

Original Research Article

Investigation of an outbreak of suspected food poisoning in a school

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ABSTRACT

Background: An outbreak investigation for food poisoning in a school of rural Maharashtra was carried out. This school had central kitchen for children staying at hostel. During monsoon season occurrence of acute gastroenteritis diseases is common and hence it important to investigate each and every suspected outbreak presenting with similar symptoms to that of acute gastroenteritis.

Methods: It was a retrospective and prospective study design. All 140 children who ate food from central kitchen were interviewed and followed up. Median incubation period was obtained from the 12 children who fitted into case definition which was given by integrated diseases control program of Maharashtra. Environmental and food sampling along with laboratory investigations was done for diagnosis.

Results: Total 12 children had symptoms of food poisoning. The median incubation period was around 8 hours. Gastrointestinal symptoms were the commonest reported by all the 12 children. It was found out that all the symptomatic children had eaten laddu brought from outside and stored in unhygienic conditions.

Conclusions: Eating of laddu which were stored in unhygienic conditions had resulted into growth of *Clostridia streptofaecalis* in it causing food poisoning to children.

Keywords: Food poisoning, School children, Central kitchen, *Clostridia streptofaecalis* outbreak

INTRODUCTION

Outbreak is defined as the unexpected increase in the disease frequency above normal in a localized area in short duration. Outbreak of food poisoning is one of the common outbreaks among the others such as cholera.¹ Outbreaks of food poisoning commonly occur in closed communities where the food is prepared and served centrally for a limited population like student hostels, old age homes, prisons, hospitals and nursing homes.² Hence investigation of such outbreak is important to establish causality and factors determining it.

This case study investigated an outbreak of food poisoning which was reported from a school in rural Maharashtra. On 3rd August 2018, 12 cases reported to

primary health centre of Khadavli village with complaints of loose motions, vomiting and abdominal pain. All cases were treated at the PHC and no referral made. Pharmacist of the school reported the cases to the higher authorities of the school and to the medical officer incharge of the primary health centre (PHC) Khadavli.

This school with its hostel is situated near the PHC Khadavli, Thane district, Maharashtra. The nearest first referral unit (FRU) is civil hospital Ulhasnagar as well as subdistrict hospital (SDH) Shahapura and the nearest tertiary referral centre is Rajiv Gandhi Hospital Kalva, Thane. This PHC supervises the work of 6 subcentres This school provides education from 5th standard to 12th standard is located at distance of 1 km from the PHC.³

METHODS

A retrospective-prospective study design was used for the investigation of this outbreak occurred on 3rd August 2018 in a school in Khadavli, Maharashtra. A team was formed under medical officer (MO) In charge consisting of 1 resident medical officer (RMO) from community medicine, 1 multi-purpose worker (MPW), 1 auxiliary nurse midwife (ANM), 1 pharmacist, 1 teacher, 1 sanitation inspector from gram-panchayat Khadavli. Previous 7 days health records were checked at PHC as well as at military school. Guidelines given by Ministry of health and family welfare and Integrated Disease Surveillance Project (IDSP) were used to form the case definitions and to define the outbreak.

As per the guidelines for infectious diseases epidemic control, an outbreak will be considered in the PHC Khadavli if more than 5 cases of diarrhoea with moderate to severe dehydration in age group under the 14 or a death due to diarrhoea.

Case definitions were formed which are as follows: (1) a probable case of food poisoning was defined as a previously well individual who suddenly developed any 2 of the following symptoms after eating dinner on 2nd August 2018: diarrhoea (3 or more loose stools in 24 hours or less) abdominal pain, nausea, vomiting or fever, and (2) a confirmed case of food poisoning was defined as a previously well individual who suddenly developed any 2 of the following symptoms after eating dinner on 2nd August 2018: diarrhoea (3 or more loose stools in 24 hours or less) abdominal pain, nausea, vomiting or fever with laboratory confirmed results for the pathogenic isolates either microscopy and staining method or by culture microscopy.²

A WHO modified epidemiological case sheet as a study tool was used to collect information on demographic details of individuals, date and time of onset and time of reporting, progression, food items eaten, presenting symptoms and history of outside food consumption. A line listing of all these individuals was also done.³ All cases were interviewed on 3rd August 2018 and relevant details were obtained. Other students who had eaten from the mess but did not fall ill were also interviewed after informed consent. All cases were followed up till recovery.

An environmental survey was undertaken to assess hygiene and sanitation of cook house, dining hall, hostel and nearby area of the mess. Flies and mosquito breeding site surveillance was also undertaken. Details of food processing, food preparation and storage of prepared food pending consumption were ascertained by interviewing the food handlers. Medical examination of food handlers was carried out and stool specimens were collected and sent for bacteriological examination.

