VISWASS SCHOOL & COLLEGE OF NURSING

GNM 1ST YEAR
ANATOMY AND PHYSIOLOGY
UNIT-7
THE DIGESTIVE SYSTEM
SHORT QUESTIONS AND ANSWERS

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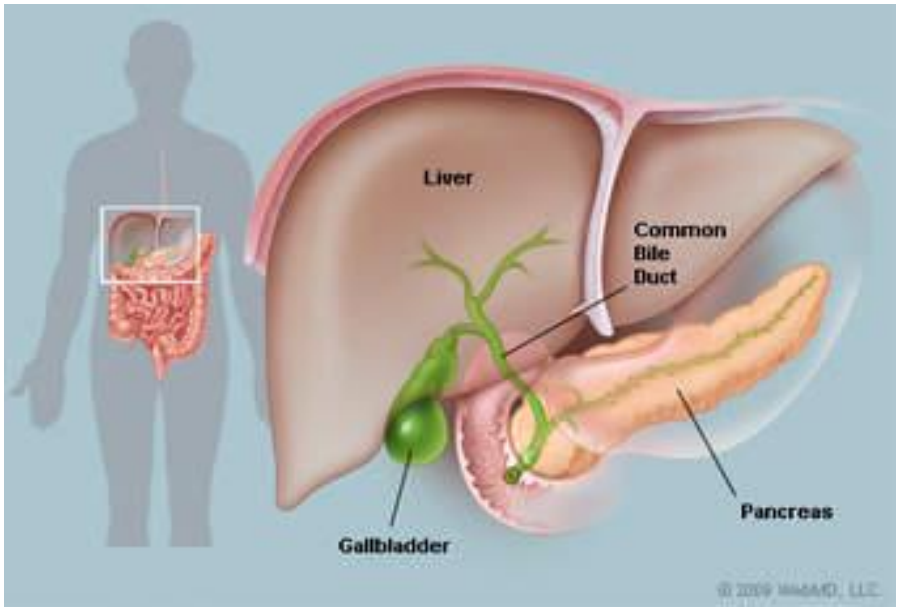
1)Explain the structure and function of Gall bladder.(5)

Gall bladder:

- The gall bladder is a pear shaped sac attached to the posterior surface of the liver by connective tissue.
- It has a fundus or expanded end, a body or main part, and a neck, which is continuous with the cystic duct.



Structure:

- The gallbladder is a hollow organ that sits in a shallow depression below the right lobe of the liver, that is grey-blue in life.
- In adults, the gallbladder measures approximately 7 to 10 centimetres (2.8 to 3.9 inches) in length and 4 centimetres (1.6 in) in diameter when fully distended.
- The cystic duct unites with the common hepatic duct to become the common bile duct. At the junction of the neck of the gallbladder and the cystic duct, there is an out-pouching of the gallbladder wall forming a mucosal fold known as "Hartmann's pouch".

  Peritonium:

  - This covers only the inferior surface because the upper surface of the gall bladder is in direct contact with the liver and held in place by the visceral peritoneum that covers the liver.

Muscle layer:

- There is an additional layer of oblique muscle fibres.

Mucous membrane:

- This displays small rugai when the gall bladder is empty;these then disappear when it becomes discended with bile.

Blood supply:

- The cystic artery, a branch of the hepatic artery, supplies the gallbladder. Blood is drained away by the cystic vein, which joins the portal vein.

Functions:

- Storage of bile.
- Concentration of the bile by upto10 or 15-fold, by absorption of water through the walls of the gallbladder .
- Release of stored bile.

