



**A REVIEW ON PATHOGENESIS, ETIOLOGY, MODE OF TRANSMISSION AND
PREVENTION OF DIARRHEA**

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ABSTRACT

Diarrhea is the most important public health problem connected to water and sanitation and can be both "waterborne". Diarrhea results from an imbalance in the absorption and secretion properties of the intestinal tract and if absorption decreases or secretion increases beyond normal, diarrhea results. It can range in severity from an acute, self-limited annoyance to a severe, life-threatening. This review paper provide me information about improving sanitation and hygiene, drinking clean water, regularly washing hands and proper hand washing by mothers before feeding children, hygiene and proper storage of food items in kitchen are the key factors should always be kept in mind to prevent the risk of diarrhea among children.

KEYWORDS: Diarrhea, sanitation, life threatening, water and food borne.

INTRODUCTION OF DIARRHEA

Today Diarrhea remains a major public health problem. In developing countries, diarrhea is among the leading causes of childhood morbidity and mortality. Diarrhea is the most important public health problem connected to water and sanitation and can be both "waterborne". About 80% of deaths due to diarrhea occur in the first two years of life.^[1,2] The key factors for the prevention of diarrhea are sanitation, personal hygiene, availability of water and good quality drinking water so that the quantity of water is an important for the prevention of diarrhea as the bacteriological water quality.^[3] According to K. Armon, diarrhoea is defined as a change in bowel habit for the individual child resulting in substantially more frequent and/or looser stools.^[4] Diarrhea results from an imbalance in the absorption and secretion properties of the intestinal tract and if absorption decreases or secretion increases beyond normal, diarrhea results. It can range in severity from an acute, self-limited annoyance to a severe, life-threatening. Diarrhoea is a clinical syndrome in which there is frequent passage of unusually loose or watery bowel movements, usually three or more in a 24 hour period, sometimes accompanied by vomiting and fever, abdominal pain or cramps, faecal urgency or the passage of bloody or mucoid stools. Diarrhea is caused by bacterial, viral and parasitic infections. Infectious diarrhoea is spread by the faecal-oral route. The most common sources are contaminated food and water, person-to-person contact and direct contact with infected faeces.

ETIOLOGY OF DIARRHEA

The vast majority of Diarrheal infections are caused by infectious pathogens.^[5]

1. Bacterial infections: Diarrhea caused by enteric bacterial infections is very important worldwide, especially in tropical and developing countries, and is a serious problem among older children and adults as well as in infants and young children. The range of causative bacteria are very large, they include E. coli, Salmonella, Shigella, Campylobacter, Yersinia, Vibrios, and Clostridium difficile.^[6]

2. Viral infections: Rotavirus is one of the most common causes of severe diarrhea. Other viruses may be important causes of diarrheal disease in human, including Norwalk virus, Norwalk-like viruses, enteric adenoviruses, caliciviruses, and astroviruses.^[6]

3. Parasites: Parasites can enter the body through food or water and settle in the digestive system. Parasites that cause diarrhea include Giardia lamblia, Entamoeba histolytica, Cyclospora cayetanensis and Cryptosporidium.

OTHER CAUSES OF DIARRHEA

1. Food intolerances: Some people are unable to digest some component of food, such as lactose - the sugar found in milk, or gluten found in wheat and barley.

