primary and secondary data were used in this study**.** The primary source includes: the socio-demographic characteristics of respondent, the households' sanitation practice and the socio-cultural risk factors for cholera in the study area which were obtained through a structured questionnaire and personal observations. The secondary data sources were the population figure of the study area and the ward map of the study area.

The population figure of Ilorin metropolis was sourced from the National Population Commission, (NPC), Ilorin, and ward map of the study area was collected from Office of the Surveyor General, Kwara state. Other secondary data sources were online articles and statistical data obtained from published works such as NCDC and WHO. The 2006 census puts the population of Ilorin at 777,667 (NPC 2006). Using the estimated growth rate of Ilorin (3.2%) as stated by NPC 2006, the population of Ilorin was projected from 2006 to 2017 given a total number of 1,099,690 people. For a reasonable sample size, Yaro-Yamane (1967) sample size formula was adopted (1)

$$n = N/(1 + N(e)^2 \quad (1)$$

Thus, a total number of 400 copies of questionnaire were administered. Ilorin has 20 political wards across the three local governments; the sampling was in favour of women because they play dominant role in household cleanliness and other health-related actions. All the 20

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

political wards in the Ilorin metropolis were considered for this study (Table 1). This is in order to ensure that the aim of this research is meticulously addressed. The questionnaires for this research were administered using the simple random sampling technique in each wards of the study area. The number of households in the study area has obviously increased since the 2006 census last conducted in the study area and thus the numbers of households in each ward were projected to 2017 using the geometric growth formula (2)

$$H_t = H_0\{1+\frac{r}{100}\}^n \quad (2)$$

The numbers of households sampled in each ward were determined by dividing the projected household size of each ward by the projected household size of Ilorin metropolis multiplied by the number of copies of questionnaire (400).

Data collected were analyzed using both descriptive and inferential statistical methods. The descriptive statistical methods (table, frequencies and percentages) were used to analyse sanitation facilities and socio- cultural risk factors. T-test was used to examine the variation in households' sanitation practices. Table was employed to identify the hotspot areas of cholera incidence based on the socio-cultural risk factors in the study area and these were mapped out with the use of ArcGIS.

Results and Discussion

Socio-demographic characteristics of the respondents

Majority of the respondents were female which accounted for 93% of the total respondents. Also, the age statistics show that the majority of the respondents belong to the reproductive age group of the study area (Table 2). The respondents' levels of education were of three classes; qur'anic, secondary and tertiary as shown in Table 2. Findings show that majority of the respondents in the study area are literate and thus indicates that despite the huge household workload on women, many still struggle to attain education which in turn affects the attitudes of women to sanitation and hygiene practices. On marital status, 63% of the respondents were married, while 13% were single, none of the respondents were separated while others are either widowed or divorced.

The implication of this result was that majority of the respondents were married and there is tendency for increment in population and waste generation in the study area. Findings on occupation reveals that majority of the respondents, are engaged in petty trading (54.2%), artisans (30.8%), civil servants (10.5%) and a simple minority were farmers This supports the findings of Okunola et al., (2015) that despite the fact that women are responsible for most domestic activities they are also involved in petty trades and paid employment. As regards average household income, a simple minority (4%) earn less than N10, 000, while majority (68%) earns between NGN10, 000 – NGN59, 000 other fall in the categories of people who earn 60,000 and above. The researcher observed that majority of those who earn average income of between NGN10, 000 – NGN59, 000 were dwellers of the transition and core residential zones while those who earn above NGN100, 000 were inhabitants of the suburb of the study area.

Households' sanitation facilities

As indicated in Table 3, 32(8%) of the household depends on tap water as their major source of potable water, 200(60%) of the respondents majorly source their potable water from hand-dug well while 168(32%) of the respondents depend heavily on borehole for their daily water consumption.

This finding implies that majority of the households in the study area depend on hand-dug wells and closely followed by borehole. Since most parts of Nigeria depend on well or stored rain water, water-borne infections are high in the country, predominantly with typhoid, bacillary dysentery and cholera (Oguntoke et al., 2009). This shows that the study area heavy reliance on hand-dug well contributes to its cholera vulnerability.

