Introduction to Maternal Infant Young Children Nutrition
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Lecture - 16
Session - 4

Importance of First 1,000 Days
1st 1000 Days and Nutrition

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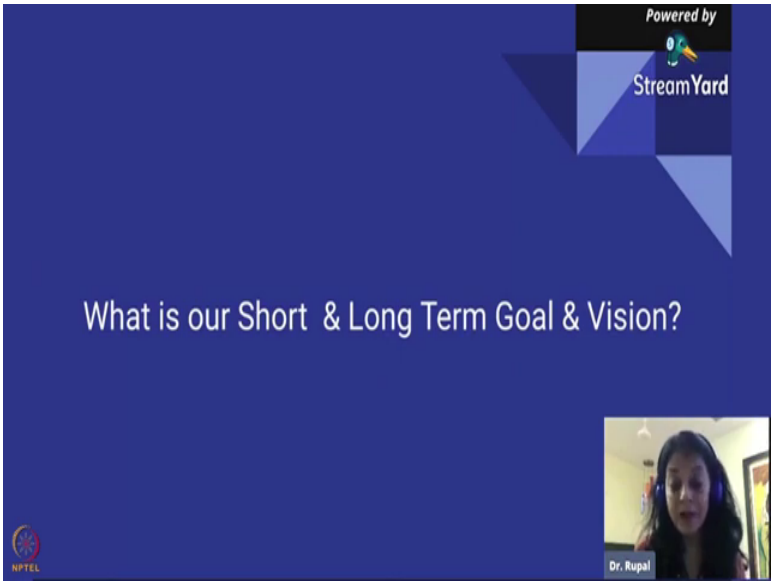

Today, we are going to talk about the first 1000 days and nutrition. First 1000 days how, what is first 1000 days? I am sure we all know it, but just, I am going to write, why it is important and when we think of first 1000 days, forget about other children, let us talk about us, a lot of us are women, men, and some of you are very young, and probably thinking of future of having children, and thinking about their growth and their their career.

So, when we think of that, we always think of short-term goal and long-term goal. So, what is a short term long, term goal for children, not only children, but for ourselves. So, I mean, obviously, in short term, we want our children to be healthy, we want them to be doing well in school, and succeed, of course and in long term, we want them not to have any diseases, to have good immunity, no blood pressure, no diabetes and of course we all want healthy ageing for all of us. That is our long- and short-term goal, by and large.

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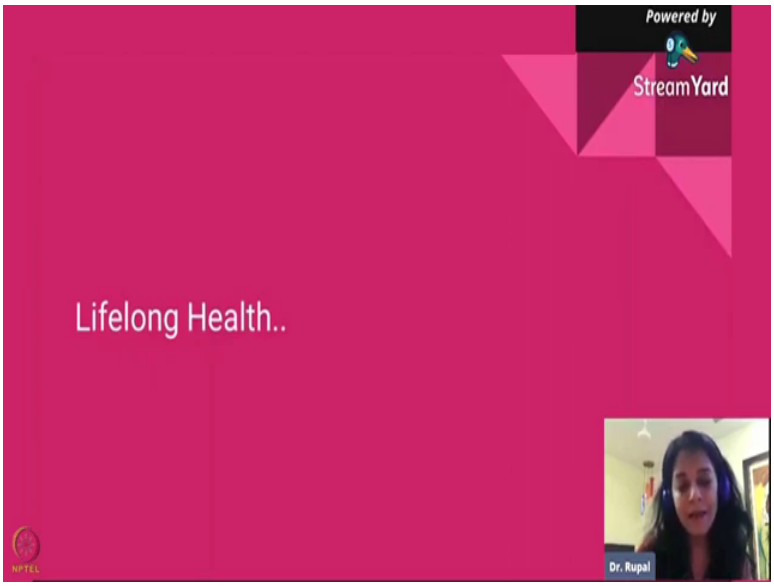

So basically, I mean, health comes first, health is wealth, as you know we all are stuck at home because our health is at stake. So, if we do not have good health nothing else matters really. So, literally, our goal is to have lifelong health.

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Why first 1000 days critical? We need to kind of understand why is it critical, why those 1000 days.

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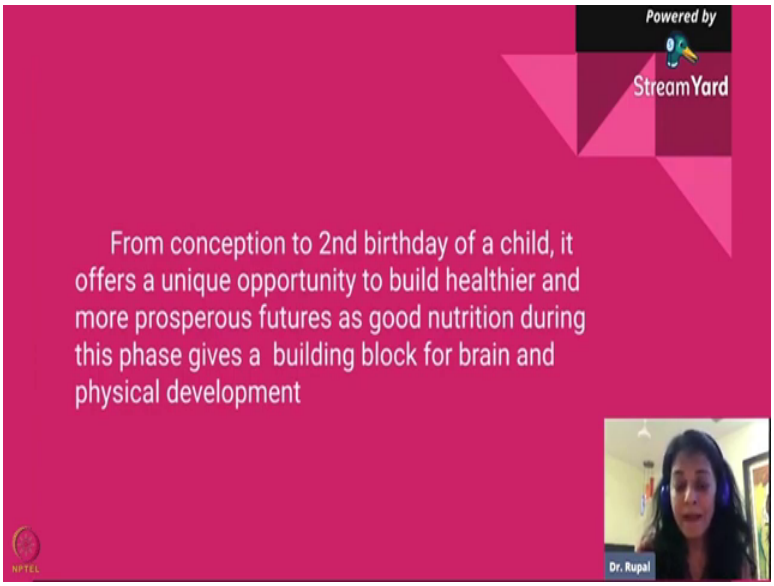

So, first 1000 days is basically conception to second birthday of the child and it offers the opportunity to build healthier and more prosperous future as good nutrition during this phase is a building block for brain and physical development. So, what is happening during these 1000 days is baby's brain is been developed.

Not only baby's brain is being developed, but basically there is a full physical growth can you imagine from literally from small little ovum from sperm and that ovum you having at birth weight is about 3 kg and by the time child is about 2 years of age or more 12 kg 12 and half kg. So, you have tremendous growth in this first 1000 days, and not only physical growth, but there brain when brain is the most important part of our body. So, it is very important that we take care of this 1000 days.

