GASTROINTESTINAL SYSTEM

Major Symptoms of the Gastro-intestinal Tract Disorders (GIT):-

I. Anorexia
II. Dysphagia
III. Regurgitation
IV. Vomiting
V. Diarrhea
VI. Functional Constipation
VII. Acute Abdominal Pain
VIII. Gastrointestinal Bleeding
IX. Abdominal Distention And Abdominal Masses

I. Anorexia:

Hunger and satiety centers are located in the hypothalamus; it seems likely that afferent nerves from the (GIT) to these brain centers are important determinants of the anorexia that characterizes many diseases of the stomach and intestine as well as extra-intestinal systemic disorders.

II. Dysphagia:

Dysphagia, or difficulty swallowing, may be caused by a structural defect or motility disorder. Structural defects that cause a fixed obstacle to the food bolus arise from narrowing within the esophagus, as from a stricture, web, or tumor. Extrinsic obstruction is most often caused by a vascular ring. Structural defects typically cause more problems in swallowing solids than liquids. Most nonstructural causes of dysphagia are caused by motility abnormalities of the oropharynx or the esophagus.

III. Regurgitation:

Regurgitation is the effortless movement of stomach contents into the esophagus and mouth. Infants with regurgitation are often hungry immediately after an episode. It is a result of gastroesophageal reflux through an incompetent or, in infants, immature lower esophageal sphincter. Regurgitation should be differentiated from vomiting, which denotes an active reflex process with an extensive differential diagnosis.

IV. *Vomiting:*

Violent descent of the diaphragm and constriction of the abdominal muscles with relaxation of the gastric cardia actively force gastric contents back up the esophagus. This process is coordinated in the medullary vomiting center, which is influenced directly by afferent innervation and indirectly by the chemoreceptor trigger zone and higher central nervous system (CNS) centers. Differential diagnosis:-

V. Diarrhea:

Definitions:

It is defined as excessive loss of fluid and electrolyte in the stool.

1- Acute watery diarrhea: Passage of liquid (or watery stools) three or more times in 12 hours or single soft or watery stool containing blood, mucus or pus.
2- Dysentery: (small-volume, frequent bloody stools with mucus, tenesmus, and urgency) is the predominant symptom of colitis.
3- Persistent diarrhea: is defined as episodes that began acutely but last for at least 14 days.
4- Chronic diarrhea: prolonged course and started gradually (e.g. malabsorption syndromes)

Approach to a child with diarrhea:

I. History:

- Age (Type of weaning food & type of dehydration)
- Onset & Duration (Acute or persistent)
- Frequency in 24 hours (To prove diarrhea, follow-up)
- Consistency: (soft or watery)
- Blood in the stools (Dysentery)
- Associated manifestations: cough, fever, vomiting etc
- Diet (breast feeding, artificial feeding, weaning food)
- Dehydration (irritability, thirst, decreased urine output)
- Vaccinations (completed or not)
- Drugs (may cause lethargy, ileus)

II. Examination:

- Body weight
- Temperature
- Signs of dehydration
- Systemic examination

III. Stool Examination

What are the **complications** of diarrhea?

1- Dehydration: shock, pre-renal failure, disseminated intravascular coagulopathy
2- Electrolyte & PH disturbance: hypo or hyperkalemia, hypo or hypernatremia, acidosis and hypocalcaemia
3- Persistent diarrhea leads to protein energy malnutrition (PEM)
4- Convulsions: febrile, hypo or hypernatremia, CNS hemorrhage

Treatment:

The broad principles of management of acute diarrhea in children include oral rehydration therapy, enteral feeding and diet selection, zinc supplementation and drugs (antibiotic in GE)

Prevention:

- Promotion of exclusive breast-feeding
- Improved complementary feeding practices
- Rotavirus immunization
- Improved water and sanitary facilities and promotion of personal and domestic hygiene

Drugs used in treatment of diarrhea and its hazards:

1- Antimicrobials

Indications:

a) Bloody diarrhea
b) cholera
c) Associated bacterial infections
- Trimethoprim- Sulfamethoxazole (10 - 50 mg/kg) for 5 days
- Metronidazole for trophozoite (Giardiasis 15 mg/kg, 30 mg, for amoebiasis) for 10 days

2- Antidiarrheals (not effective)

a) Constipating drugs
b) Antimotility drugs

Hazards:

- May cause ileus; parasympatholytic action.
- Risk factor for prolongation of diarrhea.
- Increases the chance of toxemia.

