

INVESTIGATION OF FOOD POISONING OUTBREAK IN A TEMPORARY CAMP USING MIXED METHODOLOGY APPROACH

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ABSTRACT

Objectives: In the present study, a food poisoning outbreak was reported from a medical officer in-charge of the temporary camp, where a large gathering of around 400 boys and girls had consumed meal from a common kitchen during training event. Thus, the main objective of the study was to investigate the outbreak and institute preventive measures.

Methods: The camps had a total strength of 400. Ten individuals reported with history of vomiting and diarrhea. Mixed methodology approach was used to carry out epidemiological investigation. Inspection of cookhouse and surroundings was carried out.

Results: Ten individuals were affected. A short incubation period ranging from 4 to 6 h with median incubation of 5 h. Among cases, all had diarrhea with the number of episodes ranging from 3 to 5. Seven patients had vomiting (70%), two (20%) patients had blood in stools, and none reported with abdominal cramps and fever. A total of five food items were suspected for food poisoning. However, none had a significant association with outcome. In depth interview and descriptive analysis revealed that mayonnaise in sandwich was the cause for food poisoning.

Conclusion: Food poisoning outbreak is a common occurrence now days. Hygiene and sanitation of cookhouse to be carried out routinely to prevent outbreak. Individuals in camps should also be educated of 5 Key points of food safety by the WHO.

Keywords: Food poisoning, Outbreak investigation, Temporary camp, Epidemiological investigation, Food safety, Staphylococcal poisoning.

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INTRODUCTION

Food poisoning outbreaks are characterized by consumption of common meal, similar symptoms, and involvement of sizeable proportion of population involved in short duration of time. Food poisoning is caused by bacteria, bacterial toxins, inorganic poisons, plant, and animal poisons. Most of the reported outbreaks are usually bacterial in origin [1,2].

Food poisoning outbreaks commonly occur in closed communities where food is prepared and served centrally for a sizable population such as students' hostels, old age homes, prisons, hospitals, and nursing homes. Investigation of such an outbreak is not just a matter of elucidating the cause, but also of establishing why the causal circumstances arose [3,4].

The integrated disease surveillance project (IDSP) in India is being reported about food poisoning outbreaks all over the country. Out of the total outbreaks reported to the IDSP, approximately 60% are related to food-borne infections [5]. In the present study, a food poisoning outbreak was reported from a medical officer in-charge of the temporary camp, where a large gathering of around 400 boys and girls had consumed meals from a common kitchen during training event.

METHODS

A mixed methodology approach was used for investigation of the outbreak. Initially retrospective-prospective study design was used, followed by qualitative method [6]. A probable case of food poisoning was defined as a previously well individual who suddenly developed any two of the following symptoms after eating dinner on January 19, 2021, that is, diarrhea (three or more loose stools in 24 h or less), fever, abdominal pain, nausea, or vomiting. An epidemiological case sheet was developed for collecting the information on demographic profile of individuals, date and time of onset of symptoms and time of reporting, food items consumed, presenting symptoms, and history of consumption of water or food outside.

A line-listing of all these individuals was also done. Ten cases that occurred on January 19, 2021, were traced and relevant details were obtained. Search was also made for those who had taken dinner in the same kitchen but had not fallen ill. All such individuals were also interviewed and data on the epidemiological case sheet was recorded. For each case four controls were selected using random sampling who had food in the same kitchen. All cases were followed up until recovery. Some respondents who were not available on the day of the investigation or who could not recall accurate food history were excluded from the analysis. Attack rate (AR) and relative risk (RR) with 95% confidence interval (95% CI) were calculated for each food item to establish an association with the illness.

An environmental survey was undertaken to assess the hygiene and sanitation of the cook house. Details of food processing, food preparation and storage of prepared food pending consumption were ascertained by interviewing food handlers. Medical examination of food handlers was carried out and stool specimens were collected for bacteriological examinations. Stool samples were also collected from eight patients and sent for culture. Water samples from three different points of water consumption were collected and analyzed for residual chlorine and bacteriological examination.

Epidemiological study

The standard protocol for investigation of a food poisoning outbreak was followed. The first step, verification of diagnosis of food poisoning, was arrived at by history taking and clinical examination of the cases that reported to the hospital. The symptoms of diarrhea, abdominal cramps and vomiting were common symptoms among the cases after consumption of common food and confirmed the diagnosis of food poisoning. The second step of confirmation of an outbreak of food poisoning was assessing the linkage of the cases by time, place, and person with a history of consumption of common food in a community gathering. The number of cases was clearly in excess of expected frequency for this population as was assessed using data from hospital.

Fig. 1 shows the epidemic curve with a steep up slope and down slope, with a width approximating the average incubation period of the pathogen. This indicates a point source outbreak, classically seen in a food poisoning outbreak [7].