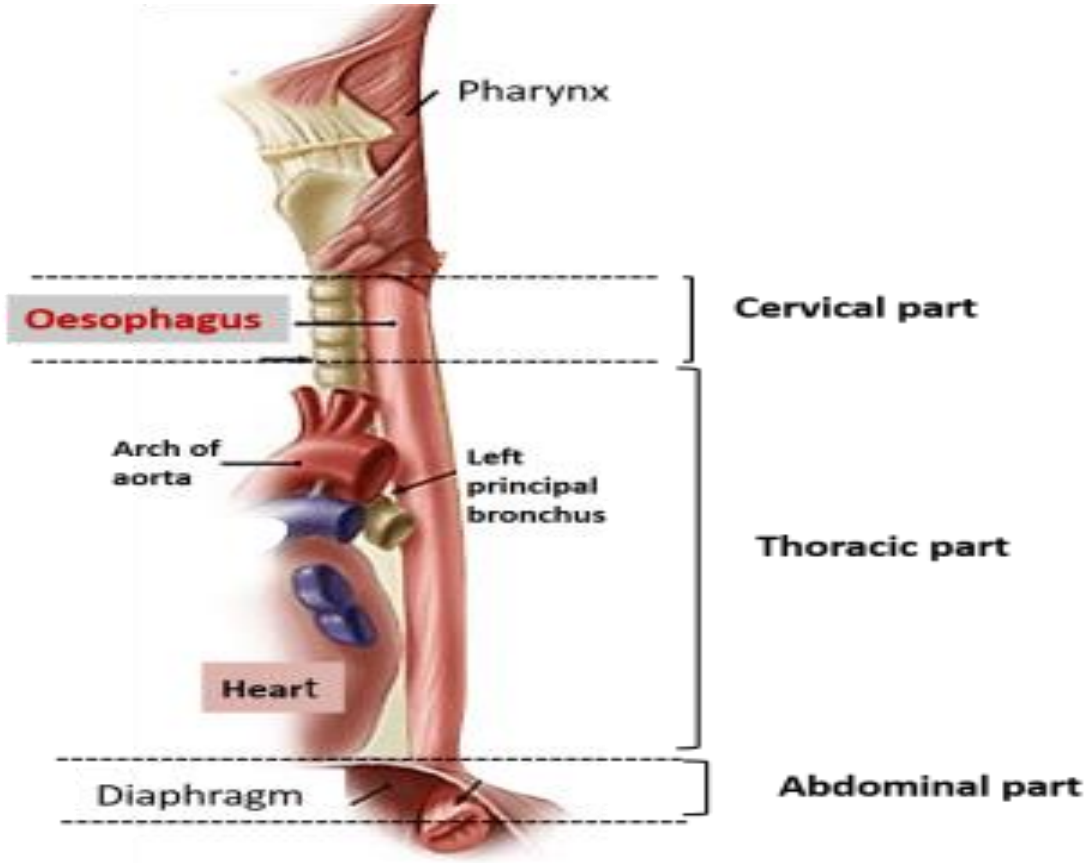
When the muscle wall of the gall bladder contracts, bile is expelled into the bile ducts and then enters the duodenum. Contraction is stimulated by the hormone CCK, secreted by the duodenum, and by the presence of fat and acid chime in the duodenum.

Relaxation of the hepatopancreatic sphincter is caused by CCK and is a reflex response to contraction of the gall bladder.

2)structure and function of oesophagus(5)

Oesophagus:

- The oesophagus is about **25 cm long** and **about 2 cm in diameter**; it lies in the median plane in the thorax in front of the vertebral column and behind the trachea and the heart.
- It is continuous with the pharynx above, and just below the diaphragm it joins the stomach.
- It passes between muscle fibres of the diaphragm behind the central tendon at the level of the 10^{th} thoracic vertebrae.
- Immediately the oesophagus has passed through the diaphragm it curves upwards, before opening into the stomach.
- This shaped angle is believed to be one of the factors that prevents the **regurgitation**(backflow) of gastric contents into the oesophagus.
- The upper and lower ends of the oesophagus are closed by **sphincters**.
- The **upper oesophageal sphincter** prevents the passage of air into the oesophagus during inspiration, and the aspiration of oesophageal content.
- The **lower oesophageal sphincter** prevents the reflux of acid gastric contents into the oesophagus.



Structure:

- The esophagus is one of the upper parts of the digestive system.
- There are taste buds on its upper part. It begins at the back of the mouth, passing downwards through the rear part of the mediastinum, through the diaphragm, and into the stomach.
- The esophagus generally starts around the level of the sixth cervical vertebra behind the cricoid cartilage of the trachea, enters the diaphragm at about the level of the tenth thoracic vertebra, and ends at the cardia of the stomach, at the level of the eleventh thoracic vertebra.
- The esophagus is usually about 25 cm (10 in) in length.

Blood supply:

- Arterial blood supply: The thoracic region is supplied mainly by the paired oesophageal arteries, branches from the thoracic aorta. The abdominal region is supplied by the branches from the inferior phrenic arteries and the left gastric branch of the coeliac artery.

- Venous drainage: From the thoracic region venous drainage is into the azygos and hemiazygos veins. The abdominal part drains into the left gastric vein. There is a venous plexus at the distal end that links the upward and downward venous drainage.

