

# Gastroenteritis

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# OBJECTIVES

**At the end of this session each student will be able to:**

1. Define gastroenteritis, diarrhoea and loose stool.
2. Classify diarrhoea.
3. Describe the epidemiology of gastroenteritis.
4. Describe the cause of gastroenteritis.
5. Describe the pathophysiology of gastroenteritis.
6. Describe the clinical features of gastroenteritis.
7. Describe the complications of gastroenteritis.
8. Describe the differential diagnoses of gastroenteritis.
9. Investigate patients with gastroenteritis.
10. Treat patients with gastroenteritis.
11. Describe the prognosis of patients with gastroenteritis.
12. Describe the preventive measures to gastroenteritis.

# Definitions

1. Gastroenteritis refers to diarrhoea associated with nausea and vomiting.
2. Diarrhoea refers to passage of loose stool for more than 3 times per day.
3. Loose stool is the stool that takes the shape of their container.

# Classification of diarrhoea

## **A. Osmotic diarrhoea:**

- Diarrhoea due to an increase in the osmotic load presented to the intestinal lumen, either through excessive intake or diminished absorption e.g. diarrhoea due to ingestion of mannitol.

## **B. Inflammatory (mucosal) diarrhoea:**

The diarrhoea that results from inflammation of mucosal lining the intestine e.g. infectious diarrhoea caused by *Shigella dysenteriae*, *Campylobacter jejuni* and Enteroinvasive *Escherichia coli*.

# Classification of diarrhoea

## **C. Secretory diarrhoea:**

- Diarrhoea that occurs when there is increased secretory activity in the intestine e.g. diarrhoea due to Enterotoxigenic *Escherichia coli* or *Vibrio cholera*.

## **D. Motile diarrhoea:**

- Diarrhoea caused by intestinal motility disorders e.g. diarrhoea caused by magnesium sulphate or magnesium containing antacids.

# Epidemiology

## **Age:**

- Gastroenteritis may occur at any age.
- Morbidity and mortality are much higher in the very young and the very old.

# Causes

## **A. Viral: (50-70%)**

- Norovirus.
- Rotavirus.
- Adenovirus.
- Parvovirus.
- Astrovirus.
- Coronavirus.
- Pestivirus.
- Torovirus.

**B. Shellfish poisoning and poisoning from other marine animals.**

## C. Bacterial (15-20%)

1. *Shigella*.
2. *Salmonella*.
3. *Campylobacter jejuni*.
4. *Yersinia enterocolitica*.
5. *Vibrio cholera*.
6. *Escherichia coli*.
7. *Bacillus cereus*.
8. *Clostridium difficile*.
9. *Clostridium perfringens*.
10. *Listeria monocytogenes*.
11. *Mycobacteria avium complex (MAC)*.
12. *Vibrio parahaemolyticus*.
13. *Bacillus cereus*.
14. *Staphylococci aureus*.
- 15.



# Pathophysiology

- Acute gastroenteritis is usually caused by infectious agents.
- These agents cause diarrhoea by adherence, mucosal invasion, enterotoxin production and/or cytotoxin production.
- These mechanisms results in increased luminal fluid content that cannot be adequately absorbed leading to dehydration and loss of electrolytes and nutrients.

# Pathogenesis of diarrhoea

## **1. Micro-organisms may produce toxins that facilitate infection**

### A. Enterotoxins production:

- Enterotoxigenic *Escherichia coli*.
- *Vibrio cholera*.

# A. Enterotoxins production

- They produce proteins that aid their adherence to the intestinal wall, thereby displacing the normal flora and colonizing the intestinal lumen.
- Then, enterotoxin is transported into the mucosal cells where it transfers Adenosine Diphosphate (ADP) into Cyclic Adenosine Monophosphate (cAMP) and activates it.

# A. Enterotoxins production

## **The activated Cyclic Adenosine Monophosphate:**

- Inhibits the absorptive sodium transport.
- Activates the excretory chloride transport in the intestinal crypts cells. And
- Inhibits the absorption sodium chloride in the villus cells, eventually leading to an accumulation of sodium chloride in the intestinal lumen.

The high osmolarity in the intestinal lumen is balanced by water secretion that eventually overwhelms the lumen absorptive capacity and leads to watery diarrhoea.

