



A Review Article on Food Poisoning

Harshal Rajendra Desale, Assitant Prof Rutuja Abhonkar

Department of Pharmacology ,Swami vivekanand Sansta's Institute of Pharmacy Mungase , Malegaon

Corresponding Author: Assitant Prof.Rutuja Abhonkar

ABSTRACT :

Food poisoning, also called foodborne illness, this is caused by consuming contaminated food. The common reasons food poisoning are microorganisms like bacteria, viruses, parasites and toxins produced by these infectious organisms.

Key Words: Microbial contamination, Oral Rehydration Therapy, Medicolegal Aspects.

Introduction:



Food poisoning means illness resulting from ingestion of food with microbial or non-microbial contamination.[1] The condition is characterized by (a) history of ingestion of a common food (b) attack of many persons at the same time, and (c) similarity of signs and symptoms in the majority of cases.[2] The World Health Organization estimates that there are more than 1000 million cases of acute diarrhea annually in developing countries, with 3-4 million deaths.[3]

According to the Food Standards Agency (FSA) there are nearly 900000 cases of food poisoning each year. Our lifestyles have changed over the last few years which include an increasing reliance on ready prepared meals, eating out rather than cooking and taking more holidays abroad. We all lead busy lives and as a result of that tend to spend less time preparing and cooking food. People often cook several meals in advance and freeze them for a long period of time or buy convenience food which only has to be put in a microwave oven. This is the reason for increasing food poisoning cases in present scenario. Knowing where your food is sourced from and the standards of care and safety that have been applied may help to reduce the incidences of food poisoning.[4]

Causes of food Poisoning.[1]

A. Microbial Contamination

1. Bacteria

- Bacillus cereus
- Staphylococcus aureus
- Salmonella group (except *S. typhi*)
- Shigella
- Vibrio
- Escherichia coli
- Campylobacter
- Yersinia enterocolitis
- Clostridium

2. Viruses

- Rotavirus
- Adenovirus

3. Protozoa

- Giardia lamblia

4. Fungi

- Aspergillus flavus
- Fusarium roseum

B. Nonmicrobial Contamination

1. Vegetable origin

- Lathyrus sativus
- Mushrooms
- Argemone Mexicana

2. Animal sources

- Poisonous fish like shell fish, scombroid fish etc.

- Mussel

3. Chemicals

- Flavoring agents
- Coloring agents
- Preservatives

Classification of Food Poisoning.[5,6,7]

Factors Leading To Food Poisoning[8] Enteric pathogens have developed a variety of tactics to overcome host defenses. Understanding the virulence factors employed by these organisms is important in the diagnosis and treatment of clinical disease.

1. Inoculum size: The number of microorganisms that must be ingested to cause disease varies considerably from species to species. For Shigella, enterohemorrhagic Escherichia coli, Giardia lamblia, or Entamoeba, as few as 10-100 bacteria or cysts can produce infection, while 10⁵-10⁸ Vibrio cholerae organisms must be ingested orally to cause disease.

2. Adherence: Many organisms must adhere to the gastrointestinal mucosa as an initial step in the pathogenic process; thus, organisms that can compete with the normal bowel flora and colonize the mucosa have an important advantage in causing disease.

3. **Toxin Production:** The production of one or more exotoxins is important in the pathogenesis of numerous enteric organisms. Such toxins include enterotoxins, which cause watery diarrhea by acting directly on secretory mechanisms in the intestinal mucosa; cytotoxins, which cause destruction of mucosal cells and associated inflammatory diarrhea; and neurotoxins, which act directly on the central or peripheral nervous system.

4. **Invasion:** Dysentery may result not only from the production of cytotoxins but also from bacterial invasion and destruction of intestinal mucosal cells. Infections due to *Shigella* and enteroinvasive *E. coli* are

characterized by the organisms' invasion of mucosal epithelial cells, intraepithelial multiplication, and subsequent spread to adjacent cells.