Stool samples were also collected from the 12 patients and sent for the culture. Samples of food items of dinner which was preserved in the mess was also sent for the culture. Water samples from 3 different point of water consumption that is from the 2 hostel sections from where cases reported and 1 from the mess dining room were analysed for the residual chlorine and were sent for bacteriological examination.

All the data was entered in excel and analyzed using SPSS analytical tool version 21. Relative risk and attack rate was calculated and graphs and bar charts were used to display the data.

RESULTS

All the cases belonged to age group of 12 to 13 years and we're studying in 5th standard. All were boys. They have joined the school in July 2018. Total 140 persons reported having dinner in the mess on 2nd august 2018, 12 met the definition of food poisoning. The index case had onset of symptoms within 6 hours and reported sick in the early hours of 3rd august 2018. This was followed by the others and by midday 12 cases were reported. The first case was at 04.00 IST and the last case was at 13.00 IST on 3rd august 2018. This suggests the maximum incubation period was 16 hours. The sharp rise and fall of the epidemic curve as shown in Figure 1 confirms that the outbreak was point source outbreak. Figure 2 shows distribution of patients as per the symptoms reported. In all the 12 cases, diarrhoea was the commonest symptom and was present in all cases. Nausea and vomiting were present in 10 cases. Abdominal pain was present in 5 cases. Body ache was present in 2 cases and 1 case had fever. There was no history of fever with chills and rigors or rash. No history of hematemesis or haematochezia. The food items served during dinner on 2nd august 2018 and food specific attributable risk (AR) and relative risk (RR) are shown in Table 1. The maximum attributable risk was noted for laddus followed by the Dal. Relative risk was maximum for the laddus.

Table 1 shows the food item eaten by the students (n=140). P value is highly significant for the laddus and it also shows attributable risk 1.0, hence it is unlikely to be chance. Dietary history by 24 hour recall method showed that 12 students had eaten laddus brought by the parent of 1 child during the last parent teacher association meeting on 28 July 2018. These laddus were made of besan, ghee, mawa (condensed milk) and sugar. Samples of laddus for lab investigation could not be sent because of unavailability.

Environment survey showed the presence of mosquitoes and flies nuisance. Dry ration was stored in the gunny bags which at time of survey were closed. Vegetables are brought on biweekly basis from the nearest local market of the village. They are kept open, permitting the contamination by flies. Left-over food was found in the vicinity of the cook house. It was open and the pit was

infested with flies. Investigation into food processing revealed that the raw materials were procured from the authorised agencies. Food is cooked in the mess and served to students by 19.30 IST in the evening. Till 22.00 IST. No leftover food from previous meal was used during preparation of the dinner.

All stool culture reports showed growth of *E. coli*. Samples of dal showed growth of *Klebsiella* species., milk showed growth of *Serratia* species. Other food items did not show any growth. There was no evidence of *Clostridium* species, *Salmonella*, *Shigella* or staphylococcus or tetanus. All three water samples were also did not show micro-organismic evidence.

Table 1 shows the food item eaten by the students of two sections from where cases had been reported (n=140). It was observed that laddu had highest p statistically significant value between two groups. Relative risk was highest for laddu, followed by Butterpav.

Figure 1 shows epidemic curve. It is showing a sudden rise in the number of cases in the short span of time. Peak of cases was seen around 8.00 pm to 10.00 pm and then there is sharp fall in the number of cases.

Figure 2 shows distribution of cases as per the symptoms reported by them. Data is not mutually exclusive. All the 12 cases had diarrhea. Out of 12 cases 10 reported nausea or vomiting. Only 1 case out of 12 reported fever.

Table 1: Comparison of attack rate for various food items.

Food items	Ate food item				Did not eat food item				AR	RR (95% CI)	P value
	Tot -al	Ill	Not ill	Attack rate	Tot- al	Ill	Not ill	Attack rate			
Rice	129	12	117	9.302	11	1	10	9.090	0.002	1.0233 (0.146 to 7.155)	0.3211
Chapati	140	12	128	8.571	0	0	0	0	NA	0.1773 (0.023 to 1.350)	0.0949
Dal	120	12	108	10.000	20	0	20	0	0.1	4.3388 (0.266 to 70.536)	0.3023
Potato-pumpkin	140	12	128	8.571	0	0	0	0	NA	0.1773 (0.023 to 1.3503)	0.0949
Tea	50	2	48	4.000	90	1	89	1.111	0.028	3.6 (0.334 to 38.722)	0.2906
Milk	100	5	95	5.000	40	1	39	2.500	0.025	2.0 (0.241 to 16.587)	0.5208
Butter pav	70	5	65	7.142	70	0	70	0	0.071	11.0 (0.619 to 195.245)	0.1023
Laddu	12	12	0	100%	128	0	128	0	1.00	248.07 (15.566 to 3953.4)	0.0001

AR=Attributable Risk; RR=Relative risk.

