Diarrhoea

Diarrhoea is defined as the increased passage of loose or watery stools relative to the person's usual bowel habit.

- It is not a disease but a sign of an underlying problem such as an infection or gastrointestinal disorder.

Aetiology

A) Infections: the most common causes of diarrhoea resulting from:

1. **Viral**: viruses such as adenovirus and astrovirus are common cause of gastroenteritis.
   - Symptoms of viral gastroenteritis include (nausea, vomiting, abdominal cramps, and diarrhea) typically last only 48-72 hrs.
   - Unlike bacterial enterocolitis, patients with viral gastroenteritis usually do not have blood or pus in their stools and have little or no fever.
   - Rotaviruses usually affect children < 2 years of age. The virus has an onset of 1 -2 days and lasts 5-8 days. Patients may experience severe dehydration.

2. **Bacterial**: the bacteria E. coli, Salmonella, Shigella, Clostridium perfringens.
   - These bacteria usually are acquired by drinking contaminated water or eating contaminated foods such as vegetables, poultry, and dairy products.
   - Bacterial enterocolitis is characterized by signs of inflammation (blood or pus in the stool, fever) and abdominal pain and diarrhea.
   - The pathogenic strains of E. coli cause diarrhea either by producing toxins (called enterotoxigenic E. coli or ETEC) or by invading and inflaming the lining of the small intestine and the colon and causing enterocolitis (called enteropathogenic E. coli or EPEC).
   - **E. coli 0157:H7** is a strain of E. coli that produces a toxin that causes hemorrhagic enterocolitis.
   - Approximately 5% of patients infected with E. coli 0157:H7, particularly children, can develop hemolytic uremic syndrome (HUS), a syndrome that can lead to kidney failure.
   - Some evidence suggests that prolonged use of anti-diarrhea agents or use of antibiotics may increase the chance of developing HUS.
Other organisms, for example, *Staphylococcus aureus* and *Bacillus cereus*, produce preformed enterotoxins which on ingestion induce rapid-onset diarrhoea and vomiting that usually last less than 12 h.

**Food poisoning** is a brief illness that is caused by toxins produced by bacteria. The symptoms of food poisoning usually last less than 24 hours.

- With some bacteria, the toxins are produced in the food before it is eaten, while with other bacteria, the toxins are produced in the intestine after the food is eaten.
- Symptoms usually appear within several hours when food poisoning is caused by toxins that are formed in the food before it is eaten.
- It takes longer for symptoms to develop when the toxins are formed in the intestine (because it takes time for the bacteria to produce the toxins). Therefore, in the latter case, symptoms usually appear after 7-15 hours.

3. **Protozoa**: Cryptosporidium, Giardia and Entamoeba.
   - cause explosive, foul-smelling, large-volume, watery stools & patients are at risk for dehydration.
   - This is thought to be caused by invasion of the small intestine, which causes damage to the micro-villi and, therefore, decreases absorption of fluids.
   - Infection with *Giardia lamblia* is transmitted by contaminated drinking water & usually is **not associated with inflammation** (no blood or pus in the stool and little fever).
   - Infection with *amoeba* usually occurs during travel abroad to undeveloped countries and is **associated with signs of inflammation** (blood or pus in the stool and fever).
   - Although protozoan-induced diarrhea is self-limiting, it may persist for several months, so therapy should be considered to eradicate the organism.

**B) Traveller's diarrhoea**
- Tourists visiting foreign countries with warm climates and poor sanitation can acquire ETEC by eating contaminated foods such as fruits, vegetables, seafood, raw meat, water, and ice cubes.
- Toxins produced by ETEC cause the sudden onset of diarrhea, abdominal cramps, nausea, and sometimes vomiting.
- These symptoms usually occur 3-7 days after arrival in the foreign country and generally subside within 3 days.
- Occasionally, other bacteria or parasites can cause diarrhea in travelers (for example, Shigella, Giardia, Campylobacter). Diarrhea caused by these other organisms usually lasts longer than 3 days.
- Viruses (10–15% of cases) and parasites (2–10% of cases), such as norovirus, Giardia, Cryptosporidium and Entamoeba, account for the remainder.

**C) Drug induced Diarrhoea:** Many medicines, particularly broad-spectrum antibiotics such as ampicillin, erythromycin and neomycin, induce diarrhoea secondary to therapy.

- With these antibiotics the mechanism involves the overgrowth of antibiotic resistant bacteria and fungi in the large bowel after several days of therapy.
- The diarrhoea is generally self-limiting.
- However, when the overgrowth involves Clostridium difficile and the associated production of its bacterial toxin, lifethreatening pseudomembranous colitis may be the outcome.

**Signs and symptoms**

**Acute-onset diarrhoea** is associated with loose or watery stools that may be accompanied by anorexia, nausea, vomiting, abdominal cramps, flatulence or bloating.

