agMOOCs

Fat Soluble Vitamins 2

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Hello good morning. Last class we have seen the functions, the sources, the efficiency and excess intake of vitamin A, how it affects the health and what are the important functions of vitamin A and since it is a fat-soluble vitamin that it is stored in the liver and can be utilized by the body.

Vitamin D

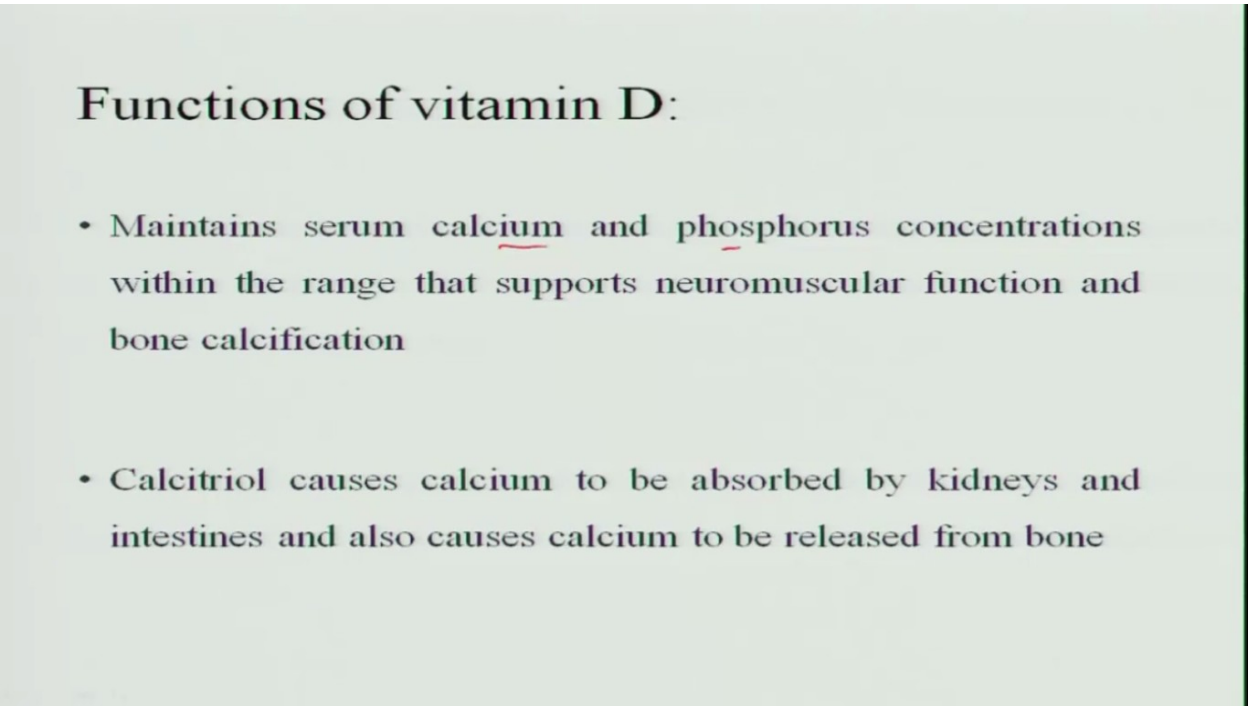
Two nutritionally important forms: vitamin

- D_2 **(ergocalciferol)** which is found in plants and vitamin
- D_3 **(cholecalciferol)** which is synthesized in the body from cholesterol