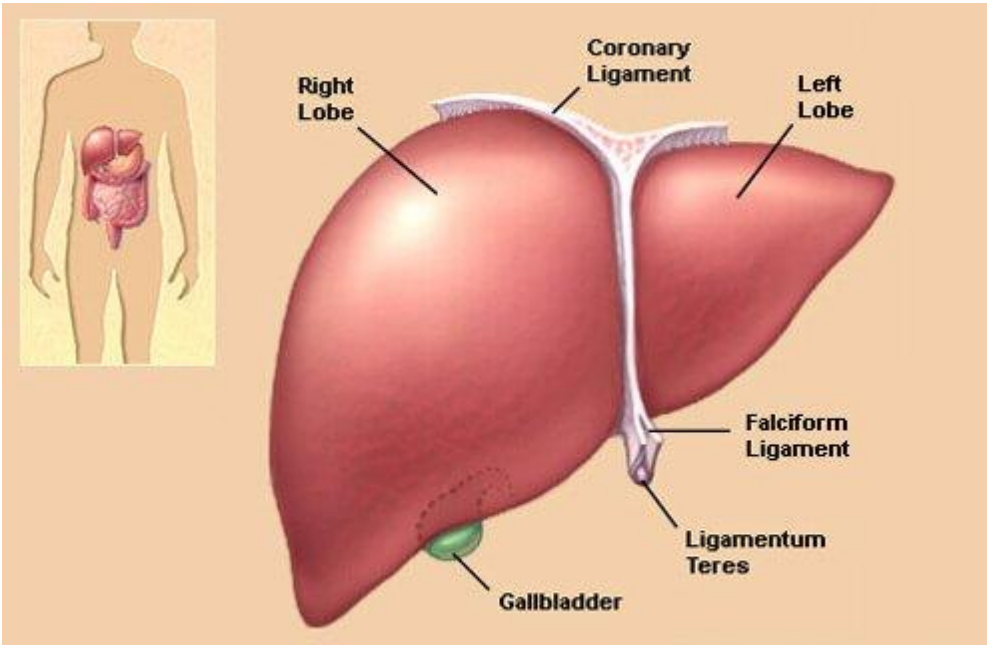
Function of oesophagus:

- Formation of a bolus:
    - When food is taken into the mouth, it is chewed by the teeth and moved around the mouth by the tongue and muscles of the cheeks.
    - It is mixed with saliva and formed into a soft mass, or bolus, ready for swallowing.
    - The length of time that food remains in the mouth largely depends on the consistency of the food.
    - Some foods need to be chewed longer then others before the individual feels that bolus is ready for swallowing.
- Swallowing(deglutition):
    - Swallowing occurs in three stages after chewing is complete and the bolus has been formed.
    - It is initiated voluntarily but completed by a reflex action.
        i. Oral stage
        ii. Pharyngeal stage
        iii. Oesophageal stage
- Oesophageal stage:
    - The presence of the bolus in the pharynx stimulates a wave of peristalasis that propels the bolus through the oesophagus to the stomach.
    - Peristaltis waves pass along the oesophagus only after swallowing begins. Otherwise the walls are relaxed,
    - Ahead of peristaltic wave, the lower oesophageal sphincter guarding the entrance to the stomach relaxes to allow the descending bolus to pass into the stomach.
    - Usually, constriction of the lower oesophageal sphincter prevents reflux of gastric acid into the oesophagus.

3)structure and function of liver.(5)

Liver:

- The liver is the **largest gland** in the body; it is **reddish brown** in colour and weights between **1-2.3kg**.
- Situated in the upper part of the abdominal cavity, it occupies the greater part of the right hypochondrial region and part of the epigastric region, and extend into the left hypochondriac region.
- Its upper and anterior surfaces are smooth and curve to fit the under surface of the diaphragm ;its posterior surface is irregular in outline.



Organs associated with the liver:

Superiorly& anteriorly- diaphragm and anterior abdominal wall

Inferiorly- stomach, bile ducts, duodenum, hepatic flexure of the colon, right kidney and adrenal gland.

Posteriorly- oesophagus, inferior venacava, aorta, gallbladder, vertebral column and diaphragm.

Laterally-lower ribs and diaphragm.

Portal fissure:

This is the name given to the region on the posterior surface of the liver where various structure enter and leave the gland:

- The portal vein enters, carrying blood from the stomach, spleen, pancreas, small and large intestines.
- The hepatic artery enters, carrying arterial blood. It is a branch from the coeliac artery, which branches from the abdominal aorta.
- Nerve fibres, sympathetic and parasympathetic, enter here.
- The right and left hepatic ducts leave, carrying bile from the liver to the gallbladder.
- Lymph vessels leave the liver, draining lymph to abdominal and thoracic nodes.

Blood supply:

- The hepatic artery and the portal vein take blood to the liver.
- Venous return is by a variable number of hepatic veins that leave the posterior surface and immediately enter the inferior venacava just below the diaphragm.

Structure:

- The lobes of the liver are made up of tiny functional units, called lobules, which are just visible to the necked eye.
- Liver lobules are hexagonal in outline and are formed by cuboidal cells, the hepatocytes, arranged in pairs of columns radiating from a central vein.
- Between two pairs of colunmns of cells are sinusoids containing a mixture of blood from the tiny branches of the portal vein and hepatic artery.
- This arrangement allows the arterial blood and portal venous blood to mix and come into close contact with the liver cells.
- Among the cellsa lining the sinusoids are hepatic macrophages, whose function is to ingest and destroy worn-out blood cells and any foreign particles present in the blood flowing through the liver.
- One of the functions of the liver is to secret bile, seen running between the columns of liver cell.
- This means that each column of hepatocytes has a blood sinusoids on one side and a bile canaliculus on the other.
- The canaliculi join up to form larger bile canals until eventually they form the right and left hepatic ducts, which drain bile from the liver.

