Digestive System

Learning objectives
After this lecture, student should be able to:
- Know the components of digestive system.
- Know the functions of the digestive system.
- Describe the differences small and large intestine.
- Describe the accessory gland of digestive system.

Content of the lecture
- The components of the digestive system.
- Structure of the stomach (surfaces, borders and parts).
- Differences small and large intestine.
- Parts of small and large intestine

The digestive system includes:

●The alimentary (gastro-intestinal) tract.

●Certain accessory (digestive organs) glands.

The alimentary (gastro-intestinal) tract is the tube in which the food travels during digestion. It starts in the mouth to end at the anus. It is formed of the following structures: the mouth, the pharynx, oesophagus, stomach, small intestine (duodenum, jejunum, and ileum) and large intestine (appendix, caecum, colon, rectum, and anal canal) (Fig. 1).

The accessory glands includes salivary glands (parotid, submandibular and sublingual), liver, pancreas and spleen.

♣♣ **Mouth:** The mouth is divided

►***The vestibule*** of the mouth is a cleft like space separating the lips and cheeks from the teeth and gums.

►***Mouth proper*** is the rest of the mouth cavity, which is enclosed by the teeth. Its floor is formed by the tongue and its roof is formed by the hard and soft palate, which is covered by a mucous membrane.

♣♣ **Lips and cheeks:** The lips and cheeks are composed chiefly of muscles and fat covered with skin and lined with mucous membrane.

♣♣ **Gums:** Gums are dense fibrous tissues covered with mucous membrane, attached to the alveolar border of the jaws. It is adherent around the neck of the teeth.

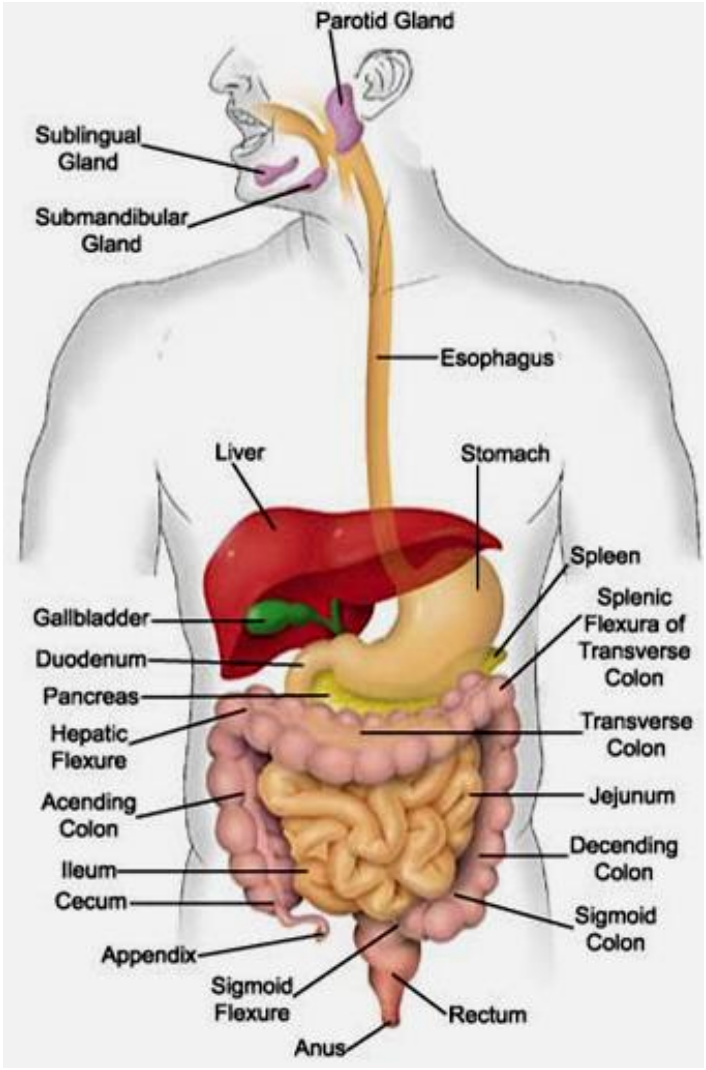

Fig. 1: The digestive system.