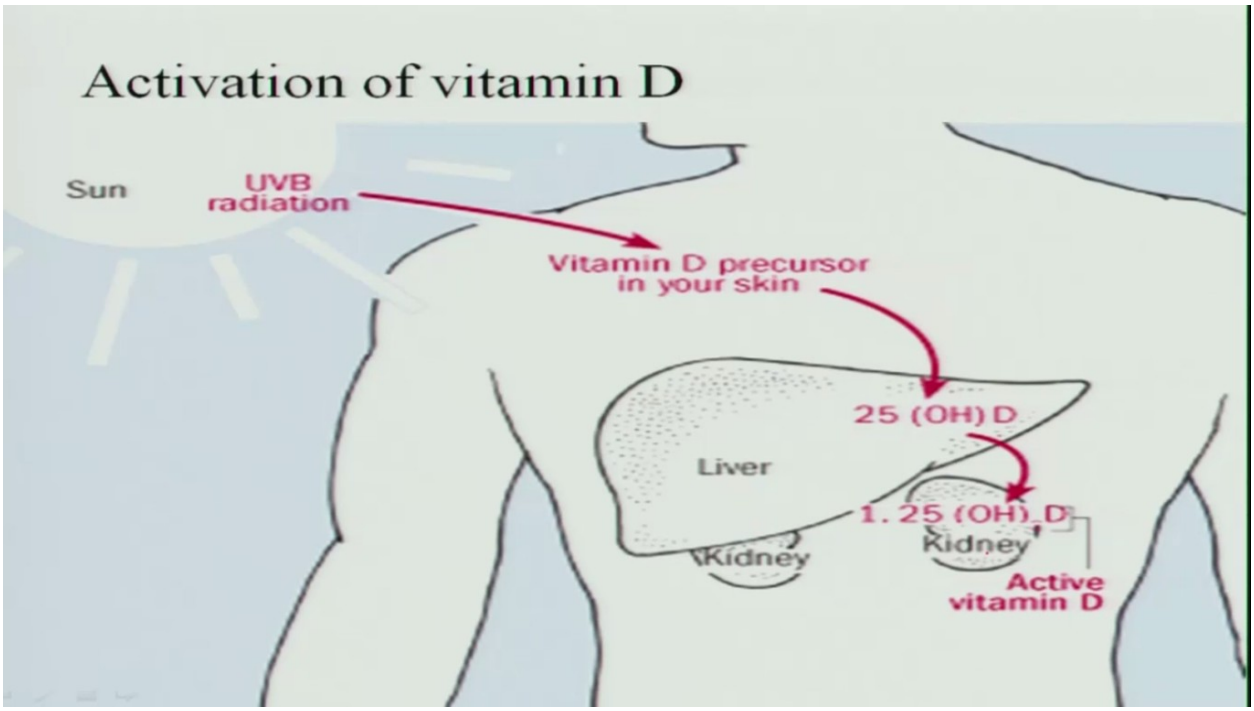
Now let us see about the vitamin D. So there are two nutritionally important forms of vitamin D. one is vitamin D2 which is ergocalciferol found in plant foods and D3 which is cholecalciferol which is synthesized in the body from the cholesterol that is the from the sunlight it is synthesized in the body.

- Conversion in skin: provitamin D (a form of cholesterol) is converted to previtamin D_3 is converted to vitamin D_3
- D_3 must be metabolized in the liver before becoming the active form of vitamin D
- Carried by proteins in blood stream

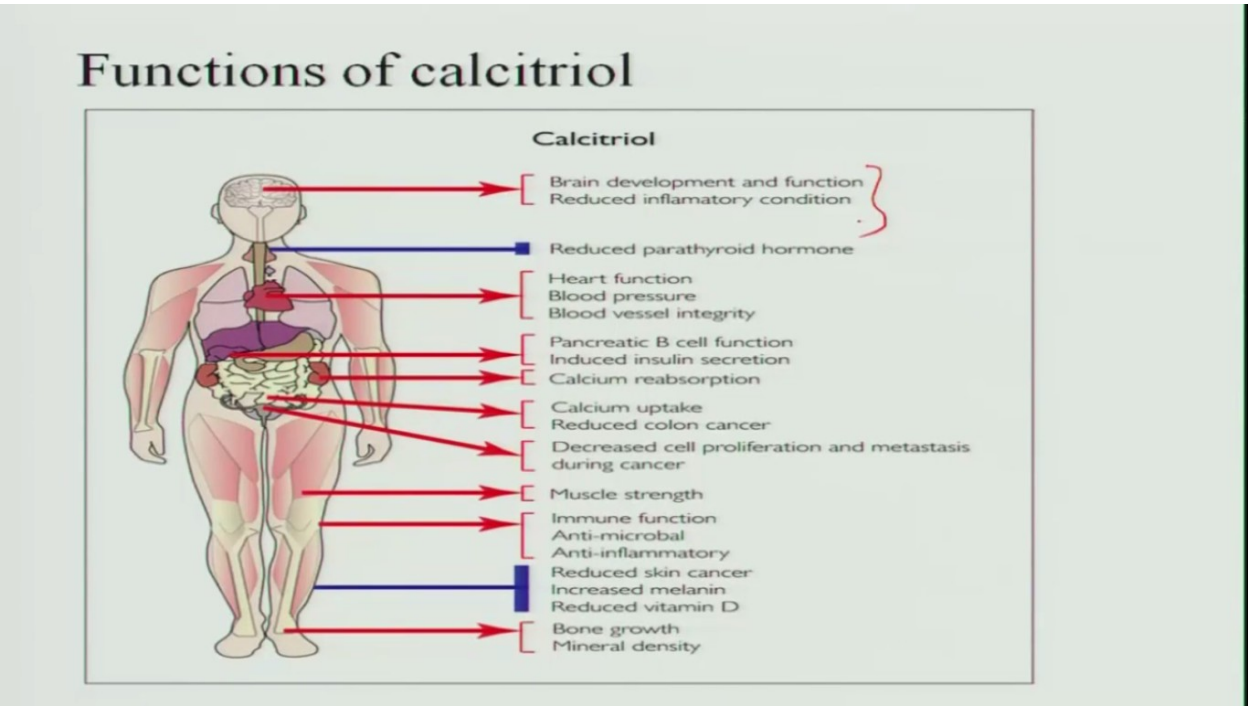
Now conversion in the skin the pro vitamin D which is a form of cholesterol is converted into previtamin D3 and then converted into the active form of vitamin D3. So D3 must be metabolized in the liver before coming into an active form of vitamin D. So this vitamin D is carried by the proteins into in the bloodstream.



