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AN OUTBREAK OF ACUTE GASTRO INTESTINAL ILLNESS IN AVARAMPATTI VILLAGE OF DINDUGAL DISTRICT, TAMIL NADU, INDIA, 2021

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Abstract

BACKGROUND : On 29 December 2021, public health officials reported a cluster of 45 cases with loose stools and vomiting after eating food at a feast organised for a funeral at Avarampatti village of Dindugal district, Tamil Nadu, India. Our objective was to identify source of the illness.

METHODS : We did a door-to-door survey to identify additional cases and collected information on demographic, symptom details and date & time of onset of symptoms. Further, we conducted a retrospective cohort study with a cohort comprising of all people who consumed food at the funeral and collected details about type of food consumed and illness. We calculated relative risk with 95% confidence interval for all food items served. We also collected blood samples from 5 patients and stool samples from 15 patients for laboratory analysis.

RESULTS : We identified a total of 94 cases in door-to-door survey. Their mean age was 37 years (SD:17.5) and 55% (n=52) cases were males. The characteristics of epi-curve indicated a point-source outbreak. Median incubation period was 11.5 hours. Spot-map showed sporadic distribution of cases. Attack rate was higher among individuals of 15-30-year age-group (18%). A total of 269 people partook in the feast. 8 food items were ordered from a catering service and one food item spinach (commonly called "Keerai") was cooked locally and served for both lunch and dinner. Attack rate was 35% in males (n=52) and 36% in females (n=42) with (39.5%) were among 15-30 age group of people who consumed food. Of all food items served, incidence of gastrointestinal illness was higher among those who consumed Spinach (RR-3.1,95%CI:2.3-4.3). Other food items did not show association with gastrointestinal illness. Laboratory investigations did not detect presence of Salmonella, Shigella, Vibrio cholera and E. coli.

CONCLUSION : Gastro-intestinal illness might be due to Spinach (Keerai) served during the funeral feast. We recommend appropriate cooking and serving of food items, especially Spinach, to prevent such outbreaks.

KEYWORDS : Acute gastro-intestinal illness, Spinach, Food-borne outbreak

INTRODUCTION

Globally, 6-60 billion cases of gastrointestinal illness occur every year and they result in considerable morbidity, mortality and economic cost.[1,2] Between 2009 and 2018, more than 2600 food-borne disease outbreaks were reported in India with 572 deaths.[3,4] Foodborne acute gastro intestinal illnesses are investigated to prevent both ongoing transmissions of disease and similar outbreaks in the future.[5]

We received a report from public health officials of Dindugal district on 29th of December 2021. It was about a cluster of 45 cases with symptoms of acute gastro intestinal illness that occurred on 28th December 2021 at Avarampatti village of Reddiyarchatiram block, Dindugal district, Tamil Nadu, India. We mobilized a rapid response team on December 30th 2021 to the village to investigate the cluster and implement control measures.

We admitted all 45 people at Dindugal medical college and we enquired about any recent events that occurred in the village. We came to know that, on 27th of December 2021, a funeral gathering that was organized at Avarampatti village of Dindugal. A feast was served between 2pm to 8pm for those who attended funeral. We found that there were 9 food items served namely lentil gravy, spicy gravy, tamarind stew, spinach, cabbage mix, potato mix, pappad, yogurt and pickles. Soon after the funeral feast was over, many people who consumed food at the funeral started having symptoms of loose stools and vomiting.

Our objective of this outbreak investigation was to identify the source of the illness.

METHODOLOGY

We gathered details about previous acute gastrointestinal outbreaks in the Avarampatti health sub-centre area for the past three years in the month of December. We defined the case as "an acute gastrointestinal illness with complaints of

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loose stools or vomiting with onset during 25th to 30th of December 2021 among the residents of Avarampatti village". We searched for cases by active case finding by using door to door search in the village of Avarampatti among all the households. We collected basic demographic details of all the cases, their symptoms history, their time of onset of symptoms and treatment history. Based on those variables we made an epidemic curve to describe the cases based on time of onset of symptoms. We made a spot map by drawing the village map and spotting all the cases in the households. We calculated incidence by age and gender with the number of cases as the numerator and the population of the village as the denominator.

Based on the hypothesis generated from descriptive studies, we conducted a retrospective cohort study to confirm the hypothesis. Our study population had all the residents of Avarampatti village who attended the funeral. We defined the cohort as residents of Avarampatti village of any age who attended the funeral house and consumed food between 2pm to 8pm on 27.12. 2021. People who did not consume food were excluded from the cohort. We defined the exposure as consuming food (lentil gravy, spicy gravy, tamarind stew, spinach, cabbage mix, potato mix, pappad, yogurt and pickles) prepared and served at the funeral house on 27.12.2021 between 2-8pm, while the outcome was exhibiting symptoms of gastrointestinal illness. Of all the food items served at the funeral gathering, we calculated incidence and relative risk with confidence interval of food borne illness for all food items served at the funeral gathering. We collected the data by structured questionnaire by in person interview about the consumption of food items, time of food consumption and occurrence of symptoms. We conducted data analysis in EpiInfo 7.2 by calculating relative risk and 95% confidence interval.