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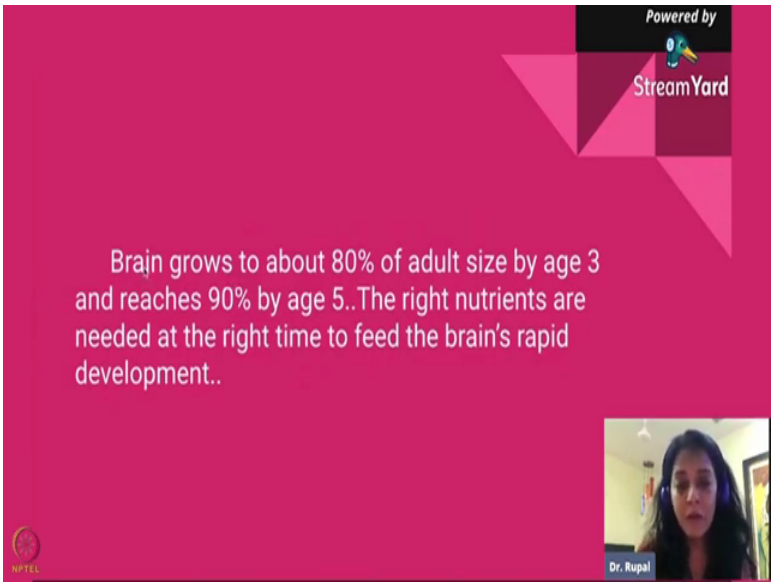

If you have if you want a brainy child, and if you want a really healthy, robust child, and if you look at the growth, brain grows to about 80 percent of adult size by age 3 and it reaches 90 percent by age 5. So, by the time child goes to schools around 4 and half, 5 years of age, 90 percent of brain development is already taken place.

So, you can imagine that mother needs to know so much. Not only when she is pregnant, but even before she is pregnant, she needs to know what I need to do, so that my child will be tall and intelligent. And what are the right nutrients that she needs and those are very important because, and those are needed at the time, because child's brain is developing so fast, and at every stage child requires different micronutrients. So, it is important and we will talk about it what is required.

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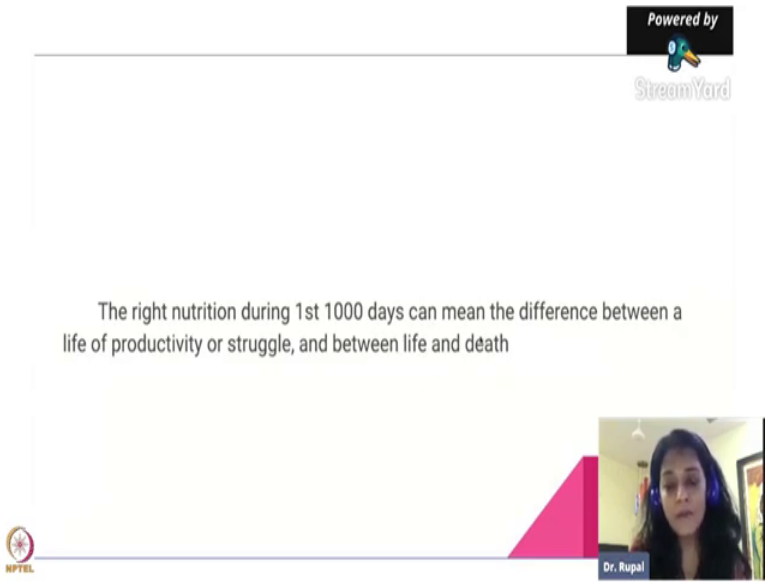

So, right nutrition during this period, it means the difference between a life of productivity or struggle, and between life and death. I mean we work in tribal areas, we work in slums and most of the time you will see that Sam children, you must be knowing Sam say malnutrition children, those are mainly under 1 year of age, under 2 years of age, mainly under 1 year of age.

And even predominately they are less than 6 months of age. See if you do not have proper nutrition during first 1000 days that is basically that that is you taking away life from that child literally. And at that child, if suppose child is survived, and if child grows up, but the body is so stunted, and with the body, the child's brain is stunted.

So, basically, that child will struggle for the whole life to survive. It is just not life and that in the beginning, but if child survives, basically they will have a child will have a very poor productivity not only in school, but even when he grows up. So, it is important that we think of not only surviving the child but also giving him good life.

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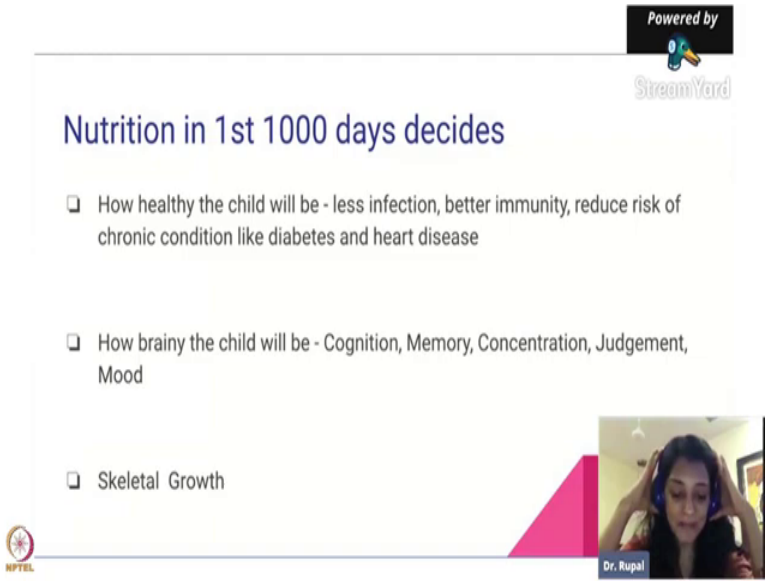

So, what does it decide? It decides how healthy the child will be. So, less infection, better immunity, reduce risk of chronic condition like diabetes and blood pressure. How brainy the child will be? What you mean by brainy? So, brainy means you have good cognition, means intelligence, your memory.

So, child has a sharp memory we all want, like believe me of all your mothers must be asking you. What grades did you get? How many marks you get? Did you get come? Do you come first? Did you come second? And for that for everything to learn, not only you need intelligence, but what else do you need? You need memory.

So, just as important that why some children in a class, they remember everything and some children, they just do not remember anything. So, that is important to have a good memory concentration. If you cannot concentrate, that means you will not be able to do well. So, it is very important that child have a good concentration, judgement, judgement with judgement, we all know what is judgement. Whether something a child is doing taking decision, whether it is taking good judgemental call those are very important, mood is important.

Sometime you find the children are very moody, they are upset, they are all the time irritable. So, your mood also depends upon how a child was brought up in first 1000 days. And then lastly, your skeletal growth, how tall the child will be. So, these are the 3 important aspects that we need to take care of one child is growing in first 1000 days.

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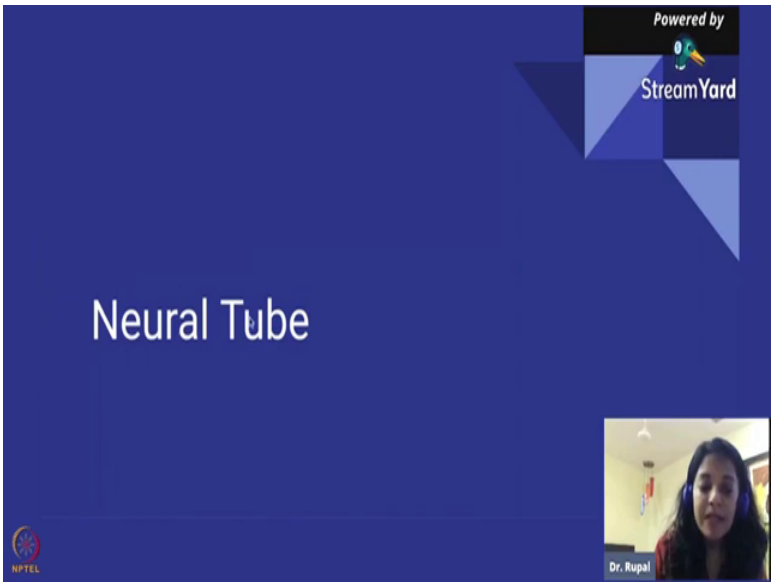

So, let us talk about brain, your brain is my favourite topic. So, I am going to talk about brain a little bit and see how we can make this child intelligent.

