An Outbreak of Food Poisoning in a Military Establishment

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Abstract

Background: An outbreak of food poisoning in a military establishment mess was investigated and remedial measures suggested. **Methods:** A total of 391 persons had consumed meals in the mess on the day of the outbreak. A detailed food history was taken from available persons and the attack rates of each specific food items were calculated with the relative risks.

Results: Of the 391 persons who had consumed meals at the mess, 123 were affected giving an overall attack rate of 31.5%. Majority of the cases had loose motions, fever, pain abdomen and vomiting. The maximum attack rate (65.1%) was for those who had eaten chicken preparation. The relative risk was also highest for those who had eaten chicken at lunch on the day of the outbreak (RR – 33.21, 95% CI 8.39 to 131.53). The mean incubation period was 19.73 hours (range 6 - 57 hours). The median incubation period was 18 hours. Bacteriological confirmation was not successful.

Conclusion: The chicken dish was the epidemiologically incriminating food item responsible for the outbreak. Clinical and epidemiological features were suggestive of salmonella food poisoning. However, same could not be confirmed bacteriologically.

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Key Words: Food poisoning; Military establishment

Introduction

Food poisoning outbreaks are common in institutions and restaurants [1]. Outbreaks of food poisoning are recognized by a large number of persons affected at the same time, similarity of signs and symptoms, and history of ingestion of common meal [2]. Outbreaks are reported frequently in the armed forces involving varying number of personnel [3].

The present study describes an outbreak of food poisoning, which occurred in an army mess.

Material and Methods

The investigations were started within 12 hours of occurrence of the first case. An epidemiological case sheet was prepared. The detailed food history for all meals in the preceding two days was elicited [2]. Attempt was made to collect food histories and signs and symptoms from all those dining in the mess whether affected or unaffected. However, some respondents were not available on the day of the investigation; some were not able to recall accurate food histories and some questionnaires were incompletely filled. All such cases were excluded from the analysis. As a result, complete data for analysis was available for 254 out of the total 391 individuals dining in the mess. These included 106 of the 123 affected persons and 148 of the 268 unaffected individuals. Majority of the respondents who were not affected were interviewed. Food specific attack rates were

calculated. Relative risks (with 95% confidence intervals), for each food item taken two days preceding the outbreak was estimated.

Fever at admission was recorded from the case sheets of the 41 admitted cases. However, temperature measurement was not available in 11 outpatient department (OPD) cases.

The food handlers were interviewed to get information on the food processing. Medical examination of food handlers was also carried out. Nail scrapings and stool specimens collected from the food handlers were sent for bacteriological examination. Water samples from the cookhouse were also subjected to bacteriological examination. Left over food was not available for examination.

Laboratory investigations were carried out at the local military hospital. Left over food was not available for examination. Samples of the chicken (the epidemiologically implicated food item), delivered on a different date by the contractor to the mess and another sample of the same batch of chicken from the factory were sent for examination. Swabs from the freezer, wooden chopping block, tabletops were taken for bacteriological culture. Stool and blood of few admitted patients were also cultured.

Result

Out of the total of 391 officers and families who were dining in the mess, 123 were affected giving an attack rate of 31.5%. Of the 123 persons affected, 113 (91.9%) were officers, 4 (3.3%) were officer's wives. Four mess employees also suffered from

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gastroenteritis. The index case presented at 0310 hrs on 24 September 2000.

Clinical Presentation

Majority (66.0%), presented with loose motions as the first symptom. 17.9% had fever and 5.7% each had pain abdomen or vomiting as the first symptom. All the affected persons had loose motions. (Table 1). Majority (73.6%), reported the consistency of the motions as watery. There was no blood or mucus in the stools. 97.2% of the cases stated the stool was foul smelling. The incidence of fever among the cases is shown in Table 2. 74.5% of the cases had fever and majority (59.4%) had fever between 99° F to 102° F. The maximum temperature recorded was 105° F. 63.2% cases gave history of nausea. The occurrence of vomiting in the study population is shown in Table 3. 61.3% had vomiting, with 42.5% having vomited 1 to 3 times while 73.5% gave history of abdominal pain. There was no mortality and all the cases made an uneventful recovery with oral rehydration solution and intravenous fluids. Antibiotics were administered in some cases.

Food specific relative risks are shown in Table 4. The authors had calculated food specific relative risks of all items served during all meals in the preceding 48 hours of the outbreak and based on this lunch served on 23 September 2000 was the incriminating meal. The relative risk was highest for chicken served at lunch on 23 September 2000.