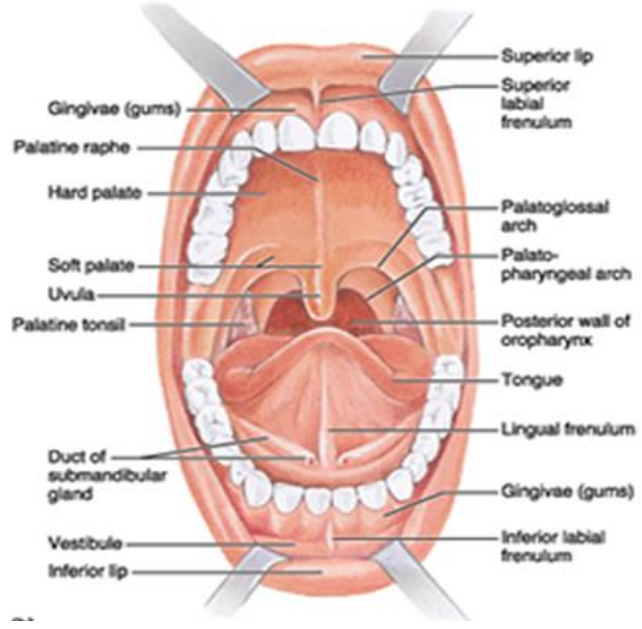

Fig. 2: Mouth cavity

♣♣ Teeth:

Permanent teeth: A full set of adult teeth consists of 32 (16 per jaw). Eight (8) in each half jaw counting from before backwards are: 2 incisors, 1 canine, 2 premolars, and 3 molars.

Eruption of permanent teeth begins at 6 years of age and ends at 12 years. The third permanent molar erupts around 18 years (Wisdom tooth).

Primary or milk (*Deciduous*) teeth:

They are 20 in number. 5 in each half jaw, counting from before backwards are two incisors, one canine and two molars. Eruption of deciduous teeth starts at 6 months of age and is completed at two years.

♣♣ Tongue:

A fleshy mobile organ, present at the floor of the mouth and mostly formed by muscles covered by a mucosa.

It is concerned with chewing (mastication),swallowing (deglutition) and. It is concerned with speech and taste. The dorsum of the tongue is divided into palatine part which occupies the anterior ⅔ and pharyngeal part that occupies the posterior⅓.

The two parts are separated by a v-shaped sulcus terminalis.

The mucous membrane of the anterior ⅔ is roughened by the presence of papillae that is responsible for taste sensation.

♣♣ Pharynx: It is a muscular tube that extends from the base of the skull to the level of the 6th cervical vertebra where it is continuous with the oesophagus. It is divided into three parts; nasopharynx (behind the nasal cavities), oropharynx (behind the mouth cavity) and laryngopharynx (behind the larynx).

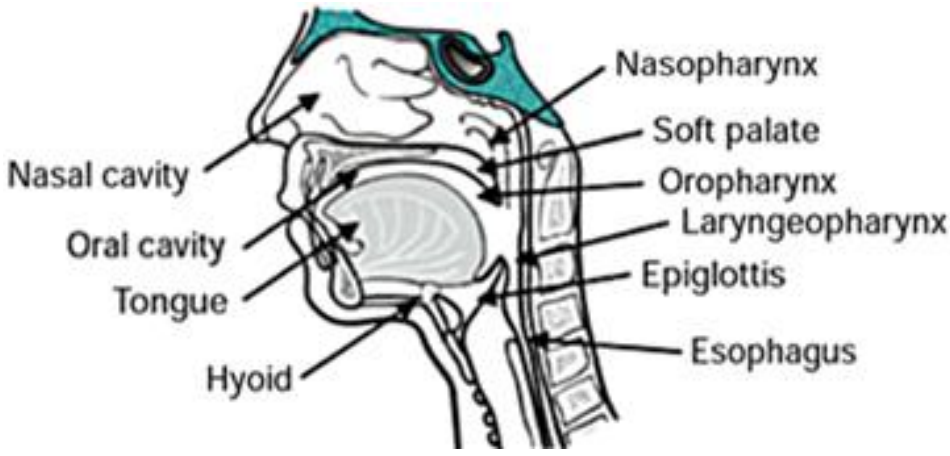

Fig.3:The pharynx, midline sagittal view.

