

Original Research Article

Epidemiological investigation of an outbreak of food poisoning in an officers' mess

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ABSTRACT

Background: Foodborne infection is a major cause of illness and death worldwide, having long term effects on children's growth; and considerable illness, heavily affecting healthcare systems. To investigate an outbreak of food poisoning which occurred in an officers' mess.

Methods: A retrospective cross-sectional descriptive study was carried out in the setting of an officers' mess in an army unit. Standard statistical methods such as calculation of percentage and Chi square were utilized for analysis.

Results: It was observed that seven (63.6364%) cases were amongst officers, 3 (27.2727%) cases were among ladies and 1 (9.0909%) case was amongst ORs. 100% cases occurred within 9 to 20 hours of consuming the food.

Conclusions: A small scale outbreak of food poisoning occurred in an officers' mess in a military establishment. Clinically the most likely causative organism was suspected to be *Salmonella typhimurium*. No microbiological confirmation could be carried out as no food sample was available for the same.

Keywords: Outbreak, Food poisoning, Microorganism

INTRODUCTION

Food poisoning is an illness caused by the consumption of food or water contaminated with bacteria and/or their toxins, parasites, viruses, or chemicals. The symptoms of food poisoning which vary both in degree include abdominal pain, vomiting, diarrhea, and headache. Serious cases may result in life-threatening neurologic, hepatic, and renal syndromes, which may further lead to permanent disability or death. Majority of the cases being mild recover without any specific treatment. Some patients with severe disease do require hospitalization, aggressive hydration, and antibiotic treatment.¹

A food borne disease outbreak is defined by the following 2 criteria: similar illness, often gastrointestinal, in a

minimum of 2 people. Evidence of food as the source. Worldwide foodborne infections are a leading cause of illness and death. Foodborne infections lead of many children in developing countries. The resulting diarrheal disease can have long term effects on the growth of children, besides their physical and cognitive development. In industrialized countries, foodborne infections cause considerable illness; and heavily affect the healthcare systems.²

Food borne illnesses being diverse in etiology, can follow ingestion of infectious organisms or non-infectious substances. Food borne diseases (FBDs) constitute a serious public health problem in the United States. Food borne diseases include classic toxin mediated food poisoning, e.g., botulism, gastroenteritis following

ingestion of preformed *Staphylococcus aureus* toxin, ingestion of chemicals in foods, besides bacterial, parasitic, and viral infections.³

METHODS

Research design

The study design was a retrospective cohort study design. The study was carried out in an officers' Institution in a remote corner of the country in the month of Jul 2007.

Data collection

All individuals giving history of gastrointestinal symptoms were included as cases. Relevant epidemiological history was taken from all the cases and recorded on an epidemiological case sheet. Case sheets and laboratory reports were perused for abnormally high

incidence of other food and water borne diseases. Search for more cases was made by visiting private practitioners and government civil hospital of the city. No additional cases were found by medical survey other than those who had already reported sick. Surveillance data obtained from all the above sources for all the cases was analysed. Meteorological data was also noted. Ethical approval of the institutional ethical committee was obtained prior to data collection. Standard statistical analysis like attack rate, relative risk and attributable risk were carried out.

RESULTS

Person distribution

Seven (63.6364%) cases were amongst officers, 3 (27.2727%) cases were among ladies and 1 (9.0909%) case was amongst OR.

Table 1: Relative risk and attributable risk of each food item.