5. **Host Defenses:** Normal host can protect itself against disease. Food poisoning depends upon host defense mechanisms e.g. Normal flora, Gastric acid, Intestinal motility, Immunity and Genetic determinants.

Food poisoning is an acute illness with recent consumption of contaminated food or water. It can be infectious or noninfectious. Infectious food poisoning is caused by eating food or water contaminated by bacteria, viruses, parasites or their toxins [1]. It is also called a food born disease [2, 3]. The most common symptoms of food poisoning are nausea, vomiting, abdominal cramps and diarrhea [1-4]. Other symptoms that may occur are fever and abdominal pain [1]. Food poisoning outbreak is the incidence of two or more cases of a similar foodborne disease resulting from the ingestion of a common food [5].

The most common microorganisms that cause food poisoning are Norvirus, Salmonella, Clostridium Perfringens, Campylobacter and Staphylococcus aureus [1, 5]. Hospitalizations due to food poisoning are mostly caused by Salmonella, Norvirus, Campylobacter, Toxoplasma gondii and Escherichia coli [1]. Salmonella, Toxoplasma gondii, Listeria monocytogenes, Norvirus and Campylobacter can cause deaths [1, 2].

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 [1].

Eggs, poultry, and meats, unpasteurized milk, cheese, raw or unwashed fruits and vegetables, nuts and spices are most commonly associated with food poisoning illness [1, 4]. Factors associated with food poisoning outbreaks also include consumption of inadequately cooked or thawed meat or poultry, cross-contamination of food

1 Resident of Field Epidemiology, Department of Epidemiology and

Biostatistics, College of Medicine and Health

Science, Bahir Dar University, Bahir Dar, Ethiopia

Full list of author information is available at the end of the article From infected food handlers, presence of flies, cockroaches, rats.

Globally, 48 million people get sick from a foodborne illness, 128,000 are hospitalized, and 3000 die in each year [9].

Even if the highest number of cases and deaths of food poisoning occur in developing countries [6], there was limited evidence on verification of occurrence of the outbreak, the descriptions of the cases and the predictors of food poisoning outbreak in the study area. This investigation aimed to verify occurrence of outbreak, describe cases in person, time and place and identify factors associated with the outbreak in Dewacheffa woreda.

On Tuesday morning, April 24/2018, Oromia Zone health department in Amhara Region was contacted by Kemisie

General Hospital. In the telephone conversation, Hospital Public Health Emergency Management (PHEM) focal person told Zonal PHEM officer that seven cases of food poisoning had visited Kemisie General Hospital from Qelo and Gure kebeles who were participants of lunch ceremony. Within 30 min of notification of the outbreak by the hospital, four

Field Epidemiology Residents, Dewacheffa woreda health office and Zonal health department PHEM officers visited

the reported hospital and checked the existence of an outbreak. Two Field Epidemiology Resident, woreda health office and Zonal health department PHEM officers visited the village where food poisoning cases outbreak occurred.

Other two Field Epidemiology Residents stayed in the hospital to see whether the case is increasing or not.

Methods Study Setting and Period

Unmatched case control study was conducted from April 24 to May 02/2018 among lunch ceremony participants in Qelo and Gure kebeles, Dewacheffa woreda, North-East of Ethiopia. The woreda is located about 325 km from Addis Ababa (the capital city of Ethiopia) and 555 km from Bahir Dar (the capital city of Amhara Region). The total population of the woreda was 151,645. The woreda is administratively divided into 26 kebeles. There are 7 health centers and 26 health post in the woreda. Gure and Qelo kebeles have total population 6001 and 7684 respectively [10]. There was lunch ceremony in Qelo and Gure kebele. The participants were from Qelo and Gure kebeles. About 162 and 50 people were participated in Gure and Qelo kebeles respectively. The outbreak was investigated among lunch ceremony participants in Gure and Qelo.