- There is no mixing of the bile and the blood, and they are drain from the liver lobules separately.

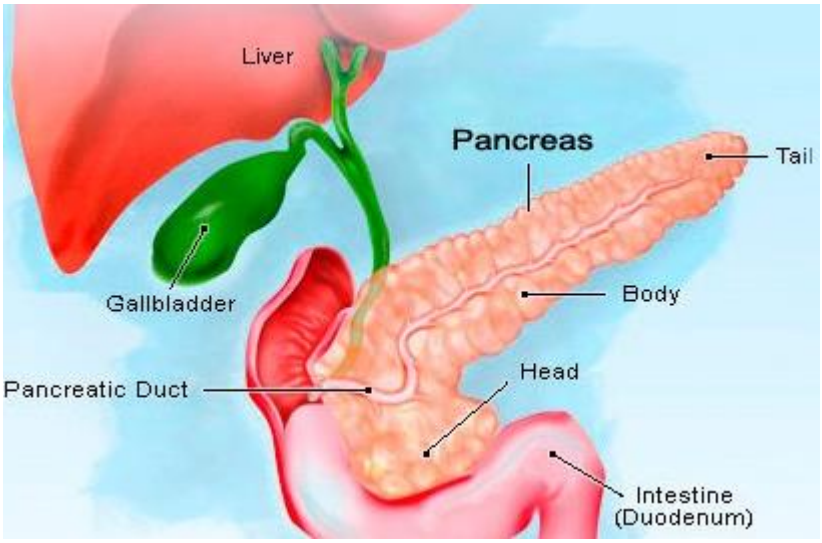
Function:

- the liver is extremely active metabolically, with multiple interrelated functions, including metabolism of key nutrients, synthesis of many vital protein, detoxification of unwanted chemicals and production of bile.
    - Carbohydrate metabolism
    - Fat metabolism
    - Protein metabolism
    - Breakdown of erithrocytes and defence against microbes
    - Detoxification of drugs and toxic substances
    - Inactivation of hormones
    - Production of heat
    - Secretion of bile
    - Stored substance includes glycogen, fat-soluble vitamins;A,D,E,K, iron, cupper, some water-soluble vitamins(B_{12})

4)structure and function of pancreas.(5)

Pancreas:

- The pancreas is a creamy pink gland weighing about 60g.
- It is about 12-15cm long and is situated in the epigastric and left hypochondriac regions of the abdominal cavity.
- It consist of a broad head, a body and a narrow tail.
- The head lies in the curve of the duodenum, the body behind the stomach, and the tail infront of the left kidney, just reaching the spleen.
- The abdominal aorta and the inferior venacava lie behind the gland.
- The pancreas is both an exocrine and endocrine gland.



Exocrine pancreas:

- This consists of a large number of lobules made up of small acini, the walls of which are composed of secretory cells.
- Each lobule is drained by a tiny duct and these eventually unite to form the pancreatic duct, which extends along the whole length of the gland and opens into the duodenum.
- Just before entering the duodenum the pancreatic duct joins the common bile duct to form the hepatopancreatic ampulla.
- The duodenal opening of the ampulla is controlled by the hepatopancreatic sphincter at the duodenal papilla.
- The function of the exocrine pancreas is to produce pancreatic juice containing enzymes, some in the form of inactive precursors, which digest carbohydrates, proteins and fats.
- As in the alimentary tract, parasympathetic stimulation increases the secretion of pancreatic juice and sympathetic stimulation depresses it.

Endocrine pancreas;

- Distributed throughout the gland, in close proximity to the capillary networks, are groups of specialised cells called the pancreatic islets.
- The islets have no ducts, so the hormones diffuse directly into the blood.
- The endocrine pancreas secrets the hormones insulin and glucagon, which are principally concerned with control of blood glucose levels.

Blood supply;

The splenic and mesenteric arteries supply the pancreas, and venous drainage is given by veins of the same names that joints other veins to form the portal vein.

Function:

- A healthy pancreas produces chemicals to digest the food we eat.
- The exocrine tissues secret a clear, watery, alkaline juice that contains several enzymes. these breakdown food into small molecules that can be absorbed by the intestine.
- The endocrine portion, secret insulin and other hormones.
- Pancreatic beta cells release insulin when blood sugar levels rise.
- When blood sugar falls, pancreatic alpha cells release the hormone glucagon.
- Glucagon causes glycogen to be broken down into glucose in the liver.
- The glucose then enters the bloodstream, restoring blood sugar levels to normal.