



An Overview about Food safety knowledge and practices

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Abstract

Foodborne illnesses are infections of the gastrointestinal (GI) tract caused by food or beverages that contain harmful bacteria, parasites, viruses, or chemicals. Common manifestations of foodborne diseases are vomiting, diarrhea, abdominal pain, fever, and chills. Most foodborne diseases are of acute onset, they happen suddenly, last for a short time and with spontaneous recovery without any treatment. Rarely, foodborne diseases may cause more serious complications. Definition of food safety is the degree of certainty that food will not cause illness or harm to the client when cooked, served, and consumed as advised. As it is currently hard for food manufacturers to maintain a pathogen-free supply, the home food preparer is a critical link in the circle for preventing foodborne disease. Therefore, home cooks must recognize how to reduce the presence of germs or their toxic substance in food. Literature on food safety issues (food safety knowledge, awareness, food handling practices, and self-reported behaviors) among consumers is limited. However, few studies have been done to assess students' food safety knowledge and behaviors.

Keywords: Food safety, Awareness.

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Introduction

Foodborne diseases are infections or irritations of the gastrointestinal (GI) tract caused by food or beverages that contain dangerous bacteria, parasites, viruses, or chemicals. Common manifestations of foodborne illnesses are abdominal pain, vomiting, diarrhea, fever, and chills. Most foodborne illnesses are of acute onset, they happen suddenly and last a short time, and most people recover spontaneously without any treatment. Rarely, foodborne illnesses may cause more serious complications (1).

Foodborne diseases are public health problems that can be prevented through following the rules of food safety. Ingesting contaminated foods with pathogens or their toxins can lead to a wide extent of foodborne diseases such as viral hepatitis, typhoid, dysentery, salmonellosis, and amoebiasis (1).

Food safety is a serious concern. It is a basic essential but there is a risk that it may be overlooked in the development of effective and efficient processes (2).

Health education is a significant requirement to support the construction of conditions for change, the growth competence of individuals and groups in an independent action for health at different planes of the organization of social life (3).

Causes of foodborne illness:

The causes fall into the following 3 categories:

a) Biological hazards:

Biological hazards include bacteria, viruses, and parasites. Bacteria and viruses are responsible for the major foodborne illnesses. Biological hazards are the main threat to food safety. They can be innate in the product or due to mishandling (e.g., time/temperature abuse) (4).

b) Chemical hazards and toxins:

Aflatoxins are fungal metabolites produced by a small number of *Aspergillus* species, particularly *A. flavus* and *A. parasiticus*. (4).

Cassava is a tropical root crop that contains cyanogenic mixtures in its edible parts and can cause acute cyanide poisoning or other illnesses, such as konzo. (4)

Dioxins are principally by-products of industrial processes, but they can also result from natural disasters, such as volcanic eruptions and forest fires. (5).

Peanut (*Arachis hypogaea*) allergy is a life-long disease related to the ingestion of peanuts or their products. (6).

C) Physical hazards:

Physical hazards include all material and foreign bodies which have incidentally penetrated foodstuffs. packaging may become one of the causes of physical contamination. (6).

Types of foodborne illness:

Pathogens can cause different types of foodborne illness. Once a contaminated food is eaten, illness can be caused by the pathogens themselves (**foodborne infection**); caused by toxins produced in the food by pathogens (**foodborne intoxication**); and caused by toxins produced in the body by pathogens (**foodborne toxin-mediated infection**) (7).

Symptoms of foodborne illnesses:

Symptoms of foodborne illnesses differ according to the poison, the amount used, the age, and the health state of the person consuming it. Some toxins cause symptoms within seconds, while others cause symptoms in hours, days, or even years later. Some toxins cause such clear symptoms that vital organs, such as the kidneys or liver, are sometimes permanently damaged. Ingested (ingested) and absorbed toxins cause symptoms throughout the body because they often deprive the body's cells of oxygen or activate or block the action of enzymes and receptors. (8)

Symptoms may include changes in conscious level, body temperature, heart rate and respiratory pattern, and many other symptoms depending on the affected organs. Caustic or irritating substances Injury to the mucous membranes of the mouth, throat, digestive tract, and lungs causes pain, cough, vomiting and shortness of breath (9).