Sample size and sampling techniques

All cases from the two kebeles who participated in lunch ceremony were included in the study with a ratio of one case to four controls. The total sample size was 175 (35 cases and 140 controls). Controls were recruited among Participants of lunch ceremony who have not ever an acute illness or sudden onset of abdominal pain, with or without diarrhea, vomiting and nausea. The controls were selected by lottery method simple random sampling in each Kebleles.

General Principles of Treatment[15]

1. Oral Rehydration Therapy (ORT)

- a) This is resorted to only in the presence of mild dehydration (3 to 5% fluid deficit), or moderate dehydration (6 to 10% fluid deficit).
- b) Rehydration should commence with a fluid containing 50 to 90 mEq/L of sodium. The amount of fluid administered should be 50 mL/kg over a period of 2 to 4 hours in mild dehydration, and 100 mL/kg in moderate dehydration. After 2 to 4 hours, hydration status should be assessed and if found to be normal, maintenance therapy can be begun, otherwise rehydration therapy is repeated.
- c) Maintenance therapy: Oral rehydration solution (ORS) should be administered as follows:
 - i. 1 mL for each gram of diarrheal stool
 - ii. 10 mL/kg for every watery stool passed
 - iii. 2 mL/kg for each episode of vomiting.
- d) Limitations of ORT: ORT is not sufficient therapy in the presence of dysentery (bloody diarrhea), shock, intestinal ileus, intractable vomiting, high stool output (> 10 mL/kg/hr), monosaccharide malabsorption, and lactose intolerance.

2. Intravenous Rehydration

- a) This is necessary when dehydration is severe (> 10% fluid deficit or shock).
- b) 20 mL/kg boluses of ringer's lactate, normal saline, or similar solution is administered until pulse, perfusion, and mental status return to normal.
- c) Two separate IV lines may be required, or even alternative access sites such as femoral vein, venous cut-down, or intra-osseous infusion.
- d) Oral rehydration is commenced when condition improves.

3. Non-specific Antidiarrheal Agents

- a) Use of agents such as kaolin-pectin, antimotility drugs (e.g., loperamide), antisecretory drugs, or Toxin binders (e.g., cholestyramine), is controversial. Available data do not demonstrate significant beneficial effects. Instead, serious adverse effects can occur, including ileus and anticholinergic syndrome.

Prevention[15]

1. Buying groceries

- a) Buy meat and seafood items only from hygienic outlets.
- b) Do not buy items whose expiry date has elapsed.
- c) Do not buy items containing undercooked or raw animal-derived ingredients.
- d) Buy only pasteurized milk or cheese.
- e) Do not buy eggs which are cracked or leaking.

2. Storage

- a) Take groceries directly home and store immediately in the refrigerator.
- b) Always store raw meat, poultry, or seafood in plastic bags, so that drippings do not contaminate other items in the refrigerator.
- c) Purchased hot foods should be eaten immediately, or kept hot (> 60°C), or refrigerated.
- d) Do not store eggs in the egg-section of the door (provided in most refrigerators), since adequate cooling does not occur. Place them inside cartons and store them in the main section of the refrigerator.

3. Temperature requirements

- a) Never leave cut vegetables or meat in the open. Store them in the refrigerator or cook them.
- b) Ensure that the temperature in the main section of the refrigerator is always below 4°C, and that of the freezer is below -18°C.
- c) Cook all meat and seafood thoroughly before eating. Never consume undercooked oysters, clams, mussels, sushi, or snails.
- d) Cook eggs thoroughly until both the yolk and white are firm. Never eat runny yolk.
- e) Reheat food or heat partially cooked foods all the way through at least 74°C.
- f) If any food item looks or smells suspicious, discard it.

4. Hygiene

- a) Wash hands, utensils, counters, and cutting surfaces with water and soap between preparation of different foods (especially in the case of raw meat, poultry, or fish).
- b) Use plastic or glass cutting boards for slicing vegetables or meat. Wooden boards are extremely difficult to clean adequately.
- c) Wash fresh fruits and vegetables under running water.