Variables	Consumed the item				Did not consume the item					
	ILL	Not ILL	Total	Attack rate (%)	ILL	Not ILL	Total	Attack rate (%)	Relative risk	Attributable risk (%)
Chicken tikka	10	0	10	100	1	3	4	25	400	75
Paneer tikka	10	0	13	77	1	0	1	100	77	-23
Fish finger	10	0	10	100	1	3	4	25	400	75
Dip salad	10	3	13	77	1	0	1	100	77	-23
Moongfali	10	3	13	77	1	0	1	100	77	-23
Veg soup	10	3	13	77	1	0	1	100	77	-23
Chicken maryland	10	0	10	100	1	3	4	25	400	75
Fish mayonnaise	11	0	11	100	0	3	3	0	∞	100
Mangoli chips	10	0	10	100	1	3	4	25	400	75
Garlic bread	8	3	11	73	3	0	3	100	73	-27
Mixed vegetable with white sauce	10	3	13	77	1	0	1	100	77	-23
Baked beans	9	3	12	75	2	0	2	100	75	-25
Dinner roll	10	2	12	83	1	1	2	50	167	33
Russian salad	10	3	13	77	1	0	1	100	77	-23
Chicken cutlet	10	0	10	100	1	3	4	25	400	75
Macaroni	10	3	13	77	1	0	1	100	77	-23
Stuffed tomato	8	3	11	73	3	0	3	100	73	-27
Tipsy pudding with chocolate sauce	10	3	13	77	1	0	1	100	77	-23

Table 2: Chart giving correlation of clinical picture with microbiological cause.

Sl. No	Microorganism	Clinical features								Median incubation period (hours)	Remarks
		DIARR	VOM	NAU	FEV	AC	BIS	DE	NS		
1	<i>Staphylococcus aureus</i>	±	+++	+++	-	-	-	-	-	½ -6	
2	<i>Bacillus cereus</i> type I	±	+++	+++	-	-	-	-	-	½ -6	
3	<i>Salmonella typhimurium</i>	+++	+	++	+++	+	-	++	-	14 -30	
4	<i>Clostridium perfringens</i>	+++	±	±	±	+++	-	-	-	12-18	
5	<i>Bacillus cereus</i> type II	+++	±	±	±	+++	-	-	-	12-18	
6	<i>Shigella</i>	±	+++	+++	+++	+++	-	++	-	4-6	
7	<i>Clostridium botulinum</i>	±	+++	+++	+++	+++	-	++	+++	4-24	
8	Present episode	+++	+	+	+	+	-	++	-	13	Salmonella typhimurium

Legend: Diarr = Diarrhea, Vom = Vomiting, Nau = Nausea, Fev = Fever, AC = Abdominal cramps, BIS = Blood in Stools, DE = Dehydration, NS = Neurological symptoms.

Time distribution

Percent cases occurred within 9 to 20 hours of consuming the food. Epidemic curve depicting hour wise occurrence of cases is given in (Figure 1).

Possible source of the food poisoning was one of the food items, cooked and consumed on the night of 16 Jul 2007. Attack rate among those who had consumed and among those who did not consume each food item, relative risk and attributable risk of each food item is presented in (Table 1).

Possible causative organism

Keeping in view the clinical findings of the cases and the incubation period of food poisoning the causative agent appears to be *Salmonella typhimurium*. Chart giving correlation of clinical picture with microbiological cause is depicted in (Table 2). No food sample was preserved and hence microbiological confirmation could not be carried out.

Environmental factors which enabled the outbreak to occur

Environmental factors which enabled the outbreak to occur were also analysed in detail. Fish, which was one of the items of the menu for dinner on 16 July 2007 was purchased from the market. Subsequently at around 1400 hours the fish was cooked. Thereafter the fish was not stored in the refrigerator and was not reheated thoroughly before serving at 2150 hours. Due to improper storage conditions the fish got contaminated with *Salmonella*

typhimurium which proliferated due to favorable weather conditions. Thereafter due to inadequate reheating the salmonella typhimurium was not killed and caused food poisoning.

Evaluation of ecological factors

Various ecological factors were evaluated at the site of the outbreak. General hygiene and sanitation of the officers' mess was satisfactory. However, possibility of contamination of any food item on the day of the party cannot be ruled out. Garbage disposal of the officer's mess was also satisfactory. Free chlorine was being checked daily and found to be present at consumer end.

