**HND 2nd Semester**

**Course Title: Anatomy Instructor: Dr. Ahmed Hayat**

**MID Term Assignment Marks: 30**

***NOTE: Mention your name and roll number on the assignments.***

Q1: Write a paragraph on the process of food digestion. Highlight the functions of each organ involved.

Q2: How kidneys are involved in urine formation. Explain the process step by step in detail.

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**Q1: Write a paragraph on the process of food digestion. Highlight the function of each organ involved.**

Answer: **FOOD DIGESTION:-**

It is the breakdown of large insoluble food molecules into small water-soluble food molecules so that they can be absorbed into the watery blood plasma.

***Process Of Food Digestion:-***

The following processes are involved in the digestion of food;

* Ingestion
* Propulsion
* Mechanical digestion
* Chemical digestion
* Absorption
* Defecation

1. **INGESTION:** It is the taking in of the food through the mouth or buccal cavity. After ingestion the food is converted into bolus form and is pushed by the tongue at the back of the mouth to the pharynx.
2. **PROPULSION**: It is the passage of the food through the pharynx and esophagus into the stomach. The food is propelled through esophagus and pharynx by the peristaltic movement of smooth muscles of these organs.
3. **MECHANICAL DIGESTION:** It is the crushing of large food molecules by mechanical forces such as; Chewing that occurs with the help of teeth and tongue in the mouth, Churning that occur in the stomach with the help of its muscular layer, and Segmentation movements that occur in the small intestine.
4. **CHEMICAL DIGESTION**: It occurs with the help of different enzymes present throughout the digestive system. These include Ptyalin and amylase in the saliva (mouth), HCL, Pepsin (stomach), pancreatic enzymes etc. All these enzymes help in the complete breakdown of the large food molecule and convert them into absorbable form.
5. **ABSORPTION:** After the complete digestion of food, the important products are absorbed from it. The absorption occurs through the blood vessels present along the small intestine. Mainly H2O is absorbed along with carbohydrates, lipids, proteins and other important particles.
6. **DEFECATION:** After absorption the remaining part is propelled into the large intestine for where it is excreted outside the body. This process of excretion is known as defecation and occurs with the help of parasympathetic nervous system.

***Function OF Organs Involved In Digestion:-***

**MOUTH:-**

1. It helps in the grinding of food with the help of teeth.
2. It contains tongue which have taste buds, with the help of which we experience the taste of different foods.
3. Contain salivary glands which secrets saliva. Saliva has two main functions i.e. Moist the bolus to help sallow the bolus and contain two enzymes namely ptyalin and amylase which begins the digestion of food.

**PHARYNX:-**

1. It only acts as a conveyer of the food bolus from the back of the mouth to the esophagus.
2. No chemical or mechanical digestion occurs here.

**ESOPHAGUS:-**

1. It helps in the passage of food from the pharynx to the stomach. The bolus enters the stomach through the esophageal hiatus.
2. The esophageal gland produces mucus which lubricates the bolus and help in its easy passage.
3. Its esophageal sphincter prevents backflow of bolus into the oral cavity.
4. Its Cardiac sphincter prevents backflow of bolus into the esophagus from stomach.

**STOMACH:-**

1. It acts as a temporary storage area for food and allows enough time for digestion and absorption.
2. It mixes the bolus of food with gastric juices and converts it into a chyme.
3. It contains three muscular layers arranger circularly longitudinally and obliquely which help in the churning of the food bolus and mixing it with chyme.
4. Its Parietal cell secrets HCL (convert pepsinogen into pepsin) which help in killing of microbes in the food and Intrinsic factor which help in absorption of Vitamin B12.
5. Its Chief cells secrets pepsinogen which is converted into pepsin by HCL and help in protein digestion.
6. Pyloric Sphincter allows approximately 3ml of chyme to pass to small intestine and remaining chyme is send back to stomach for further mixing.

**SMALL INTESTINE:-**

Receive chyme from the stomach and perform majority of the digestion and absorption.