Vomiting with diarrhea why and how to deal?

- Vomiting is due to (acidosis, hypokalaemia and hypovolemia)
- Antiemetics are not effective as it act peripherally
- Vomiting may be stopped;
  i. Spontaneously
  ii. After correction of dehydration by ORS
  iii. If persistent give ORS by Nasogastric tube or IVF

Indications for intravenous fluids in the episode of acute diarrhea::

1- Severe dehydration
2- Paralytic ileus
3- Glucose intolerance
4- Protracted vomiting

What are the risk factors for persistent diarrhea?

1- Young age less than 18 months
2- Artificial feeding
3- Malnutrition
4- Lowered immunity
5- Withholding of food during the acute attack
6- Abuse of drugs (antibiotics, constipating drugs)

How would you manage a case with persistent diarrhea?

Hospitalization if:

1- Younger than 6 months
2- Any degree of dehydration
3- Associated other severe infections e.g. viremia
4- Failure of home management
5- Presence of PEM

Lines of treatment:

a. Diet: Breast-feeding
b. Low or lactose free formula
c. Drugs: According to the condition
d. Vitamins and minerals (Folate, vitamin A, Zinc, Mg+, copper and iron)

Dehydration:

Loss of body fluids and electrolytes through:

1- Stools 2- Vomitus 3- Urine 4- Lack of food and fluid intake

Degree of Dehydration:

- Minimal or no dehydration (< 5 % in an infant; < 3 % in an older child or adult)
- Mild to moderate dehydration (5–10 % in an infant; 3–6 % in an older child or adult)
- Severe dehydration (>10 % in an infant; > 6 % in an older child or adult)

Types of Dehydration: The serum sodium concentration determines the type of dehydration:

- Isotonic (serum Na+ 130 – 150 mEq/L)
- Hypotonic (serum Na+ < 130 mEq/L)
- Hypertonic (serum Na+ > 150 mEq/L)

Symptoms Associated with Dehydration:

Symptom	Minimal Or No Dehydration	Mild To Moderate Dehydration	Severe Dehydration
Mental status	Well; alert	Normal, fatigued or	Apathetic, lethargic, unconscious

Symptom	Minimal Or No Dehydration	Mild To Moderate Dehydration	Severe Dehydration
		restless, irritable	
Thirst	Drinks normally; might refuse liquids	Thirsty; eager to drink	Drinks poorly; unable to drink
Heart rate	Normal	Normal to increased	Tachycardia, with bradycardia in most severe cases
Quality of pulses	Normal	Normal to decreased	Weak, thready, or impalpable
Breathing	Normal	Normal; fast	Deep
Eyes	Normal	Slightly sunken	Deeply sunken
Tears	Present	Decreased	Absent
Mouth & tongue	Moist	Dry	Parched
Skin fold	Instant recoil	Recoil in <2 sec	Recoil in >2 sec
Capillary refill	Normal	Prolonged	Prolonged; minimal
Extremities	Warm	Cool	Cold; mottled; cyanotic
Urine output	Normal to decreased	Decreased	Minimal

From: Department of Health and Human Services, Centers for Disease Control and Prevention: Diagnosis and management of food-borne illnesses. MMWR 2004:52; 5.

Observe:

- Pulse for signs of shock (weak & rapid)
- Consciousness (improved or still cloudy)
- Other signs (Weight, eyes, skin, urine)

VI. Functional Constipation

Definition: Delay or difficulty in defecation present for 2 wks or longer.