Diagnosis of foodborne illnesses:

Sometimes urine and blood tests and abdominal x-ray are useful in determining the poison. In rare cases, knowing the poison is useful for treatment. The labels on the bottles and other data from the patient, family members, or co-workers make it easier for the doctor or poison center to identify poisons. Yet, if labels are not accessible, the drugs can often be identified by the marks and colors on the tablets or capsules. It is highly unlikely that laboratory tests can identify the toxin, since many drugs and toxins cannot be easily detected, or their levels measured in the hospital. But, blood and urine tests can sometimes help identify the toxin. Sometimes blood tests can show the severity of the poisoning, but these tests are limited to a few toxins (1). Doctors examine patients for signs of a particular type of substance. For example, doctor's check for needle

marks or track for signs that these people have injected drugs. They also test people who have warning signs characteristic for certain types of poisoning. Doctors inspect to see if people have traces of a drug or substance on their skin, or whether labels for drugs absorbed through the skin are hidden in skin folds, on the roof of the mouth, or under the tongue. With some poisons, an abdominal x-ray may help in detecting the presence and location of the ingested substances. Toxins that may be visible on x-rays include iron, lead, arsenic, and other metals, and large packets of cocaine or other prohibited drugs swallowed through so-called body pounders or drug carriers. Batteries and magnets can also be localized on x-rays, as well as canines, teeth, cartilaginous spines, and other animal parts that may break and remain as an integral part of the body after an animal attack or exposure to insect venom (8)

Complications of foodborne illnesses:

Acute complications usually occur when infections resist the initial treatment, spread beyond the gastrointestinal (GI) tract, or if the pathogen produces toxins that damage vital organs. The 2014, Economic Research Service (ERS) published Cost of foodborne illness (CoFI) estimates included bloody diarrhea (campylobacteriosis, Shiga toxin-producing *Escherichia coli* [STEC] infection, and shigellosis), extended hospitalizations (campylobacteriosis, cryptosporidiosis, cyclosporidiosis, STEC infection, listeriosis, salmonellosis, toxoplasmosis, noncholera *Vibrio* infections, and yersiniosis), sepsis (noncholera *Vibrio* infections and yersiniosis), hemolytic-uremic syndrome (HUS) (STEC infections), and meningitis (listeriosis). (8)

Additional complications have been identified in the literature, including meningitis (brucellosis, campylobacteriosis, listeriosis, and salmonellosis); inflammation of the heart (brucellosis, campylobacteriosis, salmonellosis, and trichinosis); and inflammation of bones, the pancreas, and gall bladder (campylobacteriosis and salmonellosis) (10).

a) Dehydration:

Dehydration can result when someone does not drink enough fluids to replace those lost through vomiting and diarrhea. When dehydration occurs, the body lacks enough fluid and electrolytes (minerals in salts, including sodium, potassium, and chloride) to function properly. Infants, children, older adults, and immune compromised people have the greatest risk of becoming dehydrated.

Signs of dehydration are excessive thirst, infrequent urination, dark-colored urine, lethargy, dizziness, and fatigue. Signs of dehydration in infants and young children are dry mouth, woody tongue, lack of tears when crying, dry diapers for 3 hours or more, high fever, unusually cranky or drowsy behavior, sunken eyes, cheeks, or soft spot in the skull. With dehydration there is also loss of skin turgor; the skin does not flatten back to normal right away after being gently pinched and released (10).

Severe dehydration may require intravenous fluids and hospitalization. Untreated severe dehydration can cause serious health problems such as organ damage, shock, or coma; a sleeplike state in which a person is not conscious (10).

b) Hemolytic uremic syndrome (HUS):

Hemolytic uremic syndrome is a rare disease that mostly affects children younger than 10 years of age. HUS develops when *E. coli* bacteria is embedded in the digestive tract and its toxins reach the bloodstream. *E. coli* O157:H7 infection is the most common cause of HUS, but infection with other strains of *E. coli*, other bacteria, or viruses may also cause HUS. Symptoms of *E. coli* O157:H7 infection include diarrhea, which is usually bloody, and abdominal pain, often accompanied by nausea, vomiting, and fever (10).

E. coli O157:H7, a Shiga-toxin producing strain of *E. coli* (STEC), is a gram-negative rod-shaped enteric bacterium that typically causes a gastroenteritis like picture characterized by bloody diarrhea, abdominal cramps, and little if any fever. An infectious colitis can also result from STEC infection, characterized on computed tomographic imaging by abnormal colonic wall thickening and pericolonic stranding (figure 1). STEC infection is most often transmitted by fecal-oral contamination, as is the case with other enteric pathogens such as *Salmonella*, *Campylobacter*, or *Shigella* (10).