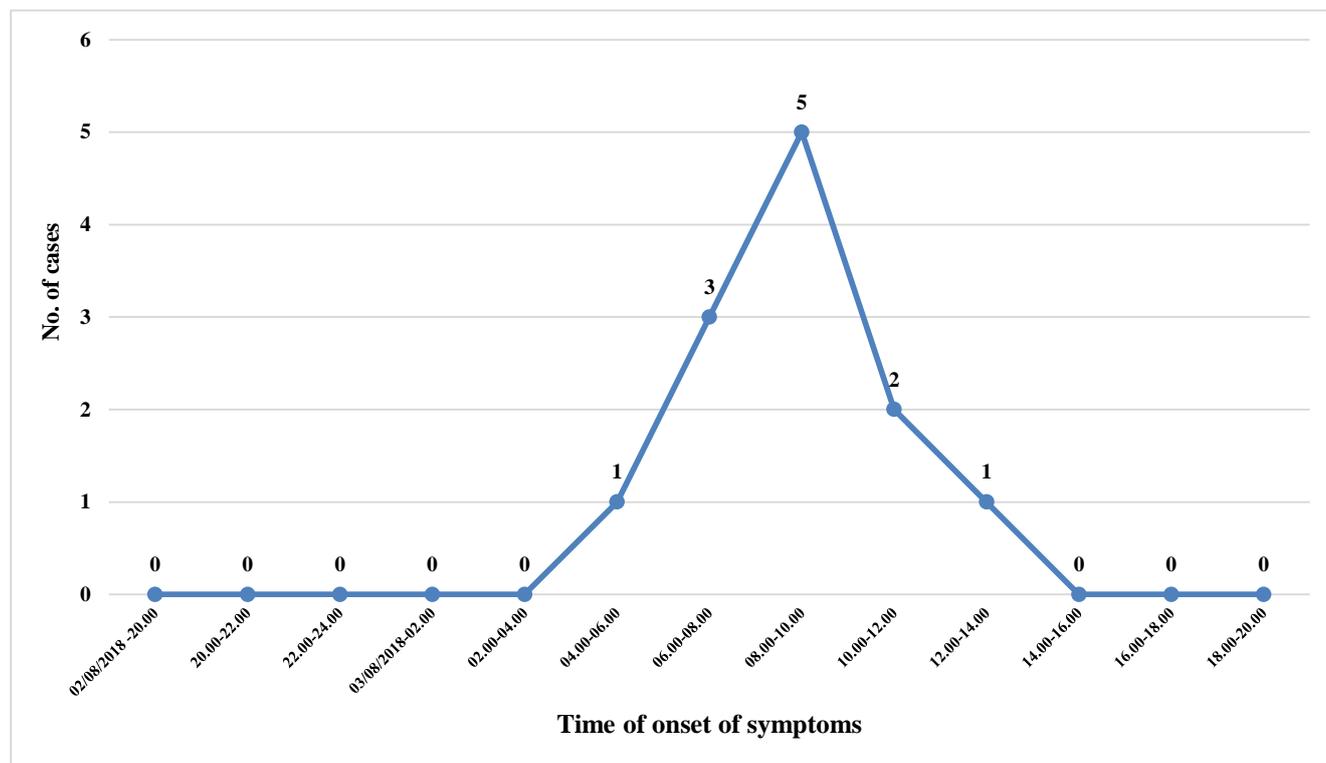


Figure 1: Epidemic curve.