♣♣ Oesophagus:

-It is a 25 cm muscular tube that extends from the pharynx to the stomach.

-It passes through the neck, thorax and pierces the diaphragm to open into the cardiac orifice of the stomach.

♣♣ Stomach:

-It is concerned with digestion of food.

-It is the most dilated part of the gut.

-Its shape and position vary according to its condition and the condition of the surrounding viscera.

-It has:

•√ 2 orifices, the cardiac and the pyloric.

•√ 2 borders, the right border is short and forms the lesser curvature and the left border is longer and forms the greater curvature.

•√ 2 surfaces, anterior and posterior.

►***Parts:***

The stomach is formed of fundus, body and pylorus.

The fundus is the upper bulging part above the level of the cardiac orifice.

The body is the major part of the stomach, lies between the fundus and the pylorus.

The pyloric part, which is divided into the pyloric antrum (wide part) and pyloric canal and pyloric sphincter (thickening of the circular layer of smooth muscle, which controls discharge of the stomach contents through the pyloric orifice into the duodenum).

♣♣ Small intestine:

-The small intestine is concerned with completion of digestion and absorption of the digested food.

-It is formed of duodenum, jejunum and ileum.

-It is about 7 meters long.

►***The duodenum:***

- It is the shortest (25 cm), widest and most fixed part of the small intestine.
- It forms a c-shaped curve around the head of pancreas.

- It begins at the pylorus on the right side and ends at the duodenojejunal junction on the left side.
- The second part of the duodenum receives the bile duct and the pancreatic duct.

►***Jejunum and ileum:*** *It* is about 5 to 6 meter in length. It extends from the duodeno-jejunal junction to the ileo-cecal junction. It forms a number of loops. The proximal two-fifths form the jejunum, while the distal three fifths form the ileum. No sharp lines between the two parts.

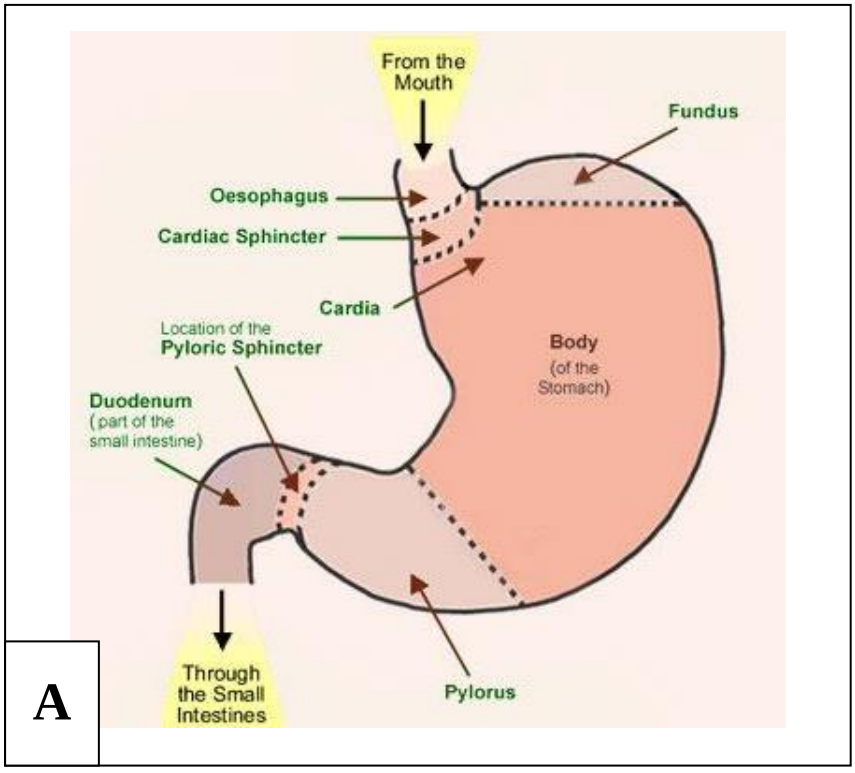

Fig. 4: The stomach.

