Slide 1: Welcome back to today's class and we have seen all the nutrients, their functions, their sources, what are the symptoms of deficiency, what are the symptoms when we take in access. And let us just very quickly brush up what are the various nutritional disorders that are caused by the excess or deficient intake of all these nutrients.

Slide 2: So protein energy malnutrition is a very important disorder, then vitamin A deficiency, iron deficiency, B-complex deficiency, and iodine deficiency. These are the important main nutritional disorders that occur because of excess or deficient intake of various nutrients.

Slide 3: The protein energy malnutrition, so this is a deficiency of protein and calories in the diet. So it refers the form of malnutrition. The types of protein energy malnutrition are, one is the, when there is only protein deficiency, the deficiency is called as kwashiorkor and marasmus is when there is deficiency in the calorie intake. So there may be marasmus alone or kwashiorkor alone and sometimes there is marasmic kwashiorkor. So this occurs when there is protein deficiency and also calorie deficiency present in the individual.

Slide 4: Now marasmus is a form of severe malnutrition and it is characterized by severe energy deficiency. So the child who is s marasmic, looks very emaciated. So body weight is reduced, less than 60% percent of the normal or standard body weight expected for that age and marasmus occurs increasing to the prior to age 1. So this happens when the second child is born and the mother puts of the first baby from the breast and it has to be weaned early, then under such conditions, the child becomes marasmic.

Slide 5: So this is how the marasmic child looks and you can see the clinical manifestation There is lot of wasting there is no muscle at all and growth retardation is there because the weight reduces by 60% of the normal weight and there are mental changes, there is no edema at all and the temperature is sub normal, because there is no subcutaneous fat and muscle in the body and there is no appetite and often there is diarrhea present in the child.

Slide 6: And kwashiorkor, it occurs after 18 months of age. So the marasmus can be when the child is put on to the adult diet, the child is not able to feed it through itself properly therefore then under such conditions protein deficiency also occurs and the child comes to kwashiorkor stage.

Slide 7: So this is how the kwashiorkor child looks like. It is looking like a normal child, isn't it? So very difficult to assess, how whether the child is having a kwashiorkor or a normal child. There is no change in the body weight.

Slide 8: So we have to go only by the diagnostic tests. So there is edema, muscle wasting, muscle wasting is covered by edema, so does not look as the child is muscle wasting and psychomotor changes and you have common signs like hair changes hair becomes brown in color, there is diffuse depigmentation of the skin, the face looks like a moon face, because of edema it becomes very round, you may think the child is chubby, but it is a deficient child. Then there is anemia. So this is got only by testing the blood of the child.

Slide 9: See the difference between the kwashiorkor and the marasmic child. The kwashiorkor child has swelling of legs then sparse hair, the hair is lost, moon face, with little interest in surroundings, he is not at all interested in surroundings, he keeps on crying, then flaky appearance of the skin, because the skin becomes dry and flaky, and swollen abdomen, and the muscles are thin, but fat is present. Whereas in the marasmic child the hair is normally, you can see the hair is normal, but the child looks like a pocket-sized old man okay, and that their limbs become very thin without any muscle or fat, and the body weight is only less than 60% of standard weight.

Slide 10: Next vitamin A deficiency also commonly occurs in children who are not fed properly. So this is lack of vitamin A in body, and generally it is very common in poor countries and rarely seen in developed countries. So the first symptom of vitamin A deficiency is nyctalopia or night blindness, and this is the first sign, that is the child will not be able to see in dark. Generally when we get into a dark place, within seconds we get adapted to the darkness and we are able to see some objects very slightly. But a child who is deficient in vitamin A, will not be able to adapt to the darkness and cannot see in night. xerophthalmia that is the cornea and the retina are involved. So conjunctiva and cornea both are involved and there is ulceration. Finally there is complete blindness. The eye just melts down. So this can occur in the children below 6 years. That is why the government has given a prophylaxis program of giving 2 lac international units of vitamin A six months to a child below 6 years.