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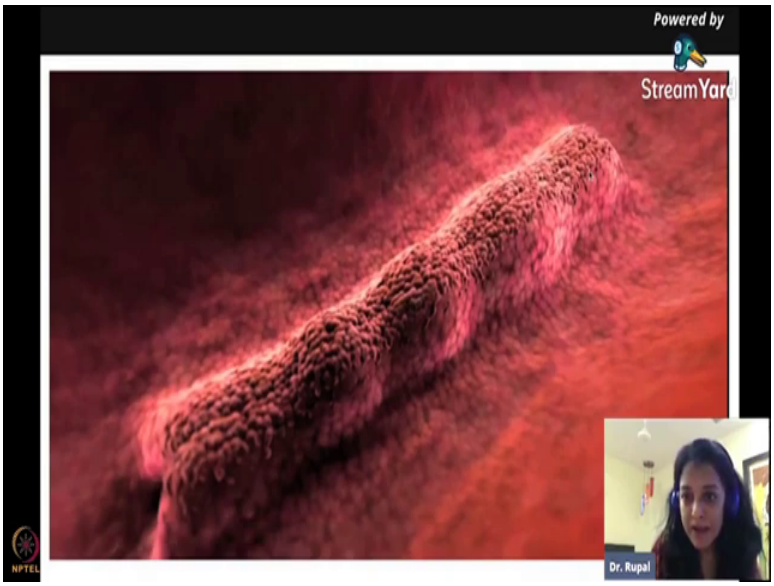

So, I am sure you guys know about neural tube, this is basically a tube here this is picture. So, this is your neural tube. So, at around 3 weeks of age, your body starts developing in the form of neural tube. So, this is a tube. Now, here this part is basically is going to develop into brain and this part is going to develop into your spinal cord.

So, here then what happens during this time, suppose if you do not have enough nutrients, which are required for this neural growth, you will have problems. So, what are the micronutrients which are required for development of this neural tube? One is your folic acid, I think everybody knows about folic acid. But what we do not know there are two, three other micronutrients which are required for a neural tube, I mean neural tube development. One is your vitamin B12. The second is your choline.

So, you require just choline your vitamin B12, and folic acid. So, we already talked about folic acid, but how about B12 and your and I know that a lot of you are nutritionist, and we know that B12 is hardly available any vegetarian food. So, what are you going to tell mother who is not even having milk? Like, for example lot of these tribal mothers, they do not drink milk, they do not have access to milk. So, how will she can B12?

So, we have to think of what nutrients that she or what all foods that you can give them. So, they will have initially I mean, this is 3 weeks, so she does not even know that she is pregnant. So, you need to start these nutrients not when she is pregnant. But when she is when she gets married, when she is planning a child that is when you need to start food which is high in all these nutrients.

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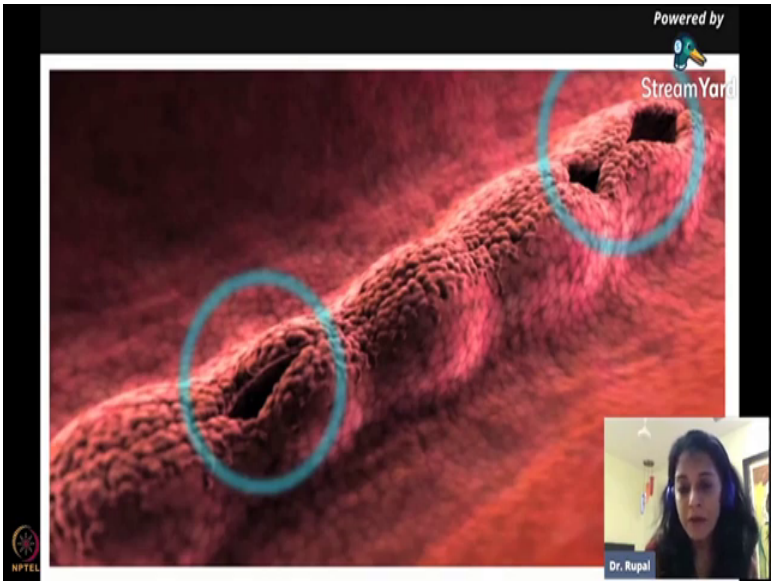

I talk about choline later. And when you do not have these most 3 important micronutrients for neural tube, what will happen this tube will not develop well. So, do you see this tube, basically

you will see the gap in there. So, just saw the all gap and this is called neural tube defect, this is a tube neural tube this a neural tube defects.

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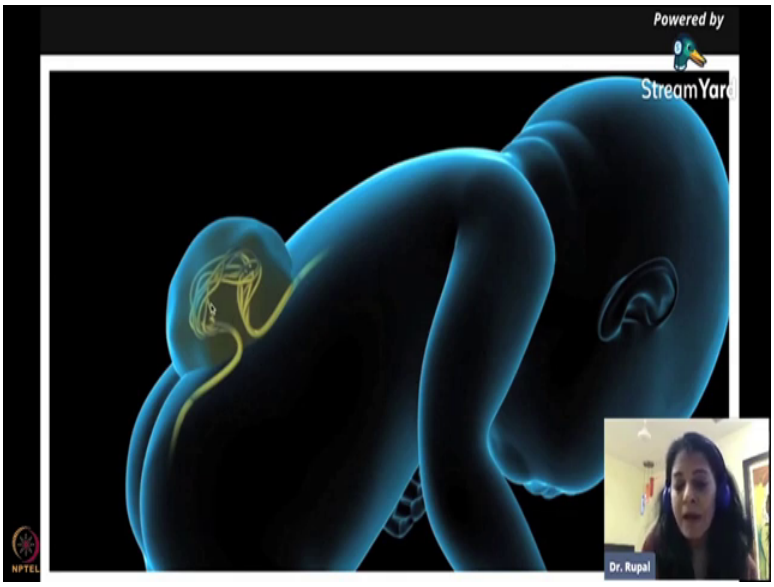

So, then what happens when you have a neural tube defect say posteriorly like towards the lower part, then you will have little bit of spinal cord coming out, because the spinal canal is not developed well. So, then what happens is that basically you will see some amount of spinal cord here.

Now, many times what happens you may not have such a big bump over here but you may just have a little bit of hole tiny my new hole over here. So, what as paediatrician we have to do, we always have to examine when the baby is born with the child has little hole and if child has a hole that means it is called basically spinal bifida and we have to get the MRI done. And that particular hole if it is worse than child has paralysis for the whole life. They have problem with urination they, we have they have to go through surgery. So, imagine folic acid, and choline, B12 is so important.

