CHAPTER IX
PDL 101 HUMAN ANATOMY &
PHYSIOLOGY

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DIGESTIVE SYSTEM

INTRODUCTION

It is the system used to describe the alimentary canal some accessory organs and a variety of digestive processes which takes place at different levels in the canal to prepare food eaten in the diet for absorption.

- It begins at mouth passes through the thorax, abdomen and pelvis and ends at anus.

- It releases its nutrients like amino acids mineral salts fat and vitamins for absorption.

- Enzyme also plays a role in absorption

- The activities in the digestive system can be grouped under five main headings.

1. **Ingestion**: taking food

2. **propulsion**: movement of food

3. **digestion**: consists of mechanical breakdown & chemical digestion

4. **absorption**: passage of food i.e, digested food to blood and lymph capillaries.

5. **elimination**: process of excretion in the form of faeces

ORGANS OF DIGESTIVE SYSTEM

**Alimentary tract**: it consists of mouth pharynx oesophages stomach small intestine large intestine rectum and anal canal.

**Accessory organs**: It consists of 3 pairs of salivary glands.

- Pancreas
- Liver and the biliary tract
The walls of alimentary tract formed by four layers of tissues. They are
1. adventitia or outer covering
2. muscle layer
3. submucosal layer
4. mucosa lining

**ADVENTITIA:** in thorax consists of fibrous tissue and covered by peritoneum.

**PERITONEUM:** largest serous membrane of the body consists of serous fluids
- supplied with blood and lymph.
- consists of two layers parietal layer and visceral layer.

**MUSCLE LAYER:** consists of smooth muscle blood supply is there and also lymph and nerves are present.

**SUBMUCOSAL LAYER:** it is a connective tissue with fibres

**MUCOUS MEMBRANE:** consists of squamous epithelium. The secretion include saliva gastric juice intestinal juice pancreatic juice bile.
- these are digestive juice and breaks the food.

**NERVE SUPPLY:** parasympathetic supply-cranial nerves, vagus nerves.
Sympathetic supply-numerous nerves these form plexus and carry to alimentary tract.

**BLOOD SUPPLY:**

**arterial blood supply:**
- in thorax oesophagels arteries in abdomen and pelvis supplied by unpaired branches from the aorta.
- left gastric artery
- splenic artery
- hepatic artery

Venous drainage - from oesophages to the left gastric vein.

Abdomen and pelvis - drains to internal iliac veins.

**MOUTH:**

- Is bounded by muscle and bones
  - Anteriorly - by the lips
  - Posteriorly - continuous with oesopharynx
  - Laterally - muscle of cheeks
  - Superiorly - by bony hard palate and muscular soft plate.
  - Inferiorly - by muscular tongue and soft tissues of floor of the mouth.
  - Oral cavity lined throughout with mucous membrane stratified squamous epithelium.
  - The palate forms roof of mouth and divided to hard and soft palate.
  - Ovula is present in untre hanging.

**TOUNGE:** voluntary muscular structure attached to hyoid bone and covered by prenulum.

- Consists of papillae consists of nerves of sense of tast called taste buds.
  - Vallate papillae are present.
  - Fungiform papillae and filiform papillae are present.

Blood supply: Is bylingual branch of the external carotid artery.

Nerve supply: Involved are hypoglossal nerves lingudal branch of mandibular nerves gacial and glosopharyngeal nerves.
**Function of tongue:**
- in masticating
- deglutition
- speech
- taste

**Teeth** - Each individual has 2 sets or dentitions the temporary or deciduous teeth and permanent teeth.
- in childhood and in adolescence

**Function of teeth**
- the incisor & canine teeth are cutting teeth and used for biting off.
- premolar and molar teeth used for grinding or chewing of food.

**SALIVARY GLANDS**
- secretes saliva for digestion
- three pairs parotid glands the submandibular glands and the sublingual glands.

**COMPOSITION OF SALIVA:**
- about 1.5 litres consists water mineral salts enzyme salivary amylase mucus lysozyme immunoglobin blood clotting factors.

**SECRETION OF SALIVA:**
- in under ANS
- parasympathetic, vasoconstriction.

**FUNCTIONS:**
- chemical digestion of saliva
- lubrication of food

- cleansing and lubricating

**PHARYNX:**

- Nasopharynx and laryngopharynx.

- the lining membrane is divided into stratified squamous and epithelium.

- the middle layer is divided into fibrous tissue, blood and lymph.

- outer layer does the involuntary constriction muscle swallowing

**FUNCTIONS:**

- formation of bolus

- deglutition or swallowing

- the voluntary muscle push the bolus backwards into the pharynx

- factors preventing gastric reflux.

