Int J Epidemiol Health Sci 2021;2(7): e14
doi: http//doi.org/10.51757/IJEHS.2.7.2021.244239

Original Article

Epidemiological approach to an outbreak of gastroenteritis in Ondo State, Southwest of Nigeria

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Cite this article: Olaoye, I., Fatiregun, A.A., Fagbemi, S., Gboyega, F., Onyibe, R. Epidemiological approach to an outbreak of gastroenteritis in Ondo State, Soutwest of Nigeria. Int J Epidemiol Health Sci 2021; 2(7): e14. Doi: 10/51757/IJEHS.2.7.2021.244239.

Abstract

Background: Acute gastroenteritis, a very common disease in humans affecting both children and adults, remains a major public health concern worldwide. Several groups of viruses have been reported as the causative agents of acute gastroenteritis. An outbreak of acute gastroenteritis with a high fatality rate was reported in Ondo State, Southwest, Nigeria, in September 2020.

Methods: To provide a descriptive epidemiology of the outbreak, a field investigation was carried out in affected communities in September 2020.

Results: Four Local Government Areas (LGA) were affected, with Odigbo LGA having the highest attack rate of 14.9 per 100,000 population. The epidemic curve was propagated in nature. 50 cases were reported with 21 deaths (42%). The outbreak primarily affected 15-year-olds (94%, n=47) and more males (58%, n=29).

Conclusion: Poor sanitation, food, and water hygiene conditions in communities of the LGA visited were observed. The spread of the outbreak was probably facilitated by water sellers.

Keywords: Gastroenteritis, Epidemiology, Outbreak investigation, WHO, Nigeria

Introduction

Gastroenteritis is the irritation of the digestive track caused by a viral, bacterial, or parasitic infection and it may cause diarrhoea, vomiting, and abdominal pain (1). Worldwide, gastroenteritis affects 3 to 5 billion children each year, and accounts for 1.5 to 2.5 million deaths per year or 12% of all deaths among children less than 5 years of age (2,3,4). Treatment mainly involves symptom relief and fluid replacement. Gastroenteritis is also known as the tummy bug, stomach flu, intestinal flu, food poisoning, and travellers' diarrhoea. It is a common condition in Nigeria, mainly because the microbes that can cause gastroenteritis are easily spread via contaminated food or water, and through person-to-person contact, contaminated food or water, unwashed hands after cleaning or changing a diaper (5). The greatest burden of gastroenteritis in developing countries, like Nigeria, is due to poor sanitation, lack of safe drinking water, and un-salutary sanitary habits (5). Previous research in Nigeria has revealed that diarrhoea is one of the top three causes of morbidity and mortality among

hospitalized children (6, 7). Gastroenteritis cases in children are caused by a virus called rotavirus and in adults by norovirus.

Risk factors for gastroenteritis seem to differ from one geographical region to another. In Nigeria, risk factors that have been recognized to be associated with gastroenteritis include contaminated water mostly distributed on the streets and non-washing of hands prior to eating food (8). In the coastal areas of Nigeria, gastroenteritis is endemic and tends to be sporadic in the southern part of the country. Due to rapid urbanization, population growth combined with inadequate sanitary conditions, inadequate water supply and poor sewage disposal, many cities in Nigeria are at risk of gastroenteritis outbreaks (9). The dependence on well water from poorly constructed uncovered wells for many people in the Southwest. In some cases, where a well and a pit latrine coexist, the risk of well water contamination is often elevated. Contaminated water remains a vehicle for the spread of gastroenteritis (10).

Infectious etiologic laboratory tests are performed, including bacterial stool culture, which is useful for reliable diagnosis and definitive diagnosis of both infectious and non-infectious gastroenteritis. Clinical diagnosis of gastroenteritis is often based on several symptoms (11). People with gastroenteritis usually have pain in the abdomen, belching, diarrhoea, flatulence, gagging, indigestion, nausea, stomach cramps or vomiting. The general whole-body symptoms include dehydration, fatigue, fever, chills, lethargy, light-headedness, or loss of appetite. Other common symptoms include fast heart rate, headache, insufficient urine production, weakness, and weight loss (12). Human feces is a primary source of contamination and gastroenteritis outbreaks are classically associated with conditions in which two factors exist: unsafe or contaminated water supply and habits of defecation and excreta-disposal are such that they facilitate, rather than the control of the spread of contamination (13). The cycle, which includes the vibrio excretor, the environment, and a water source, is critical to the transmission's survival. The paper reports the findings of an epidemiologic investigation of an outbreak of gastroenteritis in Ondo State, in Southwest Nigeria.