The result also revealed that most of the houses in the study area, 389 (97.2%) have toilet facility and only 11 (2.8%) of the respondents do not have toilet in their household. Result shows that almost all the houses present in the study area have toilet facilities, although majority 352 (88%) of respondents responded that they share toilet with other households while only 48 (12%) do not share toilet with other households. The 12% who do not share toilet are those living in government reservation areas (GRA) and other communities who are earning above NGN100, 000 as their average annual income in the study area while 88% of the respondents who stated that they share toilet facility are those residing in the core of the city who are earning between less than NGN5, 000 - NGN 50, 000. Bucket latrine, pit latrine and flush toilet are the three major types of toilets used by households in the study area. It was observed that 152 (38%) of the total respondents utilize bucket latrine, 188 (47%) uses pit latrine and the respondents that have water closet were 60(15%).

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

Table 1: Distribution of Questionnaire by wards in the study area

S/N	Ward	Population (2006)	Projected population 2006-2017	Number of households (2006)	Projected Household growth (2006-2017)	Number of households sampled
1	Adewole	43,084	60,925	454	776	23
2	Ajikobi	65,568	92,719	502	859	25
3	Alanamu	65,626	92,80	567	970	28
4	Are	54,969	77,731	462	790	23
5	Baboko	29,638	41,911	338	578	17
6	Badari	42,431	59,874	448	766	22
7	Balogunfulani	59,425	84,032	451	771	22
8	Balogungambari	37,661	53,256	421	720	21
9	Ibagun	33,872	47,898	405	692	20
10	MogajiN'geri	47,614	67,330	429	734	21
11	Okaka	32,758	46,323	365	624	18
12	Ogidi	25,553	36,134	303	518	15
13	Oju-Ekun	30,307	42,857	344	588	17
14	Oke-Ogun	29,415	41,595	336	574	17
15	Oloje	17,531	24,790	233	399	12
16	Sabon Geri 1	23,028	32,564	423	723	21
17	Sabon Geri 2	19,314	27,312	361	617	18
18	Ubandawaki	66,554	94,113	513	877	25
19	Zango	36,324	51,365	406	694	20
20	Zarumi	17,085	24,160	304	520	15
	Total	777,667	1,099,690	8,065	13790	400

Pit latrine and bucket latrine types of toilet are widely obtainable in the inner city of the study area where there are pockets of poverty. As for water closet, it is widely seen in the suburb of Ilorin where dwellers earn between ₦55, 000- ₦100, 000 and above.

This study also investigated the types of drainage existing in the study area and it was observed that 77 (19.2%) of the respondents have piped drain in their house, 265 (66.2%) of the respondents answered that they have open drainage in their house while the remaining 58 (14.5%) of the respondents' use covered drain.

Table 2: Socio-demographic characteristics

Attribute	Frequency	(Percentage, %)
Gender distribution		
Female	372	93
Male	28	7
Total	400	100
Age distribution (years)		
15- 19	11	2.75
20- 24	19	4.75
25- 29	30	7.5
30- 34	150	37.5
35 and above	190	47.5
Total	400	100
Level of education		
Secondary	11	2.75
Tertiary	278	69.5
Quranic	111	27.75
Total	400	100
Marital status		
Married	252	63
Divorced	36	9
Widowed	60	15
Single	52	13
Separated	-	-
Total	400	100
Occupational distribution		
Petty trader	217	54.2
Artisan	123	30.8
Farmer	18	4.5
Civil servant	42	10.5
Total	400	100
Average income		
< 10, 000	16	4
10, 000- 59, 000	272	68
60, 000- 100, 000	80	20
Above 100, 000	32	8
Total	400	100

Source: Authors Computation (2018)

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

This result shows that majority of the houses present in the study area have open drainages and of which many are clogged and this can serve as breeding place for disease causing organisms like *Vibrio cholerae* to thrive and thus cholera infection. The inability of many respondents to construct piped drain can be attributed to their low-income and absence of community development project as it can be seen from figure 11 that majority of respondents earn between ₦10,000 and ₦50, 000. The result also shows that 261 (65.2%) of the respondents have container with lid as their waste storage facility, 33 (8.2%) uses polythene bags while 106 (26.5%) used sacks as their waste storage facility. The implication of this is that there is no residence that didn't have any means of storing their waste even though most of these storage facilities are not seen in good condition especially amongst households of respondents who earn between ₦10, 000 and ₦50, 000 and less.