## B. Cytotoxins production

- *Shigella dysenteriae*.
- *Vibrio parahaemolyticus*.
- *Clostridium difficile*.
- Enterohaemorrhagic *Escherichia coli*.

### **Pathogenesis:**

They result in mucosal cell destruction that leads to bloody stools with inflammatory cell, resulting into decreased absorptive capacity.

## 2. Enterocytes invasion

- *Shigella dysenteriae*.
- *Campylobacter jejuni*.
- Enteroinvasive *Escherichia coli*.
- *Salmonella*.
- *Yersinia*.

### **Pathogenesis:**

They cause destruction of the enterocytes and leads to inflammatory diarrhoea.

### 3. Alternation of bowel normal flora

- A. The normally acidic pH of the stomach and colon is an effective antimicrobial defence.
- In achlorhydric states caused by antacids, histamine-2 (H<sub>2</sub>) blockers, gastric surgery and decreased colonic anaerobic flora, the GIT defence is weakened.

### 3. Alternation of bowel normal flora

- B. Hypomotility states may result in colonization by pathogens, especially in the proximal small bowel, where motility is the major mechanism in the removal of organisms.

Hypomotility may be induced by anti-peristaltic agents e.g. opiates, Diphenoxylate and atropine, Loperamide; or anomalous anatomy e.g. fistulae, diverticula, anti-peristaltic afferent loops; or inherent disorders e.g. diabetes mellitus and scleroderma.



# Pathogenesis of vomiting

- The mechanisms of vomiting in diarrhoea illness is not known.
- Serotonin release has been postulated as a cause, stimulating visceral afferent input to the chemoreceptor trigger zone in the lower brainstem.

# Clinical features

## **History:**

### **☐Fever:**

- The presence of fever with or without chills, generally suggests that an invasive organism is the cause of diarrhoea.

### **☐Vomiting:**

- Vomiting implies proximal bowel involvement, especially with preformed enterotoxin.

# Clinical features

## □ Abdominal pain:

### Causes:

- Electrolyte imbalance.
- Ischaemic process.

## □ Stool:

- Large volume of stool is associated with small bowel infection, whereas colonic infections results in many small stools.
- The presence of fresh blood indicates colonic ulceration (bacterial infection, inflammatory bowel disease, ischaemia).
- White bulky faeces that float after flushing with water (high fat content) are due to a small bowel pathology that leads to malabsorption.
- Copious rice water diarrhoea is a hallmark of cholera.

# Clinical features

## **□ Ask about extra-intestinal causes:**

- Recent surgery.
- Recent radiation.
- Food or drug allergies.
- Endocrine disorders.
- Previous episodes e.g. malaria, partial intestinal obstruction etc.

# Clinical features

## **□ Symptoms of marked dehydration:**

- Orthostasis.
- Lightheadedness.
- Diminished urine formation.
- A change in mentation.

# Epidemiological factors

- Foreign travel to developing countries.
- Recent camping.
- Recent use of antimicrobial agents.
- Day care attendance.
- Ingestion of raw, possibly spoiled or new marine products.
- Similar illness in the family, friends or contacts.
- Homosexuality.
- Immunosuppression.

# Physical examination

1. Assess hydration status.
2. Abdominal examination:
  - Look for signs of acute abdomen.
  - Listen for bowel sounds.
  - Determine the location of any tenderness.
  - Palpate for masses or organomegaly.
3. Rectal examination.

# Complications

- Dehydration.
- Malabsorption.
- Persistent diarrhoea.
- Chronic diarrhoea.
- Toxic megacolon.
- Reactive arthritides.
- Guillain-Barré syndrome.
- Transient lactose intolerance.
- Systemic infections, especially salmonella infections.
- Septicaemia.
- Haemolytic uraemic syndrome.
- Thrombotic thrombocytopenic purpura.



# Differential diagnoses

- Acute appendicitis.
- Botulism.
- Giardiasis.
- Haemolytic uraemic syndrome.
- Inflammatory bowel syndrome.
- Intestinal obstruction (small or large bowel).

# Differential diagnoses

- Salmonella infection.
- Pseudomembranous colitis.
- Food-borne toxigenic diarrhoea.
- Hormonal (vasoactive intestinal peptides).
- Drugs-induced diarrhoea.