Methodology

Outbreak Setting

Ondo State, one of the 36 states in Nigeria, is located in the Southwestern zone, with its capital in Akure City. The state shares boundaries with Edo and Delta States in the east, Ogun and Osun States in the west, Ekiti and Kogi States in the north and the Bight of Benin and the Atlantic Ocean in the South (Figure 1). Ondo State is divided into three senatorial districts: Ondo Central, North and South districts, and has 18 Local Government Areas (LGA) with 203 wards. The state's projected population in 2020, according to the 2006 population census, is 5,205,141, with an annual growth rate of 3% (14). The Index case was reported on 18 Sep 2020 in Odigbo LGA which is located in the southern senatorial district, headquartered in Ore and with 11 wards, and 668 settlements within the wards. It has an area of 1,818 km^2 and an estimated population of 230,351, according to the 2006 census. The LGA is bordered by the states of Ogun, Edo, and Osun. People's main occupations are farming and trading. Boreholes and wells are the sources of drinking water. The indiscriminate disposal of waste and excreta is common in most rural areas.

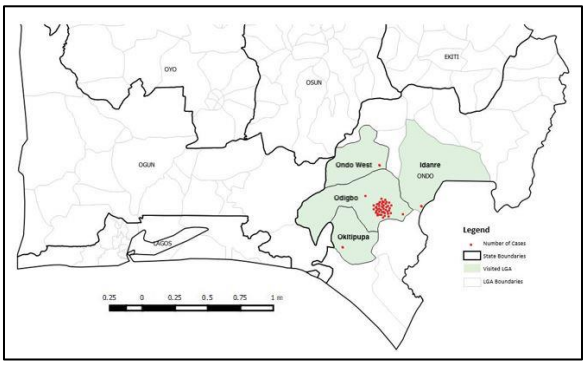

Figure 1. Map of Ondo State, Nigeria showing gastroenteritis cases in 3 LGAs

The Outbreak

A suspected outbreak of gastroenteritis was first reported by an environmental health officer on the 30th of September 2020 to the Odigbo LGA health team. A cluster of 29 cases of acute watery stooling and vomiting with 19 deaths were reported from one community in Ore ward in Odigbo Local Government Area. New cases were reported from health facilities and communities.

The State and LGA Rapid Response Team (RRT) comprised of field epidemiologists, a laboratory scientist, a case manager and risk communicators were deployed to support the outbreak response at the LGA level.

Case finding

For the purposes of this investigation, an operational definition of the case was defined as an illness

consisting of vomiting, diarrhoea, abdominal cramps, and nausea. During a 6-week period, 50 cases were identified in four LGAs and four wards through record reviews in health facilities and case searches in communities. Cases occurred in all age groups and both sexes were affected. Investigations were conducted at health facilities to document the case management of treated cases and cases that were undergoing treatment. Heads of households were asked at community level if members of their households had reported episodes of stooling with or without vomiting.

Line-listing of all identified cases was done using the line-list template from the Nigeria Centre for Disease Control (NCDC). The name of the LGA, settlements, age, sex of cases, date of onset of illness, whether specimens were taken, laboratory results of specimens taken, and the status of the case, whether they are alive or dead, were all included in the online list.

Laboratory investigations

Efforts were made to confirm diagnoses and rule out other causes of gastroenteritis. Stool samples were collected and tests for 8 cases were detected through hospital-based surveillance. Due to delays in the delivery of Cary Blair transport media to the designated treatment center and sample transportation to the designated laboratory, collecting stool samples proved difficult. Five of the eight stool samples collected were positive for cholera, using a rapid cholera diagnostic test kit.

Statistical analysis

Statistical analyses were done using SPSS 27.0. Descriptive statistics for frequencies and proportions were carried out to show the distribution of cases by person, place and time.

Results

A total of 20 health facilities and 90 households in 3 settlements in Odigbo LGA were visited for the case search. Additional line-listed cases were obtained from 3 settlements in 3 LGAs. We identified a total of 50 cases with 21 fatalities, giving a case fatality rate of 42%. The attack rate was the highest in Odigbo LGA with a 14.9/100, 000 population. One case each was reported from bordering communities in Ore-1 ward in Odigbo, from Idanre, Ondo West and Okitipupa LGAs, giving attack rates of 0.004, 0.010 and 0.003 per 100, 000 population respectively. More than half of the cases were males (58%, n = 29). The age distribution showed the highest proportion of cases among those who were more than 15 years of age (94%, n = 47) (Table 1). An epidemic curve (Figure 2) indicates that the index case occurred on 18 September 2020, followed by a rapid increase in the number of cases. The peak of the outbreak occurred around 29 September 2020. The last case occurred on the first day of the disease, on October 19, 2020. The lag time between the onset of the disease in the index case and the reporting of the outbreak was two days. The epidemic curve seems to indicate the propagated nature of the outbreak. The most frequently reported symptoms in the cases were diarrhea in all patients (Figure 3), vomiting in 40 patients (80%) and abdominal cramps in 31 patients (62%). The symptom of nausea was experienced only in one patient (2%).