The next step was defining the population at risk. All the people who consumed food from same kitchen were considered as the population at risk. Approximately 400 individuals were dining in the kitchen. A probable case definition was formed and included any person who reported with gastrointestinal symptoms (abdominal cramps, diarrhea, or vomiting) with or without fever, after consuming food from same kitchen. Rapid search for cases was carried out in the camp and detailed history was taken from cases and controls. The index case had onset of symptoms at around 2 AM on January 20, 2021, and reported to the hospital at 7 AM with complaints of diarrhea, abdominal cramps, and vomiting. The last case had onset of symptom at 5 AM and reported at 7 AM on January 20, 2021. The outbreak had a steep rise and fall, classical of acute food poisoning probably due to Staphylococcal food poisoning.

After assessing the incubation period and possible causative organism, it was concluded that all cases had occurred in same group of individuals, none of the individuals in other groups had reported with symptoms of food poisoning. This information led to a suspicion of unlikely of a common source contamination of food poisoning. A detailed history of 24 h activity of each case was extracted. On probing into their food consumption items and timing in relation to short incubation period it was noticed that 22 individuals of the group were out for field exercise from morning 5 AM previous day and returned back to camp at 8 PM. After consuming dinner ten of the individuals had sandwich at 8 PM, which was issued to them in evening snacks. This correlated with the short incubation period and point source of infection. The sandwich was prepared by an outsourced caterer which was prepared during noon and issued in evening snacks. The mayonnaise used in sandwich is well known to cause staphylococcal food poisoning if not preserved and consumed after long time.

RESULTS

Data analysis

A total 400 individuals were stationed in temporary camp. Out of them ten patients reported sick to hospital. All were males belonging to same group. The predominant features among cases were diarrhea (100%) with the number of episodes ranging from 3 to 5. Seven

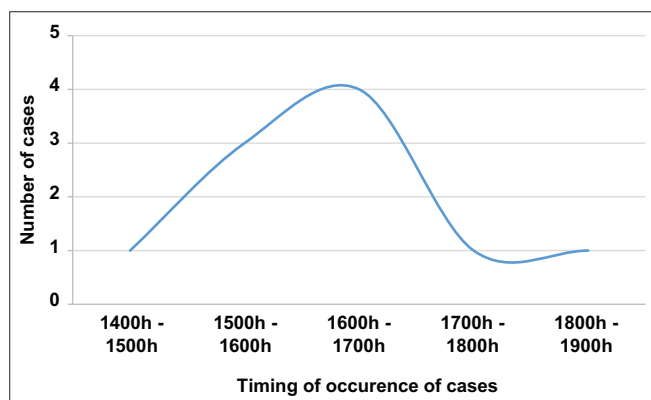


Fig. 1: Epidemic curve showing onset of cases as per time

Table 1: Frequency of symptoms among cases interviewed (n=10)

Signs and symptoms	No. of cases	Percentage
Diarrhea	10	100
Vomiting	07	70
Blood in stools	2	20
Abdominal cramps	00	00
Fever with chills	00	00

patients had vomiting (70%), two (20%) patients had blood in stools, and none reported with abdominal cramps and fever. Table 1 shows the percentage of cases with each symptom.

The time of onset of symptoms in the index case was at 2 AM on day 1, after consumption of sandwich at 8 PM and the last case reported with symptoms at 4 AM. All cases reported to the hospital at 7 AM on day 1. The range of incubation period falls between 4 and 6 h. Median incubation period was 5 h.

The menu for entire day in the kitchen comprised 23 items. Dinner comprised 05 items and evening snacks had 02 items (List of food items is shown in Table 2). The dinner started at 8 PM and continued up to 10 PM. Maximum cases that reported with food poisoning had consumed food during the second half of the dinner. Persons who had consumed snacks in evening early were largely not affected. The ARs were calculated for each food item. RR with 95% CI for each food item is shown in Table 2. The maximum RR of 2.69 with 95% CI of 0.41–9.83 was for mix vegetable and 2.02 was for chicken curry with 95% CI of 0.20–6.47.

Causative organism

Keeping the incubation period and clinical profile in view, the likely organisms *Staphylococcus* and *Bacillus cereus* were considered. Stool samples from patients were sent for culture and reports showed growth of *Escherichia coli* but no growth of *Salmonella*, *Shigella*, and *Vibrio* group of organisms at 48 h and 72 h incubation period. Microscopic examination of stools showed pus cells [5].

Source of infection

Contamination of food items can occur during cooking, storage, or distribution of food by the food handlers or in the vessels used during these processes [8]. The food samples were not available for culture. The medical examination of food handlers and laboratory investigation of stool sample were conducted. There were no positive findings.

Environmental study

The preparation of the sandwich started at 1 PM on day one and dinner at 7.30 PM. Food was prepared and stored in large vessels for consumption by individuals. The maximum temperature on day 1 at the study place was 18°C. The food was cooked in closed space within cookhouse, safe from protection against flies, rats, and other animals. However, sandwich was outsourced and was not able to access the environmental conditions. Cooked food was stored in large vessels and served. The possibility of contamination of food items during the course of cooking or storage was ruled out.