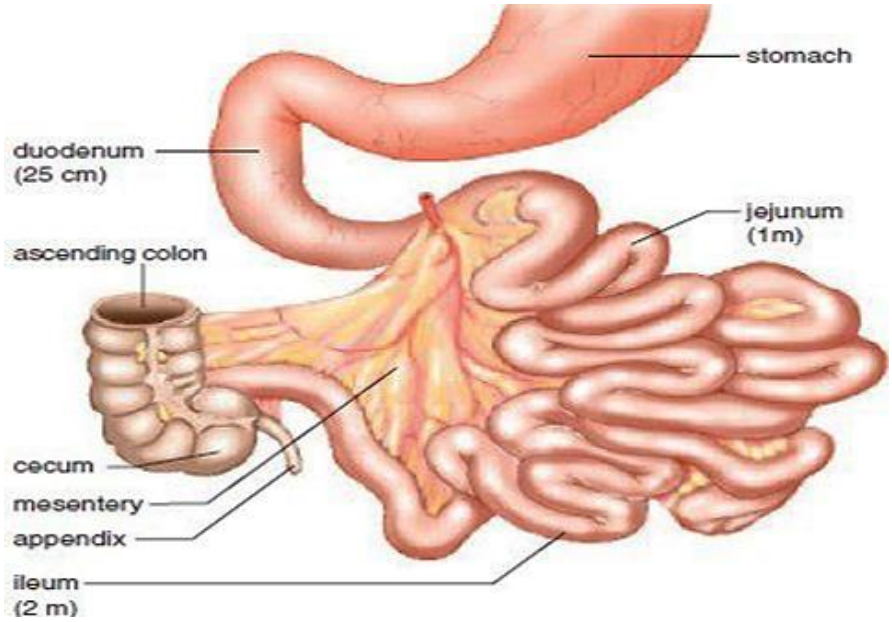

Fig.5: The small intestine

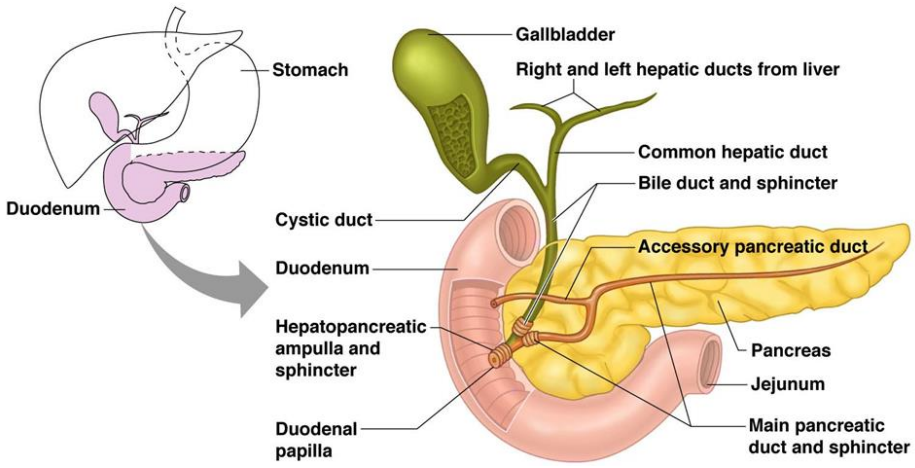

Fig. 6: The Duodenum

♣♣ Large intestine

- It is about 1.5 meters.

- It begins at the end of ileum and terminates at the anal orifice.

- It is divided into: caecum, vermiform appendix, ascending colon, right colic flexure, transverse colon, left colic flexure, descending colon, sigmoid colon, rectum and anal canal.

