

Original Article

Acute Gastroenteritis Outbreak at a Wedding, Pali District, Rajasthan, India, April 2018

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ABSTRACT

Introduction: Acute gastroenteritis (AGE) outbreaks are frequently reported in India. Nadol health centre, Pali, Rajasthan reported AGE outbreak when >100 wedding guests complained of diarrhea and vomiting on April 20, 2018. We investigated to identify food vehicles and contamination mechanisms.

Methodology: A suspected case was defined as vomiting or ≥ 3 loose stools within 24 hours among those who ate wedding dinner on April 20, 2018. A 1:1 unmatched case-control study was performed and a control was defined as a family member of case without vomiting and loose stools after eating April 20, 2018 wedding dinner. We asked about items consumed at wedding dinner. The food caterer was interviewed and food preparation was assessed against government guidelines. Logistic regression was performed and crude and adjusted odds ratios (aOR) with 95% confidence intervals (CI) were calculated.

Results: We identified 49 cases; median age was 40 years, 45% female, 82% hospitalized, and no deaths. Symptoms were vomiting (98%), loose stools (82%), abdominal pain (94%), and nausea (88%). Eating dinner to illness onset median time was 4 hours (range: 3-6) hours. Of 10 food items eaten by 39 cases and 39 controls, those who ate Rasmalai (milk-based dessert) were 62 times (aOR=62.48, 95% CI=8.51, ∞) more likely to suffer from AGE after adjusting for rice. Rasmalai was not stored at $<5^{\circ}$ Celsius until consumption and was exposed to contaminants.

Conclusions: The point-source AGE outbreak was associated with consumption of Rasmalai. Clinical presentation and incubation period suggest *Staphylococcal aureus* toxin as the most likely etiology. We recommend

safe preparation and storage of milk products.

Keywords: Acute gastroenteritis, outbreak, rasmalai.

INTRODUCTION

Acute gastroenteritis (AGE) is a leading cause of morbidity and mortality. In 2010, there were an estimated 600 million food borne-related illnesses and 420,000 deaths worldwide.^{1,2} AGE outbreaks are frequent in India and of all outbreaks reported to the Integrated Disease Surveillance Programme (IDSP), about 40% are diarrheal or AGE diseases, yet few identify vehicles, cause of contamination, or etiology. On April 20, 2018, >100 wedding guests received treatment for vomiting and diarrhea at the Nadol Community Health Centre (CHC), Pali district, Rajasthan. Nadol CHC notified AGE outbreak to IDSP. We investigated to identify food vehicles, mechanisms of contamination, and etiology.

METHODS

A suspected case was defined as a person with vomiting or ≥ 3 loose stools within 24 hours among those who ate the wedding dinner on April 20, 2018 and received treatment at Nadol CHC, Pali during April 20-21, 2018. Cases were searched from the out-patient and in-patient registers of Nadol CHC. To identify food vehicles, a 1:1 unmatched case-control study was performed. All cases who could be contacted and who consented to participate were registered. A control was defined as a person without a history of vomiting and loose stools during April 20-21, 2018 after eating the wedding dinner. Controls were selected from the family of cases; if more than one family member of the case was eligible to be a control then the one whose birthday was closest to the date of interview was

selected. Cases and controls were interviewed. During the interview, data related to food and beverages consumed at the wedding dinner on April 20, 2018 were collected. To identify the mechanism of contamination, the food caterer was interviewed regarding food preparation processes, time taken for preparing food items, temperature for storage, and illness among food handlers. We assessed reported food preparation methods against the Food Safety and Standards Authority of India (FSSAI) guidelines.

We calculated proportions, median, and range. Chi-square test with one-sided Fisher's exact test was used. Statistical significance was tested at $p < 0.05$. We performed exact logistic regression due to small sample size and calculated crude odds ratio (OR) with 95% confidence intervals (CI) for variables that had one-sided Fisher's exact test p -value < 0.05 . Adjusted odds ratio (aOR) with 95% CI for variables that had one-sided Fisher's exact test p -value < 0.05 using Stata 14 was calculated. This investigation was in response to a public health emergency hence exempted from ethical clearance.

RESULTS

We identified and interviewed 49 cases, the median age was 40 years (range: 7-70 years), 22 (45%) were female, 40 (82%) were hospitalized, and there were no deaths. Fourteen families had more than one case. Symptoms included three or more loose stools within 24 hours (82%), vomiting (98%), abdominal pain (94%), and nausea (88%) (Table 1).

No one reported fever or blood in stool. Cases started coming to Nadol CHC at 2300 hrs; one-third cases (17, 34%) came at 0100 hrs. The median time from eating dinner to illness onset was 4 hours (range: 3-6 hours) (Figure 1). All persons recovered within 24 hours after treatment with intravenous fluids and anti-emetics.