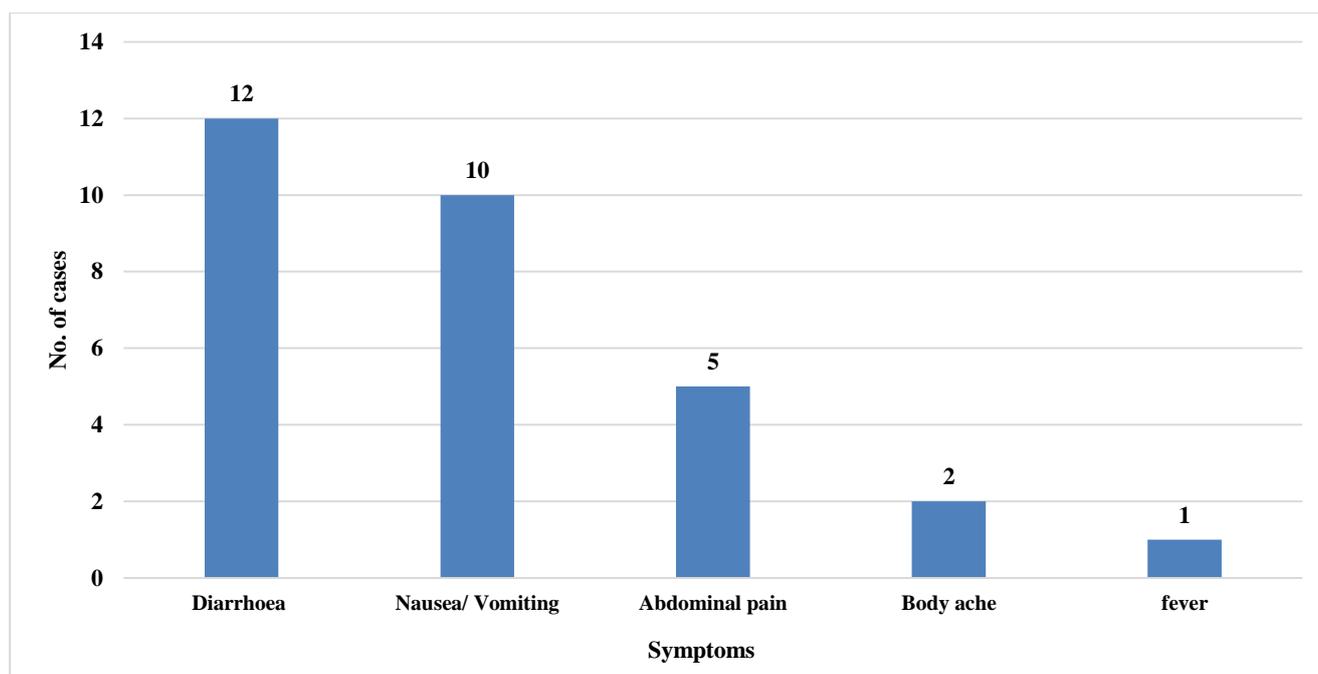


Figure 2: Distribution of cases as per their symptoms.

DISCUSSION

Interviews of the students and cases were conducted. One of the students told about eating of laddus brought by the parent of his friend. When that friend was interviewed regarding the laddus, he admitted eating and sharing them with friends. Teachers were interviewed. Most of teachers said that children from school do not eat from outside. Care taker of the school said on interview that ‘most children never left premises, however few who managed to bypass the security eat from the street vada pav vendor secretly, but for 3 days that vendor has not come so it was unlikely to eat from outside.’ When head master was interviewed he said laddus might be brought by the parents in the parent teacher meeting held 4 days back.

In the present outbreak of food poisoning, laddus brought 4 days back and eaten on 1st august 2018 was responsible. Clinic-epidemiological picture gives a clue to its aetiology. In the present study all the case occurred within 6 to 18 hours. With median incubation period of 8 hours. Such incubation period is seen in cases of food poisoning due to salmonella, *Clostridia* species, *B. cereus*. Diarrheal form of *B. cereus* has minimum incubation period of 12 hours and do not have fever. Food poisoning due to *Clostridia* species occurs following the consumption of food which was prepared 24 hours or more before consumption and presents with diarrhoea but no fever. Food poisoning due to *Salmonella* species presents with diarrhoea and fever. Hence in this case it is unlikely to be salmonella. With all this clinical and epidemiological picture possible cause of food poisoning appears to be *Clostridia streptofaecalis* species.³⁻⁵ Laddus were made available to child 4 days back but history of proper and safe cooking cannot be elicited.

Food poisoning due to *C. streptofaecalis* species are sporadic. It usually occurs due to the uncooked food or non-pasteurized milk. Main route of transmission is ingestion of spores or organisms in food. Food can also be contaminated by the food handlers. Poor hygiene and faecal contact are also responsible for transmission.

A study done by Bawa et al in a village of Maharashtra found that products consumed from outside vendors were the source of contamination and resulted in outbreak of acute gastroenteritis.⁶

A study done by Grewal et al in working men's hostel found that the self-limiting acute gastroenteritis with median incubation period of 8 hrs suspected *Clostridium perfringes* or *B. cereus* food poisoning. The culprit was faulty food storage conditions. This finding is similar to our study.⁹

Milk and milk products are germinating medium for *Clostridia* and *B. cereus* species. Food stored in faulty conditions leads to toxin productions by these organisms and hence food poisoning. This finding is similar to study done by Chopra et al.¹⁰

CONCLUSION

Source of infection can be a good which was not stored and prepared hygienically. Children being at the most risk of food poisoning it is very important to have stringent policies regarding eating of outside foods especially in hostels. Children need to be educated about food safety and various methods to judge the quality. This study emphasizes the role of WHO 5 steps of food safety that to be taught at school level.

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