- The large intestine can be distinguished from the small intestine by:

√ Teniae coli: three thickened bands of longitudinal muscle fibers.

√ Haustrations (sacculations) of the colon between the teniae.

√ Appendices epiploicae: small, fatty appendices (projections) of colon.

√ Caliber: the internal diameter is much larger.

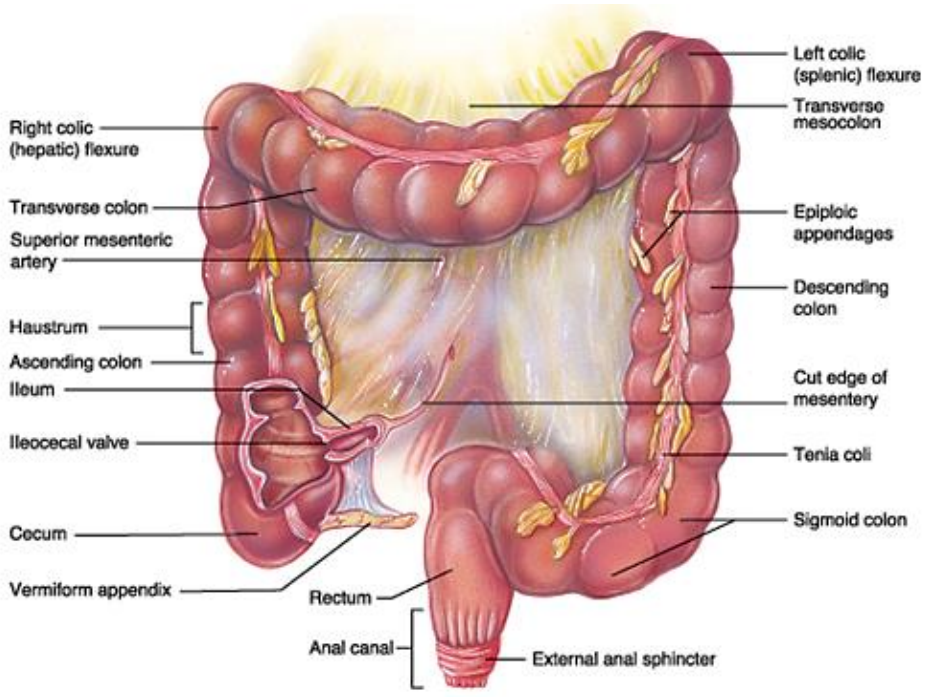

Fig. 7: Large intestine.

Differences between the small and large intestine

	Small intestine	**Large intestine**
Length	It is about 7 meters long	It is about 1.5 meters long
Caliber	Smaller	Larger
Mobility	Freely mobile	Less freely mobile
Teniae coli (3 bands of longitudinal muscles)	Absent	Present
Sacculations	Absent	Present
Appendices epiploicae (fat)	Absent	Present over the free surface of the colon except the caecum, the appendix and the rectum
The mucous membrane	Has permanent folds, called plicae circulares	No plicae circulares
Villi in mucosa	Present	Absent
Peyer's patches (lymphatic aggregations)	Present	absent

Accessory glands: They consist of:

• 3 pairs of salivary glands (Parotid glands, submandibular glands and sublingual glands).

• Pancreas.

• Liver and the biliary tract.

♣♣ Salivary glands: are 3 pairs

The parotid glands are the largest and located one on each side in front of the ear. They open in the vestibule of the mouth opposite upper second molar tooth.

The **submandibular glands** are located one on each side deep to the mandible. The ducts open in the floor of the mouth .

The **sublingual glands** are also located at the base of the mouth (under the tongue).