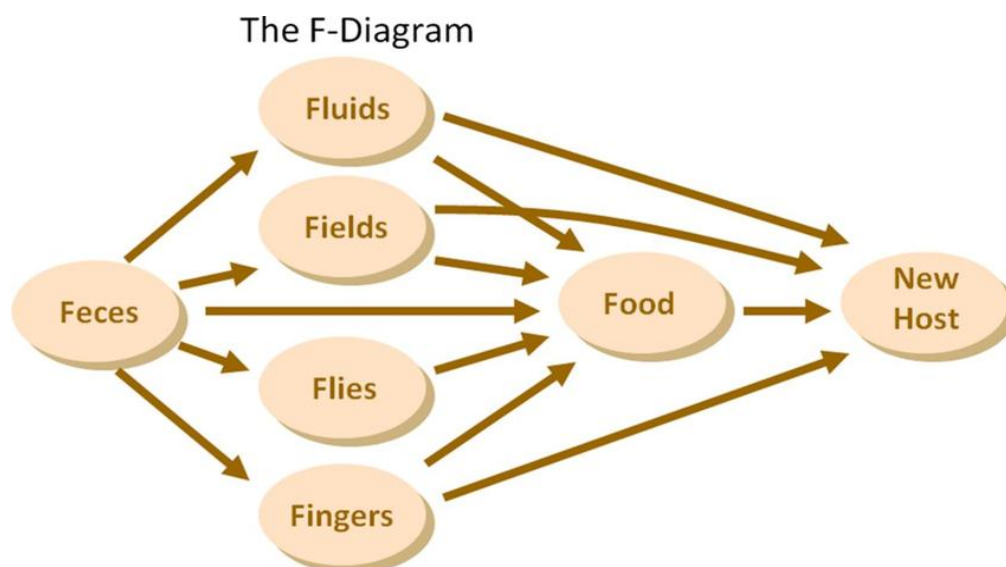
2. Reaction to medicines: Some kinds of antibiotics, laxatives and antacids.

3. Intestinal diseases: Functional bowel disorders, such as irritable bowel syndrome, in which the intestines do not work normally.

MODE OF TRANSMISSION

According to Curtis V, there are four transmission routes that the major infectious agents use to reach human hosts, namely human-to-human via the environment, human-to-human multiplying in the environment; human-to-animal-to-human via the environment and animal-to-human via the environment.^[7]

- Infectious diarrhoea is spread by the faecal-oral route. The most common sources are contaminated food and water, person-to-person contact and direct contact with infected faeces.
- Enteropathogens survive in ice and untreated swimming pools.
- Protozoan parasites can survive as cysts even in water. Seawater contain heavily contaminated faecal microorganisms is another source.
- Diarrhoea is many times greater in non-breast-fed infants than in breast-fed infants. Prolonged breastfeeding reduces the incidence or severity of certain types of diseases causing diarrhoea, such as shigellosis and cholera.
- Using infant feeding bottles: these easily become contaminated with faecal bacteria and are difficult to clean. When milk is added to an unclean bottle it becomes contaminated and if it is not consumed immediately, further bacterial growth occurs.
- Allowing an infant or child to crawl, or play in an area where human or animal faeces are present.
- Stored cooked food at room temperature: when food is cooked and then saved to be used later, it may easily be contaminated, for example, by contact with contaminated surfaces or containers. If food is kept for several hours at room temperature, bacteria in it can multiply many times.
- Drinking water that is contaminated with faecal bacteria
- Contamination in the home may occur when a storage container is not covered, or when a contaminated hand comes into contact with water while collecting it from a container.
- Failing to wash hands before handling food, after defecation, or after handling faeces.
- Failing to dispose of faeces (including infant faeces) hygienically. It is often believed that infant faeces are harmless, but sometimes they contain large numbers of infectious viruses or bacteria such as rotaviruses or enterotoxigenic *E. coli*.
- Animal faeces can transmit enteric infections such as salmonella to humans.
- Host factors also increase susceptibility to diarrhoea and are associated with increased incidence, severity or duration of diarrhoea.
- Under nutrition: the frequency, severity, duration and risk of death from diarrhoea are increased in undernourished children, especially those with severe under nutrition.
- Immunodeficiency or immunosuppression: this may be a temporary effect of certain viral infections (for example, measles), or persons with the acquired immunodeficiency syndrome (AIDS). When immunosuppression is severe, diarrhoea can be caused by unusual pathogens and may also be prolonged.
- Direct **transmission** occurs through contact between hands contaminated with faeces and the person's mouth; indirect **modes of transmission** are through ingestion of contaminated food or water, contact with infected soil, utensils, etc., and **transmission** by flies that have crawled on faeces.