Variation in sanitation practices between different wards in the study area

As evident from Table 4, households in Adewole ward have significance value 0.909 which is greater than 0.05 ($p>0.05$), this reveals that there is no statistically significant variation among households in Adewole ward and households in other wards. In Ajikobi ward, the significance value 0.033 is less than 0.05 ($p<0.05$), hence there is statistically significant variation among households in the ward and relatively to other wards. In Alanamu ward the significance value 0.031 is less than 0.05 ($p<0.05$), this explains that there is statistically significant variation among households in the ward and in relation to households in other wards. In Are, the significance value 0.286 is greater than 0.05 ($p>0.05$), this implies that there is no statistically significant variation among households in the ward and in relation to households in other wards. Baboko ward has a significance value of 0.012 which is less than 0.05 ($p<0.05$), this means that there is statistically significant variation among households in the ward and in relation to households in other wards.

In Badari, the significance value 0.002 is less than 0.05 ($p<0.05$), this means that there is statistically significant variation among households in the ward and in relation to households in other wards. In Balogun Fulani ward of the study area, the significance value 0.031 is less than 0.05 ($p<0.05$), this implies that there is statistically significant variation among households in the ward and in relation to households in other wards. In Balogun Gambari, the significance value 0.996 is greater than 0.05 ($p<0.05$), this suggests that there is no statistically significant variation among households in the ward and in relation to households in other wards. The result also shows that in Mogaji N'geri, the significance value is 0.371 which is greater than 0.05 ($p>0.05$), this implies that there is no statistically significant variation among households in the ward and in relation to households in other wards.

Ibagun ward has significance value 0.023 which is less than 0.05 ($p<0.05$), this indicates that there is statistically significant variation among households in the ward and in relation to households in other wards. In Okaka, the significance value is 0.371 which is greater than 0.05 ($p>0.05$), this implies that there is no statistically significant variation among households in the ward and in relation to households in other wards. In Ogidi, the significance value is 0.965 which is greater than 0.05 ($p>0.05$), this implies that there is no statistically significant variation among households in the ward and in relation to households in other wards. In Oju Ekun ward, the significance value is 0.068 which is greater than 0.05 ($p>0.05$), this shows that there is no statistically significant variation among households in the ward and in relation to households in other wards. In Oke Ogun ward, the significance value is 0.149 which is greater than 0.05 ($p>0.05$), this implies that there is no statistically significant variation among households in the ward and in relation to households in other wards.

In Oloje, the significance value is 0.687 which is greater than 0.05 ($p>0.05$), this means that there is no statistically significant variation among households in the ward and in relation to households in other wards. In Sabon Geri 1, the significance value is 0.508 which is greater than 0.05 ($p>0.05$), this suggests that there is no statistically significant variation among households in the ward and in relation to households in other wards. Sabon Geri 2 ward of the study area has significance value 0.03 which is less than 0.05 ($p<0.05$), this explains that there is statistically significant variation among households in the ward and in relation to households in other wards. In Ubandawaki ward, 0.463 is the significance value, which is greater than 0.05 ($p<0.05$), this means that there is no statistically significant variation among households in the ward and in relation to households in other wards. In Zango, the significance value 0.032 is less than 0.05 ($p<0.05$), this proves that there is statistically significant variation among households in the ward and in relation to households in other wards. Finally, in Zarumi, the significance value 0.531 is greater than 0.05 ($p>0.05$), this is an indication that there is no statistically significant variation among households in the ward and in relation to households in other wards.

