



Epidemiological investigation of an outbreak of food poisoning at a religious gathering in South India

KEYWORDS

Food poisoning, prasad, religious function

Dr V G Prasad

Associate Professor Dept of Community Medicine
Kamineni Institute of Medical Sciences Narketpally,
Nalgonda dt, Telangana State

Dr M V Malhotra

Associate Professor, Dept of Community
Medicine Kamineni Institute of Medical Sciences
Narketpally, Nalgonda dt, Telangana State

Dr Kishore Yadav

Assistant Professor Dept of Community Medicine
Kamineni Institute of Medical Sciences Narketpally,
Nalgonda dt, Telangana state

Dr K Nagaraj

Professor & HOD Dept of Community Medicine
Kamineni Institute of Medical Sciences Narketpally,
Nalgonda dt, Telangana State

ABSTRACT *Background: An outbreak of food poisoning in a rural setting after a religious function in a temple was reported when 800 cases of food poisoning reported sick.*

Methods: A cross sectional study was conducted where in a representative sample of 185 subjects out of 800 persons affected were interviewed regarding source of infection, time interval between food intake and onset of symptoms and clinical manifestations. Epidemiological factors associated with the outbreak which include water supply and sanitation and other factors were investigated. The investigation revealed that contamination of Prasad distributed during the ceremony in a temple by E coli infected water was responsible for the outbreak. Salient findings of the epidemiological investigation and recommendations to prevent outbreak in similar situations are presented

Results

The source of infection was identified as panakam (a liquid preparation made with jiggery and water) given as prasad to devotees who have come to temple. Young adults in the age group 19-45 years were mostly affected (49.4%). Average time interval between ingestion of food and symptoms was found to be 12-24 hours and 1-12 hours i.e 55.1% and 28.6% of cases respectively. Most of the cases affected presented with symptoms of diarrhoea (94.6%) and vomiting (70.3%). The epidemic curve suggested that it was common source single exposure outbreak. Most of the cases (64.3%) investigated had more than one member in the family also affected. Attack rate was found to be 39.95%. E.coli were grown from the stool samples as well as water used for preparation of Prasad. There was no death reported.

Conclusions

Maintenance of highest standard of personal hygiene, food and environmental sanitation need to be taken in Religious functions

Introduction

Food poisoning is defined as an illness caused by ingestion of food or drinks contaminated with microbes or their toxins, or chemicals including those derived from plants and animal¹. History of ingestion of a common food item, an epidemic curve suggestive of common source-single exposure, and similarity of symptoms and signs in majority of patients are characteristics of an outbreak of food poisoning. The contamination of food can occur at any stage in the process from food production to consumption ('farm to fork'). The most common clinical presentation of food poisoning takes the form of acute gastrointestinal symptoms; however, the patients may also present with neurological or symptoms related to other systems².

Food poisoning have been classified as bacterial and non bacterial. The common organisms responsible for food poisoning are Salmonella^{3,4}, Staphylococci^{5,6}, Clostridium perfringens⁷, B cereus⁸, E coli⁹ and Clostridium botulinum¹⁰. Among chemicals, metals¹¹ have been incriminated, but in recent decades organic chemicals^{12,13} including pesticides have assumed greater significance.

Outbreaks of food poisoning cause considerable morbidity, economic loss and overwhelm the health care system due

to acuteness of onset and high attack rate. Risk of mortality is higher in extremes of age, episodes due to chemical intoxicants¹³ and high infective dose¹⁴.

Investigation¹⁵ into an episode of food poisoning is important to establish the epidemiological, clinical and microbiological aspects of the outbreak with the ultimate aim of preventing the recurrence in similar scenarios. The present study reports findings of an investigation into an outbreak of food poisoning after a religious function in rural setting.

Study setting :

An epidemiological investigation of food poisoning was conducted in Damercherla village located in Damercherla mandal in Nalgonda district, Telangana State of South India. Nalgonda district has a population of approx. 3.5 million of which only 13.32 % is urban. The district has a sex ratio of 982 females for 1000 males and literacy rate of 65%.