Other complications:

Some foodborne illnesses lead to other considerable complications. For example, *C. botulinum* and certain chemicals in fish and seafood can cause paralysis of the respiratory muscles. *L. monocytogenes* can cause spontaneous abortion or stillbirth in pregnant women. Acute foodborne illnesses may lead to chronic conditions, including:

Reactive arthritis, a type of joint inflammation that usually affects the knees, ankles, or feet. Some people develop this disorder following foodborne illnesses caused by certain bacteria, including *C. jejuni* and *Salmonella*. Reactive arthritis usually lasts fewer than six months, but this condition may recur or become chronic arthritis (10). **Irritable bowel syndrome (IBS)**, a disorder of unknown cause that is associated with abdominal pain, bloating, and diarrhea or constipation or both. Foodborne illnesses caused by bacteria increase the risk of developing IBS (11).

Guillain-Barré syndrome, a disorder characterized by ascending muscle weakness or paralysis that begins in the lower body and progresses to the upper body. This syndrome may occur after foodborne illnesses caused by bacteria, most commonly *C. jejuni*. Most people recover in six to twelve months (11).

Prevention of foodborne illnesses:

Proper frozen stored food helps prevent food poisoning. Prevention is often the role of government, by setting firm instructions for health and public services for veterinary surveys of animal products in the food chain, from the agricultural field to manufacturing and bringing products to supermarkets and restaurants. Here, the organizing process includes: Traceability: the origin of the ingredients in the final product must be identified (whether from the parent farm from which the ingredients were collected, by identifying the crop or animal sources) and where and when they were processed; Then the source of the illness can be detected, traced, and then try to find solutions to treat it (and it may be possible to punish the responsible), in addition to providing the opportunity to dispose of the final products and extract them from the market if a problem is proven; Application of sanitary measures including Hazard Analysis and Critical Control Point (HACCP) and “cold chain” certification standards; control, deterrence and law enforcement authority for veterinarians. In the year 2006, the US Food and Drug Administration in the United States of America approved the methodology of phage therapy, which includes spraying meat with viruses that infect bacteria, thus preventing the spread of infection. However, this has raised concerns, because without mandatory labels, customers would not be notified that meat and poultry products have been treated with that spray (8)

In the home, prevention is mainly food safety practices. Many forms of bacterial food poisoning can be prevented, even if the food has been contaminated by sufficient food cooking, and either eating it directly, or freezing it effectively. (8)

Valuable advices regarding food safety practice:

Four simple steps are to be followed to keep food safe:

Clean:

-Wash hands and food contact surfaces and tools frequently, between tasks, and if they have become contaminated. Effective cleaning involves removing soil and debris, scrubbing with hot soapy water and rinsing, using potable drinking water. Sanitizing involves the use of high heat (e.g., a dishwasher) or chemicals (e.g., chlorine bleach) to reduce or eliminate the number of microorganisms to a safe level. **(8)**

-Wash hands with warm water and soap for twenty seconds and dry with a disposable paper towel or clean hand cloth. Alcohol based hand sanitizers are not a alternative for handwashing. They are not effective if the hands are dirty, as they are not effective against Norovirus, and they do not eliminate all types of microorganisms. **(8)**

-Wash cutting boards, dishes, and utensils after cooking each food item and before you use it for the next food using hot, soapy water, rinse with hot water, and air dry or dry with a clean paper towel or clean dish cloth, Or wash in the dishwasher. **(12)**

- After preparing each food item, wash the countertops before you use it for the next food by using paper towels or clean dish cloths to wipe kitchen surfaces or spills, Wash countertops with hot soapy water, rinse with hot water and air dry or dry with a clean paper towel or clean dish cloth. **(13)**

- To sanitize for added protection for bacteria on surfaces, you can use the following:
 - Diluted mixtures of chlorine bleach and water are a cost-effective method of sanitation. Chlorine bleach is a extremely effective sanitizer. It comes in various dilutions.
 - If bleach is 8.25%: measure 1 teaspoon of bleach per 1 gallon of water or 1/8 teaspoon of bleach per 1 pint of water.
 - Apply to the cleaned countertop and allow to sit for about two minutes and allow air dry or dry with a clean paper towel.
 - Alternatively, commercial products for sanitizing the home kitchen are available. Follow manufacturer instruction for use.
 - Wash dish cloths regularly in a washing machine.
 - Keep sponge in a place so it can dry after use.
 - Sanitize the dish sponge, often soak in a chlorine bleach solution for one min to lower the risk of cross-contamination.
 - Microwave heat a damp sponge for 1 min.
 - Put the sponge in the dishwasher cycle.
 - Replace the dish sponge regularly. **(8)**

Separate:

Separate to prevent cross contamination. Cross contamination is the transfer of harmful bacteria from uncooked food products (e.g. raw meat, fish, and poultry) or unclean people, countertops, and kitchen equipment to ready-to-eat foods (e.g., fruits, vegetables, deli meats/cheeses, and prepared or cooked foods). **(14)**

◆ Prevent cross contamination when grocery shopping.