- When there is blood in the diarrhoea this is classed as dysentery and indicates the presence of an invasive organism such as Campylobacter, Salmonella, Shigella or E. coli O157.

**Dehydration is a common problem** in the very young and frail elderly and the signs and symptoms must be recognised.

- Symptoms that could indicate **mild dehydration** include tiredness, anorexia, nausea and light-headedness.
- Symptoms become more prominent in **moderate dehydration** and include dry mucous membranes, sunken eyes, decreased skin turgor, tachycardia, apathy, dizziness and postural hypotension.

- In **severe dehydration**, the above symptoms are more marked and may also include hypovolaemic shock, oliguria or anuria, cold extremities, a rapid and weak pulse and low or undetectable blood pressure.

- **Severe dehydration** if untreated it might progress to acidosis and circulatory failure with hypoperfusion of vital organs, renal failure and death.

**Investigations**

1. A **medication history** is required to eliminate antibiotic- and other drug-induced diarrhoeas, or the possibility of a laxative overuse-induced diarrhoea.

   - Testing for C. difficile-induced pseudo membranous colitis is indicated in those with severe symptoms or where hospitalisation or antibiotic therapy with lincomycins, broadspectrum β-lactams or cephalosporins has occurred within the preceding 6 weeks.

2. The history of symptom onset is important as well as the duration of diarrhoea, whether other members of the family and contacts are ill, recent travel abroad, food eaten, weight loss and the possibility of underlying diseases.

3. **Stool culture** is required in patients who are immunocompromised, with bloody diarrhoea, severe symptoms, where there is no improvement within 48 h.

   - Stool culture is also required when there is a history of recent overseas travel to non-Western countries.

4. Where the diarrhoea persists for more than 10 days, further investigation should be undertaken to exclude parasites such as Giardia, Entamoeba and Cryptosporidium.

**General measures**

- Patients should be advised on handwashing and other hygiene-related issues to prevent transmission to other family members.

- Exclusion from work or school until the patient is free of diarrhoea is advised.
In acute, self-limiting diarrhoea, children, healthcare workers and food handlers should be symptom free for 48 h before returning to school or work.

In both children and adults, normal feeding should be restarted as soon as possible.

In weaned and non-weaned children with gastroenteritis, early feeding after rehydration has been shown to result in higher weight gain, no deterioration or prolongation of the diarrhoea and no increase in vomiting or lactose intolerance.

Similarly, breast-feeding infants should continue to feed throughout the rehydration and maintenance phases of therapy. Avoidance of milk or other lactose-containing food is seldom justified.

### Dehydration treatment

- Since diarrhoea results in fluid and electrolyte loss, it is important to ensure the affected individual maintains adequate fluid intake.
- Most patients can be advised to increase their intake of fluids, particularly fruit juices with their glucose and potassium content, and soups because of their sodium chloride content.
- High-carbohydrate foods such as bread and pasta can also be recommended because they promote glucose and sodium co-transport.
- Young children and the frail elderly are prone to diarrhoea induced dehydration and use of an oral rehydration solution (ORS) is recommended.

The formula recommended by the WHO contains glucose, sodium, potassium, chloride and bicarbonate in an almost isotonic fluid.

- Glucose concentrations between 80 and 120 mmol/L are needed to optimise sodium absorption in the small intestine.
- Glucose concentrations in excess of 160 mmol/L will cause an osmotic gradient that will result in increased fluid and electrolyte loss.
- High sodium solutions, in excess of 90 mmol/L, may lead to hypernatraemia, especially in children, and should be avoided.
- Until recently, the WHO ORS contained 90 mmol/L sodium, as cholera is more common in developing countries and associated with rapid loss of sodium and potassium.
However, a systematic review of trials using a reduced osmolarity ORS concluded that solutions with a reduced osmolarity compared to the standard WHO formula were associated with:

- fewer unscheduled intravenous infusions,
- a trend towards reduced stool output and
- less vomiting in children with mild-to-moderate diarrhoea.

Based on this and other findings, the WHO ORS now has a reduced osmolarity of 245 mOsm/L and contains **75 mmol of sodium**.

The presence of potassium prevents hypokalaemia occurring in the elderly, especially in those taking diuretics.

There appears to be no significant difference between intravenous and oral rehydration.

For healthy adults, an appropriate substitute for a rehydration sachet is 1 level teaspoonful of table salt plus 1 tablespoon of sugar in 1 L of drinking water.

The volume of ORS to be taken in treating mild-to-moderate diarrhoea is dependent on age.

In adults, 2 L of oral rehydration fluid should be given in the first 24 h, followed by unrestricted normal fluids with 200 mL of rehydration solution per loose stool or vomit.

For children, 30–50 mL/kg of an ORS should be given over 3–4 h.

This can be followed with unrestricted fluids, either with normal fluids alternating with ORS or normal fluids with 10 mL/kg rehydration solution after each loose stool or vomit.

The solution is best sipped every 5–10 min rather than drunk in large quantities less frequently.