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

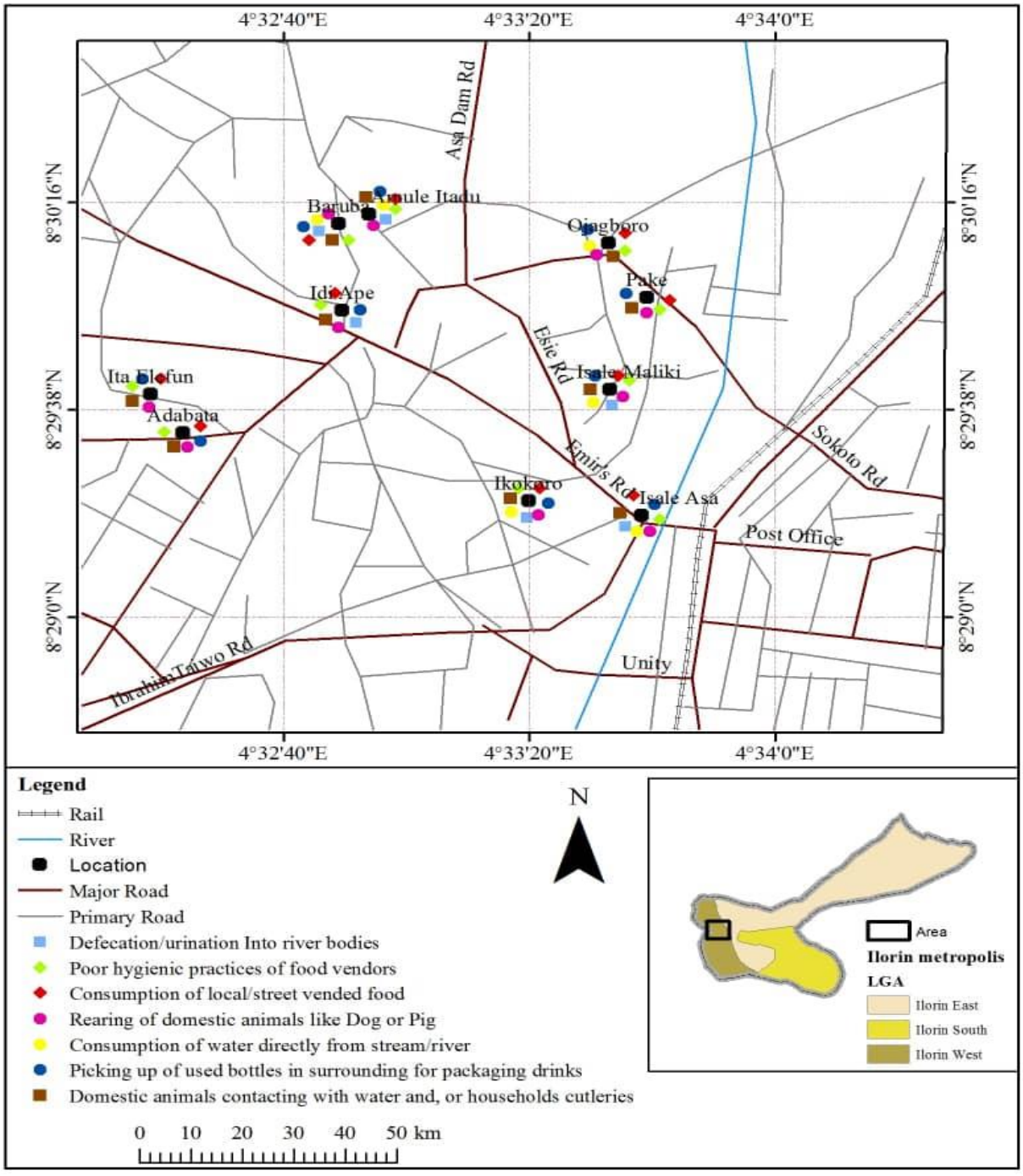

Figure 1: Spatial pattern of risk zones for cholera incidence in the study area

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

Socio-cultural risk factors for incidence of cholera outbreak

The study revealed that 41 (10.2%) of the respondents do go to stream or river to defecate/urinate while 359 (89.8%) responded that they do not urinate or defecate inside stream or water as expressed in table 5.Although this shows that relatively, few people defecate or urinate into water bodies in the study area but epidemiologic disasters like cholera can emerge as a result of just a person's wrong sanitary attitude. Urination and defecation into stream or any water body can aid in the spreading of cholera especially when the person is already infected. This attests to IMC (2015) that cholera infection is transmitted through contaminated fecal matter, which can be consumed through tainted food and water sources. It was also found out that these water bodies are accessed by dwellers for some purposes for domestic purposes like laundry.