Fig 1: Spot Map of outbreak area

Methods

The outbreak occurred in Damercherla village of Nalgonda district of Andhra Pradesh (now in Telangana) during April 2014. District health authorities informed Kamineni institute of medical sciences regarding occurrence of an outbreak of acute gastroenteritis affecting about 300 residents of Damercherla village in the district. A team consisting of Epidemiologists, Microbiologists, Physicians reached Primary Health Centre (PHC) wherein an epidemiological investigation into the outbreak was initiated by recording the personal and socio-demographic data, clinical manifestations, and consumption of food items prior to the onset of symptoms. A preliminary analysis revealed that all patients had attended Sri Ram Navami function organized in a nearby temple and had ingested panakam (*Prasad*) about 2 PM on 8 April 2014 after the *puja* ceremony. *Prasad* (Hindustani pronunciation: [pr̩s̩ɑːd̩]; also called *prasada* or *prasadam*) is a material substance of food that is a religious offering in both Hinduism and Sikhism. Panakam which is *Prasad* is prepared by mixing jaggery with water and cardamoms. It is normally consumed by worshippers during this festival. The symptoms of acute gastroenteritis started from evening of the same day.

Data regarding socio-demographic factors, time interval between intake of panakam and onset of symptoms, clinical presentation was collected from selected patients by using pre-designed structured questionnaire. A total of 185 study subjects were selected representing three categories of the patients i.e. (A) who had mild symptoms and did not report to the PHC. The data from this group was obtained by 'house to house' visit in the nearby villages. (B) who had moderate symptoms and were discharged after treatment from PHC and (C) those with severe symptoms and needed in-patient management in sub-district hospital. In addition, laboratory samples from patients (stool, vomitus and blood) were collected as per standard procedures. Environmental survey was conducted in temple premises by the team members which studied the process of procurement, preparations, storage and distribution of *prasad* from temple pujaris and members of Temple organizing committee. As per the local custom *panakam*- prepared from jaggery was distributed during *Sri Ram Navami* function. The temple premises, its surroundings, source of water and utensils used for the preparation of *panakam* were inspected. Water used for preparation of *panakam* was collected for bacteriological examination. However, sample of *Prasad* was not available for laboratory tests.

The data was tabulated on Windows EXCEL and analyzed using SPSS version 19.

Results

The age distribution of the cases reveals that all age groups except infants were affected by the outbreak (Table 1). The

highest rates (49.7%) were in age group 19-45 years. Outbreak affected both sexes equally. The distribution of cases as per occupation reveals that all occupational groups residing in the geographical area were affected (Table 3). Majority of cases belonged to the village where the temple is located. In addition, individuals from nearby villages who attended the function at the temple were also affected.

Time Distribution

The time distribution of the outbreak of food poisoning provides information regarding the type of outbreak (single or repeated exposure) as well as the likely organisms responsible for the outbreak. As seen in Table 4, the median incubation period was 12-24 hours. This is suggestive of infective type of food poisoning where the microorganisms are ingested in food/drinks, and multiply in the gastro-intestinal tract to reach critical numbers to initiate symptoms.

Clinical presentation

Diarrhoea (94.6%) was the commonest symptoms. The stools were watery, foul smelling and greenish in colour. Bloody stools were present in 2.7% of cases. Other common symptoms were fever (83.2%) and vomiting (70.3%) preceded by nausea (56.8%). In 83.8% of cases the dehydration was mild to moderate, while 16.2 % had severe dehydration requiring management at sub-district hospital.

Most of the patients were treated as inpatients (88.9%) while rest of them were treated as out patients. Most of the cases were treated in Governmental health facilities, and 4.8% of patients opted for private clinics/ nursing homes.

Duration of Treatment: Among the cases treated as inpatients, two thirds were discharged after 1 day, and another 24.5% were sent back home within 48 hours.

Table 1: Age Distribution of Cases of Acute Gastroenteritis

Age in years	Number (N=185)	Percentage
< 1	Nil	-
1-5	17	9.2
6-18	54	29.2
19-45	92	49.7
> 45	22	11.9
Total	185	100.00

Table 2: Sex Distribution of cases of Acute Gastroenteritis

Gender	Number (N=185)	Percentage
Male	90	48.6
Female	95	51.4
Total	185	100.00

Table 3: Distribution of Cases as per Occupation

Occupation	Number	Percentage
Labourer	49	26.5
House wife	45	24.3
Student	48	25.9
Farmers	28	15.2
others	15	8.1
Total	185	100.00

Table 4: Duration of Onset of Symptoms after Ingestion of Prasad

Time in hours	Number (N=185)	Percentage
1-12	53	28.6
12-24	102	55.1
24-48	29	15.7
> 48	1	0.5
Total	185	100.00

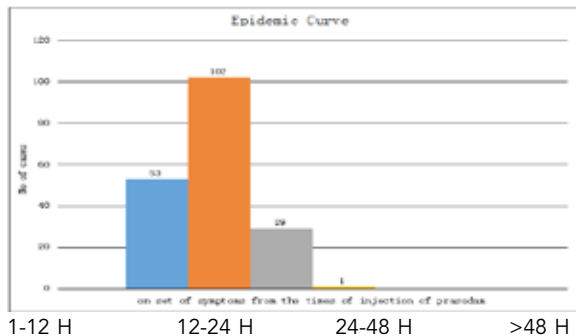


Fig 2 : Epidemic curve of sampled population .