Now functions of vitamin D it maintains the serum calcium and phosphorus concentration in the blood within the range and supports the neuromuscular function and bone calcification. Vitamin D is very important for the absorption of calcium. Therefore it has a very important function in the bone calcification. Now this is also called as calcitriol which causes calcium to be absorbed by the kidneys and intestines and also causes the whenever the blood level of calcium is decreased it causes the calcium to be released from the bones to maintain the level of calcium in the blood.



Now let us see how the activation of vitamin D occurs. So we get our vitamin D from the sun rays, the UV radiation when it touches the skin then the vitamin D in the form of 7 D hydro cholecalciferol enters into the skin and this goes to the liver and it converts into 25 hydroxy, the hydro cholecalciferol and from there it reaches the kidney and here it is the active form that is the 125 dihydroxy cholecalciferol and in this form only the vitamin D helps in the absorption of calcium.



Now functions of calcitriol. It helps in the brain when you see different parts of the body the brain development and function reduces the inflammatory condition of the brain. Then it reduces the parathyroid hormone. Then when it comes to the heart; heart function, the blood pressure, blood vessel integrity are very important and the pancreatic B-cell function, induced insulin secretion and calcium reabsorption occurs in the pancreas. So here the pancreatic function it reduces the incidence of diabetes. Then in the calcium uptake is improved and it reduces the colon cancer and decreases the cell proliferation and metastasis. So during cancer especially the uterine cancer and muscle strength increases, immune function, antimicrobial, anti-inflammatory and skin cancer is reduced. Then there is increased melanin and reduced vitamin D and bone growth and mineral density are also very important functions of the calcitriol.

