Impact of Dietary Modification on Growth Parameters among Children in Mohanpur Village, Rural Howrah District, West Bengal

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Abstract: According to Paediatricians, first 3- 10 years of age is a critical phase for children's growth, because at this stage a child grows at a steady pace. Final growth spurt begins at the start of puberty, for the girls it is between the ages of 8 to 13 & for boys the ages between ages 9 to 15. Inadequate growth can happen sometimes due to fussy eating, illness or for several other possible reasons. Growth lost in early childhood requires specialised nutrition in order to meet up the proper growth rate according to their biological age. The objectives of this research are, i) to measure the nutritional status of the individual growing child; ii) to find out the nutritional deficiency in growing children's daily diet; iii) to maintain their healthy growth though dietary supplements. The data is primarily collected from the village area of Howrah District. Survey method is used here. Assessment is done by using of anthropometric method. Various secondary data is collected from renowned research journals, books and online resources. Findings are reached after analysing the data. I find that some children with short height are completely healthy and they do not have any medical causes for their short structure. Dietary modification can be helpful if nutrient deficiency is the underlying cause behind their growth retardation. Height cannot be altered once someone has stopped growing. Nutritional supplement can only change the height of children in very limited circumstances and, almost always where treatment is for an underlying medical condition.

IndexTerms - NFHS-2018, Biological Growth, BMI, DIET, National Family Health Survey (NFHS), which is India's Demographic and Health Survey (DHS)

INTRODUCTION

Early life is an important time for children because it affects a child's ability to succeed, maintain good health, and survive into adulthood. So, when child height in a population is shorter than it would be, represents a significant loss of well-being, not only for the welfare of the present but also for the future, when stunted children will continue to live and have an impact on the economy and society as adults. Several sources of data (i.e. NFHS or DHS,2018) have helped establish these facts that, the average Indian child is shorter than children from upper-middle-class households in Delhi, shorter than children from other developing nations (Coffey et al.,2018). It can be achievable with better nutrition, sanitation, and maternal well-being. Sufficient nutrition is a crucial element impacting both development and resistance. A balanced diet must contain sufficient amount of carbohydrate, protine, fat, vitamins, minerals and fibre in right proportions. Each one of these nutrients is very essential for a child's overall growth and development. A gap in macro- and micronutrient intake can put a child in different cycles that affect their growth. This various cycle starts with inadequate nutrition, which may lead to infection and impaired immunity. As a result of this vicious cycle, it creates obstacles in achieving age-appropriate growth. Normal growth of a person is controlled by hormones such as growth hormone, sex hormones and thyroid hormones. Age-appropriate growth is a result of their genes as well as general health and nutrition during theirs of growing period. A child of tall parents may have a child who is unusually tall or short in comparison to the rest of the family, but a child of short parents is more likely to be short from themselves. Children may not grow to their full adult height due to illness, malnutrition, small stature at birth, or preterm delivery. Over the ages, the population's average height has progressively increased due to improved nutrition and a decrease in diseases and infections among their children. Bones increase in length because of growth plates in the bones called epiphysis. As puberty progresses, the growth plates mature, and at the end of puberty they fuse and stop growing. The whole of the skeleton does not stop growing at the same time; hands and feet stop first, then arms and legs, with the last area of growth being the spine. Growth slows down and stops when a child has gone all the way through puberty and has reached an adult stage of development. It shows that, growth does not stop as particular age, but children who are 'early developers 'will stop growing before late developers. After the growth plate fuse, there is no more increase in height, and we all then shrink gradually as we get older.

REVIEW OF LITERATURE

a) Growth assessment is an essential component of pediatric health surveillance because almost any problem within the physiologic, interpersonal, and social domains can adversely affect the growth of a child (Ali, S. S. 2013).

b) Under-nutrition, both protein-energy malnutrition and micronutrient deficiencies, directly affects many aspects of children's development. In particular, it retards their physical and cognitive growth and increases susceptibility to infection and disease, further increasing the probability of being malnourished. Micronutrient deficiencies alone may cost India US$2.5 billion annually (Gragnolati et al., 2005).

c) Iron deficiency anaemia create influence on child growth & development. It is estimated that 30% of the world's population is anaemic, with the global prevalence of anaemia among 6–12-year-old children to be 36% and 77% in developing regions respectively. Iron deficiency anaemia (IDA) was found to be the commonest followed by vitamin B12 and folic acid deficiencies. Severe iron deficiency infants have shown lower cognitive test scores than the infants with good iron status (Gomber et al.,2003).

