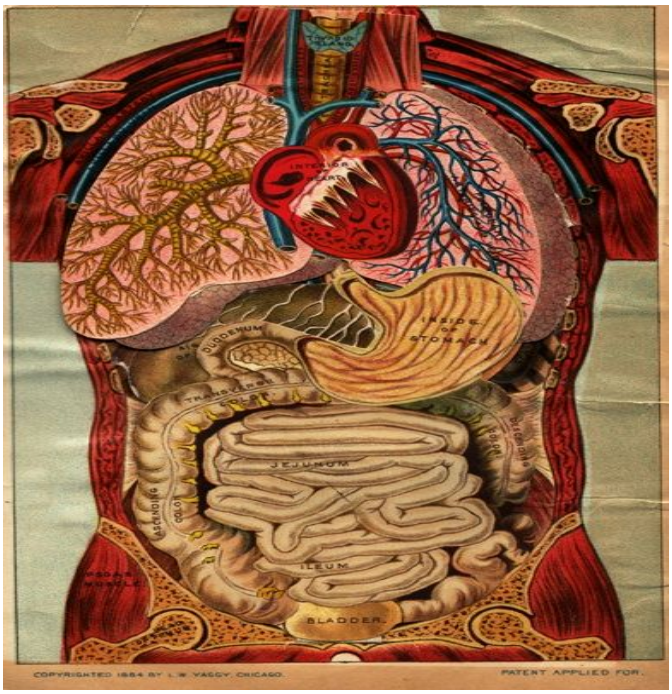
Diarrhea and Malabsorption



Objectives:

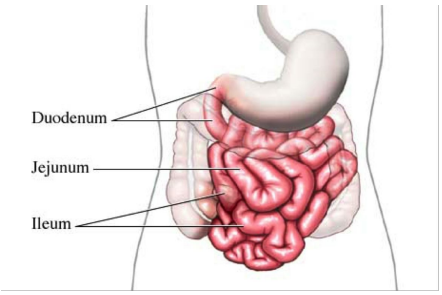
1. Define Malabsorption
2. Know the major malabsorption syndromes and its causes
3. Know the many organ systems affected by the consequences of malabsorption
4. Know the following aspects of celiac disease:

definition, pathogenesis, clinical features, pathology (gross and microscopic features), complications (T-cell lymphoma and GI tract carcinoma)

5. Know the cause and types of Lactose intolerance.

Important note: **Please check out this link before viewing the file to know if there are any additions or changes. The same link will be used for all of our work: Pathology Edit.**

Introduction just for Knowledge



Absorption of Nutrient:

Anatomy:

the digestion and absorption of foods usually take place in Stomach and small intestine through secretion of digestive enzymes that coming from : mouth , stomach , pancreas and small intestine .

Any problem in these structure can lead to malasporbion

Physiology.

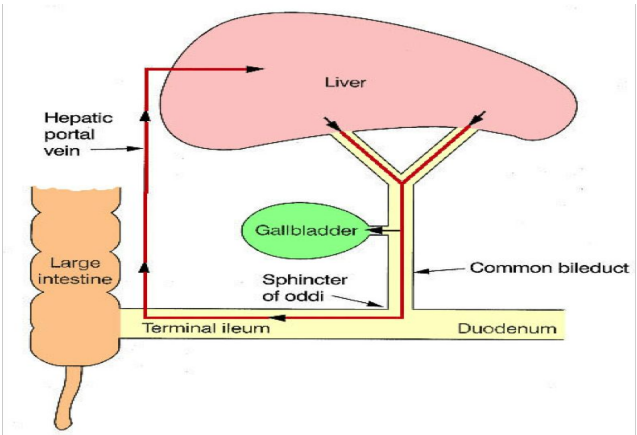
The main purpose of the gastrointestinal tract is to digests and absorbs nutrients (fat, carbohydrate, and protein), micronutrients (vitamins and trace minerals), water, and electrolytes.

Mechanisms of absorption

1) ***Intraluminal digestion,*** in which proteins, carbohydrates, and fats are broken down into absorbable forms;
2) ***Terminal digestion,*** which involves the hydrolysis of carbohydrates and peptides by disaccharidases and peptidases, respectively, in the brush border of the small intestinal mucosa;
(3) ***Transepithelial transport,*** in which nutrients, fluid, and electrolytes are transported across and processed within the small intestinal epithelium; and
(4) ***Lymphatic transport*** **of absorbed lipids.**

More than 70 % of almost 11 million child deaths every year are attributable to 6 causes:

- **1.Diarrhea**
- 2.Malaria
- 3.neonatal infection
- 4.Pneumonia
- 5.preterm delivery
- 6.lack of oxygen at birth.



Enterohepatic Circulation:
The bile that had been ejected by the gall bladder into the duodenal lumen is resorbed by the intestine and sent back to the liver through the portal vein. This cycle is called the "Enterohepatic Circulation".

Malabsorption is characterized by defective absorption of fats, (fat- and water-soluble vitamins), proteins, carbohydrates, electrolytes and minerals, and water. Presents most commonly as chronic diarrhea.

Malabsorption Syndrome[1]

- Inability of the intestine to absorb nutrients adequately into the bloodstream
- Impairment can be of single or multiple nutrients depending on the abnormality.

