agMOOCs

Major Minerals 1

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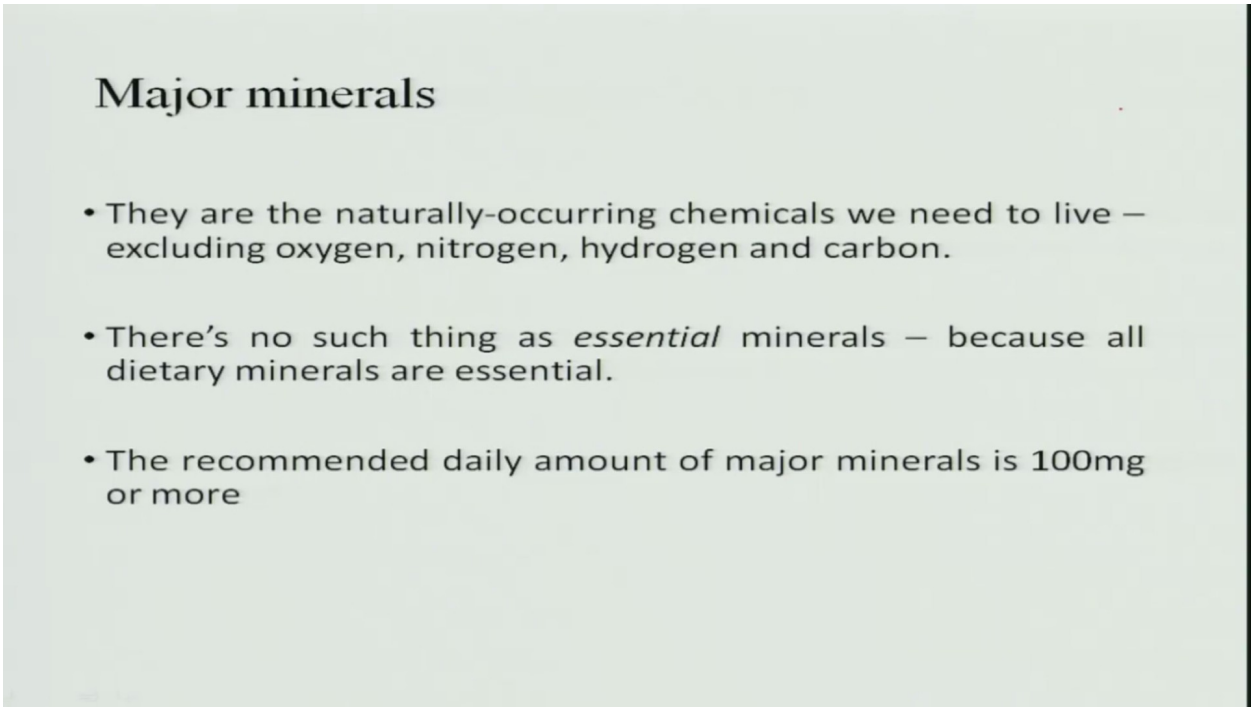
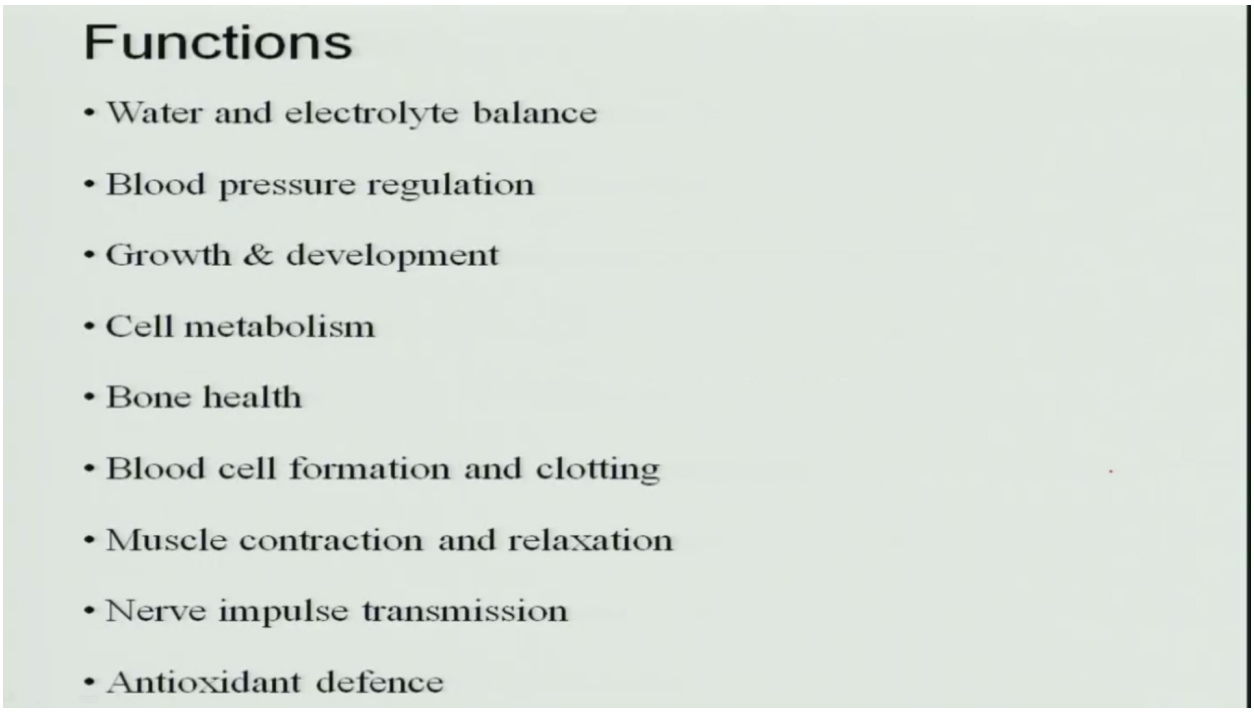
The last few classes, we have been dealing about the various nutrients starting from the major nutrients, like carbohydrates, proteins and fats, and the energy, and we have started with the minor nutrients like the vitamins, including fat soluble vitamins and water-soluble vitamins. Now we go to the next class of minor nutrients called minerals, and among the minerals, we have major minerals and minor minerals. We call major minerals for whom we have to -- the intake is more than 100 milligrams per day and the intake where the amount is less than 100 milligrams are classified as minor minerals. Let us go into the major minerals and see what their functions sources and deficiency symptoms are.