As regards to consumption of water directly from stream or river, it was observed that 41 (10.2%) of the total respondents responded that their children consume water directly from the stream or river and they claim their children do so to quench their thirst especially after playing football at riversides and on way home from school, while 359(89.8%) of the respondents asserted that no member of their households consume water from streams or rivers. This is an indication that the study area has few people consuming water directly from stream or river. However, the spatial diffusion nature of cholera means the 10.2% of those that do so set the study area at risk because run-off carrying the causative organism for cholera from a certain region may flow into rivers in the study area. It was also indicated in Table 5 that all of the respondents replied that no one in their household consume raw fishes and this shows that this risk factor is absent in the study area. Rearing of animals in households also contribute to the vulnerability of an area to cholera because domestic animals like pigs and dogs can move into water bodies which is the habitat of *Vibrio cholerae* and make contact with it and move back to the household to lay the risk (see Plate 3). The study also reveals that 286 (71.5%) of the respondents' rear animal in their household while the remaining 114 (29.5%) do not rear animal in their households. The implication of this is the tendency for waterborne diseases like cholera in the study area because these animals especially pigs (See plate 2) enjoy free movement including into vibrio cholerae habitat such as streams and rivers, this is the case in some parts of the study area like Amule, Itadu and Isale Asa.

The study reveals that 119 (30%) of the respondents posited that domestic animals do make contact with their household water and or cutleries while 281 (70%) of the respondents answered that animals do not have any contact with their household water or cutleries (Table 5). The implication of this result is that the animals (pig, dogs, and other domestic animals) in the study area can help transmit the bacteria (*Vibrio cholerae*) from rivers into the household and therefore the risk for cholera. Personal observations show that majority of food vendors in the study area have poor hygiene practices, related to food handling, water use and wastewater disposal. This corroborates with the study of Adeneye *et al*. (2016) that food vendors in communities visited during observation are characterized with poor sanitation and food hygiene practices.

Also, food vendors, especially those in the traditional areas, fetch water from unsafe sources for cooking and washing dishes, this is especially noticeable during the dry season. Dishes are also left outside for hours before being washed and used water are disposed just in front of their space and into open drainages that are already clogged. This was much observed in Ikokoro and Isale Maliki in the study area. Respondents' replies on this concern shows that 273 (68%) replied that there exist poor hygiene practices of food vendors while 127 (32%) responded that food vendors in their areas do not have poor hygiene practices. Lastly the table further shows that 226(57%) of the respondents replied that they pick up used plastic bottles in their surrounding for packaging their household drinks while only 174 (43%) of the respondents used to pick up used plastic bottle for packaging their household drinks. This is one serious factor for cholera incidence because some of these plastic bottles may have been transported from cholera endemic states like Borno and Lagos (Adeneye *et al*., 2016).

Spatial pattern of risk based on socio-cultural risk factors

Ten hotspots areas were identified and these areas are where there are significant high socio-cultural risk factors for incidence of cholera in the area of study (Table 6 and Figure 2). These areas have at least five of the eight examined socio-cultural risk parameters for cholera incidence (Figure 2), pose serious cholera threat to the inhabitants of the area. Defecation and urination into water bodies are obtainable in IsaleAsa, Idi Ape, Baruba, AmuleItadu, Isale Maliki and Ikokoro but absent in Pake, Ojagboro, Adabata and Ita Elefun. Consumption of water directly from water bodies is a common practice in Isale Asa, Idi Ape, Baruba, Amule Itadu, Ojagboro, Isale Maliki, and Ikokoro, while these practices are absent in only three of the identified risk zones viz (Pake, Adabata, and Ita Elefun) (Table 6 and Figure 2).