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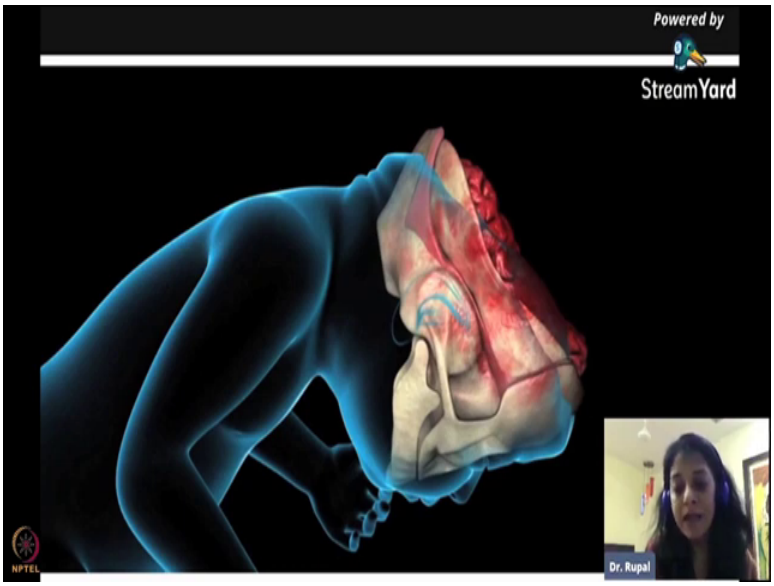

And if child has holes in the front part, right their brain is then this is called Anencephaly. We nowadays we do not see it much. But they do have when they are born obviously they do not survive. So, this all basically totally you can prevent all this condition and that is why folic acid is been done compulsory.

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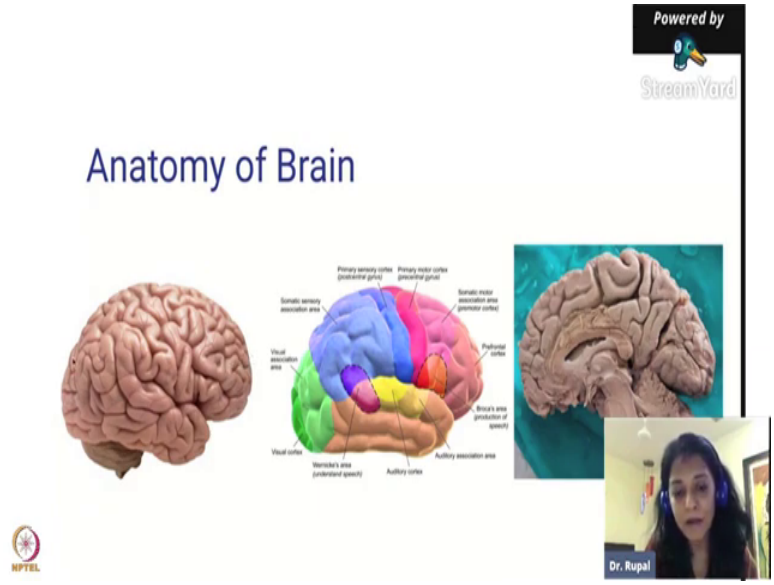

Now, this is basically anatomy of brain. Now, I am going to go a little bit in detail that what happens in child's brain when the brain is developing. So, just saw basically different parts of your brain, this is the frontal cortex, frontal part, front of your brain, this is the back part. This is

your side part parietal, this is your occipital lobe, temporal lobe, this all different kinds of lobes. This is the cross section, this is cross section. This is a front part, this is the back part. So, if you look at it over here, so this is again your prefrontal cortex, your primary motor cortex is all the different parts of your brain.

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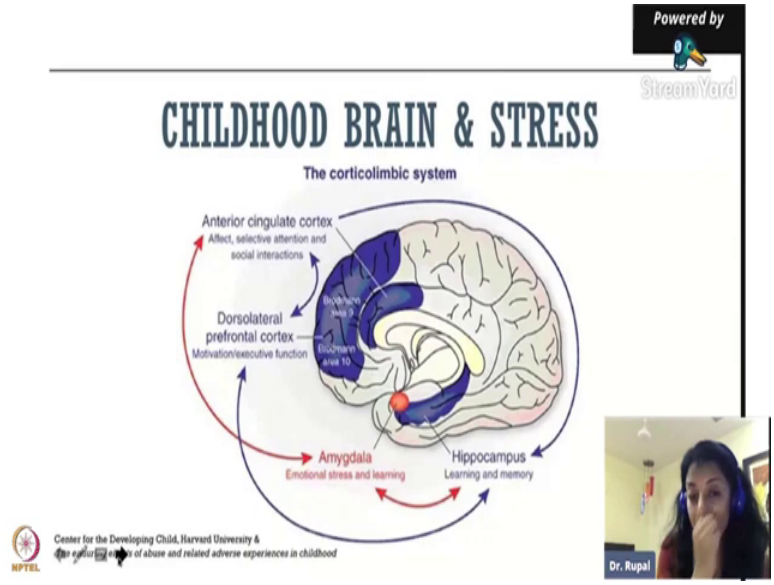

Now, if you look at the function of brain, so here is your front part of your brain. So, do you see over here, this is this particular frontal part, it is involved in motivation, executive function. Motivation, if you do not have motivation to do anything you cannot succeed. So, it is very important that this part of brain is developed well.

Because it is it functions wise - for execution and for motivation. Now, a little bit about the anterior cingulate cortex over here, this part over here, that is involved in your social interaction, affection, attention. So, look at this, this part is also so important, because that will help with attention. Do you see what this red part over here? It is called amygdala.

Amygdala is important for stress and for learning. So, lot of time what happens is, lots of children, they get a lot of anxiety, stress, or they have learning problems. That is because of problems with amygdala. And this is your hippocampus, hippocampus, remember, it is for learning and memory. If you want good memory, to make sure that anything which is required to develop is hippocampus, you work on that and child will have good memory. So, this all your basically brain development.

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So, at 4th week of pregnancy, the brain has about 10,000 cells and by 24th week, it contains about 10 billion. So, you can imagine and just matter of 20 weeks, look at the number of cells being developed. So, nutrition is absolutely important, but there are so many other things which are important.