Source: Wagner and Lanois, 1958

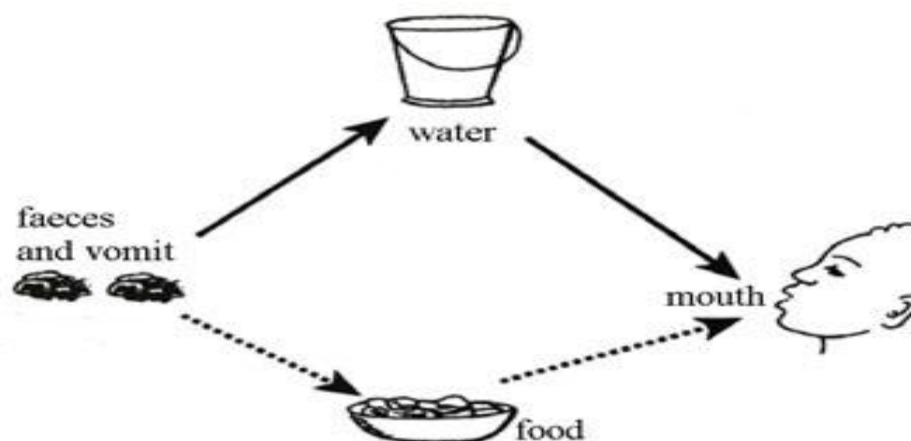


Fig. 1 & 2: Mode of Transmission.

TYPES OF DIARRHEA

Diarrhea may be classified into four general types, based on the mechanism, including osmotic diarrhea, secretory diarrhea, exudative diarrhea, and motility disorder diarrhea.^[8]

Diarrhea can be classified into four types:-

1. Acute watery diarrhea,
2. Dysentery,
3. Persistent or prolonged diarrhea
4. Chronic diarrhea.

Acute watery diarrhea characterized by abrupt onset of frequent, watery, loose stools without visible blood, lasting less than two weeks and usually subside within 72 hours of onset. Other symptoms are flatulence, malaise and abdominal pain. Nausea, vomiting may occur and also fever may be present. The common causes of acute watery diarrhea are viral, bacterial, and parasitic infections. Bacterial pathogens are more important in countries with poor hygienic conditions. The most important causes of this diarrhea in developing countries are Rotavirus, Shigellae, enterotoxigenic *E. coli* (ETEC), *Vibrio cholerae*, *Campylobacter jejuni*, enteropathogenic *E. coli* (EPEC), *Salmonella* spp. and *Cryptosporidium*.^[9]

The most dangerous complication is dehydration that occurs when there is excessive loss of fluids and minerals (electrolytes) from the body. With vomiting, dehydration becomes more severe. Dehydration is especially dangerous in infants and young children due to rapid body water turnover, high body water content and relatively larger body surface.^[10]

Dysentery in simple terms may be defined as diarrhea containing blood and mucus in feces. The illness also includes abdominal cramps, fever and rectal pain. The most important cause of blood diarrhea is *Shigella*. Important four species of *Shigella* are *S. dysenteriae*, *S. flexneri*, *S. boydii* and *S. sonnei*. In developing countries, the main causative agents of dysentery are *S. flexneri*, *S. boydii* and *S. dysenteriae*, whereas *S. sonnei* is the main

cause in developed countries.^[11] *S. flexneri*, *S. boydii* and *S. sonnei* are usually less dangerous than *S. dysenteriae* type 1 and they do not cause large epidemics.^[12] Evidences showed that around 10 percent of diarrhoeal episodes in children under five years of age have visible blood in the stool. Other pathogens causing endemic dysentery in children include: *Campylobacter jejuni*, invasive strains of *E. coli* (EIEC), non-typhoid *Salmonella* strains and *Entamoeba histolytica*.^[10]

Persistent diarrhea is defined as diarrheal episodes of presumed infectious aetiology and usually persists for long duration and last at least 14 days.^[9,10] This diarrhea causes substantial weight loss in most patients. Persistent diarrhea is a major cause of malnutrition in the developing countries.