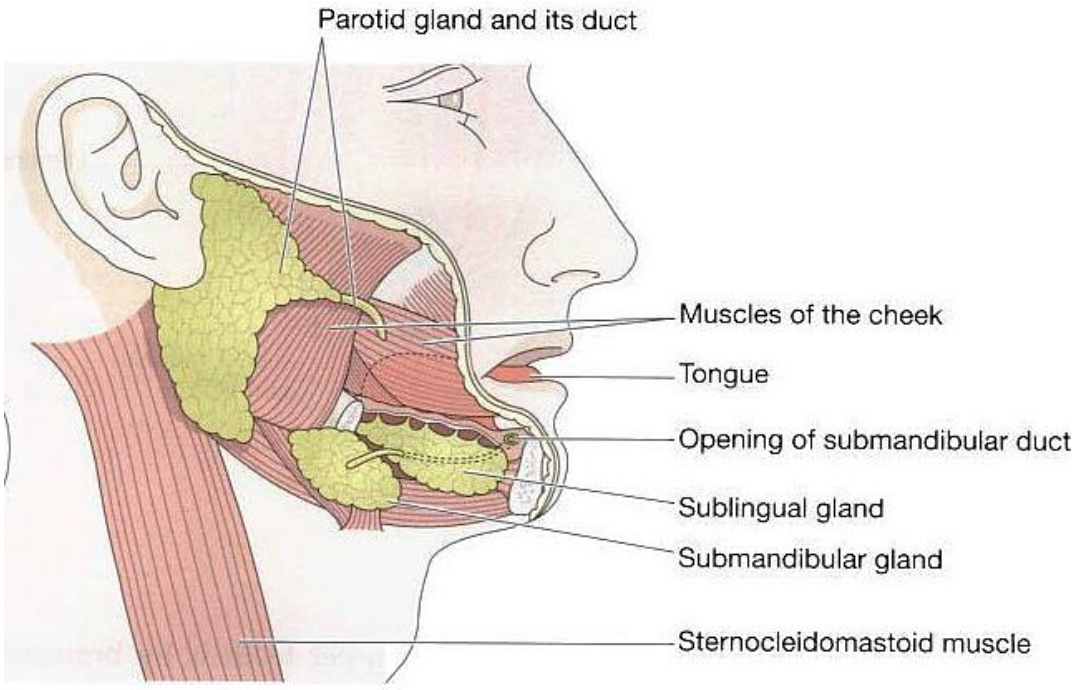

Fig. 8: Salivary glands.

♣♣ Liver

- It is the largest gland in the body concerned with metabolism of absorbed food, detoxification of chemicals and secretion of the bile salts which emerge from the liver through the right and left hepatic ducts.

- It lies under the right copula of the diaphragm.

- It is formed of 2 large lobes ***(right and left lobes),*** and 2 small lobes ***(caudate and quadrate lobes)*** which are present on the under surface of the liver. They are separated by (porta hepatis) the hilum of the liver, through which vessels and ducts pass.

Extra hepatic biliary passages

The biliary system:

The biliary system consists of the **organs and ducts** (bile ducts, gallbladder, and associated structures) that are involved in the production and transportation of bile.

Hepatic ducts are two, right and left, one from each lobe. They unite in the porta hepatis to form the common hepatic duct.

- The common hepatic duct then joins with the cystic duct from the gallbladder to form the common bile duct.

- Common bile duct unites with the pancreatic duct to form the hepatopancreatic ampulla (of Vater) that opens into the wall of the second part of the duodenum. The hepatopancreatic ampulla is guarded by a sphincter (of Oddi) to control the flow of bile