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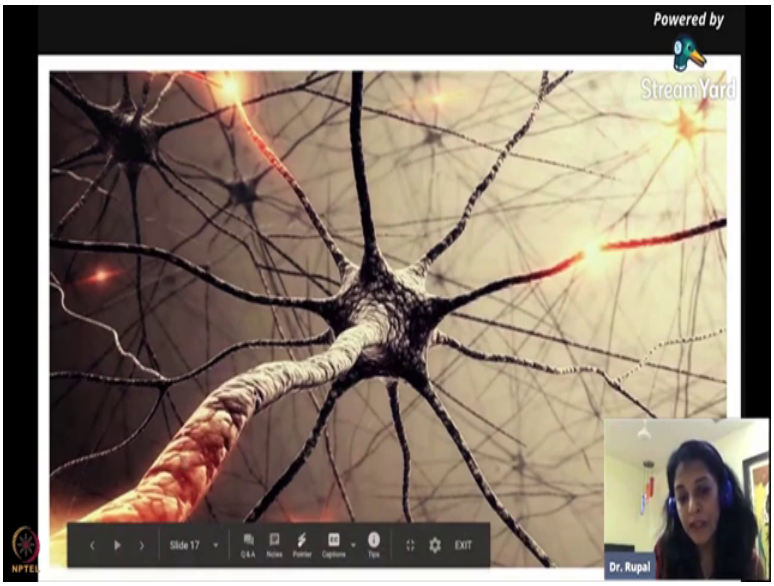

This is your neurons, do you see all these neurons these are basically connection. So, as brain is developing neuron cells are developing and do you see this layer of, myelin sheath, this is called myelin sheath. A myelin sheath is your fat is made up of fat. So, when you have a good myelin

strong myelin sheath, what happens the message passing through is very fast the message the signal neuronal signals, those are very rapid signals. So, you want you make you want to make sure that when mother is pregnant, that she gets good amount of fat, because baby's brain is made up of fat, this are all basically it is all fatty sheet and most important, cholesterol is important, saturated fat is really important.

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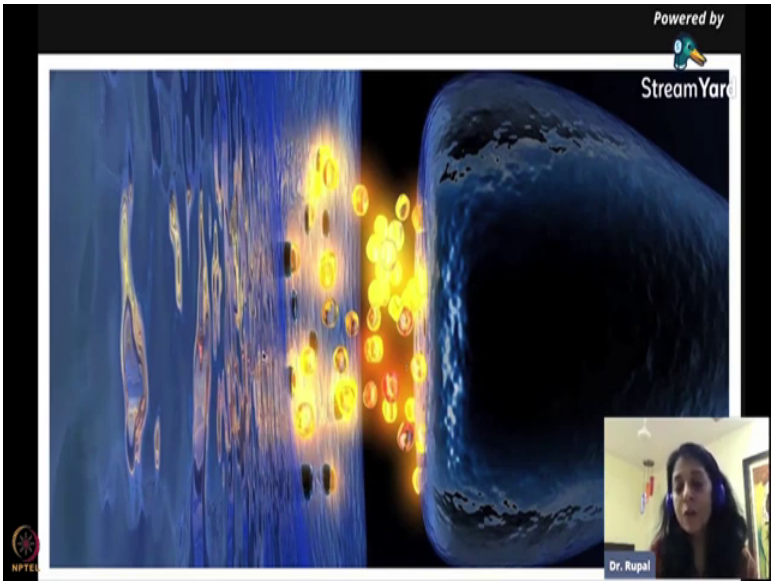

This is your, what is this? Neurotransmitters. Remember your synapses, this is synaptic junctions and there are your neurotransmitters. So, Neurotransmitters are also really really important basically to pass on this segment. So, you want to make sure that you have to learn that which are these nutrients which are important for formation neurotransmitter one of the neurotransmitters acetylcholine if you remember acetylcholine now choline, remember choline I spoke about. So, we need to know how to this mother get choline so that she baby gets beautiful amount of neurotransmitters.

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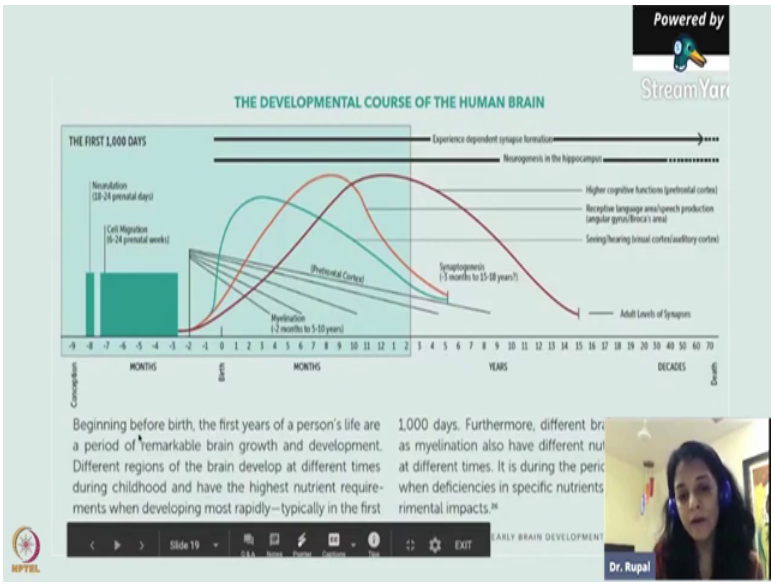

Now, this is another beautiful graph what here what we have shown over here, this is basically from conception from 9 months to birth, this is your first 2 years of life so from this first 1000 days in this green box is first 1000 days and here is your child growing up becoming adult and this is your 70 years that is your basically your lifespan.

So, here at around say 8 months of age I mean after 1 month of pregnancy child develop neurulation here that means child has developing neural tube. Once a neural tube is developed here for next few months, they it causes cell migration which different parts of the brain are being formed frontal lobe, occipital lobe.

And then just before 2 months of a birth, child start developing myelination. Myelination means you saw those neurons. So, it start developing that myelin sheath around those neural cells. So, if you look at around 0 month and birth some of the myelination is already started using all this there are some amount of myelination already started, but then it starts picking up.

So, if you look at birth over here, the green colour graph over here, so that is mainly your so when you when the baby is born, what is baby do? Baby can see, baby can hear. So, those parts of your brain is getting myelinated, your saying, hearing so visual cortex is for saying an auditory cortex is for hearing. So, those parts of your brain start getting myelination, then if you look at your orange graph, this peaks at around 8 to 9 months of age, do you see around 9 months of age?

So, what happens at 9 months of age? Do you remember what happens in the child they start developing language. So, they start speaking a word or two so there is a receptive language they can understand what you are saying and they can also start producing speech they say mama, dada, they will say a word.

So, to around 9 months of age that area get myelinated, this are the areas of brain. And this one the last line the red line, that is yet around 12 months to 1 year of age and that is your higher cognition. So, by 1 year of age 2 years of age children have good amount of higher cognition function, they can understand what you are saying they can respond, they become extremely smart.

So, do you see what this is the most important part and after 2 years of age you can see myelination going down, but it is very important that child continues to have good nutrition otherwise what will happen is if we have get myelination problem, we will have a cognition issue means we will forget we will have a forgetting our memory will get worse. So, it is important that we take care of myelination. So, this 2 as you could see, 1000 days are extremely important for brain development.

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Now, what are the other external factors which affects as I told you nutrition is good, but because this long these neural cells are developing, you want to make sure that there is reduction of toxic stress in mothers. So, tomorrow if you want to we have to plan to become when we get married

and plan to become pregnant, you make sure that you do not have a stress, you do not have any inflammation in the body.