Mechanisms and Causes of Malabsorption Syndrome

1. Inadequate digestion
2. Deficient bile salt
3. Inadequate small intestine
4. Lymphatic obstruction

Pathophysiology

Inadequate digestion or Small intestine abnormalities = Malabsorption

1-Inadequate digestion	2-Small intestine abnormalities
Stomach: - **Postgastrectomy** - **Zollinger-Ellison syndrome** **Pancreas:** - Deficiency of pancreatic lipase - **Chronic pancreatitis** - **Cystic fibrosis** - Pancreatic resection **Bile:** - **Obstructive jaundice** - Bacterial overgrowth - Stasis in blind loops, diverticula[2] - Fistulas (abnormal connection between two spaces) - Hypomotility states (diabetes) - **Terminal ileal resection** - Crohn's disease - Precipitation of bile salts (neomycin)(antibiotic cause intreption in enterohepatic circulation)	**Mucosa:** - **Celiac disease (Most common)** - **Tropical sprue** - **Whipple's disease** - Amyloidosis(buildup of misfolded protein) - Radiation enteritis (is damage to the lining of the intestines caused by radiation therapy, which is a type of cancer treatment.) - Abetalipoproteinemia (is a rare autosomal recessive disorder that interferes with the normal absorption of fat and fat-soluble vitamins from food.) - **Giardiasis** (parasitic infection of SI) **Inadequate small intestine:** - **Intestinal resection** - **Crohn's disease**(a chronic inflammatory disease of the intestines,associated with ulcers and fistula) - Mesenteric vascular disease with infarction - Jejunoileal bypass (was a surgical weight-loss procedure) **Lymphatic obstruction:** - **Intestinal lymphangiectasia**(pathologic dilation of lymph vessels) - **Malignant lymphoma** - Macroglobulinemia

[1] is a set of medical signs and symptoms that are correlated with each other and, often, with a specific disease.

[2] an outpouching of a hollow (or a fluid-filled)

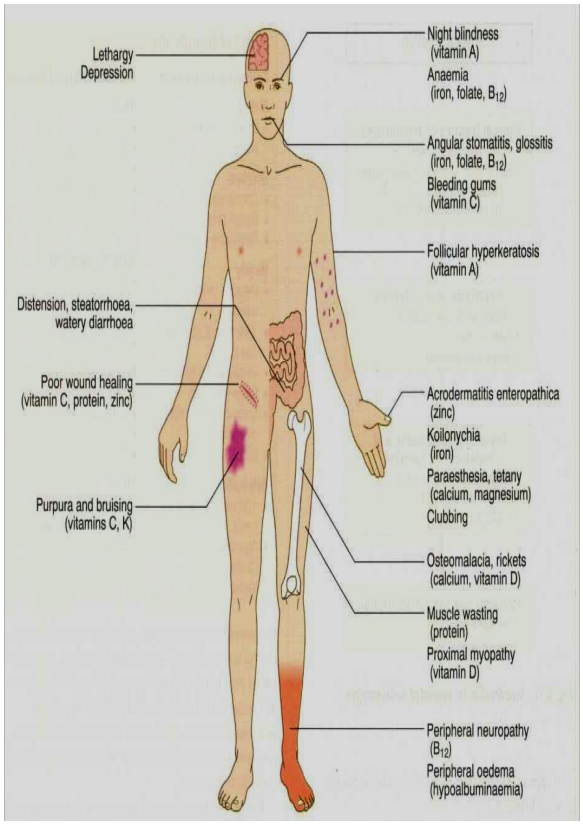
Clinical features

1- General :

- **Abnormal stools:**
  - There is increased fecal excretion of fat (steatorrhea).
  - Stools become **soft, yellow, malodorous**[3]**, greasy**[4] and floated at the top of the water in the toilet.
- **Failure to thrive or poor growth**(usually in children) in most but not all cases→ **Weight loss** despite increased oral intake of nutrients.
- Specific **nutrient deficiencies**, either singly or in combination.

2- Other that depend on the deficient nutrient:(see pic)

- **Protein → Swelling or edema , Muscle wasting.**
- **B12, folic acid and iron deficiency → Anemia (fatigue and weakness).**
- **Vitamin D, calcium → Muscle cramp, Osteomalacia and osteoporosis.**
- **Vitamin K and other coagulation factor → Bleeding tendencies**



Diagnosis

There is no specific test for malabsorption.

-Investigation is guided by symptoms and signs:

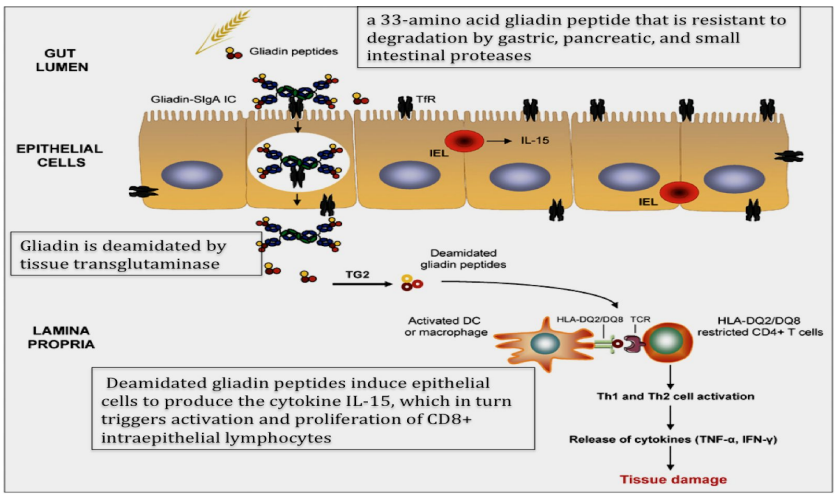
1. **Fecal fat study** to diagnose steatorrhoea
2. **Blood tests**
3. **Stool studies.** (it will be bulky and Frothy)
4. **Endoscopy** (Biopsy of small bowel)

[3] unpleasant smell

[4] oily دهني

Celiac disease (Gluten-sensitive enteropathy)

An immune reaction to gliadin fraction of the wheat **protein gluten** in genetically predisposed persons more in European white.
Usually diagnosed in childhood – mid adult.
Patients have **raised antibodies to gluten autoantibodies.**
Highly specific association with class II HLA DQ2 (95% of cases) and, to a lesser extent, DQ8 (5% of cases).