1. Have three main regions i.e. **Duodenum** (receive chyme from stomach and digestive enzymes from the pancreas and bile from the liver) and **Jejunum/Ilium** (help in absorption of the nutrients).
2. Secretes different types of enzymes which help in digestion that are;

* **Secretin:** Released in response to acidic chyme and causes release of bicarbonate rich pancreatic juices and neutralizes the acidity.
* **Somatostatin:** Slows the gastric emptying and release of gastric juices and allows enough time for digestion by the small intestine.
* **Cholecystokinin:** released in response to the fatty, protein-rich chyme and causes the release of enzyme-rich pancreatic juices and bile.
* **Brush Border Enzymes:** Process long peptides, nucleic acid and sugar into small ones.

**LIVER:-**

1. Filters and process nutrient rich blood of carbohydrates, lipids and proteins from the small intestine.
2. It secretes Bile. This bile helps in the emulsification of fats and converts them into smaller parts and helps in its easy digestion.
3. Stores necessary minerals and vitamins
4. Regulation of cholesterol is also done by liver

**GALL BLADDER:-**

It is found beneath left lobe of liver and stores bile which is basically produced by hepatocytes.

1. It helps in emulsification of fats as it contains enzymes that processes large fat globules.

**PANCREAS:-**

1. Secrets pancreatic juices which contain;

* **Sodium Bicarbonate**: Buffers HCL in stomach
* **Proteases**: Help in digestion of protein polypeptides.
* **Pancreatic Amylase:** Digests oligosaccharide and disaccharide into monosaccharides.
* **Pancreatic lipases:** helps in digestion of lipids into fatty acids and glycerols.
* **Pancreatic nucleases:** Digests nucleic acids.

**LARGE INTESTINE:-**

1. Helps in the reabsorption of the remaining water and electrolytes from the chyme.
2. Also helps in the absorption of vitamin B and K.
3. Forms a solid mass of feces from the chyme add bulk to it and excretes it out of the body.

**RECTUM:-**

Feces is stored in rectum.

**Anus:-**

Defecation occur through internal and external anal sphincter muscles.

**Q2: 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 on each side of the vertebral column behind the peritoneum.

Each kidney consist of 1-2 million nephrons which is the excretory unit of the kidney.

**URINE FORMATION BY KIDNEYS:-**

* The kidneys filter unwanted substances from the blood and produce urine to excrete them.
* There are three main steps of urine formation:

1. **Glomerular Filtration**
2. **Reabsorption**
3. **Secretion**
4. **GLOMERULAR FILTRATION:-**

* When the blood passes through the GLOMERULI, much of the fluids and important electrolytes along with dissolved waste material diffuse out of the blood vessels into the membranes by the process of osmosis and diffusion.
* These substances are then filtered by the glomerular capillaries into the Bowman’s capsule.
* The product formed is known as Glomerular Filtrate.
* GLOMERULAR FILTRATE: Contains water, waste products, excess salts (Na & K), Glucose and other chemicals that have been filtered out of the blood.
* This filtrate then passes into the tubular process of nephron.

1. **REABSORPTION:-**

* It is the movement of substances out of the renal tubules back into the blood capillaries.
* The substances reabsorbed are water, glucose and other nutrients and sodium and other ions.
* It starts in the proximal convoluted tubule in which majority of the glucose and amino acids are reabsorbed in addition to some ions.
* In loop of Henle mainly water along with sodium ions and other ions are reabsorbed.
* In Distal convoluted tubule mainly water and sodium is reabsorbed with the help of different hormones.
* In collecting tubule mainly water is reabsorbed.
* Of 180ml of glomerular filtrate produced each day, 99% is reabsorbed. This is called passive reabsorption.
* Reabsorption occurs by both active and passive reabsorption.
* Glucose is fully reabsorbed in blood from proximal convulated tubule.
* Sodium ions and other ions are partially absorbed from renal tubules.
* Increase sodium uptake lead to decrease salt absorption in blood and increase excretion in addition with large amount of water.

1. **SECRETION:-**

* It is the reverse of reabsorption i.e. movement of substances from blood capillaries into the renal tubules.
* Secretion of substance occurs either by active transport or as a result of diffusion across the membrane.
* Secretion helps in maintaining the acid-base level of the body.
* The substances secreted include the Hydrogen ion, Potassium ion, ammonia and certain drugs which are then eliminated out of the body.

All these processes lead to the formation of urine. Urine is about 95% water and 5% waste products. Urine also contain nitrogenous waste products in the form of ammonia and uric acid ion. Also contains different ions such as sodium, potassium, hydrogen and calcium.