Table 1. Distribution of cases by age group, gender, status, and Local Government Area (LGA)

Characteristics	n (50)	%
Age group		
1-4 years	3	6%
5-14 years	1	2%
15-24 years	12	24%
25-34 years	13	26%
35-44 years	9	18%
> 45	12	24%
Gender		
Male	29	58%
Female	21	42%
Occupation		
Trader	42	84%
Housewife	5	10%
Student	3	6%
Status of cases		
Alive	29	58%
Dead	21	42%
LGA		
Odigbo	47	94%
Idanre	1	2%
Okitipupa	1	2%
Ondo West	1	2%

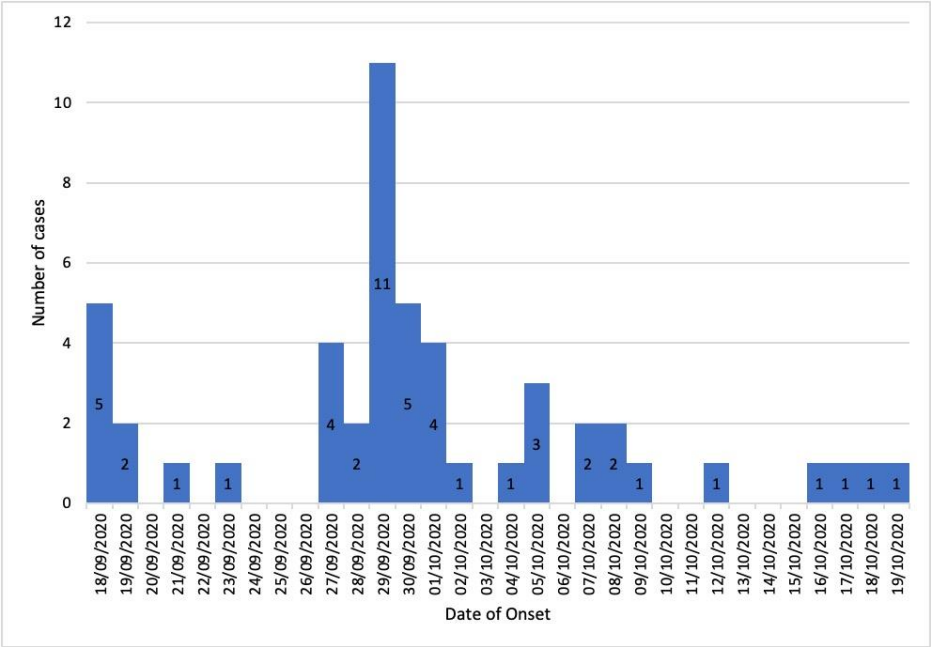

Figure 2. Epidemic curve showing the number of cases by date of onset in Ondo State, Nigeria

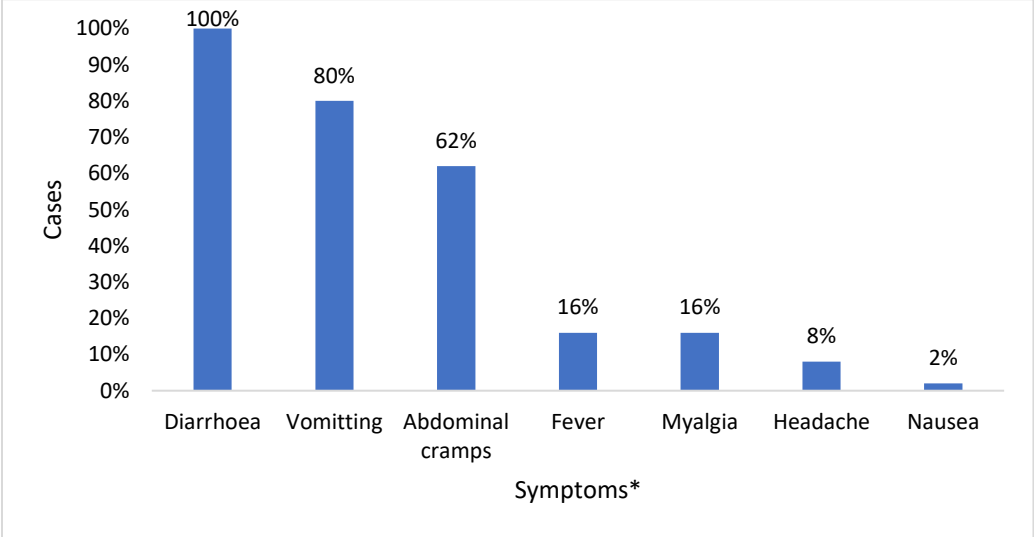

Figure 3. Symptoms of suspected cases in Ondo State, Nigeria (n=50).
*Multiple responses allowed.