Pathophysiology:

- Gluten is digested by luminal and brush border enzymes into(amino acid,peptide and 33-amino acid gliadin peptide that is resistant to degradation).
- The pathogenic component is **gliadin.**

1-Once absorbed ,**gliadin** is deamidated by **tissue transglutaminase (tTG).**
2-Deamidated gliadin is presented → **Antigen presenting cells→ MHC class** 2
3-**CD4 T** cells produce **cytokines** that release matrix proteases causing cell death and degradation in the epithelial cells, resulting in the loss of the villous surface in the small intestine.

- This results in **impaired mucosal function and inability for absorption.**

Clinical features:

Symptoms begin at various times after the introduction of **foods that contain gluten;**

- **Wheat, barley, flour.**
- other grain,such as rice and corn flour **DO NOT HAVE** such effect.

1-Typical presentation:

- **GI symptoms** that characteristically appear at age **9-24 months.**(usually after starting to eat,after stopping breast feeding).

2-A relationship between the age of onset and the type of presentation:

Infants and toddlers: GI symptoms and failure to thrive(grow).
Childhood: minor GI symptoms, inadequate rate of weight gain.
Young adults: anemia is the most common form of presentation.
Adults and elderly: GI symptoms are more prevalent.

- GI symptoms in children→ abdominal distention and diarrhea.
- GI symptoms in adult→ chronic diarrhea and bloating.
- Small herpes like vesicles may arise in skin(dermatitis herpetiformis) → due to IgA deposition.

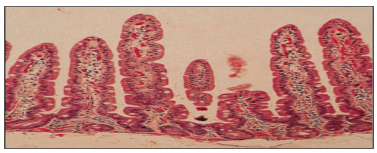
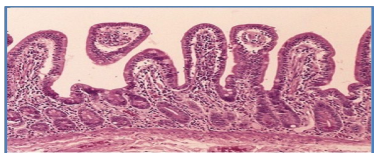
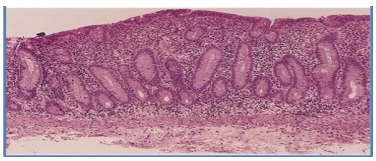
Investigation :

1-Endoscopy: (see pic)

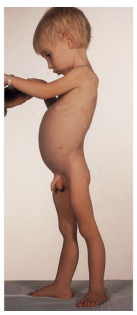
- It affect proximal part of GI (duodenum and first portion of jejunum)

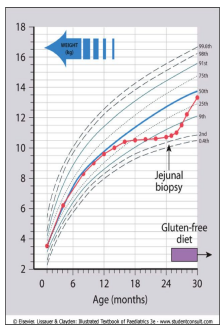
2-Histology:

1-Mucosa is flattened with marked villous atrophy.
2-Increased intraepithelial lymphocytosis.(more than 40 T-lymphocyte in 100 enterocyte is a diagnostic feature)
3-Crypt elongation,with increase of mitotic rate.

Normal	Subtotal villous atrophy	Total villous atrophy
		

Diagnosis





- **Clinical documentations** of malabsorption.
- **Stool** → ↑Fat
- **Serology** is +ve for IgA to tissue transglutaminase or IgG to deamidated gliadin or anti-endomysial antibodies
- **Small intestine biopsy** demonstrate villous atrophy.
- Improvement of symptom and mucosal histology on gluten withdrawal from diet.

Complications

- Osteopenia [5], osteoporosis
- Infertility in women
- Short stature, delayed puberty, anemia,
- Malignancies[intestinal T-cell lymphoma],
- 10 to 15% risk of developing GI lymphoma.

Differential diagnose

Tropical sprue→ Damage to small bowel due to unknown organism result in malabsorption.

Similar to celiac disease except :

1- History of visiting tropical region (Caribbean).
2-Arises after infectious diarrhea and respond to antibiotic.
3-Positive culture of bacteria.
4-Damage of villi is more prominent in jejunum and ileum,(duodenum less common).

[5] reduced bone mass

Lactose Intolerance

Low or absent activity of the enzyme lactase

Lactose —(lactase; At the brush border of enterocytes)→ **glucose + galactose → normal stool**

Pathophysiology

- Deficiency/absence of the enzyme lactase in the brush border of the intestinal mucosa → maldigestion and malabsorption of lactose (found in milk or milk products).
- Unabsorbed lactose draws water in the intestinal lumen.
- In the colon, lactose is metabolized by bacteria to organic acid, CO_2 and H_2; acid is an irritant and exerts an osmotic effect→ diarrhea

Causes

Inherited lactase deficiency	Acquired lactase deficiency
Congenital lactase deficiency **extremely rare**(autosomal recessive disorder) **Childhood-onset and adult-onset lactase deficiency** ● **Common** ● **Genetically programmed progressive loss of the activity of the small intestinal enzyme lactase.** Doctor explanation: It happens to people that use to live in big cities,but they don't have milk (milk in rural القرى areas).So children their only source of milk is breast feeding,after that they stop drinking as before or very less intake → there will be genetically programmed loss of activity of this enzyme,when they go back to rural area they find out they have lactose intolerance :).	● **Transient** ● **Secondary lactase deficiency due to intestinal mucosal injury by an *infectious, allergic, or inflammatory process*** (that causes downregulation of lactase gene expression،lactase is highly susceptible to injury,it's usually in the period where they are infected).

