# Investigation Of An Outbreak Of Food Poisoning In A Resource-Limited Setting

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### Abstract

An acute onset of gastrointestinal symptoms among people who had attended and eaten at a burial ceremony generated a lot of public concern as indicated by subsequent media reports. We, therefore, set out to investigate this outbreak with the aim of assessing its magnitude and identifying the implicated food item.Case patients were sought, line listed and described. A retrospective cohort design was used to evaluate the risk for each food item reported to have been served at the ceremony. A total of 60 case patients and 3 deaths were identified. Symptoms reported included fainting spells in 100% of patients, vomiting in 86% and diarrhea in 7%. The average incubation period of the disease was 90 minutes (range 30 to 150 minutes). The risk difference for each food item reported to have been served at the ceremony was observed to be 59.2% for meat, 52.9% for mixed yam/cassava flour "amala", 52.9% for vegetable "ewedu", 42.9% for rice grain and 45% for sachet water. This investigation provided the opportunity to identify the major constraints to an effective outbreak investigation in our environment, including inadequate preparedness and lack of public health laboratories; hence it is necessary for the government at all levels to support the provision of this service.

Key words: Outbreak Investigation, Food Poisoning, Nigeria.

### Introduction

Food poisoning is an acute gastroenteritis caused by the ingestion of food or drink contaminated with either living bacteria or their toxins, poisons derived from plants or animals or inorganic chemical substances<sup>1</sup>.

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The condition is often characterized by a history of ingesting a common food, and may affect many people at the same time causing similar gastrointestinal signs and symptoms. Outbreaks are recognized by the occurrence of illness within a variable, usually a short time period (a few hours to a few weeks) after a meal where individuals consumed common foods. Non-bacterial food poisoning is usually due to chemicals such as arsenic, cvanide, certain plants, seafood, fertilizers, pesticides, cadmium and mercury. Exposure to low levels of cyanide over a long period (e.g., after the consumption of cassava roots which are a primary food source in tropical Africa) results in increased blood cyanide levels, which can result in weakness and a variety of symptoms, including permanent paralysis. The conventional classification of bacterial food poisoning into either toxin- or infective-type poisoning is becoming increasingly difficult as some types of poisoning result from the involvement of both multiplicative and toxin products<sup>2</sup>.

There are five recognized types of bacterial food poisoning which have a variable presentation and incubation period. These are salmonella, staphylococcal, botulism, *Clostridium perfringes* and *Bacillus cereus* food poisoning. The clinical features and epidemiology of these diseases have been well described<sup>1,2</sup>. However, food poisoning in these diseases may be mistaken for cholera, acute bacillary dysentery and chemical poisoning. In addition, the identification of specific agents involved in a food poisoning outbreak will guide case management, prognostication and recommendations to prevent future occurrences, hence the need for proper investigation.

A report on the acute onset of gastrointestinal symptoms among people who had attended and eaten at a burial ceremony in the Ojomu compound of Ede in the Ede North Local Government Area (LGA) of Osun State was made on the 15th of June 2008 by the Disease Surveillance and Notification Officer (DSNO) of the LGA. A newspaper report on the same incident was also observed the following morning, which claimed that 10 people had died and many had been hospitalized. This generated considerable public concern as indicated by subsequent media reports. We therefore set out to investigate the outbreak with the aim of assessing the magnitude of the reported outbreak, and identifying the implicated food item.

# Materials and Methods

### Investigation site

An investigation into the outbreak was conducted in Ede North LGA; one of the 30 LGAs in Osun State, Nigeria which has its headquarters in Oja-timi, Ede. The council was established on October 2, 1996, has a land mass of 40,000 sq km, and a population of 89,282 in 2008 based on 2006 census projection. The people of this local government are predominantly farmers but are also involved in the weaving of traditional cloth and trading. The township of Ede is a single community with a single history and language. However, for administrative convenience, the community is run by two LGAs, i.e. Ede North and Ede South. The LGA lies on the geographical latitude of  $4^{\circ} x 50^{\circ}$  north of the equator<sup>3</sup>.