# Investigations

## 1. Stool analysis and culture:

### A. Faecal leucocytes

- **Present:** Salmonella or Shigella infections, ulcerative colitis and Crohn's disease.
- **Absent:** Viral infections, Giardiasis, amoebiasis, enterogenic *E.coli* and toxigenic bacteria food poisoning.

# 1. Stool analysis and culture

## **B. Stool ova and parasitic studies:**

### **Indications:**

- Immunocompromised.
- Persistent diarrhoea.
- Conditions unresponsive to antibiotics.
- Travel to endemic regions, followed by chronic diarrhoea without signs of acute bacterial diarrhoea.
- Bloody stool without leucocytes in stool (amoebiasis).

# 1. Stool analysis and culture

## C. Stool culture:

### Indications:

- Fever.
- Bloody stool.
- Stool that tests positive for occult blood or leucocytes.
- Abdominal pain resembling that associated with appendicitis (*Yersinia enterocolitica*).
- Diarrhoea illness associated with partially cooked hamburger (cytotoxigenic *E.coli* 0157:H7).
- Prolonged diarrhoea that has not been treated with antibiotics.
- Immunocompromised host.
- For epidemiological purpose, such as cases involving food handlers.

# Investigations

2. Serum electrolyte.
3. Serum creatinine and blood-urea nitrogen.
4. Full blood picture.
5. Clostridium toxin assay.
6. Radiography.

# Treatment

## **Goals:**

- Rehydrate patients as needed.
- Treat symptoms e.g. fever, pain etc. as indicated.
- Prevent complications.

# Rehydration

## **Indications for intravenous rehydration:**

- Severe intractable vomiting.
- Altered consciousness.
- Severe dehydration.
- Paralytic ileus.
- Excessive cholera-like stool.
- Time or environment not conducive to oral rehydration therapy.



# Antibiotic therapy for infectious diarrhoea

## **Goals:**

- Reduce morbidity.
- Prevent complications.
- Reduce the duration of illness.

## **NB:**

- Viral gastroenteritis require only supportive treatment without antibiotics.

# Drugs

## 1. Ciprofloxacin:

### Indications:

- Acute infectious gastroenteritis caused by:
  - *Campylobacter jejuni*.
  - *Escherichia coli* 0157:H7.
  - Non-typhoid salmonella.
  - Shigella.
  - *Yersinia enterocolitica*.

Severe cases of *Yersinia enterocolitica* infection are treated with intravenous Ceftriaxone.

### Dose:

- 500 mg PO bid for 3-5 days. A single dose of 500 mg or 1 g is equally effective.

# Drugs

## **2. Co-trimoxazole:**

### **Indications:**

- Invasive and traveller's diarrhoea.
- Shigellosis.

### **Dose:**

- 1 double strength tablet PO BID for 3-5.

## **3. Erythromycin or Azithromycin:**

- It is indicated in patients with campylobacter infection.

# Drugs

## 4. Metronidazole:

### Indication:

- Mild to moderate cases of clostridium difficile. In severe cases use Vancomycin.
- Amoebiasis.
- Giardiasis.

**Dose:** 400 mg tablets PO TID for 5 days.

# Anti-emetic agents

- Prochlorperazine.
- Promethazine.
- Ondansetron.

# Anti-motility agents

- Loperamide.
- Diphenoxylate hydrochloride 2.5 mg/Atropine sulphate 0.025 mg.
- Bismuth subsalicylate.
- Octreotide.

# Prognosis

- Most cases of gastroenteritis are self-limited with an excellent prognosis.

# Prevention

## **A. Do:**

- Wash hands.
- Wash fruits and vegetables.
- Use alcohol-based hand sanitizers.
- Vaccination of children against rotavirus gastroenteritis.
- Use of prophylactic antibiotics among travellers.



# Prevention

## **B. Don'ts:**

- Drink unfamiliar fresh water.
- Eat shellfish served in unregulated environments.
- Eat raw shellfish, especially oysters.
- Cross-contaminate food.
- Eat raw or undercooked eggs or poultry.
- Use ice, raw fruits without skin or peel, raw vegetables, unpasteurized milk or dairy products and foods sold in the streets.
- Use moist foods served at room temperatures.

Thank you for your attention

# Reference

- Diskin A. Gastroenteritis.  
[www.emedicine.com/emerg/topic213.htm](http://www.emedicine.com/emerg/topic213.htm)  
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