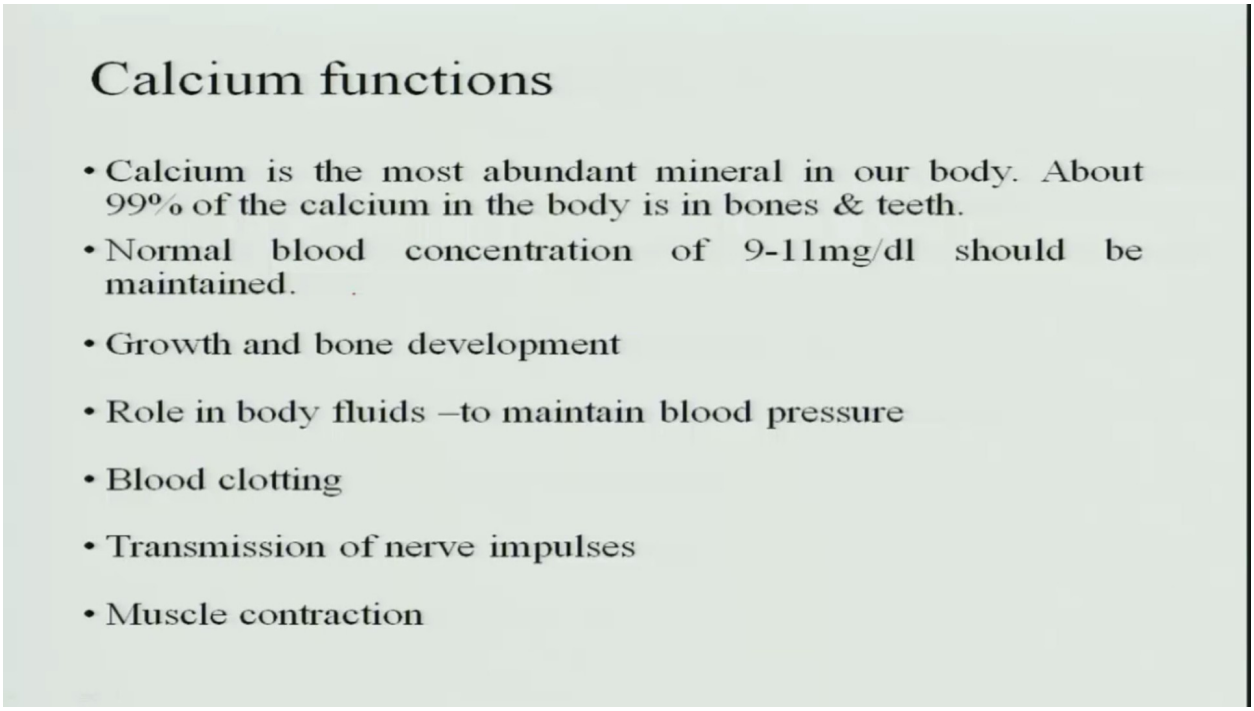


So these are the naturally occurring chemicals we need to live, and they are excluded of oxygen, nitrogen, carbon and hydrogen. So there is no such thing as essential minerals, because all the minerals are very important for our survival. The recommended daily amounts of major minerals is hundred milligrams per day.



The functions these major minerals carry out are, they are important for water and electrolyte balance and blood pressure regulation, only if the water and electrolyte balance is properly maintained the blood pressure is regulated then growth and development, cell metabolism, bone health, then blood cell formation and clotting and muscle contraction and relaxation, nerve impulse transmission and antioxidant defense, all these are the general properties or in general functions that all the minerals carry out. So each mineral may have a specific function among this.

Now there are seven major minerals like calcium, magnesium, potassium, sodium, sulfur, phosphorus and chloride. So let us see in detail about each of the minerals.



Starting with the calcium, this is the major amount of mineral that is found in the body and this is -- about 99% of this calcium which is present in the body is present in bones and teeth. Calcium is also circulating in the blood. So the normal concentration of blood is 9 to 11 milligrams and this has to be normally maintained. That is the homeostasis of the blood, if it is normal, you have 9 to 11 milligrams per deciliter of blood, and if there is any change then the stores or the calcium where it is stored in form of bones or teeth, they are depleted and the blood level is maintained normally.

Growth and bone development, growth is when the calcium is deposited, there is growth, there is increase in the size of bones and there is growth and bone development. Then it has a role in body fluids, so it maintains the amount of the body fluids and therefore maintains the blood pressure, and it is very important for blood clotting. Calcium is one of the factors in the blood clotting factors, which is very important and if there is deficiency of calcium, the blood clotting is affected. Then transmission of nerve impulses and muscle contraction, muscle contraction including the heart muscle, so that means it also helps in the maintaining the rhythm of the heartbeat. If calcium is deficient, there is irregular heartbeat and this also leads to so many problems.

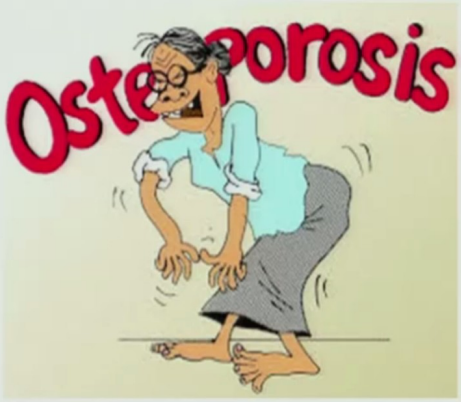
Food sources of calcium

- Dairy products : milk and milk products
- Dried fish
- Green vegetables like kale and broccoli.
- Black-eyed peas
- Orange juice.