Table 5: Time Distribution of the Cases

Date	Number of Cases reported to PHC	Percentage of total patients
8 April 2014	102	12.77
9 April 2014	375	46.93
10 April 2014	164	20.53
11 April 2014	97	12.14
12 April 2014	45	5.63
13 April 2014	16	2.00
Total	799	100.00

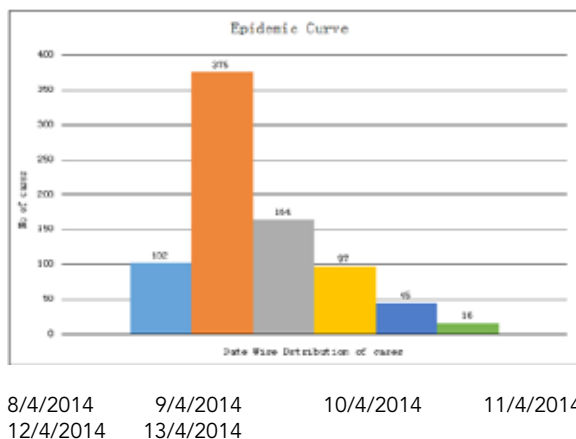


Fig 3: Epidemic curve of total cases (n=799)

Table 6: Symptoms Associated with the Cases

Symptom	Number who had symptom	Number without the symptom
Diarrhoea	175 (94.6)	10 (5.4)
Nausea	105 (56.8)	80 (43.2)
Vomiting	130 (70.3)	55 (29.7)
Fever	154 (83.2)	31 (16.8)
Blood in stools	5 (2.7)	180 (97.3)
Body aches	99 (53.5)	86 (46.5)
Any other*	75 (40.5)	110 (59.5)

* include weakness, giddiness, headache etc.

Table 7: Place of Treatment

Place of treatment	Number	Percentage
Out-patient at PHC	22	11.9
In-Patient at PHC	124	67.0
In-patient at sub-district Hospital	30	16.2
Private clinics	9	4.8
Total	185	100.00

Table 8: Duration of Treatment of In-patients

Number of days	N= 163	Percentage
1	108	66.3
2	40	24.5
3	15	9.2
Total	163	100.00

Clustering of Cases within Families: Religious functions in India are social event and usually most or all members of the families participate. In this outbreak also, 64% of cases had more than one family member affected. As seen from Table 9, approx 10% of families had more than three additional cases in the family, thus causing considerable hardship to the family.

Table 9: Clustering of Cases within Family

Number of other cases in Family	Number	Percentages
Nil	66	35.7
1	53	28.6
2	34	18.4
3	14	7.6
More than 3	18	9.7

Laboratory Finding: Stool, rectal swabs, blood and vomitus samples from patients, and water samples from the temple were collected and forwarded to microbiology laboratory of the hospital. E coli were grown from the stool samples, as well as water used for preparation of prasad. Blood cultures were negative.

Attack Rate: Investigation revealed that out of 2,000 individuals who had ingested the prasad seven ninety nine reported to the PHC, giving an attack rate of 39.95%.

Mortality and Disability Rates: All patients recovered fully. There was no death or residual disability.

Discussion:

The investigation revealed that the outbreak was caused by contamination of panakam (prasad) by non potable water. The prasad was prepared a night before, and presence of favourable environmental conditions (temperature, humidity and availability of sugars) provided optimal conditions for E coli to multiply. Although the outbreak occurred in a remote rural area, participation of over 2,000 devotees, and high attack rate resulted in overwhelming of local medical resources, requiring mobilization of human and material resources from district and tertiary care hospitals.

Young adults (9- 45 years) Atul Trivedi followed by children (6-18 years) were affected i.e 49.7% and 29.2% of cases respectively. This was in contrast (9- 45 years) to findings of Atul Trivedi et al and Sangrulkar et al where most of the cases in the outbreak belonged to the individuals in the age group of <12 years and 10-20 years respectively. Most of the cases affected in the outbreak presented with diarrhoea (94.6%) and vomiting (70.3%) respectively. Sangrulkar et al in his study reported similar findings where most of the cases present with diarrhoea (83.75%) and vomiting

(65%). The average time interval between ingestion of food and onset of symptoms was 12-24 hours in most of the cases (55.1%). However Sangrulkar et al reported the average interval between ingestion of food and onset of symptoms was 6-9 hours in most of the cases (54.6%). E.coli were grown from stool samples and water used in the preparation of prasad.