## Steps in the outbreak investigation

The investigation team met on the 16<sup>th</sup> June, 2008, one day after the report of the outbreak, to plan administrative, consultative and logistic measures. Visits were made to the Ojomu compound in Ede, where the outbreak occurred and to the health facilities where cases were admitted and treated. To verify the diagnosis, we defined a suspected case as any person in the town with a history of fainting spells or impaired consciousness with or without vomiting. In order to establish the existence of an outbreak, we compared the frequency of food poisoning cases in previous years to the current year and found that the frequency this year was clearly excessive. A line list of cases was obtained from the health facilities in the LGA. The houses of those who had been discharged and those who attended the ceremony were also visited to determine any additional cases.

Using the line list, an epidemic curve was plotted with the number of cases against the time of onset of disease symptoms. The distribution of cases by age and sex were also obtained. The simple hypothesis that the food poisoning outbreak occurred due to contaminated food or water was evaluated using a retrospective cohort study design. The subjects were those who attended the burial ceremony. In-depth interviews of key informants were carried out to obtain a list of all the foods served. A questionnaire was developed and administered at interview to obtain data on exposure factors among the study subjects. An exposed person was defined as any person who ate any of the food items or drank water served at the ceremony. Data were entered and analyzed using Epi-info 2000<sup>4</sup>.

# Results

# Descriptive Epidemiology

A total of 60 case patients and 3 deaths were line listed and given a case fatality ratio of 5%. The persons who died were less than 3 years old. The median age of the case patients was 26 years with a range of 1 to 70 years. The majority of cases (74%) were aged less than 40 years. More than half (54.2%) were female and all resided within Ede township. The epidemic curve (Figure 1) indicated that the highest number of cases occurred between 3.30 and 4.00 pm, about an hour after the food was said to have been served. All cases presented with fainting spells, 86% experienced vomiting and only 7% also experienced diarrhea.

Analytical Epidemiology

A total of 71 cohort members were interviewed. The number of ill persons among these 71 was 44, giving an incidence rate of 62%. Table 1 shows that the food items "amala" and "ewedu" had the highest relative risk (RR) of 4.7 each (95% CI 0.8-29.1), followed by meat with a RR of 3.7 (95% CI 1.7-8.2). The incidence rate differences for these food items were also the highest (Table 2).

# Discussion

The data from this investigation revealed that the majority of cases (73.7%) were aged less than 40 years, were female (54.2%) and all resided in Ede township. This is not surprising as young adults, especially females, attend ceremonies of this nature in our environment. In addition, the interviews indicated that the average incubation period was about 90 minutes with a range of 30 minutes to 150 minutes. The largest number of cases occurred about an hour after ingestion of food substances at the burial ceremony. This outbreak was similar in magnitude to the outbreak of salmonella food poisoning in Riyadh, Saudi Arabia in 2001 reported by Abdullah et al<sup>5</sup>. A total of 68 cases; with a mean age of  $18.3 \pm 13$  years, and a male to female ratio of 1:0.9 was identified. However, unlike the outbreak in this study, the average incubation period was 8 hours in the Saudi outbreak<sup>5</sup>.

There was also a similarity in symptoms among the majority of cases, with all cases presenting with fainting attacks, 86% with vomiting and only 7% with diarrhea. These findings are similar to the food poisoning characteristics described by Park in  $2000^2$ , Abdullah et al in 2001<sup>5</sup> and Adedoyin et al in 2008<sup>6</sup>. Although, the large majority of cases were mild to moderately ill, with an average illness duration of about 2 hours, there were 3 deaths, all in children less than 3 years old who were reported to have been given some of the food substances at the ceremony. In an outbreak of food poisoning due to yam flour consumption in five families in Ilorin, Nigeria, reported by Adedoyin et al,<sup>6</sup> all cases recovered within 48 hours of admission. Although no postmortems were conducted to ascertain the cause of death in this outbreak; these deaths may have resulted from the relatively large dose of toxins to body mass in these cases. The investigators also felt that the duration of illness was not entirely reliable since difficulty was encountered in determining the termination of illness in some cases.