Clinical Manifestation:

1 - Starts after the neonatal period (usually after 2 yr of age)
2 - Daytime encopresis (fecal soiling of the underwear) is common.
3 - Physical examination:- Large volume of stool palpated in suprapubic area
4 - Rectal examination:- Stools in the ampulla & normal anal tone
5 - Recurrent UTi: In refractory patients special investigations should be done:
- Hypothyroidism.
- Hypocalcaemia.
- Celiac disease.
- Lead toxicity.

6 -Presence of hair tuft over the spine, spinal dimple, or failure to elicit a cremasteric reflex is suggestive of spinal pathology

Investigation:

1 Anorectal manometry: Distension of rectum causes relaxation of internal sphincter.
2 Rectal biopsy: Normal.
3 Barium enema: large amount of stools & no transition zone.

Treatment:

1- Patient education. 2- Softening of stool.
3- Regular bowel training program include sitting on toilet for 10 -15 minutes after meal.

4- Enema if impaction is present: maintenance therapy is generally continued until regular bowel pattern established for several months.
5- Children with spinal problems (low volume fluid through a cecostomy tube).

VII. Acute Abdominal Pain

- Important **causes of acute abdominal pain** potentially **requiring surgery** "acute abdomen":

- Intestinal obstruction due to malrotation and volvulus, intussusception, strangulated hernia, or adhesions
- Appendicitis, Meckel's diverticulitis, or an abdominal abscess
- Rupture of the spleen or other organ due to trauma

- Important causes of acute abdominal pain **not requiring surgery:**

- Enteritis
- Fecal impaction
- Hepatitis
- Pancreatitis
- Urinary tract infection or urinary calculi
- Extra-abdominal causes, such as pneumonia, osteomyelitis, and acute neurologic processes

Definitions:

- **Hematemesis**: vomiting of bright red or coffee – ground blood; due to bleeding above the ligament of Treitz.
- **Melaena**: defined as passage of black, soft, tar- like stools; owing to the presence of blood altered by G.I. juices.
- **Hematochezia**: passage of bright red stools denoting fresh blood originating usually from the colon.
- **Occult gastrointestinal bleeding**: Stools containing blood but not detected by naked eye as the color and texture of the stools are not changed.

VIII. Abdominal Distention and Abdominal Masses:

Enlargement of the abdomen can result from diminished tone of the wall musculature or from increased content: fluid, gas, or solid. **Ascites,** the accumulation of fluid in the peritoneal cavity, revise the chapter of liver disorders.

IX. Jaundice: revise the chapter of the liver disorders.

Esophagus

I. Esophageal Atresia & Tracheo-esophageal Fistula:

50% of cases have associated anomalies ⇨**VACTERL**
(**V**ertebral, **A**norectal, **C**ardiac, **T**rachea, **E**sophagus, **R**enal, **L**imbs)

Types:

1- The upper esophagus end in blind pouch and trachea-esophageal fistula (TEF) is connected to the distal esophagus.
2- Pure esophageal atresia
3- H-Type TE fistula

Presentation:

1- Frothing and bubbling at mouth & nose in neonate
2- Episodes of coughing, cyanosis & respiratory distress.
3- Feeding increase these symptoms causes regurgitation & aspiration from blind upper pouch
4- H- type fistula present later in life with: Chronic respiratory problems**:** Bronchospasm & recurrent pneumonia

Diagnosis:

1- Prenatally: polyhydramnios.
2- Inability to pass nasogastric or orogastric tube in newborn with respiratory distress.
3- Lateral radiograph: **Nasogastric tube coiled in the proximal part of esophagus and or air distended stomach indicate the presence of TEF.**
4- Pure esophageal atresia present airless scaphoid abdomen.

Diagnosis of H-type fistula:

1- Esophagogram: with contrast injected under pressure.
2- Bronchoscopy.
3- Endoscopy: Methylene blue dye injected into endotracheal tube during endoscopy is observed in the esophagus during forced inspiration.

Treatment:

1- Maintain patent airway
2- Prone position
3- Operative:
Surgical ligation of TEF and primary end to end anastomosis of the esophagus.