Conclusions and Recommendations:

Religious functions are interwoven in socio-cultural fabric of Indian society. These vary from small function at homes attended by family members and close friends to huge congregation of thousands of devotees at religious places. The probability and magnitude of outbreaks are related to multiple epidemiological factors. In general, religious places are kept clean and are able to maintain environmental sanitation and food-safety. However, large functions may overwhelm the capacity of management of religious-places to ensure the required standards, thus leading to outbreaks of food and water borne diseases. In addition, the management is usually unaware of preventive measures. This report based on epidemiological investigations carried out in a remote area highlights the significance of health education of management of religious places by health care staff to ensure maintenance of the highest standards of personal hygiene, food and environmental sanitation in such situations. Use of safe water, quality food ingredients, clean utensils and immunization of food handlers are also recommended to prevent water and food borne infections. Many places of worship that are visited by large number of devotees on regular basis have started distribution of hygienically pre-packed prasad to prevent bacterial and chemical contamination. This may require cultural changes of the community through behavioural change communication.

REFERENCE

- Park K. Park Text Book of preventive and Social Medicine 21 ed. M/s BanarsidasBhanot: 216 | • Foodborne Disease Outbreaks: Guidelines for Investigation and Control WHO 2008 | Available at www.who.int/foodsafety/publications/foodborne_disease/outbreak_guidelines.pdf | • Antony B, Dias M, Shetty AK, Rekha B. Food poisoning due to Salmonella enteric serotype Weltevreden in Mangalore, Indian J Med Microbiol 2009;27:257-8 | • Kunwar R, Singh H, Mangla V, Hiremath R. Outbreak investigation: Salmonella food poisoning. Medical Journal Armed Forces India 2013; 69 (4): 388-391 | • Do Carmo LS et al, Cummings C, Linardi VR, De Souza JM et al. A case study of a massive staphylococcal food poisoning incident. Foodborne Pathog Dis 2004 Winter; 1(4):241-6 | • Pillbury A, Chiew M, Bates J, Sheppard V. An outbreak of staphylococcal food poisoning in a commercially catered buffet. Communicable Diseases Intelligence 2013;37 (2). | • Regan CM, Syed Q, Tunstall PJ. A hospital outbreak of Clostridium perfringens food poisoning-implications for food hygiene review in hospitals. J Hosp Infect 1995; 29 (1):69-73 | • Dierick K, Coillie EV, Swiecicka I, Meyfroidt G, Devlieger H, Meulemans A et al. Fatal family outbreak of Bacillus cereus-associated food poisoning. J ClinMicrobiol 2005; 43(8): 4277-4279 | • Charatan F. New York outbreak of E coli poisoning affects 1000 and kills two. BMJ 1999; 319 (7214): 873 | • Chaudhry R, Dhawan B, KumarD, BhatiaR, Gandhi JC,Patel RK et al. Outbreak of suspected Clostridium butyricum Botulism in India (letter). Emerg Infect Dis 1998;m4(3) | • Pereira LMP, Teelucksingh S. Fish faddism causing low-level mercury poisoning in the Carribean: two case reports. Cases Journal 2009; 2:7009 | • Wu ML, Deng JF, Tsai WJ, Ger J, Wong SS, Li HP. Food poisoning due to methamidophos-contaminated vegetables. J ToxicolClinToxicol 2001; 39 (4): 333-6 | • Idrovo AJ. Food poisoned with pesticide in Bihar, India: new disaster, same story. Occup Environ Med 2014; 71(3):228 | • Pande TK, Khan AH, Pipersania R, SethiSk, Rath Y. Watermelon poisoning. Postgrad Med J 2002;78:124-125 | • Standard Operating Procedure for investigation of Food Poisoning Outbreaks. Department of Health. Perth Metropolitan Area Edition 2003. Available at <http://www.public.wa.gov.au/> | • T V Sangrulkar,S V Gandham,Anout break of investigation of food poisoning reported from a rural village in Western Maharashtra,BombayHospitalJournal,vol 54No2:2012 | • Atul V Trivedi,RohitVRam,Keyur B Patel.Epidemic investigation of an acute Gastroenteritis out break in Daslana village of Ahmedabad Gujarat,National Journal of Medical Research,vol 3/issue3/ Jul-Sep 2013 |