

## Original Research Article

# Investigation of the food poisoning outbreak in girls hostel of medical college in Punjab

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## ABSTRACT

**Background:** Food safety is intricately woven with food security and nutrition. The “in-living personnel” constitute a high-risk group for food poisoning because of community kitchen practices. Quick response and action are vital to limit the morbidity and spread of the disease.

**Methods:** A retrospective cohort study was conducted to investigate the food poisoning outbreak in private medical college. After the initial information of the sudden cases of vomiting and diarrhoea from girls’ hostel, epidemiological case sheet was developed for collecting the information from students. A line listing of all the probable cases was done. Common food items were identified. An environmental data recording was done. Attack rate, attributable risk and relative risk with 95% confidence interval were calculated for each food item to establish an association with the illness.

**Results:** Out of the 97 students, who consumed the dinner, 8 girls presented with severe symptoms of the gastrointestinal upset along with other bodily symptoms, 60 students showed mild symptoms and 29 students did not show any of the symptoms of the disease. After analysis, palak paneer was found to be the food responsible for outbreak with most probable cause of contamination with *Staph aureus*.

**Conclusions:** It has been found out in this investigation that whenever the sanitation conditions of the cooking area were compromised and negligence was played at the part of food handlers - it has always increased the probability of such outbreaks and sufferings of the people.

**Keywords:** Food poisoning outbreak, Palak paneer, *Staph aureus*

## INTRODUCTION

Safe food and water is a public health requirement. Safety refers to protection from all hazards that make food injurious to health. Food safety is intricately woven with food security and nutrition. While chronic food insecurity is associated with poverty and arises due to continuous inadequate diet, transient food insecurity is related to the availability of food that is safe for human consumption.<sup>1</sup> The term “Food poisoning” is usually used when a large number of persons are affected with similar gastrointestinal symptoms and signs, at the same time with a history of intake of a common meal.<sup>2</sup> Depending on the

cause of food poisoning, the duration of the majority of food poisoning usually ranges from a few hours after exposure to contaminated food or fluid to several days.<sup>3</sup>

The “in-living personnel” (personnel staying in the single accommodation without families, like student’s hostels, old age homes, prisons, hospitals and nursing homes) constitute a high-risk group for food poisoning because of community kitchen practices. In such settings, every meal is a common meal and hence detection of the item which caused the incidence of food poisoning may not be as simple as commonsense conclusion.<sup>2,4</sup> Quick response and

action is vital in such outbreaks to limit the morbidity and spread of the disease.

The eggs, poultry, meat, unpasteurized milk, cheese, paneer, raw or unwashed fruits and vegetables, nuts and spices are most commonly associated with food poisoning illness. Factors associated with food poisoning outbreaks include consumption of inadequately cooked or thawed meat or poultry, cross-contamination of food from infected food handlers, presence of flies, cockroaches, rats, etc in the food environment that acts as vectors of the disease.<sup>3</sup>

Past experiences indicate that, the common bacterial organisms implicated in food poisoning are *Staphylococcus aureus* and *Bacillus cereus* (incubation period 1-6 h), *Clostridium perfringens* and *B. cereus* (diarrheal toxin) (incubation period 8-16 h), *Vibrio cholerae*, enterotoxigenic *Escherichia coli*, enterohemorrhagic *E. coli*, *Salmonella*, *Campylobacter*, *Shigella*, and *Vibrio parahaemolyticus* (incubation period >16 h).<sup>5</sup>

On 10<sup>th</sup> December, 2019 (between 12 midnight to 3 am) three students from the MBBS girls hostel presented to the hospital emergency department with similar complaints of fever and gastro-intestinal symptoms. The cases were managed as per the emergency protocol. Complaint of other similar cases from the same hostel came in to the light and letter of request was submitted to the principal by the hostel superintendent regarding the incident and to take necessary action for the same on 11<sup>th</sup> December, 2019.

The community medicine department of the medical college was assigned to do the necessary work for the above mentioned situation. Looking into the seriousness of the situation, investigation of the outbreak was planned. Also, it was needed to find out the cause for the occurrence of the incidence and to recommend necessary precautionary measures to prevent same type of future happenings.

