Human Physiology
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Week - 01
Lecture - 02

Welcome again everyone in our next class. So, in the last class we discussed about like briefly about what is human physiology, how it came, we little bit discussed about western and Indian history of physiology. Along with that we discussed like what would be different type of organs and other components will discuss during the next few weeks in the next few classes. So, I hope that you enjoyed the first class and you are somehow better prepared this time. So, let us see this class is very important which will cover about human anatomy. So, before we go to like each organ as a whole we should know about our human anatomical system.

So, let us see what are different important anatomical terms related to our body because before we discuss we should know like what are those term right we will repeatedly utilize and use this terminology. So, let us discuss some terminologies. So, first one you can see here which is the anatomy right. So, what is anatomy? Anatomy is nothing but the study of human body structure and form, right.

So, when we are saying about human anatomy, what we will do, we will discuss about human structures, human body structures, about the human physiological structure and the form. Already we have mentioned in the last class, but again let's brush up what is physiology. Physiology is the study of the processes of living organism or how they work. Then another important terminology will come many time is like pathology. What is pathology? its study of the nature and cause of the disease.

So, pathology is directly related with the disease and how it progress. The next terminology embryology, which is a study of the origin and development of the organism. So, how the origination happened, how the human origination happened, this is so important component. Histology, this will come sometime of course. What is histology? Histology is the studies of the tissue and why histology is so important? Just out of the context little bit I'll tell you because in cases of many diseases, for example, like cancer, if we remove tissues and test them by the help of histology we can see some differences between the normal tissue and cancerous tissue.

So, what is the procedure for the removal of the tissue you all know it is the biopsy. So, doctor generally do the biopsy to remove some tissue if they suspect like a cause of the development of cancer in the body and through the processes of histology you can identify the differences between a normal and cancer cell. Same way many disease you can detect by the process of histological examinations of the tissue. So, histology is very important component, then cytology as you can understand by the cytology is the study of the cells. So, if you remove the cells from the tissue and do thorough study it is called cytology.

Another very important terminology I mentioned you in the last class also it is homeostasis. What is homeostasis? Homeostasis is the ability to maintain relatively a balanced condition in our body. Can you give an example about a homeostasis? So, for example, glucose right. Glucose regulation is so important for our body. Glucose is first of all an important component that helps our body to make energy.

But in case of excesses glucose in our body what will happen? Because with glucose it also influences a significant inflammation to our body. So, if there is a much higher glucose present in the body, our organ will get damaged due to the high concentration of the glucose. Of course, the situation does not happen in a single day, if regularly the glucose level stays in a higher level, slowly, slowly you will see like many of our organ will fail and a situation of multi-organ failure can also happen. So, basically it is diabetes right, you all know this excessive proportion of glucose in the body in an unregulated stage is called diabetes, we will discuss later. But glucose homeostasis is very important and who maintains it? Insulin and glucagon.

So, insulin and glucagon both this hormone which gets secreted from the pancreas, they are highly crucial to maintain glucose homeostasis in the body. Next protoplasm, we all know like this is basic substance of all life which includes like carbon, oxygen, hydrogen, nitrogen and phosphorus. So, all these some terminology hopefully now you understood and many a time I will use this terminology. So, please try to remember some of these, so that when in context it comes it would be easier for you to understand the topic. And how the hierarchy of structural organization works, right, because we are here, we are down here as a human and we are studying about us.

but how the structural organization work. So, as you know right, we have atoms then if we come little bit bigger few molecule few atoms will get joined with each other will get a molecule then from molecule will get like organelles, cells, few cells they can combine to form like tissues and then tissues can combine to form organs, right. So, organs are, we gave many example like our brain, heart, different organ we will discuss. And once we combine various organs in our body along with like all the fluidic systems like blood, lymph, water as a whole with organs, tissues, cells, bones, the whole organ system and eventually the whole organism form as the human. And in the physiology course, in the human physiology class, we will not only try to understand about the anatomy of the organs.

Of course, we will discuss about different anatomy, but we will go to the micro level also. So, from the macro level, we will go to the micro level and we will see how the tissues function, how the cells function inside of the organ because for basic mechanism we have to understand. If we want to find out how things work, we have to go in detail and understand their basic mechanism. So, we have to discuss in the micro level also to know about the cells, organelles, molecules even in the atomic level. So, we will try to cover as much as macro and micro for you to understand our human physiological system in a better way and we hope like once the whole course is done you will be equipped with different aspect of knowledge of human physiology and to start with What is cell, right? So, this is a beautiful structure of cell.

You should try to get this Guyton textbook, this is so beautiful book. If you can from acquire, get from some library or if you have some online version of it read, this is a beautiful book about medical physiology. But let us discuss, what is cell? Cell is a structural unit or the building block of our body. And can you imagine how many number of cells we have? We have trillions and trillions of cells in the body. So, each cells are performing regular actions and it is carrying lot of functions in order to keep us alive.

