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**Paper: Anatomy**

**Question # 1**

**Write a paragraph on the process of food digestion? Highlight the function of each organ involved.**

**Answer:**

**Introduction:**

The digestive system is used for breaking down the food particles into smaller one or nutrients which then pass into the circulatory system and are needed in the body. In digestion the chemical breakdown of complex biological molecule into their component parts.

\*lipids to fatty acids

\*proteins to individual amino acids

\*carbohydrates into simple sugars

**Functions of digestive system:**

Digestive system function is the production of various chemicals to break down the food. Filter out harmful substances. Ingest food. Absorb molecules into the blood stream. Get rid of solid wastes.

**Steps involve in digestion:**

Four steps are involve in food digestion.

**1: Ingestion**

Taking in of food through mouth is known as ingestion i.e. eating or drinking

**2: Digestion**

Breakdown of food into smaller molecules is known as digestion.

### **3: Absorption**

This is the process by which digested food substances pass through the walls of some organs of the alimentary canal into the blood for circulation.

### **4: Egestion**

Removing of waste material from the body is called egestion.

### **Major organs of the digestive system:**

- 1) MOUTH**
- 2) PHARYNX**
- 3) ESOPHAGUS**
- 4) STOMACH**
- 5) SMALL INTESTINE**
- 6) LARGE INTESTINE**
- 7) RECTUM**

### **ACCESSORY ORGANS:**

**\*Liver**

**\*Gall bladder**

**\*Pancreas**

### **Major organs:**

#### **1. THE MOUTH:**

First part of the digestive system through which the food enters. Structures in the mouth that help in digestion are: teeth, tongue, salivary glands.

- 1. TEETH:** Teeth are concerned with mastication and chewing.

**Function:** Teeth performs four function:

- a) Cutting by two incisor
- b) Tearing by one canine
- c) Crushing by two premolar
- d) Grinding by three molar

2. **TONGUE:** Tongue is a muscular organ in the mouth that helps the food in swallowing. The upper surface of the tongue is covered by four types of taste buds that helps in the recognition of food.

- a) Circumvallate papillae
- b) Fungiform papillae
- c) Filiform papillae
- d) Folate papillae

**FUNTION:** swallowing, mastication, taste.

3. **SALIVARY GLAND:** There are three pairs of salivary glands in the mouth.

- a) **Parotid:** One on each side is present below and anteriorly front of each ear. These are the largest slivery gland.
- b) **Submandibular:** It is a major pair of slivery gland located beneath the lower jaws.
- c) **Sublingual:** It is situated inferior to the tongue and anterior to the submandibular gland.

4. As well hundreds of minor slivery glands are also present.

Function: the function of the saliva is to smoothen the food and kill all the harmful bacteria.

#### # PROCESS OF THE MOUTH:

First the teeth chewed the large food molecules into smaller then with the help of saliva the food particles get soft and convert into digested food called bolus. Saliva contain enzymes amylase which converts starch into maltose. Then the food is swallowed.

## 2. THE PHARYNX:

The pharynx is the part of the throat that is behind the mouth and nasal cavity and above the esophagus and the larynx. The pharynx receives the food from mouth. It has two muscular rings that maintain the constrictions of a natural body passage and relaxes as required by normal physiological functioning. The lower sphincter helps the upcoming flow of acids.

#### **Function:**

Formation of a bolus.

Swallowing

Reducing gastric reflux

### **3. ESOPHAGUS:**

Esophagus is also known as food pipe. The bolus is passed into the esophagus by automatic contractions of the pharynx. This stage of swallowing is entirely automatic and cannot be controlled. Its length is 25 cm and diameter is 2 cm.

#### **Peristalsis:**

Once the food ball enters the esophagus, it is pushed towards the cardiac sphincter by smooth muscle contractions called peristalsis. Food travels from mouth to stomach in about 4 to 8 seconds.

### **4. STOMACH:**

Located on the left side of the abdominal cavity. Food enters at the cardio esophageal sphincter. Here food is churned into chyme. An empty stomach has a volume of approximately 50ml. But typically after a meal its capacity expands to about 1 liter of food and may expand to hold as much as 4 liters. Regions of the stomach.