## METHODS

A food poisoning outbreak was suspected to occur in the Girls hostel of Private Medical University of Bathinda, Punjab with the reporting of 8 students complaining of symptoms like abdominal cramps, nausea, vomiting and loose stools at midnight, after taking the dinner at mess on 9<sup>th</sup> December 2019. A retrospective cohort study was conducted to investigate the food poisoning outbreak and to recommend the preventive and control measures. A Probable case of food poisoning was defined as a previously well individual who suddenly developed any one of the following symptoms after eating dinner on 9<sup>th</sup> December 2019 diarrhoea (three or more loose stools in 24 hours or less), fever, abdominal pain, nausea, indigestion or vomiting.<sup>2</sup> As total exposed population was interviewed, sampling was not required.

## Methodology

An epidemiological case sheet was developed for collecting the information on demographic particulars of individuals, date and time of onset of illness and time of reporting, food items eaten, presenting symptoms, and history of consumption of water or food outside the mess. A line listing of all the probable cases was done. A thorough history taking along with dietary history (24-hour recall) of the students was done. Common food items were identified.

An environmental data recording was done by visiting to the girls' hostel mess area and cooking area, so as to find the lacks in the cleanliness, food handling habits and other details related to the outbreak occurring. Information from other girls residing in the hostels of the institution was also obtained in order to find any other such case. Microbiological testing was not done in this investigation as the food samples were not preserved.

## Statistical analysis

Attack rate, attributable risk and relative risk (RR) with 95% confidence interval were calculated for each food item to establish an association with the illness.

Informed verbal consent was taken from each student. Confidentiality of the participants was maintained. Information obtained was used for research purpose only.

## RESULTS

Out of the total 113 girls residing in the A block hostel, 97 girls had dined on 9<sup>th</sup> December, 2019. After consuming the dinner meal served at the hostel mess, many of the girls student experienced gastro-intestinal symptoms within a short duration. All the exposed girls were investigated during this investigation. As per the findings of the investigation: 8 girls presented with severe symptoms of the gastrointestinal upset along with other bodily symptoms, 60 students showed mild symptoms and only 29 students were such, who did not show any of the symptoms of the disease.

The index case of this outbreak reported to have symptoms within 1 hour of consumption of the food. The last case of this outbreak was found to have symptoms after 10 hours of food intake. Epidemic curve was plotted for the above data- indicating the median incubation period of 6 hours (Figure 1). Clinical presentation of the cases was almost similar to one another. Majority of students had suffered from the following symptoms of food poisoning - most common initial symptoms were of nausea (50%) associated with abdominal cramps (44.12%) followed by episodes of vomiting (36.76%), fever (14.71%) and diarrhoea (11.76%) (Figure 2).

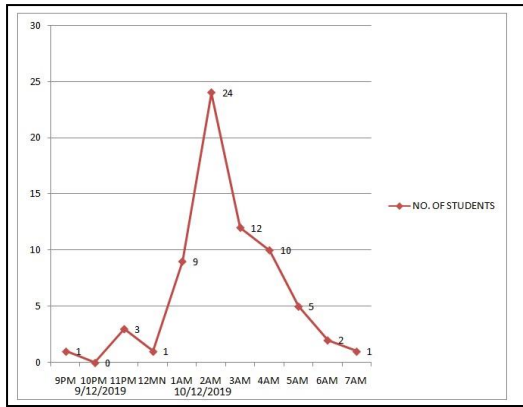


Figure 1: Epidemic curve of the outbreak.

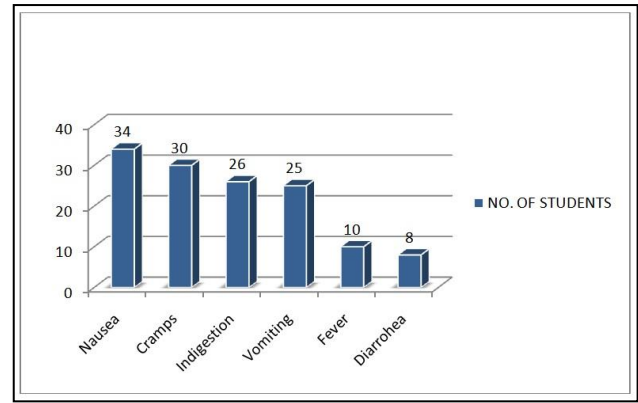


Figure 2: Symptoms experienced by the students.

Table 1: Analysis of the outbreak investigation.