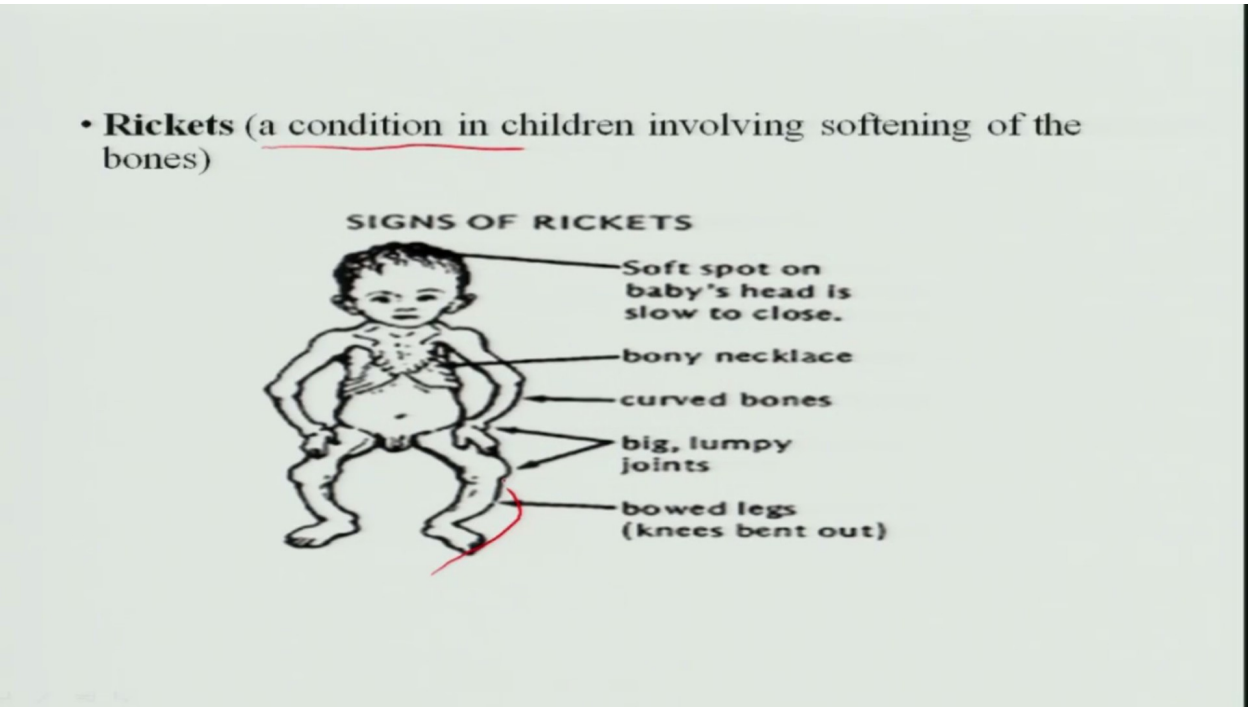
Now food sources of calcium, dairy products are very rich in calcium all the milk and milk products, and dried fish, dried fish when it is eaten completely without throwing out the bones, the small fish along with the bones when they are eaten they are rich sources of calcium. Then green vegetables, green vegetables are very rich in calcium, then you have black-eyed peas and orange juice. So these are the good sources of calcium and when you consume them, the calcium requirement is met.

Problems due to deficiency of calcium

- **Osteoporosis** (weak bones due to low bone density)

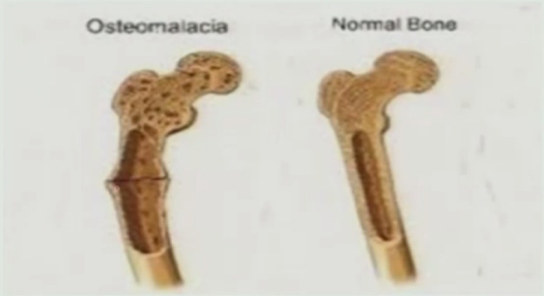


Now deficiency of calcium, so in adults, it causes osteoporosis. The name itself says there is porisis, that means the bone is depleted, the calcium is depleted from the bone to maintain the blood levels in the body. So therefore, the calcium deficiency occurs and the bones become porous and they have a deficiency symptom called osteoporosis, and such people are prone to fractures very easily. This is a very common symptom in adults when the calcium deficiency occurs.