Chronic diarrhea: This term refers to diarrhea which is recurrent or long lasting due to mainly non-infectious causes. Chronic diarrhea may be caused by gastrointestinal disease, may be secondary to systemic disease.^[8,9]

RISK FACTORS FOR DIARRHEA

1. Demographic factors: The prevalence is highest for children 6-11 months of age, remain at a high level among the one year old children, and decrease in the third and fourth years of life.^[13,14,15]

2. Socio-economic factors: Some studies have shown that the association between socio-economic factors, such as poor housing, crowded conditions, low income and higher rate of diarrhea was statistically significant.^[13,14, 15,16, 17]

3. Water-related factors: As diarrhea is acquired via contaminated water and foods, Increasing distance from water sources, poor storage of drinking water, use of unsafe water sources (such as rivers, pools, dams, lakes, streams, wells and other surface water sources), water storage in widemouthed containers 9, 30, low per capita water used 25, 26, have been found to be risk factors for

more diarrhea occurrence among children less than five years [18,19,20,21,22,23,24,25]

4. Malnutrition: the association between diarrhea and malnutrition is so common in low income societies that the concept of a vicious circle is appealing, with diarrhea leading to malnutrition and malnutrition predisposing to diarrhea. Children whose immune systems have been weakened by malnutrition are the most vulnerable to diarrhea. [13,26]

5. Seasonal distribution: Seasonal patterns to childhood diarrhea have been noted in many tropical locations, where there are two definite seasonal peaks: the summer one, associated with bacterial infections, and the winter one, related to viruses. In some studies diarrhea prevalence was found to be higher in the rainy season than in the dry season due to scarcity of drinking water. [6,27]

PREVENTION

In recent decades the key factors for the prevention of diarrhea are sanitation, personal hygiene, availability of water and good quality drinking water; and that the quantity of water that people have available for hygiene is of equal or greater importance for the prevention of diarrhea. [4]

The WHO's CDD Programme and other organizations (UNICEF, USAID, etc) have given first priority the prevention of diarrheal deaths, rather than prevention of cases, and focused on promotion of ORT. It is estimated that ORT was used in about 69 % of all diarrheal episodes in developing countries. [27,28]

A long-term, sustainable solution to childhood diarrheal disease must combine treatment with actions to eliminate diarrheal disease through prevention.

It is reported that 90% of the child diarrheal disease burden is the result of poor sanitation conditions and inadequate personal, household and community hygiene behaviors. [29] Therefore, understanding environmental and behavioral risk factors and their interactions is a prerequisite for devising effective preventive approaches.

According to The Environmental Health Project (supported by USAID) and T. Vesikari and B. Torun, strategies for comprehensive prevention and control of diarrhea [28,30] include:

A. Good personal and domestic hygiene

1. Effective hand-washing with a cleansing agent at critical times (after defecation, after handling children's feces, before feeding and eating, and before preparing food). *f*
2. Proper disposal of feces by using latrine and toilet. *f*
3. Adequate food hygiene, such as hygienic preparation and safe storage of foods.

B. Use of safe water

1. Use of drinking water from the safest source. *f*
2. Protection of drinking water from contamination at the source and in the home.

C. Improved nutrition *f*

1. Breastfeeding (exclusively for 4-6 months and continuing to 1 year). *f*
2. Improved weaning practices. *f*
3. Growth monitoring.

D. Immunization

Measles immunization: Measles vaccine certainly has a potential in reducing mortality attributed to diarrheal disease since measles is associated with diarrhea in 20 % of the cases.

E. Effective case management (home and health facility)

Eight out of ten children who die at home, after having no contact with health facility staff. Therefore, implementing community IMCI is a priority for controlling diarrhea. This strategy includes the following interventions: *f*

- ORT *f*
- Continuation of feeding during diarrhea. *f*
- Intensive care for severe dehydration.
- Selective antibiotic therapy.
- Medical care when needed
- Health Education
- Improvement of Socio-economic status
- Female education
- Vitamin A supplementation.

CONCLUSION

It is clear from this review paper that the improving sanitation and hygiene, drinking clean water, regularly washing hands after going to toilet and proper hand washing by mothers before feeding children, hygiene and proper storage of food items in kitchen are the key factors should always be kept in mind to prevent the risk of diarrhea among children. So, recommend the people and encourage mothers to wash their hands with soap before feeding children or after going to toilet, Arrange cooking place and food-storing place in the kitchen as separately as possible. Recommend people to buy food daily and cook for every meal to prevent the risk of diarrhea and dispose the fecal matter properly to prevent diarrheal disease.

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