Of 49 cases, 39 (79%) consented to participate in the case-control study. All these 39 cases reported being hospitalized at Nadol CHC after eating dinner at the wedding on April 20, 2018. Thus 39 controls were enrolled for the case-control study. At the wedding buffet, following 10 items were served: water-based snack (Pani puri), potato snack (Aloo tikki), flat bread, rice, lentils curry, fresh cheese curry, okra, milk and cheese dessert (Rasmalai), mango juice, and ice cream. Multivariable

analysis showed that those who ate milk and cheese dessert (Rasmalai) were 62 times more likely (aOR=62.48, 95% CI=8.51, ∞) to suffer from acute gastroenteritis after adjusting for having eaten rice (Table 2).

Interviews with the food caterer revealed that the 200 kg of milk and cheese dessert (Rasmalai) was prepared about 34 hours before consumption. First, cheese was prepared and then rolled into small balls which were soaked and stored in sugar syrup for 15 hours at room temperature. Alongside, milk was boiled, stored at room temperature, and refrigerated for 7 hours. Cheese balls were added to the refrigerated cold milk. Half the quantity (100 kg) of this milk and cheese dessert (Rasmalai) was first stored at below 5° celsius for 6 hours (in deep freezer) and later with the remaining 100 kg was stored at 8-10° Celsius (using ice bricks) until consumption. On the wedding eve, April 20, 2018, the milk and cheese dessert was served at 7 pm and ice cubes were added to keep it cold. The food caterer did not report any illness in the food handlers; all food items were prepared with bare hands in a make-shift kitchen. Due to high cost of refrigeration, the milk and cheese dessert (Rasmalai) was not stored at desired temperature.

DISCUSSION

This was a point-source acute gastroenteritis outbreak associated with consumption of milk and cheese dessert (Rasmalai) at a wedding. Clinical presentation and incubation period suggest *Staphylococcal aureus* toxin as the most likely etiology. Additionally, the environmental investigation suggest that the dessert was possibly exposed to contamination during preparation with bare hands in the make-shift kitchen and during storage. Food caterer could not store the dessert at required temperature and for the required time due to high cost of refrigeration. Milk products are known to serve as a reservoir for many bacterial pathogens.³ Samples of milk and cheese dessert (Rasmalai) have tested positive for *Bacillus cereus* in other investigations in India.³ In an acute gastroenteritis outbreak at an air force base station in Greece, *Staphylococcus aureus* was detected in beef and grated cheese.⁴ At a christening party in Germany, *Staphylococcal* enterotoxins in ice cream caused a large food poisoning outbreak.⁵ In six food poisoning outbreaks in France, *Staphylococcal* enterotoxin type E was found in soft cheese made from

Table 1: Description of acute gastroenteritis cases, Nadol Community Health Centre, Pali district, Rajasthan, India, April 20-21, 2018 (N=49)

	n	(%)
Median age in years (range)	40 (7-70)	
Female	22	(45)
Hospitalized	40	(82)
Died	0	(0)
Median time from eating dinner to illness onset (range)	4 (3-6) hours	
Symptoms		
Three or more loose stools in 24 hours	40	(82)
Vomiting	48	(98)
Abdominal pain	46	(94)
Nausea	43	(88)
Fever	0	(0)
Blood in stool	0	(0)

unpasteurised milk.⁶ In a *Staphylococcal* food poisoning outbreak at a Swiss boarding school, *Staphylococcal* enterotoxin D was found in soft cheese produced from raw milk.⁷ *Staphylococcus aureus* found in meat, pastries, cheese, pasta, and potato salad was an important food poisoning etiologic agent in southern Brazil during 2000-2002.⁸ Our findings are consistent with acute gastroenteritis outbreaks in other countries that have established milk products such as cheese as a food vehicle.^{4,6-8}

Due to limited resources at Nadol CHC, our investigation remains short of laboratory confirmation. A large number of patients rushed to the short-staffed Nadol CHC late at night and the health staff present at that time were overburdened and could not prioritize stool sample collection. Due to limited laboratory infrastructure and recovery of patients in a short time span, *Staphylococcal aureus* outbreaks often lack in-depth investigation and laboratory confirmation.^{9,10} However, the prompt and effective response of Nadol CHC during the outbreak successfully averted mortality, particularly among children and the elderly. In this investigation, we had to restrict our case search to the health records of only one health facility because searching for cases among approximately 3000 wedding guests who came from 25 different villages and cities would have been resource prohibitive. However, since the cases described here are those who were hospitalized, we have likely minimized a chance association between food items and illness. Misclassification of a non-case as a case would have diluted the

association and biased the association towards the null.