And in children, the rickets, we were talking about this in the vitamin D deficiency. How it has come into the calcium deficiency is, vitamin D is very essential for calcium absorption. if there is no vitamin D, there is no calcium absorption. So when calcium is lacking, then the bones are not performed properly and they get deformed, therefore, again, signs of rickets appear in small children that is infants.

- **Osteomalacia** is the softening of the bones caused by defective bone mineralization secondary to inadequate levels of available phosphate and calcium

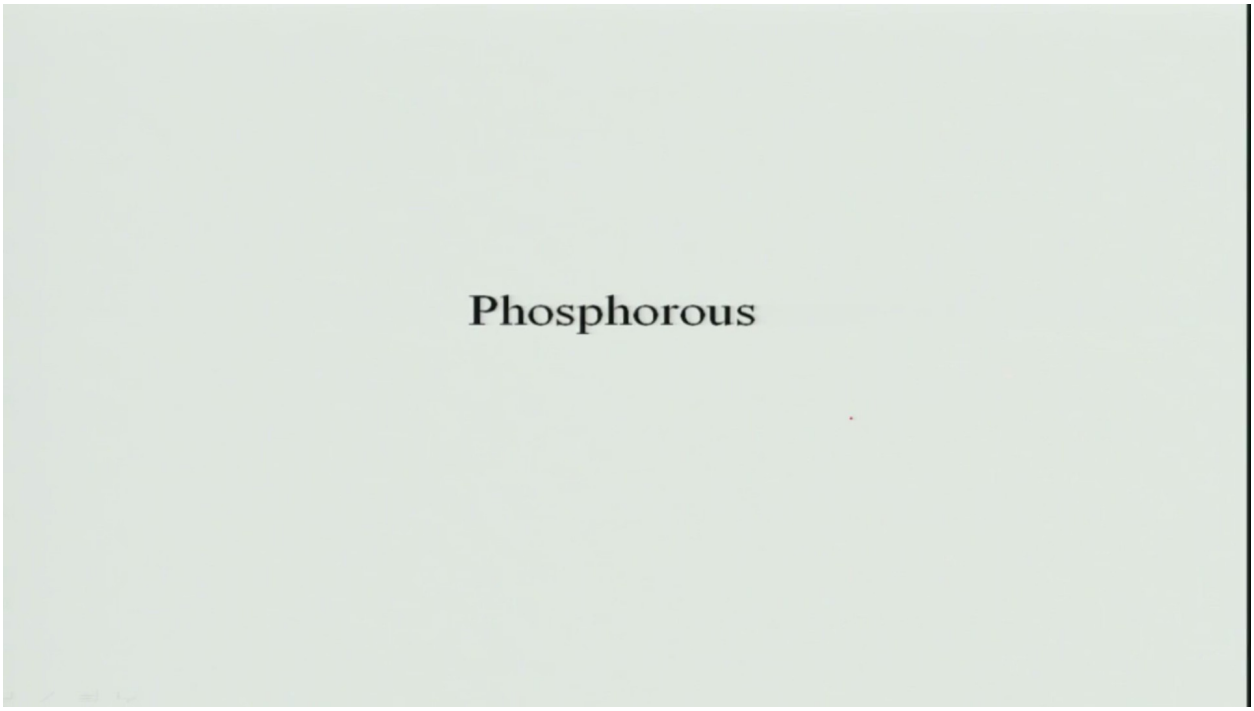


Then osteomalacia occurs in children where there is softening of bones which is caused by defective bone mineralization. This usually occurs in children, therefore, when inadequate levels of calcium are there, the children cannot form their bone properly. There is no proper mineralization in the bone and there is deformity of bone. You can see the bone, normal bone here and the deformed bone here.