DISCUSSION

In temporary camps food is cooked on mass scale and served in make shift dining area in a common cookhouse. Preparation and storage of food under such makeshift arrangements are often leading to local outbreaks of foodborne infections [6]. In present study a food poisoning outbreak occurred in a temporary camp where 400 individuals were staying. Food was prepared in a common cookhouse. Ten individuals reported at 7 AM with acute gastrointestinal symptoms mimicking food poisoning, all of them belonged to same group. Cases reported of diarrhea and vomiting as common symptoms. Ostyn *et al.* in a study reported that majority of cases had diarrhea and vomiting due to staphylococcal food poisoning which is consistent with present study [9]. An outbreak in Malaysia among school children showed staphylococcal poisoning in rice noodles mixed with meat [10].

The mean incubation period was 5 h in the current study. In an outbreak investigation at Germany, *Staphylococcus* was the causative organism with mean incubation period of 3 h and pancake stuffed with chicken was the food item contaminated [11]. In the present study, the predominant symptoms were diarrhea and vomiting, which indicates toward *Staphylococcus* enterotoxins as one of the likely contaminants. Absence of blood in stools reduces the possibility of *Shigella* and *E. coli* O157. Profuse diarrhea with rice water stools and severe dehydration, pathognomonic of *Vibrio cholerae*, was also absent. Absence of fever as

Table 2: Food-specific attack rates of subjects

Food	Cases				Controls				Odds ratio	Lower 95% C.I.	Upper 95% C.I.	Chi-square	
	Ate	Did not eat	Total	%Ate	Ate	Did not eat	Total	%Ate				Value	p-value
Chapati	9	1	10	90.00	34	6	40	85.00	1.588	0.169	14.932	0.1661	0.68359
Rice	5	5	10	50.00	38	2	40	95.00	0.053	0.008	0.347	13.4551	0.00024
Moong dal	3	7	10	30.00	34	6	40	85.00	0.076	0.015	0.377	12.5780	0.00039
Chicken curry	3	7	10	30.00	7	33	40	17.50	2.020	0.416	9.803	0.7813	0.37676
Tea	9	1	10	90.00	31	9	40	77.50	2.613	0.291	23.470	0.7813	0.37676
Mixed veg dry	9	1	10	90.00	31	9	40	77.50	2.613	0.291	23.470	0.7813	0.37676
Sandwich	8	2	10	80.00	31	9	40	77.50	1.161	0.208	6.473	0.0291	0.86446

predominant symptom ruled out Salmonella. Considering the incubation period of 4–6 h and symptoms, the likely organisms was *Staphylococcus* or *B. cereus* [5,8]. In current study all cases recovered within 24 h with conservative management. Staphylococcal food poisoning is one of the most common causes of foodborne intoxication worldwide. It is typically self-limiting, presenting with violent vomiting following a short incubation period, as clinical symptoms of staphylococcal food poisoning are often self-limiting. Only 10% of patients with staphylococcal food poisoning are estimated to visit a hospital [11].

In current study, the sandwich was the contaminated food item. However, it was brought to light by one to one interview of cases about their food consumption and probable source of contamination. Mayonnaise used in preparation of sandwich is one of the commonest causes of food poisoning. In several studies, Salmonella is the causative organism present in eggs used for preparation of mayonnaise [12]. Current study differs from other studies as usually contamination takes place at source end. In the present study, improper storage and shelf life of food item were the causative factor which gave rise to staphylococcal type of food poisoning.

As the food was prepared early and stored in open for a long time, it is likely to have been contaminated during this time. Keeping food for prolonged periods of 6–8 h at a temperature range between 05°C and 60°C (danger zone) can lead to rapid microbial growth and contamination of food [13].

Recommendations

Prevention of food poisoning during mass gatherings and temporary camps should involve stringent hygiene standards and safe surroundings while preparing food. Food warmers should be used to store the cooked food above 70°C to prevent growth of microorganisms. Consumption of uncooked foods such as salads, fruits, and raw milk should ideally be avoided. In camps, during outdoor activities easily perishable food should not be given, for example, sandwich, boiled/fried eggs, and meat/chicken products. Food samples of all food items prepared should be preserved for 72 h in deep freezers to aid in investigation in case of any food poisoning outbreaks. Outsourcing of food should be discouraged. The World Health Organization's (WHO) Five Keys to Safer Food explains the basic principles that each individual should be aware of and the same to be conveyed to all to prevent food-borne diseases [14].

CONCLUSION

Establishment of temporary camps are more common in the present day for adventure/leisure activities, such camps expose masses to risk of food-borne infections, as the food is prepared under temporary arrangements. The application of WHO Five Keys to Safer Food can prevent such occurrences. The food safety and standards authority in India is a forward looking act aimed at food safety at all levels. It brings the food prepared and consumed by caterers under its purview and comprehensively addresses this issue. The institution has comprehensive documents on "Prevention of Food and Water Borne Diseases and Food Poisoning," which give detailed guidelines on these subjects. However, due to resource constraints, it is commonly observed that food is being outsourced frequently. It is important to educate masses and to bring the matter to notice of concerned authorities at all levels, to prevent outbreak of food and water borne diseases.

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All authors have contributed to the preparation of manuscript.

CONFLICTS OF INTEREST

Nil.

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