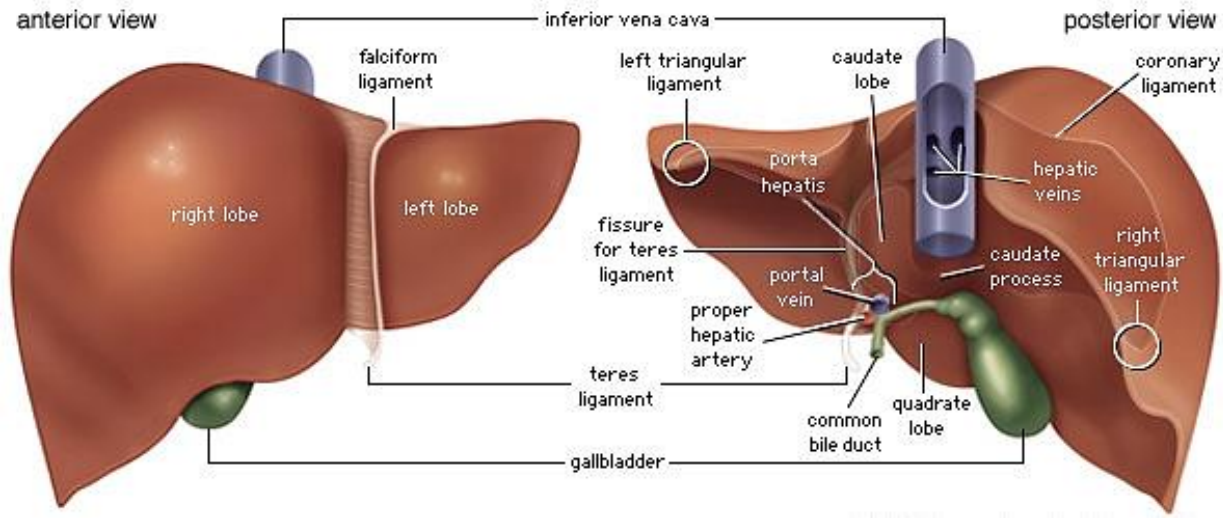

Fig. 9: The Liver.

♦***Gall bladder*** is an elongated pear-shaped sac that lies on the inferior surface of the right lobe of the liver.
It has a *fundus* or expanded end, a *body* or main part and a *neck* which is continuous with the cystic duct
It serves as a reservoir for bile, with a capacity of about 50 ml and it has the ability to concentrate the bile.

Bile is delivered to the duodenum as the result of contraction and partial emptying of the gall bladder and this mechanism is initiated by the entrance of fatty foods into the duodenum.

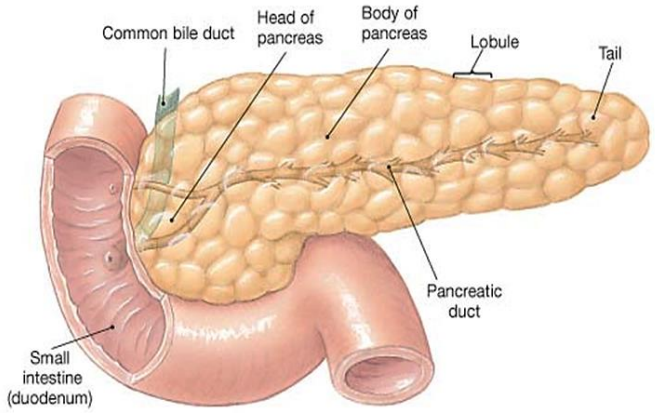

Fig. 10: The pancreas

♣♣ **Pancreas** is a soft lobulated gland. It lies transversely across the posterior abdominal wall behind the stomach. It extends from the duodenum to the spleen. It secretes pancreatic juice into the duodenum. It also has an endocrine function, and secretes insulin directly in the blood stream.

The parts of the pancreas are the head (within the duodenal loop), the neck, the body (extends upwards and to the left) and the tail which reaches the spleen.

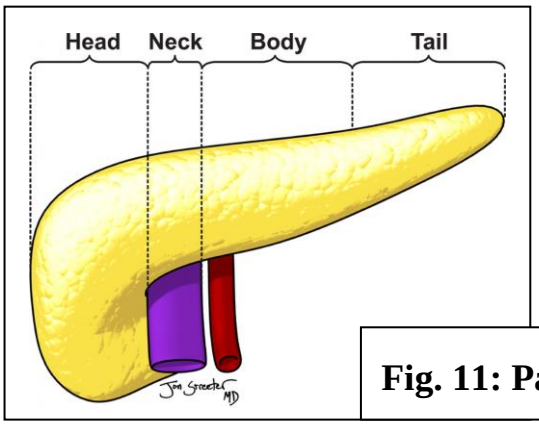

Fig. 11: Parts of pancreas.