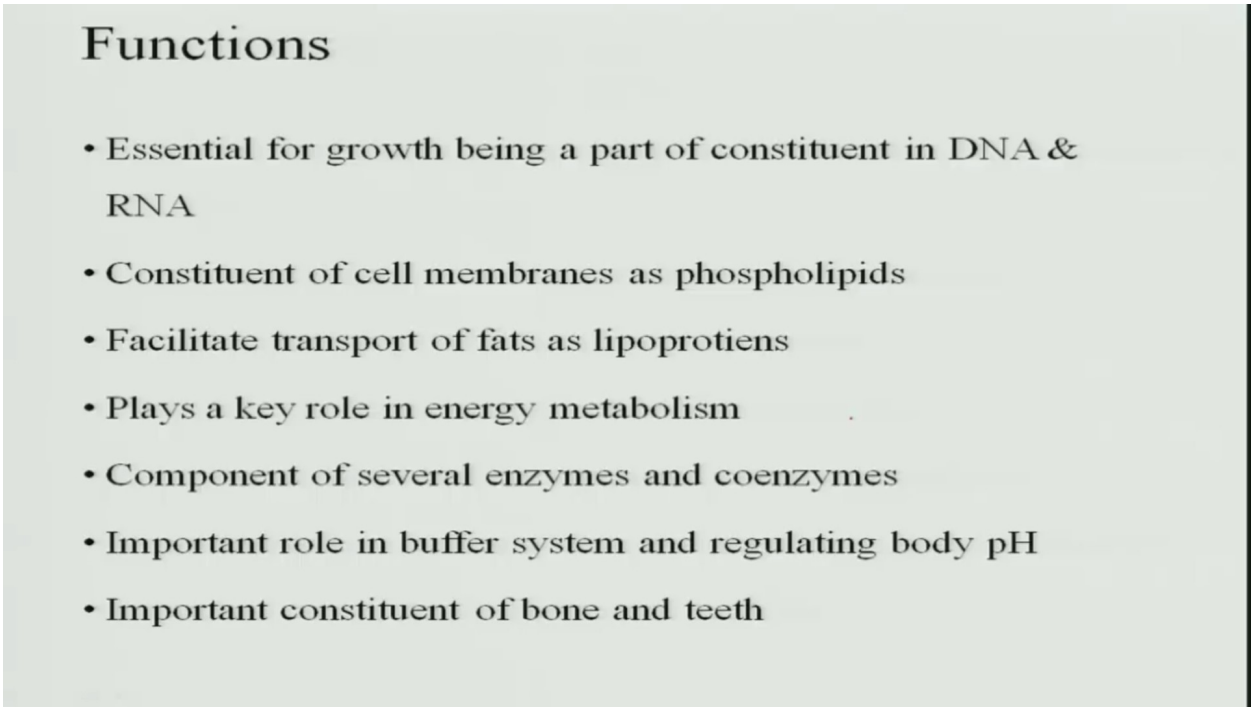
Problems due to excess intake of calcium

- Increased risk of kidney stone formation
- Affects the absorption of other minerals like iron and zinc
- Calcium supplements may increase calcium deposits in coronary arteries and increase risk of heart attacks

Now problems due to excess intake of calcium, now deficiency cause a lot of problem, in the similar way since minerals are stored in the body, they are not excreted, therefore, the excess also causes problems in the body. So there is increased risk of kidney stone formation. How? Because the calcium has to be excreted out from the body and when it keeps excreting it starts depositing in the kidneys and forms kidney stones. Then it affects the absorption of other minerals like iron and zinc and calcium supplements may increase the calcium deposits in the coronary arteries, so the arteries also may become calcified and become hard and there is a very increased risk of heart attacks.



The next important mineral which is along with the calcium is to phosphorus, both together calcium phosphate is found in the bones, and therefore, phosphorus is another important mineral.



And the functions of phosphorus are, it is essential for growth being a part of the DNA and RNA, then it is a constituent of cell membranes as phospholipids and especially it is present in the brain which is important for the functioning of the brain and facilitates the transport of fats as lipoprotein, otherwise fats are not transported in the body. They combine with proteins in the form of phospholipids and they are transported. Then it plays a key role in energy metabolism the end product of energy metabolism is ATP. So here the phosphorus is very important for release of energy.

Then component of several enzymes and coenzymes and so it is involved in reactions, the metabolic reactions and it just gets added and removed so the metabolism is carried out without phosphorus, the metabolism also is deficient. Then it has an important role in maintaining the buffer system, so because of phosphorous acid base balance is maintained very well and the body is normal. And important constituent of bone and teeth because along with calcium, it is in the form of calcium phosphate that it is present in the bones and teeth.