Care is required in diabetic patients who may need to monitor blood glucose levels more carefully.

**Drug treatment**

1. **Antimotility agents.** such as loperamide, diphenoxylate and codeine are occasionally useful for symptomatic control in adults who have mild-to-moderate diarrhoea and require relief from associated abdominal cramps.

   Antimotility agents are not recommended for use in children because of unacceptable levels of side effects observed.
Management should initially focus on prevention or treatment of fluid and electrolyte depletion before antimotility agents are considered.

Antimotility agents should be avoided in severe gastroenteritis or dysentery because of the possibility of precipitating ileus or toxic megacolon.

All appear to have comparable efficacy but loperamide is the drug of choice given its low incidence of CNS effects.

A. Diphenoxylate.
- is a synthetic opioid available as co-phenotrope in combination with a subtherapeutic dose of atropine.
- The atropine is present to discourage abuse but may cause atropinic effects in susceptible individuals.
- Administration of co-phenotrope at the recommended dosage carries minimal risk of dependence.
- However, prolonged use or administration of high doses may produce a morphine-type dependence.

B. Loperamide.
- Loperamide is a synthetic opioid analogue.
- In uncomplicated diarrhoea, it may have an effect within 1 h of oral administration.
- It is relatively free of CNS effects at therapeutic doses, although CNS depression may be seen in overdose, particularly in children.
- As it undergoes hepatic metabolism it should be used with caution in patients with hepatic dysfunction.

C. Codeine.
- The constipating side effect of the opioid analgesics codeine and morphine may be used to treat diarrhoea.
- It is susceptible to misuse and, given in large doses, may induce tolerance and psychological and physical dependence.

2. Bismuth subsalicylate.
- Bismuth subsalicylate is an insoluble complex of trivalent bismuth and salicylate that has been shown to be effective in reducing stool frequency.
- It possesses antimicrobial activity on the basis of its bismuth content while the salicylate is considered to confer antisecretory properties.
- At therapeutic doses it is relatively free from side effects, although it may cause blackening of the tongue and stool.
- The relatively large quantity of the liquid preparation that has to be consumed is seen as a disadvantage.

3. Antimicrobials.
- Antibiotics are generally not recommended in diarrhoea associated with acute infective gastroenteritis.
- Antibiotics are indicated for patients with positive stool culture where the symptoms are not receding or for travellers’ diarrhoea.
- If antibiotics are used to prevent travelers diarrhoea, therapy should be started 1 day before arrival in high incidence region and continued until 2 days after departure. If diarrhoea has occurred, antibiotic treatment should last for 3-5 days.
- Ciprofloxacin is occasionally used for prophylaxis of traveller diarrhoea and is recommended for treatment of travellers diarrhoea if symptoms are for more than 2-3 days.
- In patients presenting with dysentery or suspected exposure to bacterial infection, treatment with a quinolone, for example, ciprofloxacin, may be appropriate.
- Where Campylobacter is the suspect causative organism, patients with severe symptoms or dysentery should receive early treatment with erythromycin or ciprofloxacin.
- Severe symptoms or dysentery associated with Shigella can also be treated with ciprofloxacin.
- Nalidixic acid can be used in children and trimethoprim may be appropriate in pregnant women where resistance is not a problem.
- The use of antibiotics in patients with Salmonella is not generally recommended because of the likelihood that excretion is prolonged.
- Antibiotics may, however, be indicated in the very young and the immunocompromised.
- **Ciprofloxacin or cefotaxime** are used to treat invasive salmonellosis.
- The benefit of antibiotic use in enterohaemorrhagic infection, for example, E. coli O157, is less clear because there is evidence that antibiotics cause toxins to be released which may lead to haemolytic uraemic syndrome.
- **Antibiotic associated colitis** is treated with either:
  - Oral vancomycin 125 mg each 6 hrs
  - Or oral flagyl 500 mg 3 times daily or IV for 7-14 days.

Note/ vancomycin is very expensive but safe for pregnant or breast feeding women.

- **Giardiasis** is treated with flagyl 250 mg 3 times daily for 10 days.
- **Amebiasis** is treated with flagyl 750 mg 3 times daily for 10 days.

### 4. Probiotics

- Probiotics have been defined as components of microbial cells or microbial cell preparations that have a beneficial effect on health.
- Well-known probiotics include lactic acid bacteria and the yeast Saccharomyces.
- The rationale for their use in infectious diarrhoea is that they act against enteric pathogens by competing for available nutrients and binding sites, making gut contents acid and increasing immune responses.

### 5. Rotavirus vaccine

- Rotavirus vaccine has been shown to protect against the most common strains of rotavirus (G1 and G3), although the benefits of the vaccine are dependant on the type of vaccine used, with rhesus and human rotavirus the most efficacious.
- Some of the common therapeutic problems in the management of individuals with constipation and diarrhoea are outlined in Table 14.5.