Food item	Group A Persons who consumed specified food item			Group B Persons who did not consume specified food items			RR# (with 95% CI)	Attack rate (%)
	Ill persons	Total	Attack rate (%)	Ill persons	Total	Attack rate (%)		
Noodles	39	53	73.58	29	44	65.90	1.188 (0.773-1.824)	15.83
Palak paneer	56	71	78.87	12	26	46.15	1.592 (1.102- 2.301)	37.19
Gulab jamun	55	78	70.51	13	19	68.42	1.02 (0.819-1.269)	1.944
Chicken	36	49	73.46	32	48	66.66	1.181 (0.744-1.874)	15.33
Rajma and rice	53	70	75.71	15	27	55.56	1.33 (0.955-1.851)	24.79

(#RR=Relative risk,\*AR= Attributable risk)

Table 2: Association of exposure and outcome.

Food item consumed	No. of persons who fell ill	No. of persons who didn't fall ill	Chi-square (at df =1)	P-value
Noodles	39	14	0.6758	0.4110
Palak paneer	56	15	9.721	0.0018*
Gulab jamun	55	23	0.319	0.8583
Chicken	36	13	0.534	0.4644
Rajma and rice	53	17	3.778	0.061

Only 8 students who had experienced severe symptoms consulted for medical care. Rest of the students didn't require any medical help and got recovered with self-medication or no medication. Most of the students confirmed of not taking any food item from outside, ordering some other eatables, ingestion of any frozen products or milk products from outside. Results deduced from the retrospective cohort investigation presented in Table 1. Highest relative risk was found with palak paneer - 1.592 (with confidence interval 1.102 - 2.301). Statistically significant association was found between the causation of outbreak by palak paneer (Table 2).

As the majority of cases had incubation period of 6-8 hours, presented with vomiting and abdominal pain. The most probable cause of this outbreak seems to be *Staph*

*aureus*. This bacterium is mostly observed in food items like milk and milk products, custard, fried rice and uncooked meat.

**Environmental data**

An investigatory visit was carried out to the hostel mess premises. Following factors were found to be lacking:

- The hygiene of the utensils in the mess (at level one) was not found to be satisfactory.
- *Water served:* Potable (but the premises of RO water were found to be stinky at level one; it might be choked/blocked. Moreover, sink pipe was not properly connected with the drain and it was left open.)

- Milk packets were kept outside of freezer, which were having last date of use by today (13.12.2019 – same day of visit).
- Rest of all things (food cooking, food heating, food covering and serving) were as per the norms.
- *Laboratory examination:* It was not done in this outbreak because information was conveyed after duration of 2 days. Food samples are preserved for 24 hours instead of 72 hours after cooking, so no food sample was available for the lab testing on the day of investigation.
- Only the students of 2019 batch both MBBS & BDS were affected by the illness. History was taken from the students of other batches also. No one else from the girls hostel reported any illness. The only point was that the food serving area is different for the Batch 2019. This indicates that contamination might have occurred due to improperly cleaned utensils or infected food handlers of that area.

## DISCUSSION

In the present study, food poisoning outbreak was investigated in a private medical college of Punjab. Outbreak occurred in one of the hostel premises, in which a total of 97 girls were served the dinner. Out of them 60 students had shown mild symptoms and 8 had severe symptoms of nausea, vomiting, abdominal cramps and episodes of fever and diarrhea. After the calculation of relative risk, attributable risk and chi square test; palak paneer was found to be the main cause of illness among the students. It was confirmed to be a common source single exposure outbreak (point source epidemic) with sudden rise and fall of the number of cases affected. All of the cases occurred within the range of one incubation period with no secondary cases, as there was no person-to-person transmission.

*Staphylococcal* food poisoning is one of the most common food-borne diseases worldwide.<sup>6</sup> The real number of cases caused by this food poisoning remains underestimated due to various reasons like- wrong diagnosis, under-reporting of food-poisoning outbreaks, lack of samples available and inappropriate laboratory inspection.<sup>7</sup> Foods that act as main source of staphylococcal intoxication includes milk and dairy products, meat and meat products, eggs, salads and cream filled products (cakes, pastries, bakery products and sandwich fillings).<sup>8,9</sup> This supports our findings of this study- palak paneer was the cause of the ailments suffered by the students.