We calculated the incubation period to determine the organism responsible for the symptoms. We calculated by incubation period by the time difference between time of onset of symptoms and time of food consumption at the funeral.

We collected blood and stool samples. Blood samples were taken from 10 cases and stool samples were taken from 5 cases. Samples were taken at Dindugal medical college and the samples were sent to the district public health lab. We tested the samples for Salmonella sp., Shigella, Vibrio and Escherichia coli. We collected the water samples from two overhead tanks in the village. Also, the tap water near the church where the funeral occurred was taken as a sample. The health inspector collected the water samples and they were also sent to the district public health lab.

The study was done with informed consent obtained from the participants and permission obtained from Ethics committee at ICMR-NIE, Chennai and Directorate of Public health and preventive medicine, Chennai, Tamil Nadu. No external funding was acquired for this study.

RESULTS

From the records at health sub-centre indicated very few acute gastrointestinal cases in the previous years in the Avarampatti village area. Additionally, through active case finding we found a total of 94 cases (incidence:8.2%) . Of those 94 case patients, 75 (80%) had vomiting, 90 (96%) had loose stools and 78 (85%) had abdominal pain. Attack rate among 9% (n=52) and females was 7.3% (n=42). Their mean age was 37 (SD:17.5). Majority of cases were among adults of age 15-30 years (incidence:17.9%), 21 cases between 30-45 years of age (incidence:8.3%). All cases were observed within a single incubation period starting from 7PM on 27th December, peaked at 9 AM of 28th December and no cases were reported after 8PM of 28th December all indicating a point source outbreak [Figure 1]. The cases were scattered throughout the village with sporadic distribution [Figure 2]. Range of the incubation period ranged from 4 to 24 hours (mean= 11.5 hours) [Figure 3]. The laboratory investigations showed no growth of organisms in the cultures. Cultures done in blood and stool sample were negative for Salmonella sp, Shigella, Vibrio and Escherichia coli. The water samples were free of E. coli, Shigella, Salmonella and Vibrio. The chlorination was found adequate in the water samples.

Of the 315 people attended the funeral. 16 people were untraceable, 16 people had incomplete entries in the food consumption profile, 14 people had incomplete symptoms profile.

269 people were taken up for study of which 150 were male. The people who consumed food had varied exposure to different food items. The incidence of acute gastro-intestinal cases in people that consumed food was 35% in male(n=52) and 36% in female (n=42) . Majority of the cases (39.5%) were among 15-30 age group people who consumed food. (Table-1)

Of the 175 people who were not sick after food consumption, majority were male (n=98) and their mean age was 38 (SD: 18.0) .55 people belonged to 15-30 age group, 49 people among 31-45 age group and 33 people among 46-60 age group.

Univariate analysis showed that occurrence of acute gastrointestinal illness was observed in people who consumed

Spinach (Keerai) at the feast [relative risk - 3.1 (confidence interval:2.34-4.36)]. All other food items had no association with acute gastrointestinal illness.(Table-2)

Further investigations revealed that Spinach was cooked and served locally at the church while all other 8 items were cooked by a catering service from outside the village.

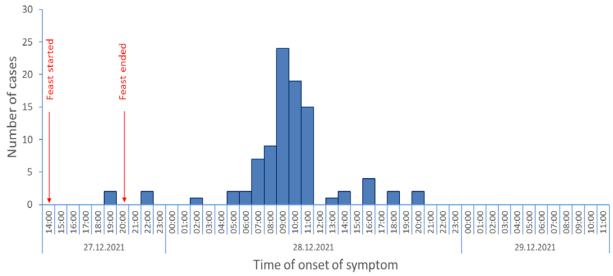

Figure 1: Epicurve showing distribution of cases by time of onset of symptoms among residents of Avarampatti village, Dindugal, Tamil Nadu, 2021

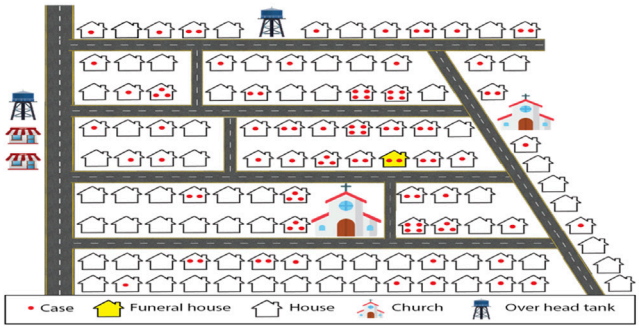

Figure 2. Distribution of cases by households among residents of Avarampatti village, Dindugal, Tamil Nadu, 2021