Dietary sources

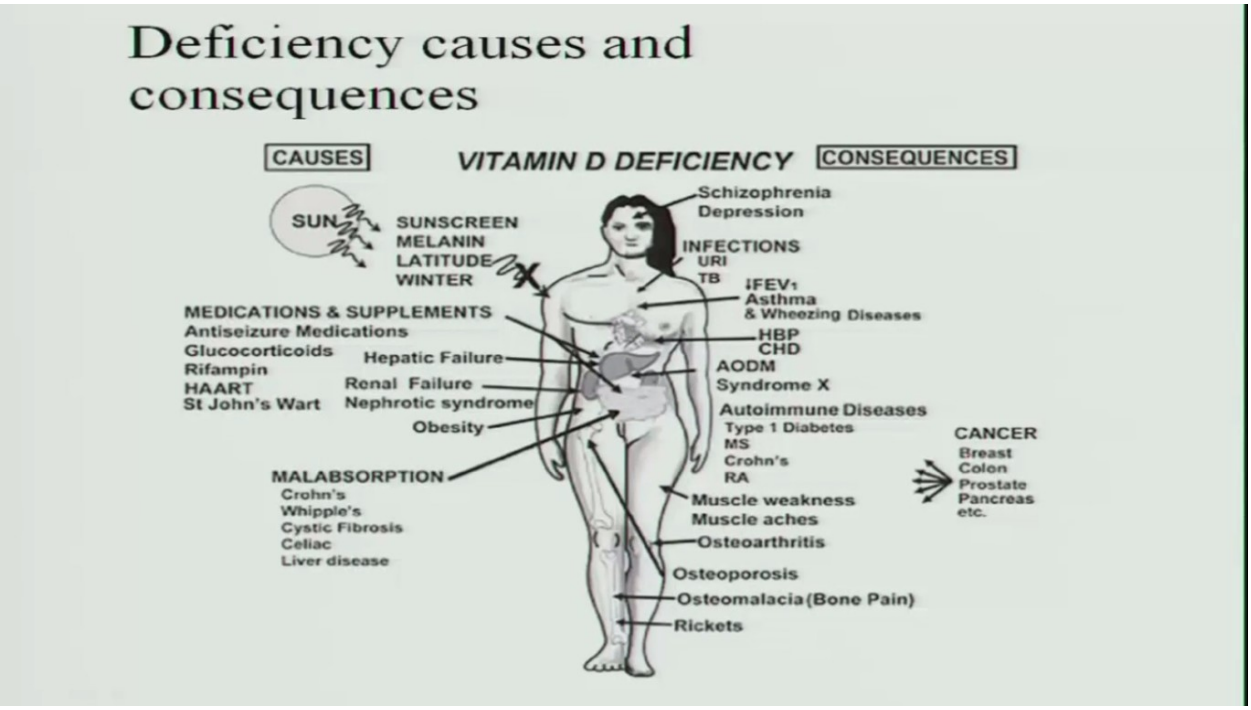
- Fortified milk, margarine, butter, cereals, egg yolks, liver, fatty fish

Various dietary sources of the vitamin D are. The main sources in sunlight and from the food sources you have the fortified milk. milk is fortified with vitamin D. Then you have margarine, butter, cereals, egg yolk, liver and fatty fish. So milk and margarine are fortified with vitamin D so that the body gets sufficient amount of vitamin D.

Problems of excess

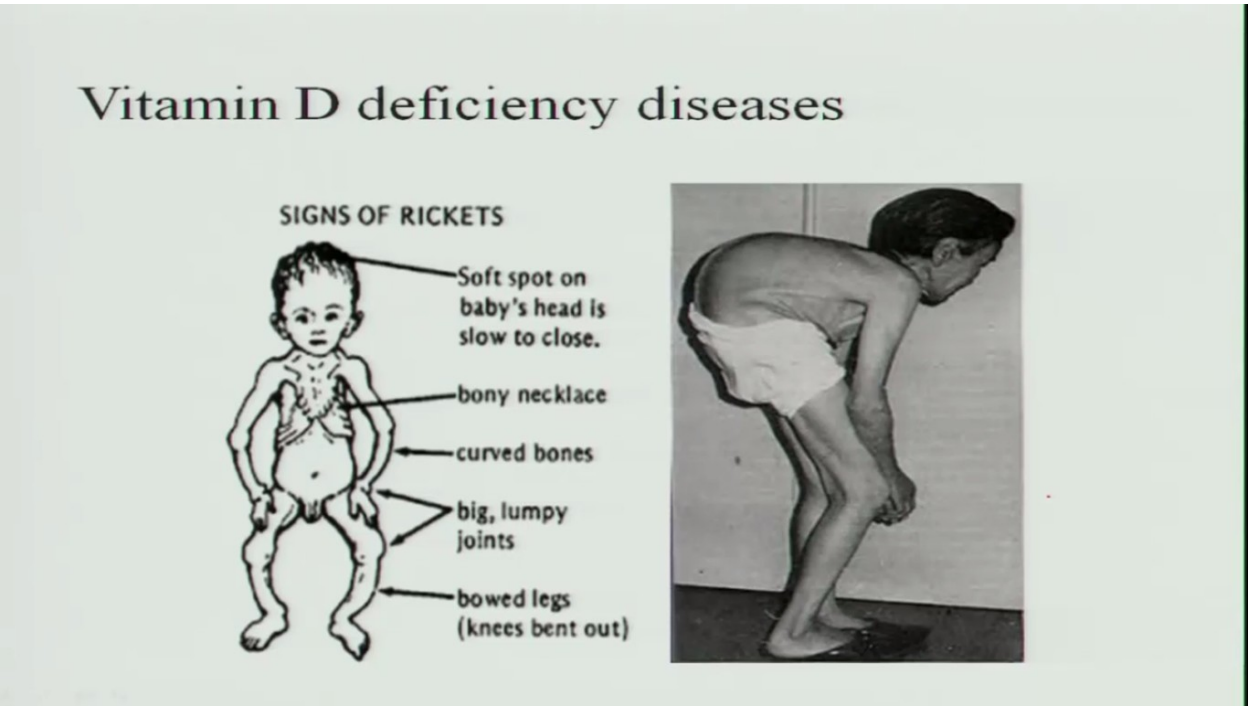
- Hypervitaminosis
- 5 times the AI is dangerous for infants, 10 times for adults.
- Calcification of soft tissue, growth retardation, excess calcium excretion via the kidneys (kidney stones), headache, muscle weakness, fatigue, excessive thirst