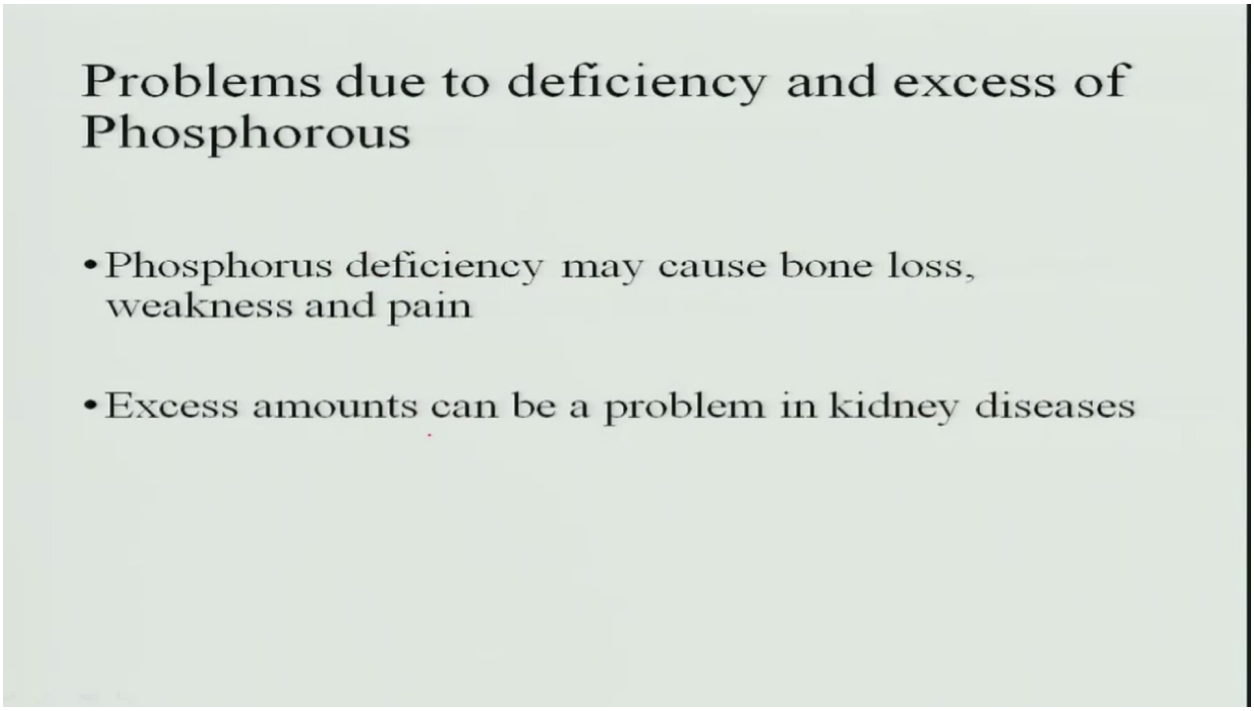
Food sources of phosphorous

- Almost all types of food contain some phosphorous, and not many people are lacking it.
- It is most prevalent in meat and seafood.
- Cheese nuts and seeds.

Now food sources of phosphorus, phosphorus is very widely present in almost all the foods, so generally there is no deficiency of phosphorus occurring in people, and high amounts are present in meat and seafood and nuts and seeds.

Phosphorous food sources

These are the food sources of phosphorus.



Now deficiency and excess of phosphorus will cause some problem in the body. So phosphorus deficiency may cause bone loss because calcium phosphate is not formed, then there is weakness and pain because there is bone loss, and excess amount again may cause kidney diseases like it may cause the formation of stones in the kidneys.

this Was about the calcium and phosphorus because both are related together and they have to be in a ratio of 1:2, therefore, the bone strength depends upon the presence of calcium and phosphorus in the body for we have seen what are the food sources of calcium and how the deficiency and excess of calcium causes different disorders in the body, therefore, they are very important minerals which have to be consumed through diet. Thank you.