So, you want to make sure that, you do not have any diseases, no, and of course presence of strong social support and secure attachment very important. So, just make sure those are met. Physical health is absolutely important but your mental health is also important and provision of optimal nutrition.

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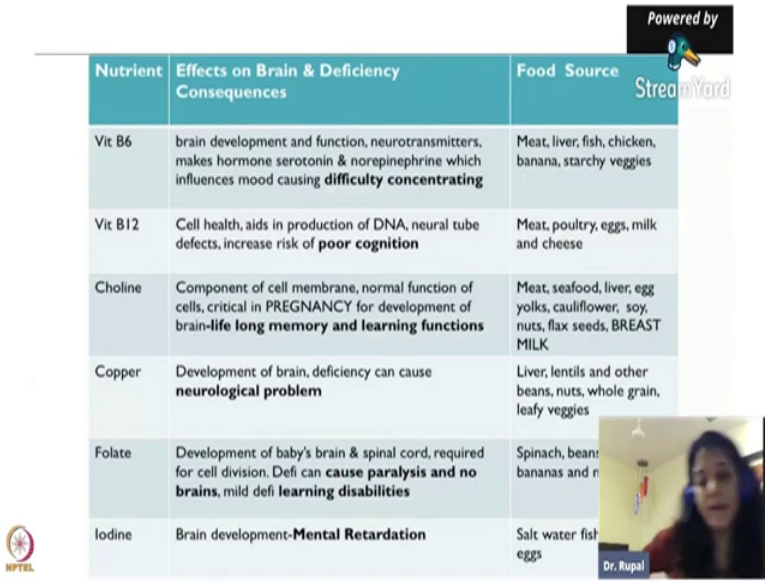

Now, this is some of the nutrients which are required for brain development. So, I am going to go quickly because I will, come back to it. But mainly look at it, this is vitamin B6, what happens when you do not have it in B6. In fact, those are important for brain development function, those are important for neurotransmitters, we talked about acetylcholine but also your serotonin and so many other neurotransmitters. They norepinephrine, which also influences mood, and if you do not have B6, they will there a chance the child can have difficulty concentrating.

Then B12 as I talked about B12, neural tube defect, then poor cognition. A child does not have B12, when babies growing in the womb, they will have poor cognition in younger children in fact, what we find is, we find children have tremors, children can have lifelong neurological problem.

So, it is important that we always think of vitamin B12 because this is quite deficient in weakened children. Mothers who are vegan. Choline I spoke about, if you want your child to

have a lifelong good memory and learning function, make sure the child gets mothers get enough choline, copper is important. Folate we talked about folate is important. We also talked about Iodine I think iodine is important because I Iodine can prevent mental retardation.

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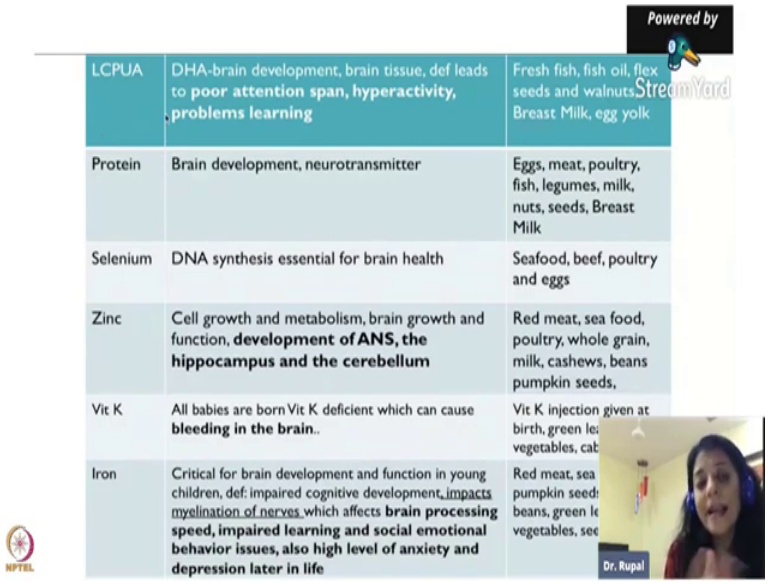

Long chain polyunsaturated fatty acids. So, mainly I am talking about DHA and EPA. ALA can get converted to DHT which I will come back later. But it is the it is probably a 4 percent to maximum 10 percent get converted. So, if it is if mother is non-veg which please offer her fatty fish. That that will really help child to become really look at this. If you do not have enough DHA, then there is poor attention, hyperactivity, problem learning.

So, DHA EPA is extremely important. Protein is important. Selenium zinc. Why zinc? Look at this. Remember hippocampus I talked about memory, you want your child to have good memory your zinc is really important. Vitamin K, we give it at birth it is compulsory it we give it all over the world.

Because children do not have enough vitamin K. So, we give an injection at birth. Iron is I mean, the iron is one topic that we can talk about for hours really it is so important. It impacts myelination of nerves, and we have also found there are a lot of studies which says that children if they do not have enough iron, it does affect their mental health. So, they have high level anxiety and depression later in life. So, it is important that we take care of food, which is high in iron.

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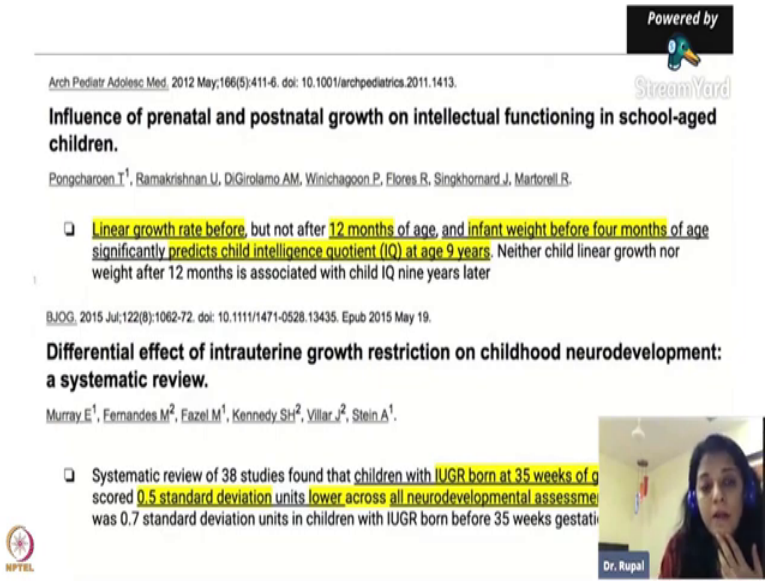

Now, this is some of the studies that I wanted to talk about. So, one of the study is what is the influence of prenatal and postnatal growth on intellectual functioning? Because we all want our children to be intelligent. So, what they found actually, I love this study really. So, what they found that when child had beautiful linear growth linear means tall.

So, when the child was growing quite tall in first year of age before, not after before 12 months of age, and weight, So, this was the length part before 12 and the weight of the child before 4 months of age, if child was growing beautifully in first 4 months weight wise and height up to 12 months of age, those children had a higher IQ at 9 years of age.