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

Table 3**:** Sanitation facilities in the study Area

S/N	Items	Frequency	Percentage, %
1.	Major source of water supply to your household		
	Pipe borne water	32	8
	Bore hole	168	42
	Hand dug well	200	50
	Total	400	100.0
2.	Availability of toilet		
	Yes	389	97.2
	No	11	2.8
	Total	400	100.0
3.	Private ownership of toilet		
	Yes	352	88
	No	48	12
	Total	400	100
4.	Type of toilet		
	Bucket latrine	152	38
	Pit latrine	188	47
	Water closet	60	15
	Total	400	100.0
5.	Type of drains		
	piped drain	77	19.2
	Open drain	265	66.2
	Covered drain	58	14.5
	Total	400	100.0
6.	Type of waste storage facility		
	container with lid	261	65.2
	Polythene bag	33	8.2
	Sacks	106	26.5
	Total	400	100.0

Plate 1: Use of sack as a waste storage material and dumping of waste into River Aluko in the study area

Plate 2: Pig roaming around Asa river catchment (a part of the study area, Isale Asa)

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

However, raw fish consumption especially shell fish which harbors vibrio cholerae without cooking is absent in all sampled households in the study area (Table 6).

In all the ten risk zones, rearing of animals is a common practice. Figure 2 also shows that domestic animals do have contact with water and household cutleries in all the risk zones (see also table 6). There also exists, poor hygiene practices of food vendors in the study area. All mapped risk zones have the presence of poor hygiene practices of food vendors as expressed in table 5. As illustrated in figure 2 and table 5, consumption of local/street vended food is not an uncommon practice in all the risk zones despite the poor hygiene practices of food vendors. And lastly the socio-cultural mannerism of picking up used bottles in the surrounding and from dumpsites for packaging household drinks is present in all the mapped risk zones.

Conclusion

This research endeavor concluded that housing characteristics especially sanitation facilities is very poor in Ilorin and sanitation practices is unacceptable in many places in the study area as households dump and dispose wastes into river bodies, roadsides and vacant plots. In this era of climate change and increasing population migration from cholera endemic cities and towns, there exists serious socio-cultural risk factors that would increase the risk of cholera outbreak in the study area, especially defecation and urination into water bodies and consumption of water directly from rivers and streams. This research task also concluded that the indigenous people of the study area ability to prevent epidemiological disasters like cholera are severely restricted by poverty and low-income earnings. The paper also concluded that Isale-Asa, Idi-Ape, Baruba, Amule Itadu, Pake, Ojagboro, Isale-Maliki, Adabata, Ita-Elefun and Ikokoro communities pose significant cholera threat to the inhabitants of the study area.

Recommendations

Cholera persists to be a global threat to public health and a key indicator of lack of social development. This means, that for goal 3 of the SDGs which is to ensure healthy living for all, to be achieved, diseases like cholera that induces great calamities needs to be eradicated using sustainable preventive strategies and disaster risk reduction practices. Based on the findings of this study, the following recommendations were put forward: (1) The government of all levels, NGOs and international organizations should aim at providing more water sources especially borehole which is much safer and less polluted; (2) The ministry of environment and ministry of health in collaboration with other stakeholders should formulate strategies to prevent indiscriminate defecation, urination, and wastes disposal in the study area especially by unlettered and the mentally unstable persons. Outreach, education and moral-persuasion by the tripartite governments, international organizations and NGOs can be used to persuade residents on the need to ensure safe environment through reasonable sanitation practices and to amend hygiene practices and lifestyles for the prevention of cholera disaster in this era of climate change and population movement; and (3) The ministry of health (state and national) should also increase disease tracking and disease surveillance coverage especially cholera and educate the general public on cholera prevention measures and begin cholera vaccination program. Disaster management agencies like National Emergency Management Agency should delve into health risk assessment research and dissemination of obtained findings to the general public.

References

Adedayo, A. F. and Ifabiyi, I. P. (1999) The distribution of water and the role of water public agencies in Kwara state. *Journal of Social and Management Studies*, *6*(1), 97-111.

Adeneye, A. K., Musa, A. Z., Oyedeji, K. S., Oladele, D., Ochoba, M., Akensinde, K. A., Niemogha, M.T., Nwaokorie, F. O., Bamidele, T. A., Brai, B. I., Ominigbehin, E. A., Bamedele, M., Fesobi T. W., Smith, S. I. & Ujah, I. A. O. (2016). Risk factors associated with a cholera outbreak in Bauchi and Gombe state in North East, Nigeria. *Journal of public health and epidemiology 8* (11), 286-296.