- the maintainance of an acute angle between the oesophages and the gundus of the stomach

- attachment of stomach to the diaphragm by the peritoneum

**STOMACH:**

- J shaped dilated portion of the alimentary tract situated in the epigastric, umbilical and left hypochondriac region

- structure continuous with oesophages at the cardiac sphincter and with duodenum at the pyloric sphincter

- lesser curvature and greater curvature

- muscle layer consists of three layers
• An outer layer of longitudinal fibres
• A middle layer of circular fibres
• An inner membrane of oblique fibres

Gastric juice and functions:
- Gastric juice consists of water, mineral salts, mucus hydrochloric acid, intrinsic factor, inactive enzyme precursors.

FUNCTIONS:
- Water further liquefies the food swallowed.
- Hcl acidifies the food and stops action of amylase.
- Kills ingested microbes.
- Provides acid environment.

SECRETION OF GASTRIC JUICE:
1. Cephalic phase – before food reaches the stomach.
2. Gastric phase – presence of food.
3. Intestinal phase – reaches the small intestine.

FUNCTION OF STOMACH:
- Temporary storage of enzymes, pepsins
- Chemical digestion
- Mechanical breakdown
- Limited absorption of water
- Non-specific defence against microbes
- Preparation of iron for absorption
- Product of intrinsic factor for absorption

SMALL INTESTINE:
- Pyrolic sphincter and leads into large intestine at ileocaecal value.
- Consists of duodenum 25 cm and curves at pancreas
- Secretions from pancreas and gall bladder
- Jejunum middle section
- Ileum controls flow of material from the ileum to caecum
- Structure of small intestine
- Mucosa - permanent circular fibres or fields
- Villi are present
- Packed in defence cells
- Blood supply and nerve supply
- Intestinal juice- water, mucus, mineral salts, enzymes

FUNCTIONS:

- Onward movement of its contents
- Secretion of intestinal juice
- Completion of chemical digestion of carbohydrates, proteins and fats
- Protection against microbes
- Absorption of nutrients

CHEMICAL DIGESTION IN THE SMALL INTESTINE:

- Carbohydrates are broken down to monosaccharides
- Proteins are broken to amino acid
- Fats to fatty acid and glycerol

BILE:

- Consists of water, mineral salts, mucus, bile salts, bile pigments, mainly bilirubin, cholesterol

FUNCTIONS:

- Sodium taurocholate and sodium glycocholate emulsifies fats in the small intestine
- Bilirubin and urobilinogen are excreted in faeces
- Fatty acids are solubilized
- Releases from the gall bladder

INTESTINAL SECRERTIONS:

- Water, mineral salts, enzyme enterokinase peptidases, lipases,sucrose, maltose, lactose
- Chemical digestion associated enterocytes
- Enterokinase, lipase, sucrose, maltose, lactose complete the digestion of carbohydrates
- Control of secretion

LARGE INTESTINE:

- 1.5 metres long at caecum and rectum and analcap
- Colon, ascending. Transverse, descending colon
- The caecum 1st part
- Ileocarcal value
- Vermiform appendix
- Ascending colon hepatic flexures
- Descending colon – abdominal cavity
- Sigmoid colon – S-shaped curve in pelvis
- Anal canal – internal and external sphincter

**STRUCTURE:**

- Taena coli situated in regular intervals round the colon
- The longitudinal muscle fibres spread out as in the basic structure and completely surrounded the rectum and anal canal.

**FUNCTIONS:**

- In absorption
- Microbial activity
- Mass movement
- Defecation
- Constituents of faeces- fibres, dead microbes, epithelial cells, fatty acids, mucus secreted by epithelial lining

**PANCREAS:**

- Exocrine pancreas
- Endocrine pancreas
- Lobules of small alveoli
- Pancreatic islets
- Secrete the hormones- insulin, glucagon

**LIVER**

- 1 TO 2.3kg
- Organs associated with liver are:
  Superiorly – diaphragm and abdominal wall
  Inferiorly – stomach, bile ducts, colon, kidney
  Posteriorly – oesophagus and inferior vena cava
  Laterally – lower ribs and diaphragm
- Lymph vessels leave the liver

**FUNCTIONS**

- Carbohydrates metabolism
- Protein metabolism
- Fat metabolism
- Breakdown of erythrocytes and defence microbes
- Metabolism of ethanol
- Production of heat
- Secretion of bile
- Storeage

DISEASES OF MOUTH:
- Physical damage due to excessive hot or cold
- Thrush (oral candidiasis)
- Acute gingivitis
- Cleft palate and cleft lip

SALIVARY GLANDS:
- Mumps, calculus formation
- Lumar of salivary glands

OESOPHAGUS:
- Oesophageal varices
- Peptic reflux oesophagitis
- Achalasia

STOMACH:
- Peptic ulceration
- Congenital pyloric stenosis
- Appendicitis
- Inflammatory bowl diseases, diventricular diseases
- Volvulus

PANCREAS
- Acute pancreatitis and chronic, cystic fibrosis

LIVER:
- Oliguria, oedema
- Jaundice etc.