Clinical Feature:

Bloating[6], abdominal discomfort, and flatulence[7], explosive diarrhea.
1 hour to a few hours after ingestion of milk products.

Diagnosis

1-Empirical treatment with a lactose-free diet, which results in resolution of symptoms.

2-Hydrogen breath test: (hydrogen is normally produced from body but after metabolism we usually exhale Co2, but when bacteria ferment lactose→ produce hydrogen)

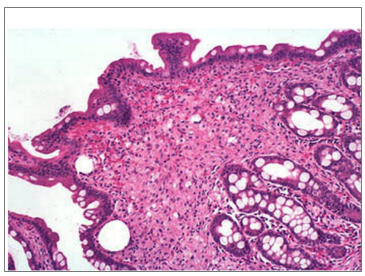
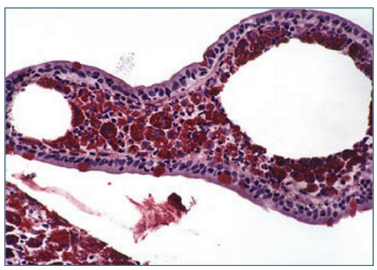
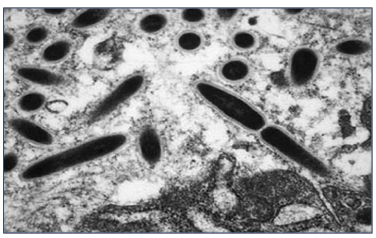
- An oral dose of lactose is administered
- The sole source of H_2 is bacterial fermentation.
- Unabsorbed lactose makes its way to colonic bacteria, resulting in excess breath H_2.
- Increased exhaled H_2 after lactose ingestion suggests lactose malabsorption.

3- A 3 week trial of a diet that is free of milk and milk products is a satisfactory trial to diagnose lactose intolerance (because it is a biochemical defect, biopsy is generally unremarkable).

Small bowel, Whipple disease (Mucosal disease)

Caused by a **gram-positive bacterium**, Tropheryma whippelii

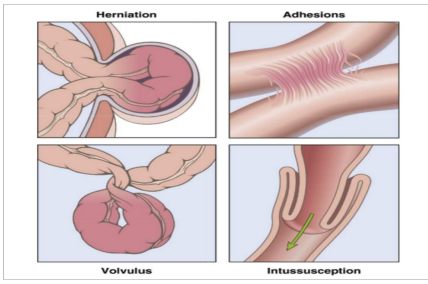
- **Whipple disease i**s a rare systemic infectious disease, it is characterized by macrophages loaded with Tropheryma whippelii organisms,present in there lysosome (PAS positive).
- **Classic site in small bowl** → primarily causes Malabsorption(caused by defect lymphatic transport,causing steatorrhea).
- **Other** common sites of infection include CNS, in joints(Arthritis),cardiac valves,lymph nodes.
- **Common in farmers.**

		
Numerous macrophages are seen throughout the lamina propria.(of small intestine)	A PAS stain highlights the cytoplasmic inclusions (staining them a deep red).	An electron micrograph reveals that these inclusions are rod-shaped bacilli.

[6] انتفاخ
[7] امتلاء البطن بالغازات

Intestinal Obstruction

- The small intestine is most often involves due to its small lumen, Hernias,adhesion,Intussusception and volvulus accounts for 80% of mechanical obstruction, while tumors and infarctions accounts for the 20% remained.



The clinical manifestations:

- ❏ Abdominal pain
- ❏ Distention
- ❏ Vomiting
- ❏ Constipation.

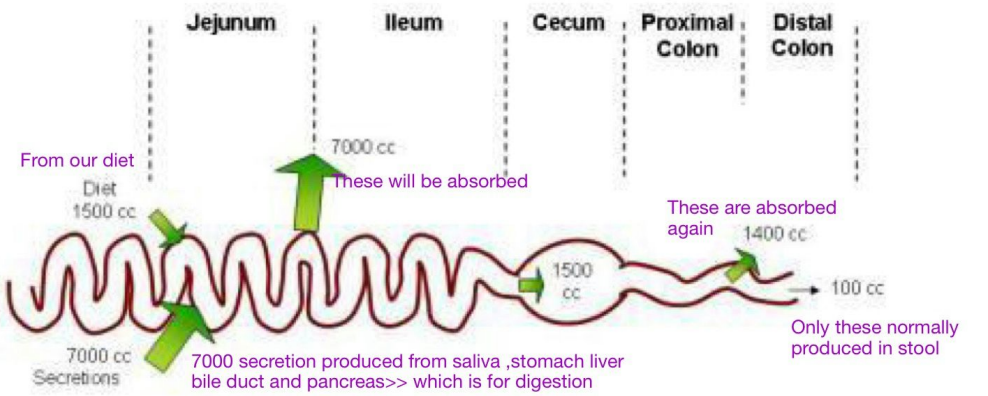
Herniation	Adhesion
If there is a structural weakness in the muscles and fibers that are part of the wall of the abdomen, a portion of the small intestine may protrude→ hernia → can become obstructed if it is trapped .In extreme cases, the pinched intestine also may "strangulate," meaning the blood supply is cut off.	Adhesions are areas of tough, fibrous connective tissue that are a type of scar. Develop on the outside of injured intestine as they heal after surgery or infection.
Volvulus	**Intussusception**
is an abnormal twisting of a segment of bowel around itself. This twisting motion typically produces a closed loop of bowel with a pinched base, leading to intestinal obstruction.These patients often have a history of chronic (long-lasting) constipation.	is a medical condition in which a part of the intestine invaginates (folds into) into another section of intestine. Result in obstruction and disruption of blood supply → infarction.