Adagbada A. O., Adesidq S.A., Nwaokorie F.O., Niemogha M.T., & Coker, A.O. (2012). Cholera epidemiology in Nigeria: An overview: *The Pan African Medical Journal*,12, 59.

Ajibade L. T. (2002). Indigenous system of land evaluation in the Yoruba speaking area of Kwara state. Unpublished Ph.D Thesis, ObafemiAwolowo University (OAU) Ile-Ife, Osun State, Nigeria..

Environmental Health Group (2017). What is cholera and why does it matter? Retrieved on 2nd February 2018, from Bestnairanews.com. Kwara State Ministry of Health (2012)

Iheke (2010). Impact of workers' remittances on efficiency and welfare of rural smallholder arable crop households in south eastern Nigeria. A PhD dissertation, Michael Okpara University of Agriculture, Umudike, Nigeria.

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

Table 4. Variation in sanitation practices between different wards

Wards	N	Mean differences	Std. Deviation	Sig.	Std. Error Mean	95% Confidence Interval of the Difference	
						Lower Bound	Upper Bound
Adewole	400	10.50	5.78	0.91	0.29	9.93	11.07
Ajikobi	400	1.90	0.30	0.03	0.02	1.87	1.93
Alanamu	400	2.00	0.46	0.03	0.02	1.95	2.04
Are	400	3.57	0.72	0.29	0.04	3.50	3.64
Baboko	400	1.81	1.05	0.01	0.05	1.70	1.91
Badari	400	1.35	0.59	0.00	0.03	1.29	1.40
Balogun Fulani	400	3.10	0.31	0.06	0.07	-0.37	0.17
Balogun Gambari	400	3.20	0.52	1.00	0.12	-0.38	0.18
Mogaji N'geri	400	2.00	0.00	0.37	0.00	-0.05	0.15
Ibagun	400	1.95	0.22	0.02	0.05	-0.05	0.15
Okaka	400	1.90	0.31	0.32	0.07	-0.13	0.33
Ogidi	400	1.80	0.41	0.97	0.09	-0.13	0.33
Oju Ekun	400	1.85	1.14	0.07	0.25	-0.78	0.48
Oke Ogun	400	2.00	0.79	0.15	0.18	-0.78	0.48
Oloje	400	1.35	0.49	0.69	0.11	-0.09	0.69
Sabon Geri 1	400	1.95	0.22	0.51	0.05	-0.09	0.69
Sabon Geri 2	400	1.95	0.22	0.00	0.05	-0.27	0.37
Ubandawaki	400	1.95	0.22	0.46	0.05	-0.27	0.37
Zango	400	1.95	0.22	0.03	0.05	-0.29	0.29
Zarumi	400	1.95	0.22	0.53	0.05	-0.09	0.69

Table 5. Response on socio-cultural risk factors for incidence of cholera

S/N	Items	Yes		No	
		No.	%	No.	%
1	Do you or anyone in your household go to stream or river to defecate/urinate	41	10.2	359	89.8
2	Do you or anyone in your household consume water directly from stream or river?	41	10.2	359	89.8
3	Do you or anyone in your household consume raw fishes like shell fish and toadfish from river or stream without cooking	_	_	_	_
4	Do you have/rear domestic animal(s) like goat, dog or pig in your household	286	71.5	114	28.5
5	Do domestic animals make contact with your household water and/or cutleries	119	30	281	70
6	Poor hygiene practices of food vendors	273	68	127	32
7	Consumption of local/ street vended food	291	72.8	109	27.2
8	Do you pick up used plastic bottles in your surrounding for packaging your household drinks	226	57	174	43

IFE RESEARCH PUBLICATIONS IN GEOGRAPHY, 2022
Volume 21, No. 1. 1- 13. *Laro, Abdrashid, Makinde & Saka*
https://irpg.oauife.edu.ng/index.php/irpg
ISSN:0795-073X eISSN:2636-5243
Published by Department of Geography, Obafemi Awolowo University Ile Ife, Nigeria