Now again the fat soluble vitamins are stored in the liver therefore excess of vitamin causes problems. So it causes hypervitaminosis. So if you take vitamin D 5 times more the recommended allowance especially for infants it becomes dangerous and if it is more than 10 times it is dangerous for the adults. Now when you take excess of vitamin D it causes calcification of soft tissues. Then there is growth retardation. Excess of calcium excretion occurs via kidneys. So kidneys are overburdened and it can form kidney stones and other symptoms are headache. Then muscle weakness, fatigue and excessive thirst.



Now deficiency and consequences of vitamin D also is very important. So the causes are when the sunlight is not properly reaching the body. So when people apply sunscreen and the melanin is less, the latitude and winter during winter when we close our entire body with the woollens then also the sun rays cannot enter into the body and there is it may cause deficiency of vitamin D. Then some of the medications like for anti-seizure, glucocorticoids, then HAART, and John's Wart which may be used for different disorders like hepatic failure, renal failure, nephrotic syndrome, obesity also causes vitamin D deficiency and malabsorption or like when the person is suffering from Crohn's disease, Whipple's disease, cystic fibrosis, celiac disease and liver disease under these conditions again the conversion of vitamin D becomes difficult and it may not be sufficient for the body to utilize it. Therefore deficiency is caused. Now when the deficiency is occurring then the consequences is occur in the brain like it causes schizophrenia and depression. Then there may be infections for the lungs which may cause the upper respiratory tract infection, tuberculosis, asthma and wheezing diseases. Then the cardiovascular function also may be affected. There may be high blood pressure and coronary heart disease. Then know your pancreas again you may have syndrome X and maybe leading to diabetes mellitus. Then it may lead to autoimmune diseases like Type 1 diabetes, Crohn's disease, etc, and muscle weakness, muscle aches, osteoarthritis, osteoporosis, osteomalacia and rickets. So all these are the consequences of the vitamin D deficiency and overall this it may also cause in the breast colon,

prostate pancreas, etc. So we should realize how important vitamin D is and what deficiency causes so many disorders in the body.



Now vitamin D deficiency when you see an infant. So ricket is the disease that is caused because of vitamin D in the infants because of lack of calcium absorption. The bones become very soft and there is a bending of the bones which causes rickets. So bow legs are caused because of it and when you see infant the cranial bones are not closed. So you have a soft tissue over the head of the infant and normally this closes by the age of one year but when the infant has vitamin D deficiency this is called as anterior fontanelle that does not close even after one year. So you can still find opening I mean the soft tissue over the head for a longer period which is caused because of the vitamin D deficiency. Then the dots or the bundling of the bones in the ribs which is called as they rachitic rosary it looks like a necklace. So then the bones are curved. Then joints become big and lumpy. So these are the major symptoms that the child or the infant suffers when there is lack of vitamin D. And you have seen in adult that the bones become weak and the person is almost bent.

So these are the various forms of vitamin D, the functions of vitamin D; very important functions of vitamin D throughout the body from the head to the toe it has so many functions in the body and the important source is sunlight and so some exposure of body to the sunlight is very important and then for infants also it is very important because it causes softness of bones and there is a permanent deformity in the body.

Thank you.