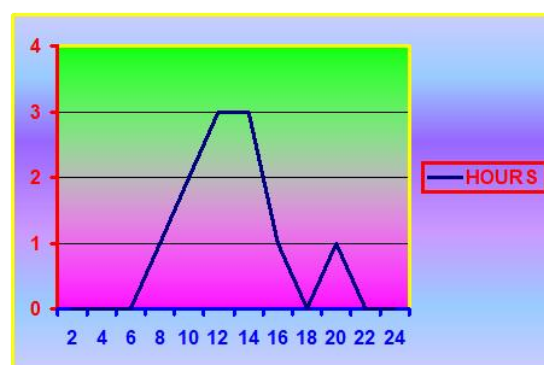


Figure 1: Epidemic curve depicting hour wise occurrence of cases.

There were adequate antifly measures being implemented to prevent fly nuisance in the cook house. Meteorological conditions were also studied as on the day of the party in the officers' mess. Maximum and minimum temp was 32

C and 25 C respectively, relative humidity was 85% and rainfall 0 mm. Thus, the meteorological conditions were highly favorable for bacterial growth in any food item which could have been previously contaminated. Monthly medical examination of all cooks and food handlers, employed in the officers' mess had been carried out regularly; and they were all free from infection. There was no water/sewage pipeline leakage or sewage overflow in the unit area where the outbreak of food poisoning occurred.

DISCUSSION

On 7 September 2005, the CDC investigated four cases of a waterborne disease caused by the *Vibrio vulnificus* bacterium in the wake of Hurricane Katrina.⁴

From 1996 to 2000, an estimated 1,724,315 cases of indigenous foodborne disease per year resulted in 21,997 hospitalizations and 687 deaths. The greatest impact on the healthcare sector arose from foodborne *Campylobacter* infection (160,788 primary care visits and 15,918 hospitalizations), while salmonellosis caused the most deaths (209). The most important cause of indigenous foodborne disease was contaminated chicken (398,420 cases, risk cases/million servings = 111; case fatality rate deaths/100,000 cases = 35, deaths = 141). Red meat (beef, lamb and pork) contributed heavily to deaths, despite lower levels of risk (287,485 cases, risk = 24, case fatality rate = 57, deaths = 164).²

From 1973 through 1997, states and local health departments reported 604 outbreaks of foodborne disease in schools. The median number of school outbreaks annually was 25 (range, 9 to 44). In 60% of the outbreaks an etiology was not determined, and in 45% a specific food vehicle of transmission was not determined. *Salmonella* was the most commonly identified pathogen, accounting for 36% of outbreak reports with a known etiology. Specific food vehicles of transmission were epidemiologically identified in 333 (55%) of the 604 outbreaks. The most commonly implicated vehicles were foods containing poultry (18 .6%), salads (6 .0%), Mexican-style food (6 .0%), beef (5 .7%) and dairy products excluding ice cream (5 .0%). The most commonly reported food preparation practices that contributed to these school-related outbreaks were improper food storage and holding temperatures and food contaminated by a food handler.⁵ Timothy, Molly, Susan, Michael and William et al reported an outbreak of community acquired food borne illness due to methicillin resistant *Staphylococcus aureus*.⁶ Tolan and Fraterelli et al reported 724 cases of food borne botulism in the United States of America from 1973 to 1996.⁷ Lanier, Hale, Geissler and Dewey et al implicated chicken liver in several reported outbreaks in the United States of America.⁸

Limitations

The limitation of the present study is that only clinical correlation with causative organism could be carried out. No microbiological confirmation could be carried out as no food sample was available for carrying out microbiological confirmation.

CONCLUSION

A small-scale outbreak of food poisoning occurred in an officers' mess. Clinically the most likely causative organism was suspected to be *Salmonella typhimurium*. No microbiological confirmation could be carried out as no food sample was available for carrying out microbiological confirmation.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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