II. Lower esophageal Sphincter (LES) Dysmotility (Achalasia)

- Loss of LES relaxation & loss of esophageal peristalsis.
- Lead to functional obstruction of distal esophagus.

Clinical picture:

1- Dysphagia for solid & liquid
2- Undernutrition
3- Esophagitis due to retained esophageal secretion
4- Respiratory symptoms

Investigations:

1- Chest radiograph: air fluid level in a dilated esophagus
2- Barium esophagogram: Dilated esophagus and narrowing of (LES) and smooth tapering of lower esophagus, Bird's beak.
3- Manometry: Confirm the diagnosis.

Treatment:

1- Pneumatic dilatation
2- Surgical {Hellar} myotomy
3- Calcium channel blockers e.g. Nifedepine
4- Endoscopic injection of LES with botulinium toxin.

Stomach

I. Hiatal hernia

Definition: Herniation of stomach through esophageal hiatus**.**

Types:

1- Sliding hernia (common) 80% gastroesophageal junction slides into the thorax

2- Paraesophageal: fundus is insinuated inside gastroesophageal junction of the hiatus
3- Mixed type

II. Gastro Esophageal Reflux Disease (GERD)

***Definition*:** Retrograde movement of gastric contents across the lower esophageal sphincter into the esophagus.

It may be:

- Physiologic i.e. regurgitation in normal infants.
- Pathologic (GERD) in children episodes are more frequent or persistent and produce esophagitis or esophageal symptoms or respiratory complication.

Pathophysiology:-

Factors determining the esophageal manifestation of the reflux include:-duration of esophageal reflux. Transient LES relaxation is the major primary mechanism allowing reflux to occur.

Clinical Picture:

Infants:

1- Regurgitation especially postbrandially.
2- Signs of esophagitis:
   - Irritability – Arching – Choking – Gagging - Feeding aversion
3- Failure to thrive
4- Extra esophageal: Obstructive apnea - Stridor

Older children:

1- Regurgitation during pre school years.
2- Chest & abdominal pain.
3- Extra esophageal:
   - Asthma - Otolaryngologic disease - Laryngitis or sinusitis

Diagnosis: history and examination

***Differential diagnosis*: (**of recurrent vomiting)

1- Milk and other food allergy
2- Pyloric stenosis
3- Intestinal obstruction
4- Non esophageal inflammatory disease
5- Infection
6- inborn errors of metabolism
7- Hydrocephalus & increase I.C.T
8- Rumination & bulimia

Investigations:

1- Barium radiography study. To evaluate; achalasia, esophageal stricture, stenosis, hiatal hernia and gastric outlet or intestinal obstruction.
2- Esophageal pH monitoring: to assess the efficacy of acid suppression.
3- Endoscopy: to diagnose erosive esophagitis, complication as stricture and therapeutically to dilate reflux induced strictures.
4- Bronchoscopy: for extra esophageal GERD.

Management:

1- Dietary measures:

- ***Infants:***
  - Normalization of feeding techniques, volumes, & frequency if abnormal.

- Thickining of formula with table spoon rice, cereal per ounce of formula to decrease regurgitation episodes.
- Greater caloric density (30kcl/oz).
- Short trial of hypoallergenic diet to exclude milk or soy protein allergy.

- ***Older children:***
  - Avoid acid food (tomato, chocolate, milk).
  - Avoid beverages (juices, carbonated, caffeinated drinks).
  - Weight reduction for obese.

2- Positioning:
  - Prone position. - Head elevation.

3- Pharmacotherapy:
  - Antacid but not for long term.
  - Histamine 2 receptor antagonist (H2RAs) for mild and moderate cases.
  - Proton pump inhibitor (PPI) 0.7-3.3 mg/kg/day for severe cases.
  - Therapy for GERD must be intense (PPI) and prolonged 3-6 mo.

4- Surgery: Fundoplication

Complications of GERD:

1- Esophageal:
  - Esophagitis as previous, Stricture. - Site: located in distal esophagus.
  - Clinically: dysphagia.
  - Treatment: repeated esophageal dilatation & often fundoplication.
  - Adenocarcinoma.