\*cardiac region \_near the heart.

\*Fundus

\*Body

\* Pylorus \_funnel shaped terminal end.

\* Rugae \_breakdown and mixing.

\* Chemical breakdown of protein begins.

\* Delivers chyme to the internal folds of the mucosa.

\* External regions (lesser curvature, greater curvature)

#### **FUNCTION:**

- Act as a storage tank for food.
- Site of food
- Small intestine via pyloric sphincter.

- **Absorption in the stomach:** Very little absorption occur in stomach. However, some water, certain ions and drugs like aspirin and ethanol are absorbed from the stomach into the blood.

## 5. SMALL INTESTINE:

As the contents of the stomach become thoroughly liquefied, they pass into the duodenum, the first segment (about 10 inches long) of the small intestine. Food takes 4-5 hours to pass through the stomach into the duodenum. The first part of the small intestine. After being churned and mixed with digestive juices in the stomach, food chyme moves slowly into the folds of small intestine through pyloric sphincter. The small intestine is the longest section of the digestive tract (approximately 17 feet) and is divided into three segments.

- The duodenum
- The jejunum
- The ileum
  - The duodenum is a short structure its length is 20 cm to 25 cm in length, and shaped like a “c”.
  - The jejunum is the midsection of the small intestine, connecting the duodenum to ileum it is about 2.5 m long.
  - The ileum is the final section of the small intestine. It is about 3 m long, and contains villi.

## FUNCTION:

- Most of the chemical digestion takes place.
- Complex chains of proteins are broken down into amino acids.
- Lipids are broken down into fatty acid and glycerol.
- Carbohydrates are broken down into simple sugar like glucose.
- Many digestive juices or enzymes that act in the small intestine are secreted by the pancreas and liver and enters the small intestine through pancreatic duct.
- In total, food typically takes 4-5 hours transit all the tree sections of the small intestine.

## 6. LARGE INTESTINE:

After all the nutrient have been absorbed from ingested food during its passage through the small intestine, the watery passes into the large intestine. It is the final section of the gastrointestinal tract and its main function is to remove water from the food and compress it into a form for easy expulsion from the body. As the chyme passes through the large intestine .the water is removed and the chyme is combined with mucus and bacteria, and is converted into feces.

▪ **Structure:**

- The length of male colon is 166 cm.
- Female colon is 155 cm.
- The colon consist of five sections.
  - Cecum
  - The ascending colon,
  - Transverse colon,
  - Descending colon,
  - Sigmoid colon and the rectum.
    - The colon is the longest segment of the large intestine. The rectum is the first part of the large intestine.
    - Anal canal, is a short passage about 1.5 inches long.

**FUNCTION:**

- It absorbs all the nutrients and water from the food that are needed before sending the indigestible matter to the rectum.
- The colon absorbs vitamins that are created by the colonic bacteria, such as vitamin k.

**# MINOR ORGANS:**

**1. LIVER:**

The liver is one of the most important and largest organ in the human body.it is located in a central position of the abdomen under the diaphragm. The liver is a reddish brown wedge-shaped organ.weight is 1.44-1.66 kg.it is both the heaviest internal organ and the largest gland in the body.

**FUNCTION:**

- Carbohydrate metabolism

- Fat metabolism
- Protein metabolism
- Detoxification
- Storage
- Synthesizes of bile which is important for fat digestion and is also a route of excretion from the body.

## **2. PANCREAS:**

The pancreas is an elongated organ, light tan or pinkish in color, that lies in close proximity to the duodenum. Pancreas anatomy has two main components acinar cells and ducts. These two constitute 80% to 90% of the pancreatic mass. It can be divided into three regions:

- The head
- The body
- The tail
  - The head is an expanded portion that lies in the c-shaped region of the duodenum to which it is intimately attached by connective tissue, which is connected by a common blood supply.
  - The body and tail extend across the midline of the body towards the hilum of the spleen.