Treatment:

- ❏ Surgical intervention.

Diarrhea

Physiology of fluid and small intestine



Fecal osmolarity

Normal : fecal osmolality is equal to the serum osmolality i.e. -290 mosm/kg.

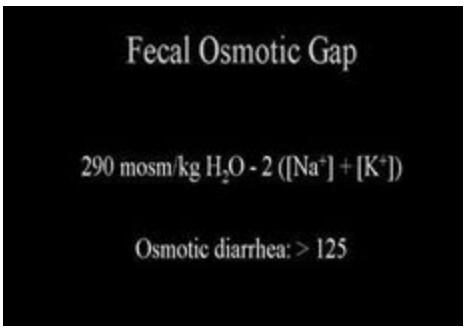
-Na+: 30 mmol/L

-K+:75 mmol/L

•Under normal circumstances, the major osmoles are Na^+ , K^+, Cl^-, and HCO_3^-

•Stool osmotic gap = **Stool osmolality- plasma osmolarity**

Stool osmolality - **2** x (**stool Na** + **stool K**)



Stool osmotic gap

•is a calculation performed to distinguish among different causes of diarrhea.

•A normal gap is between 50 and 100 mosm/kg.

•A low stool osmotic gap (<50 mosm/kg) → secretory diarrhea

that secreted sodium and potassium ions make up a greater percentage of the stool osmolality in secretory diarrhea,

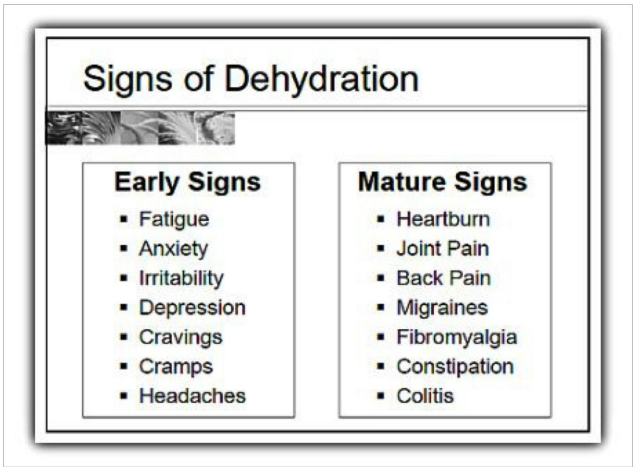
•A high gap (>125 mosm/kg) → osmotic diarrhea

in osmotic diarrhea, molecules such as unabsorbed carbohydrates are more significant contributors to stool osmolality.

DEFINITION

- is the condition of having at least three loose or liquid stools per day.
- Abnormally high fluid content of stool 200-300 gm/day.(normally 100 gm/day)

The loss of fluids through diarrhea can cause dehydration and electrolyte imbalances. Easy to treat but if untreated, may lead to death especially in children.



Complications

1. Dehydration, due to excess loss of fluid.
2. Electrolytes imbalance, due to loss of fluid & defective absorption of electrolytes.
3. Metabolic acidosis, due to low *Sodium bicarbonate* in blood.
4. Malnutrition If persistent.

CLASSIFICATION → based on duration

1.Acute (less than 2 weeks)
2.Persistent (2 to 4 weeks)
3.Chronic (over 4 weeks)

CLASSIFICATION → based on pathophysiology

Osmotic	Secretory
•**Excess amount of poorly absorbed substances that exert osmotic effect** > water is drawn into the bowels > diarrhea •Stool output is usually not massive •**Fasting improve the condition** •**Stool osmotic gap is high**, > **125 mOsm**/kg (**loss of hypotonic fluid)** **Causes :** ● **Malabsorption** in which the nutrients are left in the lumen to pull in water e.g. **lactose intolerance،celiac disease** ● **osmotic laxatives**[8]**.**(which work to alleviate constipation by drawing water into the bowels) ● **Hexitols** (poorly absorbed): sorbitol, mannitol, xylitol). ● 4-other : distention of the bowel. High-fructose foods	•There is an **increase in the active secretion of water** (or an inhibition of absorption.) •High stool output •**Lack of response to fasting** (continues even when there is no oral food intake) •**Stool osmotic gap < 100 mOsm/kg (isotonic)** **Causes :** ● ***The most common cause of this type of diarrhea is a bacterial toxin (E. coli , cholera) that stimulates the secretion of anions.*** ● **Other causes:** **–Enteropathogenic virus e.g**. rotavirus and norwalk virus **– Neuroendocrine tumours** (carcinoid tumor, gastrinomas) **–Rectal villous adenoma**