So, you can imagine many times mother said oh, my child is not gaining weight my child is not gaining weight and if we do not do anything away, then if you miss those first 3 months of weight gain where children though grow tremendously when you look at a WHO grow charts and because they do not grow well their height will also not grow well.

Those are the children will have poor IQ. So, many times mother said oh, my child is not doing good in math, my child is not doing because they must not have gained good amount of weight not only during womb not only during pregnancy, but also in first few months of life. So, this is a really good study that we read all the time in paediatric.

And also, another thing is your IGR. So, a lot of time, I mean, in India, we see a lot of low birth weight babies. So, here what they found that children who were born small for gestational age,

small for gestational age means, for that term or pre-term baby that weight was not enough. For whatever gestational age baby was born.

So, your if the baby was born, say at around 35 weeks of gestation, 35 weeks is basically a premature baby or later, they scored lower score on your neurodevelopmental assessment means they did not do well neurodevelopmental. So, it is important that basically children grow very well in the womb during pregnancy.

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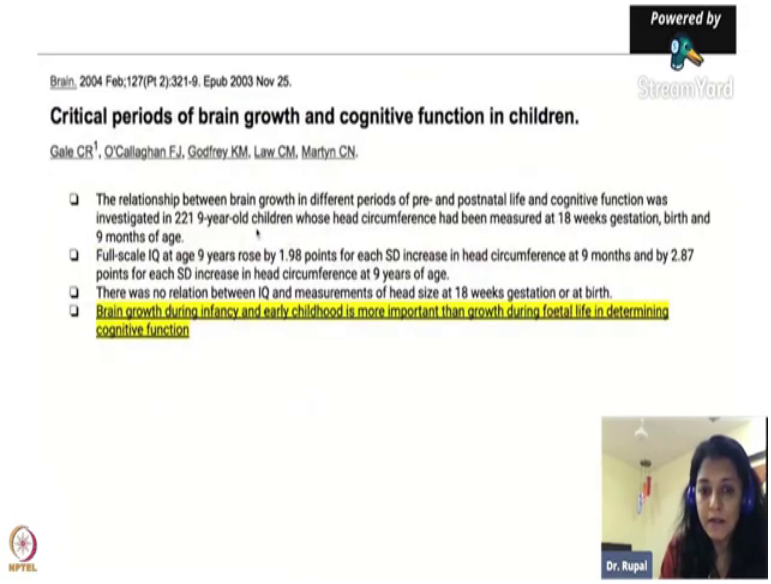

This is another very good study where there was a critical period of brain growth in cognitive function. So, this is so, what they found is a brain growth during infancy early childhood is more important than growth during foetal life in determining cognitive function. This means that even if a child is born say small but if child has beautiful growth in first says 12 months, 18 months, then that we can basically rescue the child. So, even you go in the field and you see children are born 2, 2.3 kg, 2.4 kg, but you focus on the breast-feeding scale you focus on the complementary feed and children do beautifully. So, this was another very good study which was done.

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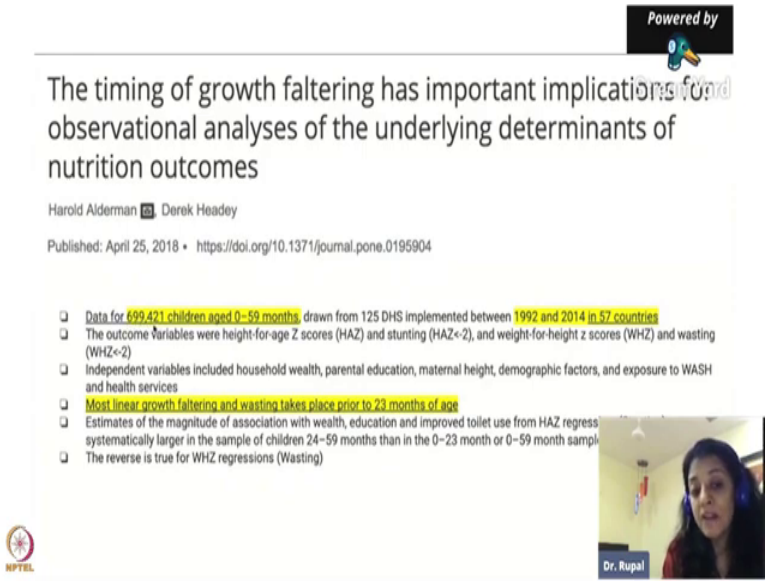

Now, timing of growth faltering is very very important. Because what we found this was one study which was done, they basically took 700,000 children from 0 to 6 years of age. And they took it they took this data from 57 different countries look at this huge study and very recent 2018. And what they found that basically most linear growth faltering linear growth means height, and the wasting which is your kid malnutrition. It takes place prior to 23 months of age, means most of your malnutrition undernutrition takes place under in 1000 days.

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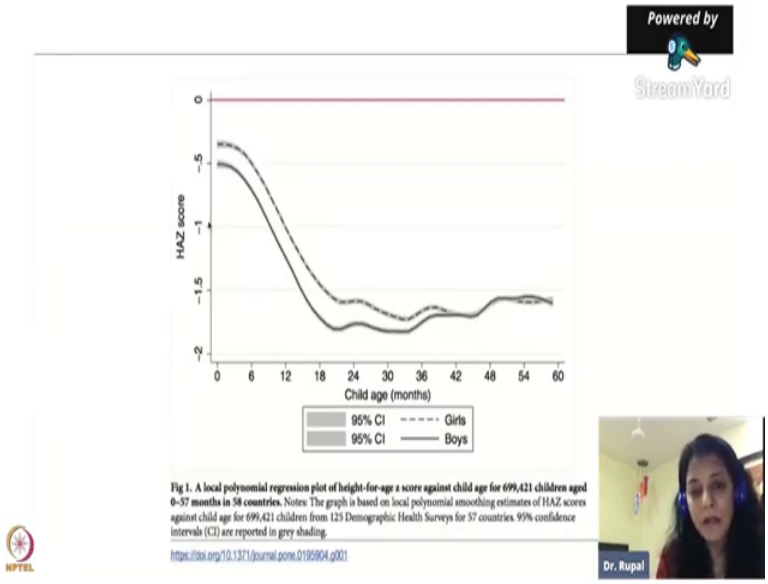

So here is the growth. Here is a chart that they showed in the publication. So, here this is your boys. So, these are your boys, this is your mean 0 is mean. Most of the 50 percent children should be over here. But here as you see, this is your 0 month, 6 months, 12 months, 18 months. Do you see how boys and this is your height for height your height for age. So, here Z score. So, look at how children are growing going down in 18 months. These are boys and these are girls. So, girls are not so small to begin with. But basically, they fall, boys fall definitely much more and that by 16 months pretty much they are pretty much equal. So, girls have advantage in the beginning.