## **FUNCTION:**

- It controls blood sugar level.
- Pancreatic islets are present in the pancreas.
- Within these islets are four main types of cells which are involved in the regulation of blood glucose levels.
- Each type of cells secretes a different type of hormone.

## **Question # 2**

**How kidneys are involved in urine formation? Explain the process step by step in detail.**

**Answer: KIDNEYS:**

The kidneys are a pair of excretory organs situated on the posterior abdominal wall, one on each side of the vertebral column, behind the peritoneum. The kidneys filter unwanted substances from the blood and produces urine to excrete them. There are three main steps of urine formation: glomerulus filtration, re-absorption, and secretion. These processes ensure that only waste and excess water are removed from the body.

**LOCATION:** The kidneys are bean shaped organs (about 11cm – 3cm) that are located against the back muscles in the upper abdominal area.

**URINARY SYSTEM:** The urinary system function is to filter blood and create urine as a waste by product. The organs of the urinary system includes the kidneys, renal pelvis, ureters, bladder and urethra.

- The kidneys remove waste products of metabolism, excess water and salt from blood and maintain the pH.
- Ureters convey urine from the kidneys to the urinary bladder.
- The urinary bladder is the muscular reservoir of urine.
- Urethra is the channel to the exterior.

**TWO KIDNEYS:** This pair of purplish brown organs is located below the ribs toward the middle of the back. .their function is to

- Remove waste products and drugs from the body.
- Balance the body fluids.
- Release hormones to regulate blood pressure.
- Control production of red blood cells.

The kidney remove urea from the blood through filtering units called nephrons. Each nephron consists of small blood capillaries called a glomerulus, and a small tube called a renal tubule. Urea, together with water and other waste substances forms the urine as it passes through the nephron and down the renal tubules of the kidneys.

**TWO URETERS:** These narrow tubules carry urine from the kidneys to the bladder. Each ureter is about 25cm long. Muscles in the ureter walls continuously tightens and relax forces urine downward, away from the kidneys. If urine backs up, or is



allowed to stand still, a kidney infection can develop. About every 10-15 sec, small amount of urine are emptied into the bladder from the ureters.

**BLADDER:** Bladder is a triangle shaped hollow organ located in the lower abdomen. The bladders wall relax and expand to store urine, and contract and flattened to empty urine through the urethra. A normal bladder can store up-to 2 cups of urine for 2- 5 hours.

**TWO SPHINCTER MUSCLES:** These two sphincter muscles help to keep the urine from leaking by closing tightly like a rubber band around the opening of the bladder in normal condition.

**NERVES IN THE BLADDER:** The nerves alert a person when it is time to urinate, or empty the bladder.

**URETHRA:** Urethra allows the urine to pass outside the body. The brain signals the bladder muscles to tighten, which squeezes urine out of the bladder. At the same time, the brain signals the sphincter muscles to relax and let the urine exit the bladder through the urethra. When all the signals occur in the correct order, normal urination occur. Male urethra is about 20cm long .female urethra is 3-4cm long.

#### **STEPS INVOLVED:**

- I. **FILTRATION:** Blood enters through the glomeruli and passes its fluid which contains both useful chemicals and dissolved waste materials, which are filtered from the blood through two process i.e. osmosis and diffusion. The blood then passes from glomerulus through Bowman's capsule. The filtered blood is collectively known as glomerulus filtrate. Water, waste products, excess salts and other chemicals have been filtered out of the blood.
- II. **RE-ABSORPTION:** Re-absorption of other nutrients begins in the proximal convoluted tubules and continues in the loop of Henle, Distal convoluted tubules and collecting tubules substances that absorbed are water, glucose, and other nutrients and sodium and other ions.
- III. **SECRETION:** The filtrate in the glomerulus goes through the renal tubule, where nutrients and other ions etc. are reabsorbed.at the same time water ions and hydrogen ions passes from the capillaries into the renal tubules.

This process is known as secretion. Secreted ions combines with the waste material urine and flows out of the body.