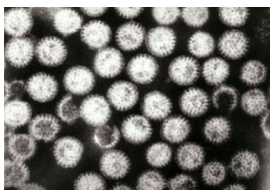
[8] ملين

Exudative (inflammatory)	Motility-related
•Results from the o**utpouring of blood protein**, or **damaged mucus** and **microvilli** from an inflamed or ulcerated mucosa. •**Presence of blood and pus in the stool**. mucus can be present •**Persists on fasting** **Causes :** ● **inflammatory bowel diseases such as** Crohn's disease or ulcerative colitis. ● **invasive infections** e.g. ***E. coli***, ***Clostridium difficile*** **and** ***Shigella.*** *(not only their toxins)* • •**Some bacterial infections** cause damage by invasion of the mucosa. → diarrhea with blood and pus in the stool caused by → **bacterial dysentery** .The main organisms are: ❑ •***Campylobacter*** invades mucosa in the jejunum, ileum and colon, causing ulceration and acute inflammation. ❑ •***Salmonella typhi, S. paratyphi*** *A, B,* and *C* ❑ •***Shigella*** **infections** are mainly seen in young children. ❑ •**Enteroinvasive and enterohemorrhagic *E. coli*.**	•Caused by the rapid movement of food through the intestines (hypermotility).Increased motility doesn't allow enough time for the intestinal content to be digested\absorbed → Presence of statoreaha and in the stool. -No inflammation in bowel mucosa. **Causes** ● **Irritable bowel syndrome (IBS)** – a motor disorder that causes abdominal pain and altered bowel habits with diarrhea predominating. ● **Carcinoid Syndrome** → Increased serotonin -It increases bowel motility.

Acute diarrhea

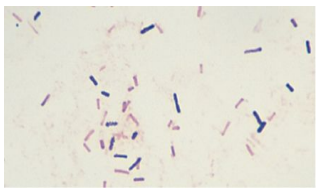
Aetiology

- **Infections** : 80% of cases (**viruses**, bacteria, helminths, and protozoa).

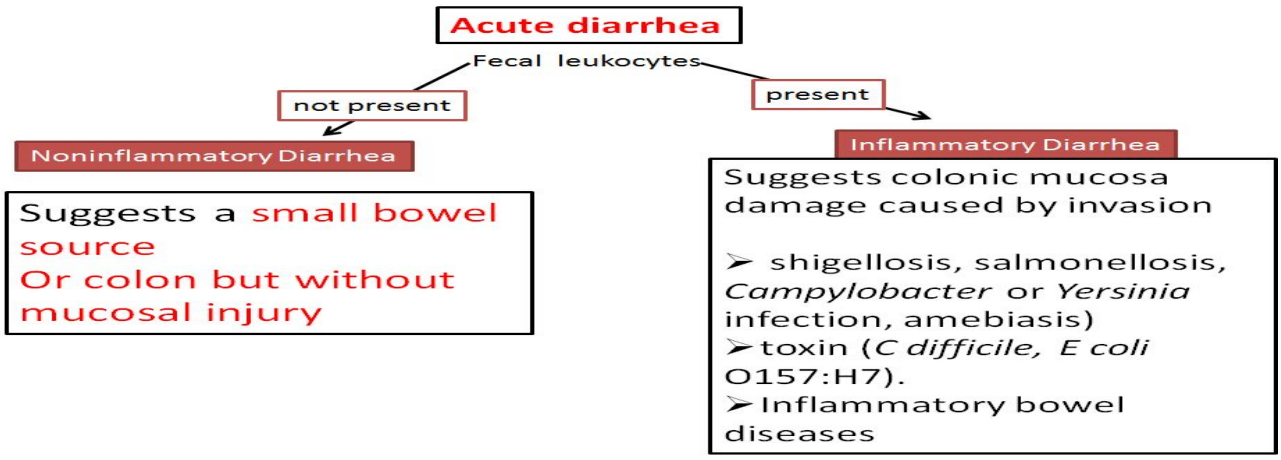


-Rotavirus The cause of nearly 40% of hospitalizations from diarrhea in children under 5 Rotaviruses cause 50% of infantile diarrhea Clinically person become dehydrated with electrolyte disturbance and low bicarbonate in blood

- **Food poisoning**
- **Drugs**
- **Antibiotic-Associated Diarrheas** : Diarrhea occurs in 20% of patients receiving **broad-spectrum antibiotics**(it will kill the bacteria for sure but also change normal flora → superinfection)**;** about 20% of these diarrheas are due to ***Clostridium difficile*** *(gram-positive rods)* Leading → **pseudomembranous colitis.** (mucosa will be covered by membrane → fibrinoid purulent exudate)