Table 6: Distribution of cholera risk zones based on socio-cultural risk factors

	Location and ward									
Socio-cultural risk factors	A	B	C	D	E	F	G	H	I	J
Defecation/urination Into stream or river bodies	✓	✓ □	✓ □	✓	×	×	✓	×	×	✓ □
Consumption of water directly from stream/river	✓	×	✓ □	✓	×	✓ □	✓	×	×	✓
Consumption of raw fish like shell fish and toad fish from river without cooking	×	×	×	×	×	×	×	×	×	×
Rearing of domestic animals like Dog or Pig	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Domestic animals contacting with water and, or households' cutleries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Poor hygienic practices of food vendors	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Consumption of local/street vended food	✓	✓ □	✓ □	✓	✓ □	✓	✓	✓	✓	✓
Picking up of used bottles in the surrounding for packaging drinks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

A = Isale Asa (B.Fulani) B = Idi Ape (Are), C = Baruba (Are), D = AmuleItadu (B.Gambari), E = Pake (Zango), F = Oja Gboro (Zango), G = Isale Maliki (B.Fulani), H = Adabata (Alanamu), I = Ita Elefun (Alanamu), J = Ikokoro (Okaka)

***Note*:** The symbols □ and × represent the presence and absence of a socio-cultural risk factor parameters respectively.

Jutla, A., Khan, R., Colwell, R. (2017). Natural disaster and cholera outbreak: Current understanding and future outlook. *Current Environmental Health Reports*. 99-107.

Mara, D., Lane, J., Scott, B. & Trouba, D. (2010). Sanitation and health. *PLOS Med*, 7 (11): el000363. doi; 10.137//journal. Med. l000363.

National Population Commission (2006). Population census of the federal republic of Nigeria: Analytical report of the national level, NPC Abuja.

NCDC (2017). NCDC weekly epidemiological report issue: Volume 7 No, 25 -7th July, 2017. Retrieved January 09-2018 from Reliefweb.com.

Okunola, J. O., Bello, O. B., & Owolabi, K. E. (2015). Marriage Systems and the Roles of Women in Offa, Kwara state, Nigeria. *British Journal of Education, Society & Behavioral Science*, 9(4), 330 - 340

Olorunfemi O. & Orire, A. (2017). Demographic characteristics of Kwara state, Nigeria. In 'Kwara state: A geographical perspective'.

Opaluwah, A. B. (2007) Nigerian women and challenge of MDGs, *Daily Independent*. B5:678-680.

Tunde, A. M.; Adeleke, E. A. & Adeniyi, E. E. (2013). Impact of climate on human health in Ilorin, Nigeria. *Environment and Natural Resources Research*, 3, (1), Published by Canadian Centre of Science and Education.

Victor (2017). Cholera in Kwara: An Environmentalist Perspective. Retrieved December 22-2017 from Google.

Vidal, J. (2012). Water and sanitation still not top priorities for African governments. Retrieved on 9th June 2014 from theguardian.com/global-deve/water-sanitation-priorities-african-govt.

Wardlaw, T., Salama, P., Brocklehurst, C., Chopra, M., Mason, E. (2010). Diarrhoea: Why children are

still dying and what can be done. *Lancet, 375* (9718), 870-872

World Health Organization (2005). *Sanitation and Hygiene Promotion Guide*. Switzerland: Water Supply and Sanitation Collaborative Council.

World Health Organization (2017). WHO AFRO outbreaks and other emergencies week 25: 17-23 June2017. Retrieved February 5-2018

WHO (2004). Water, Sanitation and Hygiene Links to Health: Facts and Figures. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/69489/factsfigures_2004_eng.pdf. Accessed on 15th June, 2022

WHO/UNICEF Joint Monitoring Program(JMP) (2017). WASH in the 2030 Agenda: New Indicators for water, sanitation and hygiene. Retrieved from https://www.waterpathogens.org/book/introduction on the 6th June, 2022

WHO (2020) World Health Organization. Cholera Fact Sheet. https://www.who.int/news-room/fact-sheets/detail/cholera, Accessed 13th May, 2022.