Other main source of food contamination by this bacterium is “carrier” food handlers harbouring *Staph aureus* in their nasal secretions and on their hands. The growth of *S. aureus* is not affected by other microbes present in the raw food, along with improper handling of cooked and processed food, improper storage of food- all allows the enterotoxin production of the *Staph aureus*.<sup>10</sup> Food poisoning caused by Staphylococcal is the consequence of intoxication by eatable products having adequate amounts

of one or more preloaded enterotoxins.<sup>11,12</sup> Consumption of the contaminated food usually presents with rapid onset (2-8 hours) of the discomfort to the person- causing symptoms like nausea, vomiting, abdominal cramps with or without diarrhoea.<sup>13-15</sup> The illness so caused is usually self-limiting with its effect declining typically in 24-48 hours after its inception. It favours the finding of the present study showing the affected girls consumed the food served at level one in their hostel, so only first year students were affected. All cases occurred within 6-10 hours of incubation period and nausea, vomiting was the predominant symptom, thus favouring the existence of *Staph. aureus* as a causative organism. It rarely causes massive sickness that requires hospitalization, which is usually seen in immuno-compromised persons (infants, elderly or chronically sick).<sup>14</sup>

## CONCLUSION

The authors have investigated a food poisoning outbreak, which are usually common in places where large quantity of food is cooked, served and stored over a period of time. Due to lack of appropriate samples, the causative organism could not be detected. But the clinico-epidemiological evidences from the participants pointed towards a single organism – *Staphylococcus aureus*. It has been found out in this investigation that whenever the sanitation conditions of the cooking area were compromised and negligence was played at the part of food handlers - it has always increased the probability of such outbreaks and sufferings of the people. In order to prevent such happenings in the future- following recommendations were suggested.

### Recommendations

Mess in-charge should be instructed to preserve all food sample (breakfast, lunch, dinner) for 72 hours after cooking. S.I. of mess should be directed to check the hygiene of food; food handlers and utensils used for cooking and serving on daily basis. Health education regarding food hygiene should be imparted to all food handlers and supervisors on regular basis. Periodic examination of all the food handlers should be done. Any kind of such incident should be immediately reported by the warden to the higher authorities facilitating the quick action. Drinking water area should be kept clean and sink must be well connected to the drain.

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## REFERENCES

1. Khare S, Tonk A, Rawat A. Foodborne diseases outbreak in India: A Review. Int J Food Sci Nutrition. 2018;3(3):9-10.

2. Kumar MK, Bhaskar V, Ray S. Food poisoning outbreak in a training establishment: A retrospective cohort study. J Mar Med Soc. 2017;19:28-33.
3. Kassahun M, Wongiel S. Food poisoning outbreak investigation in Dewachefa woreda, Oromia Zone, Amhara Region, Ethiopia, 2018. BMC Res Notes. 2019;12:377.
4. Kunwar R, Singh H, Mangla V, Hiremath R. Outbreak investigation: Salmonella food poisoning. Med J Armed Forces India. 2013;69(4):388-91.
5. Grewal VS, Khera A. Outbreak of food poisoning in a working men's hostel: a retrospective cohort study. Med J Vidyapeeth. 2017;10:517-21.
6. Hennekinne JA, Brun V, Buyser ML, Dupuis A, Ostyn A, Dragacci S. Innovative application of mass spectrometry for the characterization of *Staphylococcus enterotoxins* involved in food poisoning outbreaks. Applied Environ Microbiol. 2009;75:882-4.
7. Argaw S, Addis M. A review on *Staphylococcal* food poisoning. Food Sci Quality Manag. 2015;40:59-71.
8. Tamarapu S, McKillip JL, Drake M. Development of a multiplex polymerase chain reaction assay for detection and differentiation of *Staphylococcus aureus* in dairy products. J Food Prot. 2001;64:664-8.
9. Wieneke AA, Roberts D, Gilbert RJ. Staphylococcal food poisoning in the United Kingdom, 1969-1990. Epidemiol Infect. 1993;110:519-31.
10. Argudin MA, Mendoza MC, Rodico MR. Food poisoning and *S. aureus* enterotoxins. Toxins. 2010;2(7):1751-73.
11. Dinges MM, Orwin PM, Schlievert PM. Exotoxins of *Staphylococcus aureus*. Clin Microbiol Rev. 2000;13:16-34.
12. Loir Y, Baron F, Gautier M. *Staphylococcus aureus* and food poisoning. Genet Mol Res. 2003;2:63-76.
13. Balaban N, Rasooly A. Staphylococcal enterotoxins. Int J Food Microbiol. 2000;61:1-10.
14. Murray R.J. Recognition and management of *Staphylococcus aureus* toxin-mediated disease. Int Med J. 2005;2:106-19.
15. Tranter HS. Foodborne staphylococcal illness. Lancet. 1990;336:1044-6.

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