Discussion

An outbreak of acute gastroenteritis associated with food and water contamination in Ondo State has been described. The epidemic affected people of all ages, but those aged 15 to 34 years were most affected. These findings are consistent with a study conducted in southwest Nigeria (15), but contradict another study conducted in Southwest Nigeria (16) in which the age group of 59 years was most affected, as well as another study conducted in Nepal in which children under the age of 5 were most affected (17).

The case fatality in this outbreak was higher than the 5% reported in a study in the Southwest of Nigeria (15) and 6.1% in a large outbreak in Northern Nigeria (18). This was also higher in a study in Kenya, with a rate of 11.4%. The high case fatality rate in this study may have been due to limited access and utilization of health care services during the COVID-19 pandemic.

The epidemic curve in this study suggests a propagated pattern in the spread of the outbreak, consistent with patterns in a study in a rural northern community in Nigeria (19) and a study in southwest Nigeria (15). An outbreak investigation in the community revealed shallow open wells, which were sources of drinking water, which co-existed with latrines and refuse dumpsites. There is a high probability that the main sources of drinking water were contaminated and many of the community members were exposed to infection. Several deaths occurred earlier in the outbreak before the institution of response activities. Response activities instituted would have been more effective in preventing cases and deaths if they had started earlier. However, a timely response is largely dependent on early notification and outbreak. Also, the lack of knowledge by health professionals in Nigeria of the need for immediate notification of epidemic-prone diseases to public health authorities has been demonstrated in previous studies as a cause of untimely reporting of the outbreak of diseases (20, 21, 22). As a result, more community and health care sensitization to community and health facility-based reporting of public health events is required. Our findings show similar patterns in terms of the gender most affected by the study in southwest Nigeria (15), but are contrary to other studies (23, 24). Insufficient drainage systems and the disposal of excreta through open defecation, as well as its spread due to rainwater flooding, significantly increase the risk of gastroenteritis disease transmission. Long-term gastroenteritis prevention requires improving hygiene through the construction and routine maintenance of sewage waste disposal facilities, which should be done in collaboration with non-governmental organizations.

A widely recognized factor in the prevention of gastroenteritis is the chlorination of drinking water. There is a high possibility of heavy contamination of water even if the water is clean when it is drawn from a very deep well. There is an established statistical association between the use of water without chlorination at home and spreading the disease (13). Other studies emphasize the significance of water microbial safety immediately before it is consumed to reduce rates of diarrheal diseases (25, 26, 27).

As most people in developing countries do not have individual water sources or connections, there is also an increased vulnerability to water contamination during the process of transportation and storage. Easy and inexpensive methods for disinfecting water and its storage should be promoted to reduce the risk of diarrhea and gastroenteritis. It is worth emphasizing the need for sensitization and health education on home chlorination and at point of use water disinfection in Nigeria (13, 28). There is also the need for coordinated stakeholders' activities to improve the physical and environmental health conditions of the communities, such as the construction of deep well facilities. This can be achieved through collaboration between the National and State Ministries, Departments and Agencies.

Conclusion

The findings of the study showed poor sanitation, food, and water hygiene conditions in communities of the Local Government Area visited. These variables may have propagated the outbreak. Although the outbreak has been controlled, public health workers should remain cautious and event-based surveillance should be strengthened at all levels of public health. All critical surveillance actors at health facilities and community levels should continue to be trained and sensitized to the need for immediate notification of all events and epidemic-prone diseases to public health authorities. A crucial preventive mechanism against gastroenteritis epidemics remains the institutionalization of waste management facilities, separating water supply from sewage waste. Although oral vaccines have not yet been included in the routine immunization schedule and are not a common supplemental immunization program in Nigeria, they will be used as additional prevention and control measures for these outbreaks. The challenges encountered in confirmation of diagnoses through testing of samples can be mitigated. The State Ministry of Health must prepare for outbreaks by ensuring the functionality of laboratories, the availability of sample collection kits, and other logistics.

Conflict of interest

The authors declare no conflict of interest regarding the research.

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