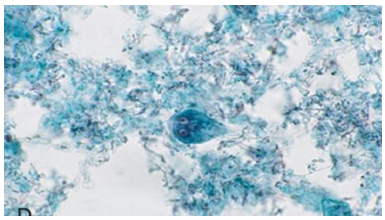


Tests



Chronic diarrhea

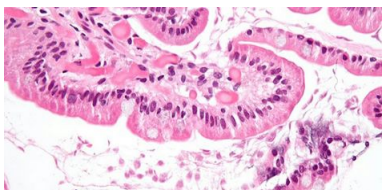
Aetiology



- **Infection**

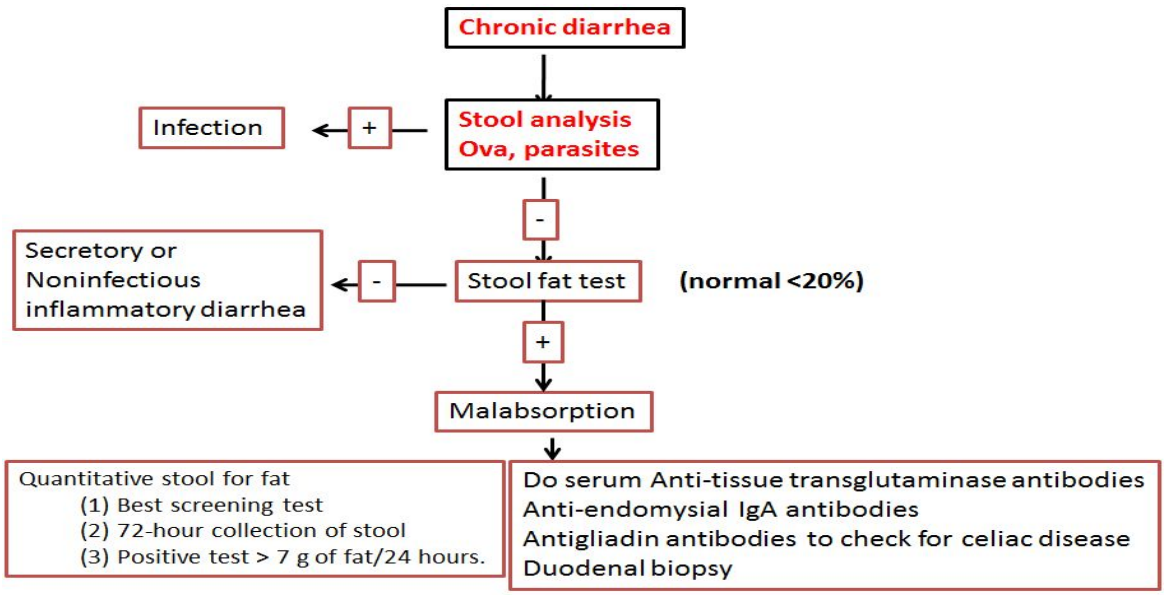
e.g. ***Giardia lamblia***.(Parasitic and protozoal infections affect over half of the world's population on a chronic or recurrent basis)

AIDS often have chronic infections of their intestines (caused by noninfectious species but because of their low immune) that cause diarrhea. Ex: Cryptosporidiosis→ a parasite (see pink pic)



- **Post-infectious** Following acute viral, bacterial or parasitic infections (ex:tropical sprue)
- **Malabsorption** (ex: Celiac disease)
- **Inflammatory bowel disease (IBD)**
- **Endocrine diseases** (ex: Carcinoid → excessive secretion of serotonin and Gastrinoma → excessive secretion of gastrin)
- **Colon cancer**
- **Irritable bowel syndrome**

Tests



Summary

Malabsorption = abnormal digestion or small intestinal mucosa

Lactose Intolerance

- **absent activity of the enzyme lactase**
- Bloating[9], abdominal discomfort, and flatulence[10], explosive diarrhea.
- 1 hour to a few hours after ingestion of milk products.
- **it can Inherited or lactase deficiency**

Celiac disease

- **An immune reaction to** gliadin fraction of the wheat **protein gluten**
- Patients have raised antibodies to gluten autoantibodies.
- Highly specific association with class II HLA DQ2 (95% of cases) and, to a lesser extent,

Define acute diarrhea and enumerate its common causes:

- **Less than 2 weeks**
- **infections (viruses, bacteria, helminths, and protozoa). Food poisoning**

Define chronic diarrhea and enumerate its common causes:

- **More than one month**
- **Infection, post Infection malabsorption, Inflammatory bowel disease (IBD), cancer.**

SUMMARY: TYPES OF DIARRHEA

TYPE	CHARACTERISTICS	CAUSES	SCREENING TESTS
Invasive Inflammatory	Pathogens invade enterocytes Low-volume diarrhea	*Shigella* spp. *Campylobacter jejuni*	Fecal smear for leukocytes: positive in most cases
	Diarrhea with blood and leukocytes (i.e., dysentery)	*Entamoeba histolytica*	Order stool culture & for O&P
Secretory	Loss of isotonic fluid High-volume diarrhea Mechanisms:Laxatives Enterotoxins stimulate Cl^- channels regulated by cAMP and cGMP	Laxatives: melanosis coli with use of phenanthracene laxatives Production of enterotoxins: *Vibrio cholerae* Enterotoxigenic *E. coli*	Stool osmotic gap < 50 mOsm/kg Fecal smear for leukocytes: negative
Osmotic	Osmotically active substance is drawing hypotonic salt solution out of bowel High-volume diarrhea No inflammation in bowel mucosa	Disaccharidase def. Giardiasis, Celiac Dis. Ingestion of poorly absorbable solutes	Fecal smear for leukocytes: negative Stool osmotic gap > 125 mOsm/kg
Motility-related	Rapid movement of food through the Intestines Serotonin increases bowel motility No inflammation in bowel mucosa	Irritable bowel syndrome (IBS) – a motor disorder Increased serotonin: carcinoid syndrome	 Increased 5-HIAA

[9] انتفاخ
[10] امتلاء البطن بالغازات

MCQ

1/A 16-year-old girl complains of chronic abdominal distention, flatulence, and diarrhea after drinking milk. Elimination of milk and other dairy products from the patient's diet relieves these symptoms. This example of malabsorption is caused by a functional deficiency of which of the following enzymes associated with the intestinal brush border membrane?
(A) Disaccharidase.
(B) Glycogenphosphorylase.
(C)Hyaluronidase.
(D)Mannosidase.
(E) Sphingomyelinase.