Slide 11: So this is how the eye looks like, it just melts down the cornea, the conjunctiva everything is involved, and the child becomes sightless.

Slide 12: Now next is the iron deficiency. Iron deficiency causes anemia in any age. So this comes quickly after the great symptoms like confusion and feeling that one is going to pass out, that means you feel so.. so much of palpitation is there, so much of confusion is there, there is increased thirst, and there is need for... to be significant anemia before a person becomes notably plain, that is the paleness is seen only after the anemic condition goes very severe, till then these clinical symptoms are not seen. So there may be add additional symptoms depending upon the cause that is behind causing anemia.

Slide 13: So the anemic person becomes easily fatigued and there is loss of energy and there is rapid heartbeat, that is palpitations occur in the heart, and particularly with exercise, the individual cannot do exercise for a longer period. There is shortness of breath, because the oxygen carrying capacity of the blood decreases, and there is headache, and particularly with exercise, the headache increases. Then the person is not able to concentrate because the level of hemoglobin is less, oxygen consumption is less, the energy input is less, and it causes dizziness, the skin becomes pale, the eyelids become pale, there are cramps in the leg, and there is sleeplessness, that is insomnia.

Slide 14: So this is how the eyelids look pale and the tongue looks pale and you can see the fingers and if the anemia becomes very severe then your nails become like spoon-shaped, which is called as koilonychia.

Slide 15: Then definition B-complex vitamins, vitamin B1 you have already seen that, deficiency of thiamine causes Berry Berry and it affects both the heart and the nervous system and there is irregular heartbeat and edema, and riboflavin deficiency generally it causes ariboflavinosis, which causes kelosis, angular cheilitis, and glossitis, that is the tongue gets cracked, it starts bleeding, there are cracks on the lips, and the angles of the mouth also get cracked, which is called as angular stomatitis.

Slide 16: Then niacin deficiency, we have already seen that it is caused because of deficiency of tryptophan and it is called as pellagra. There is... it is a disease of three Ds that is dermatitis, dementia and diarrhea and this again causes insomnia, sleeplessness and weakness. And there is mental confusion, this is dementia. And if this is neglected over a long period, it may lead to death.

Slide 17: Pantothenic acid deficiency causes acne and paresthesia. So that is tingling sensation in the periphery of the body and vitamin B6 that is pyridoxine, it causes dermatitis, especially in the, wherever the sebaceous glands are present, it causes seborrheic dermatitis.

Slide 18: Then biotin deficiency, it causes symptoms like impaired growth and neurological disorders and vitamin B9 or folic acid, we were talking about it that it does not help the RBC's to mature properly so that they decrease in size at the megaloblastic stage it is stopped, therefore it leads to macrocytic anemia and it also elevates the homocysteine levels which affects the heart. And when it is deficient in pregnant woman, it can lead to birth defects like neural tube defects, which is called as spina bifida.

Slide 19: Then vitamin B12 deficiency, this again like folic acid results in the megaloblastic anemia or macrocytic anemia. So vitamin B12 and folic acid, both are involved in maturation of RBCs. So this anemia is called as pernicious anemia. Again there are elevated levels of homocysteine and causes peripheral neuropathy and the deficiency occurs because of the lack of intrinsic factor in the stomach. So deficiency occurs only because of lack of absorption. And there is synthesis of vitamin B12 in the large intestine, which is of no use.

Slide 20: Now iodine deficiency, it is lack of the iodine that is taken in the food, leads to goiter and cretinism and in children it leads to developmental delays and other health problems. So this again iodine also is... has become a public health problem, because more and more population are getting into the iodine deficiency.

Slide 21: Therefore the government has started... it has banned the normal salt and it is forced to implement the intake of iodized salt in the population. So we have seen the pictures of goiter and cretinism in children. In short about all the nutrient to disorders that occur, which

are more common and which have a great impact on the health of the children and adults. Thank you.