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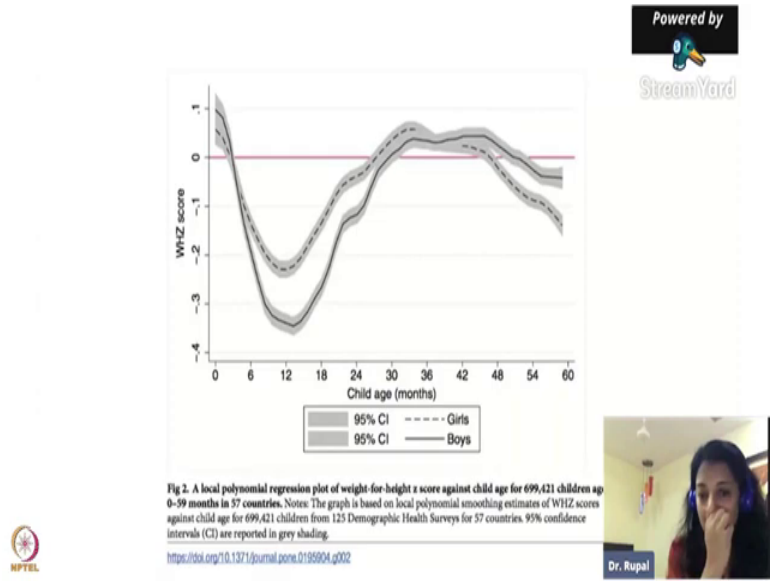

Now, this is your weight for height means this is your SAM MAM your acute malnutrition. So, here this is your boys. This are your mean 0. So, children are children overall in 57 different countries, children are not bad to begin with. But look at this how badly they fall and then they come up.

So, everything whenever you see this growth faltering occurs in first 24 months and generally wasting occurs much early on, that means children not gaining weight. So, in first year of age look at this in first year of age children are not growing well, they are not putting on weight and eventually they become stunted also.

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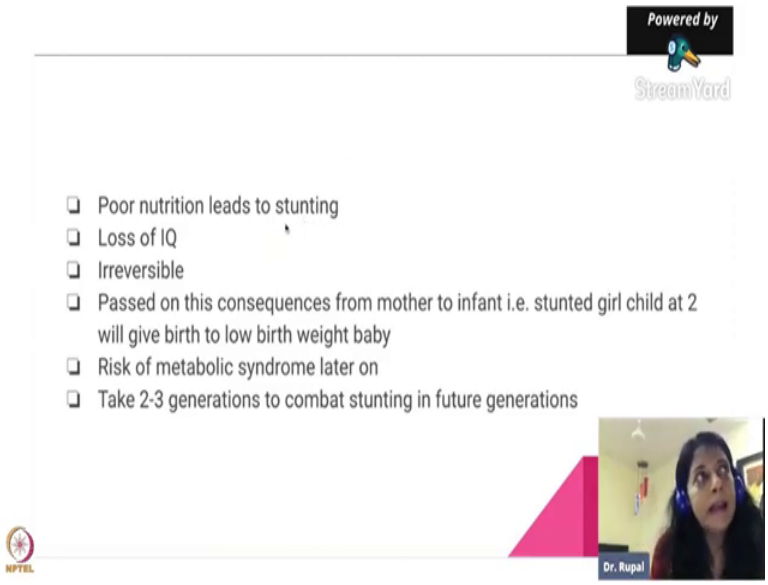

So, what happens to all these children who are not growing well? They poor nutrition will lead to stunting, they will become short. So, if you thinking that, oh my god, this child is so short. And if you see them at 3 years of age, 4 years of age his stunting is irreversible, so it is irreversible if you do not tackle it within 1 year, in my experience, if child came to me, after 6 months of age, I could not do much about the stunting part really. I had to bring those children up or reverse your stunting, I could do it just if they came before 6 months of age. So, that first 6 months is extremely important.

As they were losing height, they were also losing IQ. So, there is a loss of IQ, which is very, very detrimental to child's life. Then what happens is stunting when you are stunted, you will be stunted as an adult. And if you are a woman, and if you are only 5 feet tall, then you will be basically passing on the stunting stunted girl child to who will give birth to a low birth weight, baby.

So, your risk of getting a low birth weight baby is very high if you started. So, you basically you are passing on that I would not call it gene but epigenetic expression to the child. And then that stunted child has a very high risk of developing metabolic syndrome later on. So, you do not want the child to develop blood pressure, diabetes, so then you work on them in first 1000 days and of course, continue on these children will not develop metabolic syndrome.

And sometime it takes about 2 to 3 generations to combat stunting. Say suppose child is stunted, mother is stunting, grandmother is stunted. So, that girl child, it may take maybe 1 or 2 generation for the child to become 5'8, 5'9 I am talking about a girl child. And we have a lot of cases now the children are really girls have very tall even in India and but that takes 2, 3 generation of good nutrition.

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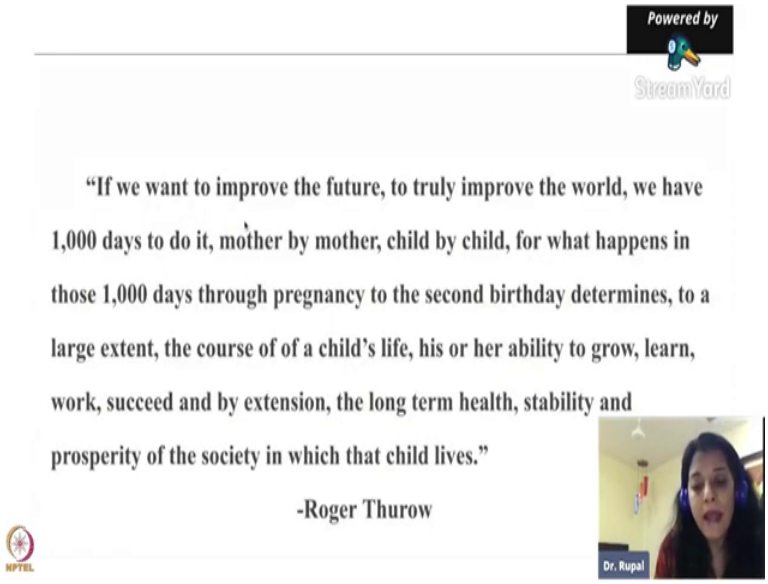

So, there is a journalist, Mister Roger Thurow, he was in India, and he did a lot of study on malnutrition his beautiful paper, you guys must read it. And he wrote a beautiful he quoted this, he wrote that, if you want to improve the future, to truly improve the world, we have 1000 days to do it, mother by mother, child by child, for what happens in those 1000 days through pregnancy to second birthday, it determines to a large extent, the course of child's life, his or her ability to grow, learn, work, succeed, and by extension, the long term health, stability and prosperity of society in which the child lives. So, if you want to improve the world, you cannot leave a single child and single mother. If you want a beautiful world where no child is malnourished, you have to basically go and help each and every mother who comes to your door or you have to go to her door.

So, I am sure you understood the importance of first 1000 days and how the first 1000 days are not taken care of then child will go into stunting and wasting and also underweight so and of

course, brain development is so important because it is very rapidly growing during first 1000 days and also the physical growth. So, now we will start with the tutorial so thank you.