So, basically cells carry functions for life. What they do? They take food and oxygen and they help in process of respiration, digestion, What is the goal of like taking food and oxygen right to the cell basically to produce heat and energy. This is the most important part to produce the energy because all our human body functions require energy and then transport is very important like blood transport fluid transport lymphatic transport. So cells also control lot of

transport they move around like the ions they move around like excess fluid they move move around like the produce synthesized proteins out of the cell different hormones enzymes finally, they help in terms of like elimination of the waste product also from the cell cells also perform special function like a secretion and finally cells divide right. So, we all know cells divide rapidly.

So, for example, like from one cells you can get like two different cells right and then from two cells you can have maybe four cell. So, cells rapidly divide because our body is always growing. Of course, the growth is much higher in the early ages like when a new baby born the growth will be much higher compared to a human person fully developed maybe in their adult age or in the old age. So, reproduction and growth is very important component to the living system. and cells by their regular process of division and cellular growth, they control our overall growth structure.

And after the cells as we know from the cells if we combine different cells, what we get? We get tissues right. So, different type of cells can be joined together like epithelial cell, muscles, nervous cells, connective cells. So, once lot of cells join get joined together they will form the tissue and very important is like 60 to 90 percent of the water with various substances dissolved in it it is called like tissue fluid. So, you will you will you will observe like lot of tissue fluids in between our organs in between like tissues. So, when dehydration happen when there is a insufficient amount of tissue fluid.

So, when we do not drink water for long time we observe a situation like dehydration and it also affects our tissue fluid. And in case excess fluid we drink or maybe in case of a disease condition, you will find a situation of swelling, swelling of tissues, swelling of local area that is called edema. High content of water is also not good for our body then it will cause edema and even low content of water is also not good for our body it will cause dehydration. So, we need a balance again this homeostasis is very important anything present in our body needs in to stay in a right balance condition. Then let us see a little bit like what are different type of tissue.

So, first one is like epithelial tissue. Epithelial tissue is very important because it covers the surface of our body, right and various lining of like intestinal lining, respiratory lining, then urinary tract and other body cavities also, different glands. It has a supporting basement membrane for protection. It forms thin sheet, but they are not that strong of course. They do not generally have like any blood vessels, but depends on the capillaries as like surrounding capillaries for grating like nutrition and oxygen and also removal of the waste.

So, what are different functions of the epithelial tissue you can see like protection like skin in skin has lot of epithelial tissue which create like a natural barrier to our human body to protect against like lot of dust particles micro bacterium different type of viruses skin is so important right and then of course it helps in absorption epithelial cells helps in absorption filtration in kidneys excretion even secretion through like various glands endocrine glands and sensory application also present in skin. So, epithelial tissue is one of the very important component of the whole tissue system, then connective tissue. By the name you can understand that connective tissues basically provide supporting framework of the organ and it basically connects like various other body parts. So, what are different type of connective tissue either it can be soft connective tissue or it can be hard connective tissue. So, under the soft connective tissue we have like adipose which is like mostly fat.

So, it stores as you know like fat is like a reserve food right for energy also fat is a very good insulator. So, fat acts like a padding it maintains like thermoregulation in our body. And also there are fibrous type of tissue. They also helps to hold our body together. Mostly we'll find like fibrous tissue in like tendons, ligaments, right.

And then heart connective tissue we have like cartilage. They are mostly like tough and elastic material. Where you can find? You can find near to like long bones. Of course, like near to also like nose, ears. They do not have a very good blood supply that is one thing they do not have very good blood supply and also in cases of damages they heal very poorly that is one challenges I will not say challenge, but this is a natural phenomena that when they get injured the recovery time is generally long it recovers very slowly.

Then we have bones, this is also like similar to cartilages, bones has like calcium, phosphorus, many other component and bone and the bone marrow especially produces like various sort of blood cells. So, bone is very important component, it gives us structural integrity, it bone marrow produces like blood cells, immune cells, then nervous tissue. So, we discussed epithelial tissue. various connective tissues and then finally, like nervous tissue. These are made of special cells as you know like very well like neurons and neuroglia, glia cells and neuron cells.

It transmits impulses throughout our body sends signals for responses, reflex action and also it reacts to stimulants. It makes mostly like our brain spinal cord and nerves will thoroughly discuss about the neuron in our nervous system classes and you will really enjoy I can promise you then muscle tissues this is also very important this is like made of mostly muscle fiber cells it helps in terms of like contraction right. So, do you know heart is also a muscle right. So, we need like continuous beating of heart, continuous contraction and relaxation of heart in order to pump out blood in our whole body. So, muscles are basically three types, skeletal muscle, cardiac muscle and smooth muscle.

Skeletal muscles are attached with the bone to provide like mostly movement support other voluntary type of functions. Cardiac muscles as we discussed it helps the heart to beat, this is mostly involuntary and then we have smooth muscles also they are part of the various organs like digestive tract, blood vessels etc. These are kind of combination of epithelial and connective tissue. So, we discuss about epithelial tissue, we discuss about connective tissue, but when there is a combination right, it forms membrane. Like you can see like mucus membrane, the mucus lines have both epithelial and connective tissues.