We recommend detailed epidemiological investigation of gastroenteritis outbreaks to better understand the agent-host-environment triad. Laboratory support and environmental investigations are critical for prevention and control of such outbreaks.¹¹ We recommend round-the-clock availability of personnel and supplies to collect human samples at a health facility. Adherence to FSSAI's food safety guidelines which has been emphasized by other researchers in the country is key to prevention of foodborne illnesses.^{3,9} The district food safety officer and medical officer can organize education and awareness sessions for the food caterers and inform them about safe preparation and storage of milk-based food products. If an outbreak occurs, food handlers should be immediately interviewed for signs and symptoms of diarrhoeal or acute gastrointestinal disease.

Our investigation underscores the potential of in-depth epidemiological investigations in resource-poor settings to determine food vehicles and to identify possible etiologic agents.

CONCLUSION

Acute gastroenteritis outbreaks demand rapid investigation by multi-disciplinary teams to effectively detect and remove implicated food items and to prevent future outbreaks. Investments in research and investigation infrastructure need to be channelized towards prevention of foodborne illnesses in India.⁹

Table 2: Food items consumed by wedding guests, acute gastroenteritis outbreak, Nadol Community Health Centre, Pali district, Rajasthan, India, April 20-21, 2018 (N=78)

	Case n (%)	Control n (%)	p-value	OR	(95% CI)	aOR	(95% CI)
Median age in years (range)	40 (7-70)	29 (5-70)	0.07				
Female	20 (51)	17 (43)	0.32				
Food items							
Water-based snack	36 (92)	29 (74)	0.03	4.06	(0.93,25.11)		
Potatoes snack	36 (92)	29 (74)	0.03	4.06	(0.93,25.11)		
Flat bread	36 (92)	33 (84)	0.24				
Rice	35 (89)	26 (66)	0.01	4.29	(1.15,20.19)	1.00	(0, ∞)
Lentils curry	35 (89)	28 (7)	0.04	3.43	(0.98, 11.96)		
Fresh cheese curry	36 (92)	32 (82)	0.15				
Okra	35 (89)	29 (74)	0.06				
Milk and cheese dessert	39 (100)	18 (46)	<0.01	59.72	(9.53, ∞)	62.48	(8.51, ∞)
Mango juice	33 (84)	30 (76)	0.28				
Ice cream	35 (89)	35 (89)	0.64				

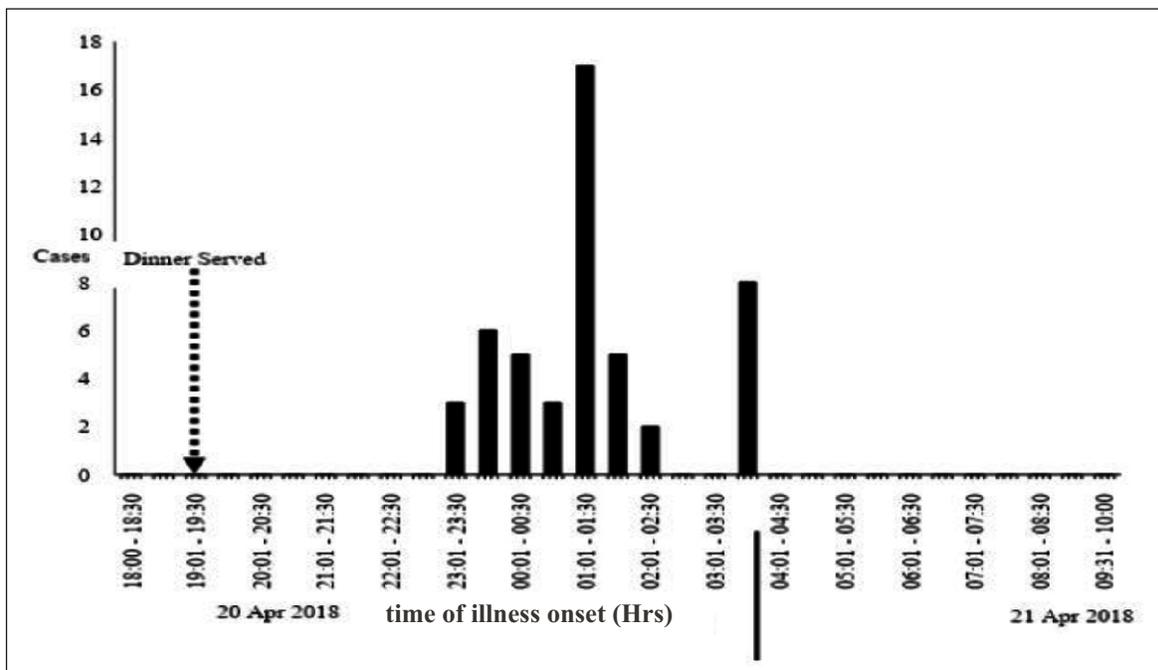


Figure 1: Acute gastroenteritis cases by time of illness onset, Nadol Community Health Centre, Pali district, Rajasthan, India, 20-21 April 2018 (N=49)

According to FSSAI guidelines, food items prepared from milk should be stored at below 5° Celsius until consumption.

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Conflict of interest: None.

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