To determine the specific food responsible for the outbreak, an analytical study design was employed. The food substances served at the ceremony were interdependent of each other; hence we used incidence rate differences between those who ate and those who did not eat for each of the identified food substances to evaluate the food substance responsible for the outbreak. A high positive value for these differences was indicative of the responsible food item. Using this analytical method, our data suggested that the meat served at the burial ceremony was the vehicle of transmission in this food poisoning outbreak. However, "amala" (made from a mixture of yam and cassava flour) and "ewedu" a vegetable soup, both had equally high positive incidence rate differences. Abdullahi et al used a similar analytic method to identify chicken shawarma as the implicated food item in their investigation<sup>5</sup>.

A number of limitations in this investigation of food poisoning were demonstrated. We were unable to determine the number of people who attended and ate at the burial ceremony. In addition, a complete menu of all the foods served could not be ascertained because the compound was deserted after the incident. This was due to police involvement and the arrest of members of the community. In addition, we were unable to interview and examine food handlers to obtain a full description of where and how the foods were prepared and served, and nose swabs and other personal and environmental specimens including remnant of food specimen could not be obtained to strengthen our investigation. Thus it was difficult to demonstrate any contamination during the food processing. Postmortem examinations to ascertain the cause of death in those persons where the food poisoning was fatal could not be performed for religious and cultural reasons.

EXPOSURE	ILL n=44		ľ	NOT ILL n=27	RR (95% CI)	P-
FACTORS						VALUE
	EXP	NOT	EXP	NOT		
		EXP		EXP		
AMALA	43	1	21	6	4.7 (0.8-29.1)	0.01*
EWEDU	43	1	21	6	4.7 (0.8-29.1)	0.01*
MEAT	<b>3</b> 9	5	9	18	3.7 (1.7-8.2)	0.00
RICE	8	36	0	27	1.8 (1.4-2.2)	0.02*
PURE WATER	42	2	20	7	3 (0.9-10.4)	0.02*
CONTACT WITH ILL PERSON	2	42	5	22	0.3 (0.1-1.8)	0.06

 Table 1: Exposure factors and relative risk estimates

\*Fisher exact test estimates

EXPOSURE FACTORS	EXPOSURE INCIDENCE RATE (AR)%	NON EXPOSURE INCIDENCE RATE (AR)%	DIFFERENCE IN INCIDENCE RATE %
MEAT	80.9	21.7	59.2
AMALA	67.2	14.3	52.9
EWEDU	67.2	14.3	52.9
RICE	100	57.1	42.9
PURE WATER	67.2	22.2	45
CONTACT WITH ILL PERSON	20	65.5	-45.5

Fable 2: Exposure	e factors and	incidence rat	e differences
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Finally, laboratory investigations of cases were not carried due to lack of public health laboratory facilities and early discharge of cases.

However, to prevent future occurrences of food poisoning as suggested by various authors<sup>1,2,5,6,7</sup>, there is a need for public enlightenment and education on the adequate processing and preparation of food substances. In addition, food handlers should be educated on the risks inherent in large scale cooking. This is in addition to education on strict food hygiene, sanitation, cleanliness of kitchens and personal hygiene, including hand washing and fingernail cleaning.

In conclusion, the investigation revealed 60 case-patients and 3 deaths from the food poisoning. Even though we could not carry out toxicological tests, data implicated meat, "amala", or "ewedu" consumed at the ceremony as possible vehicle of transmission. The investigation also provided the opportunity to identify and report major constraints to an effective outbreak investigation in our environment; hence it is necessary for the government at all levels to support the provision of this service.

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