2- Nutritional:
  - Esophagitis & regurgitation may induce failure to thrive.
  - Nasogastric feeding sometimes required.

3- Extra esophageal respiratory (Atypical) presentation:
  - Unexplained or refractory otolaryngologic and respiratory complaints.
  - Many children with extraoesophageal manifestation haven't typical GERD symptoms.

4- Others:

a) Obstructive apnea:
  - Stridor in infants - Spasmodic croup

b) Reflux laryngitis and other otolaryngologic disease:
  - Are now widely attributed to GERD.
    Hoarseness, voice fatigue, chronic cough, pharyngitis, sinusitis, and otitis media.

c) Asthma: due to GERD in
  - Those with symptoms of reflux disease.
  - Those with refractory or steroid dependant asthma.
  - Those with nocturnal worsening.

d) Dental erosions.

III. Hypertrophic Pyloric Stenosis

Incidence:

Males affected 4 times than female.

Etiology:

1- Abnormal muscle innervations.
2- Pyloric stenosis has been associated with esinophilic gastroenteritis.
3- Erythromycin & IV prostaglandin may be associated with development of pyloric stenosis.

Clinical Manifestation:

1- Non bilious vomiting:
  a) May or may not be projectile.

b) May follow each feeding or intermittent.
c) Usually progressive.
d) Usually start after 3 weeks of age but may develop early at 1st week or late at 5th month.

2- Jaundice seen in 5% of affected cases.
3- Palpating pyloric mass.

Diagnosis:

1- Ultrasound confirm the diagnosis.
2- Barium studies.
3- Alkalosis and Hypokalemia

Differential diagnosis:

1- Duodenal stenosis. Pyloric mass in physical examination in pyloric stenosis (DD by U.S).
2- GERD with OR without a hiatal hernia (DD by radiograph).
3- Gastroenteritis; vomiting & diarrhea.
4- Adrenal insufficiency: absence of metabolic acidosis and elevated serum potassium.
5- Inborn error of metabolism with alkalosis OR acidosis and lethargy, coma, or seizure.

Treatment:

1- Preoperative:
- Fluid therapy should be continued until infant is rehydrated.
- Correction of alkalosis is essential to prevent postoperative apnea.

2- Surgical:
- Ramsted + pyloromyotomy
- Endoscopic ballon dilatation in infants with persistent vomiting.

Congenital Aganglionic Megacolon (Hirschsprung Disease)

Caused by: abnormal innervation of bowel beginning in the internal anal sphincter and extending proximally to involve variable length of gut

Pathology:

- The aganglionic segment is limited to: Rectosegmoid 75 %.. Entire colon 10 %
- Total bowel aganglionosis is rare - Usually Sporadic
- Dominant & Recessive patterns of inheritance in family group

Clinical Manifestations:

A) Newborn

1 . Symptoms begin at birth with delayed passage of meconium which passes within 48 hr of birth in 99 % of full term infants.
2 . Abdominal distension
3 . Failure to thrive and hypoprotienaemia from protein losing enteropathy
4 . Formula fed infants suffer more than breast fed infants

B) Older children

Dilatation of proximal bowel & abdominal distension due to failure to pass stool. Stasis allows proliferation of bacteria which may lead to enterocolitis with associated sepsis & signs of bowel obstruction.

Examination:

Abdominal examination: Large fecal mass palpable in the left lower abdomen.
PR examination: Empty rectum + normal anal tone.

Differential diagnosis:

• *Neonates*

- Meconium plug syndrome.

- Meconium ileus.
- Intestinal atresia.

Diagnosis:

1 - Anorectal manometry: Measure the pressure of the internal anal sphincter. While a balloon is distended in the rectum, no sphincter relaxation OR paradoxical increase in pressure.

2 - Rectal biopsy: Large numbers of hypertrophied nerve bundles. Stain +ve for acetylcholinesterase with absence of ganglion cells.

3 - Barium enema: Transition Zone; the aganglionic distal segment is narrow with distended normal ganglionic bowel.

Treatment*:* surgical intervention.