Physically separate raw meat, poultry and fish to prevent their juices from dripping onto other foods. This can be done by:

- Segregate raw meat, fish and poultry on one side of the shopping cart.
- Putting raw meat, fish, and poultry in isolated plastic bags (e.g. one bag for chicken, one bag for fish, etc.).
- Designate reusable bags for grocery shopping only. Reusable bags for raw meat, fish, or poultry should never be used for ready-to-eat products.
- Constantly wash the shopping bags. Cloth bags should be washed in a machine and machine dried or air-dried. Plastic-lined bags should be scrubbed using hot soapy water and air-dried.
- Separate raw meat, fish and poultry into disposable plastic bags before putting them in a reusable bag.
- Make sure that both cloth and plastic-lined reusable bags are completely dry before storing. **(15)**

◆ Prevent cross contamination when storing food in the refrigerator.

- In the refrigerator, store raw meats, fish, and poultry below ready-to-eat and cooked foods.
- When thawing frozen raw meat, fish and poultry, put the food in a plastic bag or on a plate on the lowest shelf to prevent juices from dripping onto other foods. After thawing in the refrigerator, food should remain safe and of good quality for a few days before cooking. Food thawed in the refrigerator can be refrozen without cooking, although quality may be impacted. **(16)**

◆ Prevent cross contamination when handling, preparing, and serving food.

- Carefully wash your hands before and after handling different foods, after using the bathroom, and anytime they can become contaminated.
- Use different cutting boards for meat and produce. Alternatively, prepare produce first, then meat.
- Wash and rinse cutting board, knives, and prepare area after cutting raw meat, fish or poultry. These items can be sanitized after cleaning.
- Use a clean serving plate to serve cooked meat. Do not use the plate that held the raw meat, unless it is washed.
- Throw away any sauce or dip that has been used to marinade raw meat, fish, or poultry. Do not use this extra sauce as a dip for cooked food unless it is boiled first. **(8)**

Cook:

◆ Cook food thoroughly and use a thermometer to verify the proper temperature was reached.

- To determine that the proper temperature was reached, place a food thermometer in the thickest part of the food and allow the it to equilibrate.

- Make sure it's not touching bone, fat, or gristle.
- For whole poultry, insert the thermometer into the innermost part of the thigh and wing and the thickest part of the breast.
- For combination dishes, place the thermometer in the center or thickest portion.
- Egg dishes and dishes containing ground meat or poultry should be checked in several places.
- Clean food thermometer with hot, soapy water before and after each use. **(17)**

◆ Not only is **food thermometer** important to monitor the refrigerator temperature (chill foods); but using a thermometer is the only reliable way to ensure that a food is properly cooked. **When cooking:**

- Color is not a reliable indicator that the food has been cooked to the correct temperature to ensure that foodborne pathogens are destroyed.
- Determining “doneness” of hamburger cannot be safely done by looking at the brown color of the meat or of chicken by looking that the juices run clear.
- Time alone as an indicator that the food is cooked properly could result in a potential food safety hazard. Recipes may state “x minutes/pound”. However, different thicknesses of a food or ingredients that are used can alter the time needed at a specific temperature to make sure the food has reached the correct temperature to kill all pathogens. **(8)**

Chill:

Chill foods promptly. Cold temperatures slow the growth of harmful bacteria. Cold air must circulate to help keep food safe, so do not over fill the refrigerator. Maintain the refrigerator temperature at 41°F or below. Place an appliance thermometer in the rear portion of the refrigerator, and monitor regularly.

Maintain the freezer temperature at 0°F or below.

- ◆ Refrigerate and freeze meat, poultry, eggs and other perishables as soon as possible after purchasing. Consider using a cooler with ice or gel packs to transport perishable food. Perishable foods, such as cut fresh fruits or vegetables and cooked food should not sit at room temperature more than two hours before putting them in the refrigerator or freezer (one hour when the temperature is above 90°F). **(18)**
- ◆ There are three safe ways to thaw food: in the refrigerator, in cold water, and in the microwave.
 - Food thawed in cold water or in the microwave should be cooked immediately and prior to refreezing.
 - Submerging the food in cold water. It is important to place the food in an impermeable bag. Check the water every 30 minutes to make sure it is cold.
 - Microwave thawing. Cook food immediately once thawed because some areas of the food may warm and begin to cook. **(8)**
- ◆ Cool leftovers quickly by dividing large amounts into shallow containers in the refrigerator. **(19)**

Conclusion:

Food safety is an important issue that needs our attention as it is a major concern to all of the society. Proper food handling practices protect consumers’ health and guard against foodborne diseases.

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