The first case had onset of symptoms at 2000 h on 23 September 2000 while the last case had onset at 2300 h on 25 September 2000. Taking lunch served on 23 September 2000 as the incriminating meal, the mean incubation period was 19.73 ± 7.394 hour (range 6 - 57 hours). The median

incubation period was 18 hours. The mode was 13 hours. The epidemic curve (Fig.1) is typical of a point source outbreak.

Circumstantial Enquiry

Chicken served on 23 September 2000 was brought from a civil contractor at about 1000 hrs on 22 September 2000, weighed on a dirty scale and then kept overnight in the mess freezer. The time gap between receipt of chicken from the civil source to the time it was kept in the freezer was > 3 hours, permitting adequate time for thawing and bacterial multiplication. The chicken was removed from the freezer at about 0900 hrs on 23 September 2000, thawed for about an hour in tap water, cut into pieces and marinated in curd at room temperature. At about 1100 hrs it was cooked for about half an hour in its marinade. It was then dipped in raw egg batter and fried, for about five minutes, and supplied on demand. This process of frying was started at about 1315 hrs and officers started coming for lunch at 1330 hrs. The maximum temperature on 22 and 23 September was 33°C and minimum 21°C, providing favourable conditions for growth of microorganisms. The premises of the civil contractor were inspected and the findings did not reveal any public health hazards in the supply chain. The water supply was from military engineering service (MES) and was found chlorinated on the days preceding the outbreak.

No left over food was available for laboratory examination. Sample of chicken delivered on a different day by the contractor to the officers' mess was sent for culture. Swabs from the freezer, wooden chopping block, tabletops were taken and sent for bacteriological examination. The results are

Table 1

Frequency of loose motions*

Frequency of motions/24 hr	No of persons	Percentage
1-5	44	41.5
6-10	43	40.6
11-15	13	12.3
>16	6	5.7
Total	106	100

*Data pertains to 106 affected persons out of 123 affected. Data for remaining 17 affected persons was incomplete due to unavailability of individual/poor recall/incompletely filled questionnaire

Table 2

Pattern of fever among the cases*

Degree of fever	No of persons	Percentage
Afebrile	16	15.1
99°-100° F	35	33.0
101°-102° F	28	26.4
>103° F	16	15.1
Not recorded	11	10.4
Total	106	100

*Analysis restricted to 106 cases only

Fig. 1 : Epidemic curve showing distribution of number of cases from eating suspect meal i.e. lunch on 23 September to development of symptoms

Table 3

Pattern of frequency of vomiting*

Frequency/24hr	Number of persons	Percentage
No vomiting	41	38.7
1-3	45	42.5
4-6	14	13.2
7-9	4	3.8
>10	2	1.9
Total	106	100

*Analysis restricted to 106 cases only

Table 4**Food specific relative risks of items served during lunch on 23 Sep 2000***

Food item	No. who ate	No. ill	Attack rate(%)	No. who did not eat	No. ill	Attack rate (%)	Relative risk	95% CI of RR
Nan	199	95	47.7	55	11	20.0	2.39	1.38<RR<4.13
Rice	116	44	37.9	138	62	44.9	0.84	0.63<RR<1.14
Dal	159	65	40.9	95	41	43.2	0.95	0.70<RR<1.27
Chicken	155	104	67.1	99	2	2.0	33.21	8.39<RR<131.53
Paneer	67	13	19.4	187	93	49.7	0.39	0.23<RR<0.65
Veg	136	44	32.4	118	62	52.5	0.62	0.46<RR<0.83
Salad	149	54	36.2	105	52	49.5	0.73	0.55<RR<0.98
Cake	143	56	39.2	111	50	45.0	0.87	0.65<RR<1.16

*Analysis restricted to 254 individuals (106 affected and 148 unaffected)

Table 5**Results of laboratory investigations**

Details of sample	Results
Stool RE	38 samples tested, majority showed 6-8 pus cells/HPF
Stool exam for motility	17 samples tested, no darting motility seen
Stool culture patients	30 samples tested, no NLF grown
Stool culture on selenite broth	6 samples tested, no salmonella grown
Blood culture patients	34 samples, no growth
Stool culture food handlers	6 samples tested, no growth
Nail scraping culture, food handlers	5 samples tested, 1 positive for <i>Staphylococcus aureus</i> (coagulase +ve)
Chicken (factory) swab for culture	<i>Staphylococcus albus</i> (coagulase +ve)
Meat chopping block	<i>Staphylococcus aureus</i> (coagulase +ve)
Deep freezer (6 swabs)	<i>Staphylococcus aureus</i> (coagulase +ve)
Table tops (12 swabs)	<i>Staphylococcus aureus</i> (coagulase +ve)
Egg culture	No growth
Water for bacteriological exam (2 samples)	Satisfactory

* NLF: non lactose fermentors

shown in Table 5.