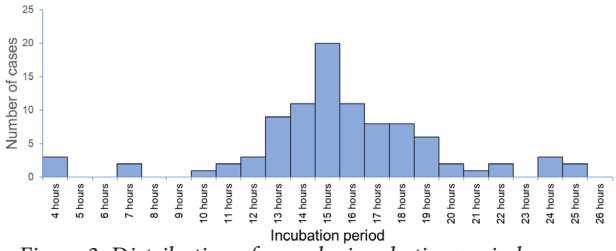

Figure 3: Distribution of cases by incubation period among residents of Avarampatti village, Dindugal, Tamil Nadu, 2021

Table 1: Attack rate by age and gender among residents of Avarampatti village who consumed food at funeral, Dindugal, Tamil Nadu, 2021

Variables		Cases (n=94)	No of people in the Cohort (n=269)	Attack rate (%)
Age Group	0-15	9	26	9.2
	15-30	36	91	39.5
	30-45	21	70	30.0
	45-60	17	50	34.0
	>60	11	32	34.3
Gender	Male	52	150	34.6
	Female	42	117	35.8
Overall		94	269	34.9

Table 2: Attack rate and relative risk of food borne disease based on consumed food items, Retrospective cohort study, Avarampatti village, Dindugal, Tamil Nadu, 2021

Food Items	No of persons those who ate specified food				No of persons those who did not eat specified food				Relative risk	95% Confidence Interval	
	Sick	Not Sick	Total	Attack rate	Sick	Not Sick	Total	Attack rate			
Lentil gravy	86	163	249	35%	8	12	20	40%	0.8	0.44	1.58
Spicy gravy	29	62	91	32%	65	113	178	37%	0.8	0.62	1.27
Tamarind stew	73	148	221	33%	21	27	48	43%	0.7	0.54	1.03
Curd	15	39	54	28%	79	136	215	37%	0.7	0.46	1.23
Potato mix	76	142	218	35%	18	33	51	35%	0.9	0.75	1.56
Cabbage mix	74	130	204	36%	20	45	65	31%	1.1	0.87	1.89
Pickle	6	33	39	15%	88	142	230	38%	0.4	0.23	0.96
Spinach	**56**	**31**	**87**	**64%**	**38**	**144**	**182**	**21%**	**3.1**	**2.36**	**4.34**
Pappad	37	83	120	31%	57	92	149	38%	0.8	0.62	1.13

DISCUSSION

Plant based toxins and some of the components of plants are found to be toxic to human body on regular consumption. An outbreak study in Purulia, India shows that the outbreak of epidemic dropsy could be due to consumption parboiled rice.[7] Similarly, several plants and their components like castor, hemlock, oleander are reported to cause acute gastrointestinal illness.[8] Even regular food items like asparagus, legumes, greens and meat products when not properly cooked or taken in excess could lead to gastrointestinal illness.[9] There are components of plant-based food items like gluten, cellulose and alkaloids that could not be processed by human body resulting in acute gastrointestinal illness.[9]

Spinach was served since it had a bitter taste as a gesture of mourning. During a funeral, it was given as a local religious practice.

Also, Spinach cannot be served for more than 8 hours after cooking, since it has a tendency of getting spoilt in a short span. But the method and time of cooking of the spinach that was served at the funeral feast could not be ascertained.

We were able to epidemiologically link the food served 'Spinach' at the funeral house as the source of the outbreak. This was the first instance in which Spinach was found to be a probable source of the outbreak in the entire locality.

LIMITATION

We could not collect the food samples because they were discarded before the start of the investigation. Also, the collected blood and stool samples did not show the growth of any organism. The samples were not tested for Bacillus sp., Clostridium sp. or other specific toxins. This lack of

laboratory confirmation served as a limitation.

There was a possibility of information bias among the participants. We narrowed it down by a closed-ended questionnaire. There were incomplete symptoms profile and incomplete profile of food consumption, both of which could lead to the underestimation of the relative risk.

CONCLUSION

Initial outbreak investigations revealed that incubation period was most likely to be 12 hours. Hence possible organism could be associated with gastrointestinal cases were E.coli, Salmonella, Shigella, Vibrio, Bacillus , clostridium and other toxins.[6]

Distribution of cases revealed point source outbreak with sporadic distribution. Majority of cases were adults and males in 15-30 age groups. All cases had history of consuming food at the feast. These descriptive findings supported the hypothesis that the outbreak could be due to consumption of food or water served during the funeral feast.

Since the water samples tested were negative for organisms and the environmental examination showed that the water source was free of pathogens, we excluded the water from the hypothesis.

From the retrospective cohort study, the results indicated that the acute gastrointestinal illness could be due to consumption of spinach.

RECOMMENDATIONS

We recommended proper cooking of food items especially spinach and serving them in closed containers before serving them to prevent such outbreaks in the future. We also recommended that food samples be collected on time by relevant authorities in case of suspicion of an outbreak, so that the microbiological agent responsible for the outbreak could be established.

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CONFLICT OF INTEREST: Nil

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