ans:A

2/A 4-year-old girl is brought to the physician because her parents noticed that she has been having pale, fatty, foul-smelling stools. The patient has short stature. Her symptoms respond dramatically to a gluten-free diet. Which of the following is the most likely diagnosis?
(A) Celiac disease
(B) Cystic fibrosis of the
(C)Ménétrier disease
(D) Tropical sprue

Ans:A

3/ A 30-year-old woman presents with 2 days of abdominal cramping and diarrhea. Her temperature is 38°C (101°F), Stool culture shows a toxigenic Escherichia coli infection. Which of the following best explains the pathogenicity of this organism in this patient?
(A) Destruction of Peyer's patches
(B) Invasion of the mucosa of the colon
(C) Invasion of the mucosa of the ileum
(D) Stimulation of acute inflammation in the superficial bowel mucosa
(E) Stimulation of fluid transport into the lumen of the intestine

Ans:E

4/A 1-year-old girl is brought to the emergency room by her parents who report that she had a fever and diarrhea for 3 days. The child's temperature is 38°C (101°F). The CBC shows a normal WBC count and increased hematocrit. Which of the following microorganisms is the most likely cause of diarrhea in this young child?
(A) Cytomegalovirus
(B) Rotavirus
(C) Salmonella typhi

(D) Shigella dysenteriae

Ans:B

5/A 53-year-old woman complains of acute diarrhea and severe abdominal pain. She was recently treated with broad-spectrum antibiotics for community-acquired pneumonia. A CBC shows increased WBC count. The patient subsequently develops septic shock and dies. A portion of her colon is shown at autopsy. These findings are typical of which of the following gastrointestinal diseases?
(A) Crohn disease
(B) Diverticulitis
(C) Ischemic colitis
(D) Pseudomembranous colitis

Ans:D

SAQ's

Scenario 1

A 44 year-old man is admitted to the hospital with an acute upper GI bleed due to several gastric and duodenal ulcers seen on endoscopy. The patient also complains of a 1 year history of frequent non-bloody diarrhea. A fecal osmotic gap is very low.

1/What type of chronic diarrhea does this patient have?
Secretory.

2/What is the most likely cause?
Zollinger-Ellison syndrome due to gastrinoma.

3/What is the mechanism to explain the diarrhea?
Acid inactivation of pancreatic enzymes and bile salts.
Excess intestinal fluid.

4/What blood test can you check to make the diagnosis?
Gastrin level.

Scenario 2 :

•A 10-month-old, previously healthy male infant develops a severe, watery diarrhea 2 days after visiting the pediatrician for a routine checkup. The most likely diagnosis is

a. **Rotavirus infection**

b. Enterotoxigenic *E. coli infection*

c. *Entamoeba histolytica infection*

d. Lactase deficiency

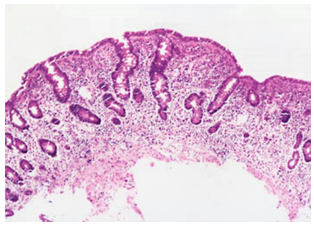
e. Ulcerative colitis

Scenario 3 :

A 44-year-old white male presented with a seven-month history of diarrhea. The frequency of his bowel movements had increased to 5-7 per day, and his stools were yellow and floated at the top of the water in the toilet. He had occasional abdominal cramping, but no tenesmus, melena, or bleeding. His appetite was good, but he had experienced gradual weight loss. His bowel movement frequency would decrease upon fasting and would increase with food intake. Stool tests revealed increased stool output with fat excretion of 17 g/d (nl <5 g/d).

Microscopic examination for ova and parasites and cultures for bacterial pathogens and acid-fast bacilli were negative.
Blood testing showed mild anemia , hypoproteinemia (4.9 mg/dL), and hypoalbuminemia (3.4 mg/dL).

Duodenal biopsy:



•Exposure to what dietary antigen is thought to be the cause of these changes?
Exposure to gluten (specifically, the gliadin constituent of this protein)

•What food components contain this antigen?
Wheat, barley, flour, and possibly oats contain gluten.

Would these histologic changes resolve with dietary modification?
Yes.

Scenario 4

A 6-year-old boy has been brought to outpatients by his mother because he has abdominal pain after some meals. This has been getting increasingly frequent and it sounds, from his description, somewhat colicky (a form of pain which starts and stops abruptly.) in nature. You discover that he has always had very smelly, loose, pale bulky stools, which his parents have put down to the fact that he likes milk. On examination, he is pale, underweight, and of short stature.

1. What are the important differential diagnosis on presentation?
Celiac disease is the most likely diagnosis. Parasitic infection (e.g. giardiasis) and pancreatic insufficiency (e.g. due to chronic pancreatitis or cystic fibrosis) may give rise to a similar presentation, but these are not supported by the results of the investigations.

2**. Blood tests reveal a mild macrocytic anemia. There is a low level of vitamin B12, and folate is at the lower end of normal. Autoantibody screens reveal a positive reaction to anti-gliadin antibodies. Do these tests help to narrow down**

the diagnosis?
These results are very suggestive of celiac disease due to the low levels of vitamin B^{12} and the hypersensitivity reaction to α-gliadin, a component of gluten. The finding of villous atrophy would support the diagnosis, and this is achieved by endoscopic biopsy of the first part of the duodenum.

•The final diagnosis is celiac disease, provided the patient's symptoms respond to a gluten-free diet and the histological changes relapse on re-challenge. Such criteria are necessary before confining a patient to a lifelong gluten-free diet.

3. What treatment options are available?
Treatment is by adhering to a strict gluten-free diet.

For any suggestions or questions please don't hesitate to contact us on:
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GOOD LUCK !!

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