Discussion

Investigation of food borne outbreaks is important to identify and rapidly control the source and to prevent similar outbreaks from happening again. In the present outbreak, lunch on 23 September 2000 was the common meal responsible and the chicken preparation was the incriminating food item on basis of the highest statistically significant relative risk for this item. The circumstantial inquiry of the manner in which the chicken was handled through the various stages of storage and preparation, afforded ample opportunity for growth of organisms.

The clinical and epidemiological features give important clues to aetiology. When nausea and vomiting occurs within 1-6 hours, the major etiologic

considerations are *Staphylococcus aureus* and *Bacillus cereus*. Fever is relatively uncommon (<23%) with these two agents [4, 5]. In the present outbreak, the median incubation period was 18 hours and 74.5% of the cases had fever thus staphylococcal and *B. cereus* food poisoning was unlikely, notwithstanding the growth of staphylococcal organisms from nail scraping of food handlers, and other sites.

Abdominal cramps and diarrhoea within 8-16 hours can occur in *Cl. perfringens* food poisoning. However, although nausea can occur, vomiting and fever are uncommon, occurring in less than 10% of the patients [5]. In the present outbreak 61.3% had vomiting and majority had fever therefore *Cl. perfringens* food poisoning was also excluded.

Fever, abdominal cramps, and diarrhoea within 16 to 48 hours (as in the present outbreak), are usually due to *Salmonella*, *Shigella*, and *Campylobacter jejuni* [6, 7, 8, 9]. *Shigella* can be excluded, as there was no blood in the stools in majority of the cases. *Campylobacter jejuni* is characterized by vomiting in only 15-25% of the cases [10, 11, 12]. The incubation period in *Campylobacter jejuni* is also longer at 1-7 days [13].

Based on clinical and epidemiological features, the present outbreak is suggestive of salmonella food poisoning. The incriminating food item i.e., chicken also strengthen this premise since poultry and eggs are known source of salmonella organisms [14, 15, 16]. However, no left over food was available to clinch this diagnosis. Stool cultures from patients did not reveal growth of salmonella. Repeated samples would have been advisable, as excretion of organisms is intermittent [17].

Approximately 500 outbreaks of food borne diseases are reported annually to the CDC Atlanta and an aetiological agent is identified in 40% cases only [18]. In some cases, appropriate diagnostic procedures are not conducted, diagnostic specimens are not collected or transported properly and in others, no agent is identified despite testing, raising the possibility that other yet unknown etiologic agents are responsible [5]. All

these possibilities explain the lack of establishment of an aetiological diagnosis in this outbreak.

Jones et al [19], have reported on outbreaks of food borne diseases in the United States in 1998-99. In 71% of the outbreaks no confirmed aetiology was identified, and in 46%, no suspected food vehicle was identified. In two-thirds of outbreaks in which an aetiology was not confirmed, no stool specimens were collected for laboratory testing, in 55% of these outbreaks, neither clinical specimens nor food samples were tested. The authors concluded that if the aetiology of and factors contributing to food borne disease outbreaks are to be understood, adequate resources must be available. Most food borne diseases can be prevented if food is selected, prepared, and stored properly. In reported outbreaks, most common error is storage of food at inappropriate temperatures.

Lastly, the authors would like to emphasize certain unresolved issues in the present outbreak. The current food poisoning appears to be of bacterial type (salmonella), on the basis of long incubation period and presence of fever in majority but it could not be corroborated by laboratory tests. The points favouring a toxic type of food poisoning are growth of staphylococcus aureus in laboratory samples taken at several points where chicken was handled, 65% cases having vomiting with watery stools without blood or mucus, and cooking of chicken which is likely to eliminate bacteria but not toxin. Due to these inconsistencies, the authors concede that the investigation has failed to firmly establish the etiological diagnosis of the outbreak one way or the other.

Conflicts of Interest

None identified

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