5. Dining out

- a) Avoid consuming uncooked animal-derived dishes (sushi, raw oysters, eggnog, mayonnaise, etc).
- b) Do not eat undercooked meat or poultry.
- c) Do not consume egg preparations with runny yolk.

6. Foreign travel

- a) Drink only boiled or bottled water.
- b) Do not eat raw vegetables and salads.
- c) Do not buy food items from roadside vendors.

Control[16]

When there is a report of case(s), of food poisoning, the remains of food, empty containers, stools and vomit should be seized and sent immediately in an ice box for bacteriological and chemical examination. Organs removed after postmortem may be sent in 30 percent glycerin solution. It is necessary to trace the source of contamination and to deal with it properly. The containers used for cooking the suspected food should be disinfected and the remaining food should be destroyed.

Tracing the Source of Infection[16]

- a) Find the extent of the outbreak, i.e. the total number of person who took the food and of those who suffered.
- b) Study the clinical picture of each case. Make a special note of the nature of onset, incubation period and involvement of nervous system, if any.
- c) Trace the evidence implicating a particular food. Note the time of the last meal and ascertain the persons who developed symptoms or remained symptom free after consuming a particular item of food.
- d) Confirm the nature of toxic agent on the basis of chemical, bacteriological and postmortem reports.
- e) Investigate the source of infection, the means of contamination and the circumstances responsible for the same during storage.
- f) Assessment of environmental factors: kitchen, dining hall, storage of food grains and cooked food, presence of rodents.
- g) Record the history of any illness among food handlers and examine their stools, urine and blood for carrier state.
- h) Laboratory report: vomitus, stool of patients for culture, sample of suspected food, serological test of blood for antibody titre.
- i) Draw conclusions and make appropriate recommendations.

Postmortem Findings.[17,18]

- a) The mucosa of the GIT is swollen and often intensely congested, and there may be minute ulcers.
- b) Microscopic examination shows fatty degeneration of the liver.
- c) The causative organism can be isolated from the blood and viscera.

Medicolegal Aspect.[19,20]

Information to Public Health Authorities Doctor must inform all cases of food poisoning to public health authorities, as well as to police, because such cases are liable to be registered u/s

269, IPC (negligent act likely to spread infection dangerous to life), 272, IPC (Adulteration of food or drink intended for sale) and 284, IPC (negligent conduct with respect to poisonous substance).

- Accidental: Mass food poisoning is not uncommon in India and usually occurs during function or celebration, when food is served to a number of guests. Contamination may be result from unhygienic measure during the preparation or storage of articles of food.
- Homicidal: Isolated case of food poisoning may have medico-legal importance as one can deliberate addition of culture of micro-organism in the food of a homicidal intent.

- Suicidal: It is nearly impossible.

The list of types of Poisoning includes:

- Food Poisoning,
- Alcohol poisoning,
- Drug poisoning,
- Carbon Monoxide poisoning,
- Heavy metal poisoning,
- Chemical poisoning [15-20].

CONCLUSION

Food borne intoxications are the most wide spread global public health problem in present scenario. An incident of food poisoning will cause serious financial loss, sometimes resulting in business closure, bankruptcy, and loss of work.

However, the true incidence of food borne illnesses are unknown for the many reasons, including poor responses from affected person during visiting the health officials, misdiagnosis of the illness, improper collection of samples for laboratory analysis and improper laboratory examination. So there is a need to implement strict food safety laws.

These laws are enforced by food inspectors and environmental health officers. Food inspectors can at any time enter a place where food is being prepared. They will inspect the food and can take away samples for testing. Premises found to be unfit can be closed, persons found guilty of breaking the laws can be fined, imprisoned, customers suffering from food poisoning can claim financial compensation.

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