It helps in terms of like various molecular absorptions and secretion. Then other examples like serous membrane, synovial membrane, dense fibres, cutaneous, cutaneous is very much known in terms of like in under the skin, right and then synovial, this is present near to like bones and joints. So, once different type of tissues and cells combine, they can form different membrane layer and membrane is kind of a second layer of protection. Then organs, right, once different tissues that work together for special function, it is called like organ and we discuss about all the organ like heart, stomach, lungs, skin, brain, etc. An organ system, group of different organs that work together for a particular function like respiratory system where like lung will work and other part of organs also like trachea, even like skin also has a role to like overall respiration, right.

Then in case of nervous system, you have like brain, spinal cord. So, different part of organ together when it functions certain task you can call it as a organ system right. So, you can see

different system in our body like skeleton system which are different component of skeleton system like bones, cartilages, joints, And what are their role? Let's discuss one by one. Like bones provide strength, support, shape, protection, right? And also bone marrow produces what? Blood and immune cells.

This is very important. Then muscular system you can see. which are the components of muscular system like muscles, we already discussed in detail, I am not again saying same thing. So, they have a important role in like motor movements, moving our all the body parts, then nervous system you see like brain, spinal cord, nerves. Nervous system control the coordination of our body function. respiratory systems, we all discuss right lung, nose, trachea, alveoli, the help in the gaseous exchange.

Cardiovascular system like heart, blood vessels, blood, it is very important for the flow of blood, for the flow of nutrients, oxygen, immune cells also to some extent. Final lymphatic system, like lymphatic vessels, lymphatic organs, lymphocyte cells, these are part of lymphatic system which is very important for the drainages of waste, tissue waste and also for the protection because it helps in terms of body's immunity. We will discuss in detail later. Then endocrine system which are part like pituitary gland, thyroid gland, ovaries, testes, it controls various body function, it controls our reproductive system, digestive system like oral cavity, esophagus, stomach, large intestine, pancreas. What it helps of course, we know very well that digestion and absorption of food, urinary system like kidneys, uterus, urinary bladder, these are part of urinary system.

We already discussed that they helps us to remove like our physiological waste right and then finally, like male and female reproductive system you know like uterus, ovaries, testes. This helps like in terms of production of sperm, production of eggs and eventually like fertilization and eventually baby development and formation. So, all this type of systems slowly we will discuss in coming classes. Lastly, different anatomical position we should also cover that you can see like in our body if we stand in a straight frontal position you can see like on the left side you can call it on the left then right side you can term it as a right side. If you go from the body, from the top part of the body, you can call it as a distal side.

If you go near to the top of your body part, you can call it as a proximal side and then in the frontal part, you can term it as an anterior and the back side, you can term it as a posterior. So, basically anterior, posterior, front and back side and then proximal is top of your, near to your brain and if you go far from your brain, you can term it as a distance. So, these are some of the terminology you can remember and our body also have some planes, right. So, if I create a half kind of like a dissection in between our body, like in between our body, if I create a plane, it is called that transverse plane. So, what it will do? It will basically create like two half of our body, one upper part of our body, one lower part.

Then if I create a plane exactly in between from our body like the green one you can see here, this is called a median plane. So, it is basically creating two half, one is right side and one is left side. And finally, the frontal plane is creating two half, one is in the frontal side right which is the anterior side and other is like the back side or posterior side. So, this type of three plane which are very important transverse plane frontal plane and medial plane right. So, I hope you get some idea about planes various postures And finally, we will end with like different body cavity part because cavities are also important.

So, this is the abdominal cavity or we sometime also say as like intraperitoneal cavity. Why it is important because majority of our organs are present in this intraperitoneal cavity like liver, kidneys, pancreas. Then you have like thoracic cavity where our lungs are there. Then in the cranial cavity our brain is there. So cavity is what? Cavity is basically a hollow space because many important organs they are big in size and they need certain space, right.

So you can go through about various body cavities and do a home task that what organs are present in those cavity right. So, take this task note like that what organs are present in the intraperitoneal or abdominal cavity please do this task ok. And finally, lastly we have like different body coordinates. So, if we kind of create a four We will see like right upper quadrant, left upper quadrant and then similarly right lower and left lower. These are just like for medical people to understand like a proper place of those organ, you can create a quadrant and then try to find out the exact location of a certain organ.

So, quadrants are important for doctors, for us to identify the exact locations of those organ. So, some finally, some fun fact, the right hand side of the human brain controls the left part of the body, whereas the left side of the brain controls the right part of the body. It is so interesting, right? Then, stomach acid that can also melt metal. Babies blink less than adults, right? Tonsils grow four times slower sorry this toenails, toenails grow four times slower than our fingernails. So, this is important like we know like our toenails are generally very slower in terms of growth than fingernail.

So, these are some of the fun facts. I hope you enjoyed this human anatomy class. Let us thank you very much. Let us meet in the next class again. Thank you.