DEFINITION OF IMPORTANT TERMS

- **FOOD:** Food is defined as a mixture of many different chemical components such as carbohydrates, fats, proteins, vitamins, or minerals., which can be solid. semisolid or liquid, which when swallowed, digested and assimilated, furnish energy and nourish the body in order to maintain life and growth.
- **DIET:** Diet is something which contains different types of foods in such quantities and proportions, so that the need for calories, proteins, minerals, vitamins and other nutrients is adequately met & a small provision is made for extra nutrients to withstand short duration of leanness.

Dietary modification is required during diseased condition or when healthy growth & development of body is hampered due to the lack of sufficient nutrients.

DIETARY ASSESSMENT (QUESTIONNAIRE METHOD)

A questionnaire is research tool that collects information from respondents through a series of questions or prompts. This is useful in carrying out survey of a large number of people in a short time- inquiries are made retrospectively about the nature and quantity of food eaten during the previous 24 or 48 hours. It properly carried out oral questionnaire method can give reliable results. A diet survey may also include collection of data relation to dietary habits and practices.

OBJECTIVES OF THE STUDY ARE

i) To measure the nutritional status of the individual growing child.
ii) To find out the nutritional deficiency in growing children’s daily diet.
iii) To maintain their healthy growth though dietary supplements.

POPULATION AND SAMPLE

Population of study is all Indian growing child. Sample is taken from the village area of Mohanpur, Block: Shyampur -II, from Howrah District.

DATA AND SOURSES DATA

The data is primarily collected from the village area of Howrah District. Survey method is used here. Assessment is done by using of anthropometric method. After that statistical analysis is done here by using online statistical tools. Secondary data is collected from renowned research journals, books and online resources.

METERIALS AND METHODOLOGY USED

The study is survey type & quantitative in nature. Findings is reached after analysing the data.

Place Of Study: The field work is conducted at the village area of Mohanpur in Howrah District.

To assess the anthropometric measurements and nutritional status of growing children, anthropometric method is used here.

These are as follows-

Selection of Subject: To conduct the study I choose total 7 samples (growing childs) from Mohanpur village, sasati Block- II. The samples were collected randomly in the age group of (2-5years).

Procedure:

1.Weight: For weight management I have used human weighing machine. Samples stands the platform of the machine with minimum clothes and exerting equal pressure on both feet. I have taken the weight reading from the scale with an accuracy of 0.5kg.

2. Height: For height measureme nt I have used an anthropometric rod. Readings are taken from the scale.

3.BMI: The formula is -

$$Body\ Mass\ Index\ (BMI) = Weight(kg)/(height\ in\ metre)2$$

Dietary Assessment: Diet survey holds an essential part of any complete study on nutritional status of individuals or groups.

Here I followed the interview method for the purpose of dietary assessment. The interview techniques used are-24 hours recall method, food frequency questionnaire etc. Here I followed the 7-days food intakes recall method. I asked the samples about the details of consumed foods during past 7 days and listed them all.

Analysis Of Data: The data which I get from field work is statistically analyzed & calculated using online statistical tools.

The whole analysis is done with the help of Several different statistical methods. These are as follows:

Mean: Mean is the arithmetic average of observed scores. The sample mean is represented by the symbol Where X represents each individual score of sample x is the sum of all scores and is sample size or the total frequency of cases in the sample.

$$x = \sum x/n$$

Standard Deviation: Standard deviation (SD) is the positive square root of the mean of squared deviations of all the scores from the mean.

It is absolute measure of deviation and is expressed in the same unit as the original scores. Standard deviation of a sample is denoted by

$$SD = \sqrt{\frac{(x-\bar{x})^2}{n}}$$

Standard Error: Standard error (SE) of a statistic is a measure of the Deviation statistic from the corresponding parameter and consequently severs as index of the sampling error of that statistic. It is the standard deviation of the sampling distribution of the relevant statistics.

T- test: To test significance of the different between the means of two small samples that difference($\bar{x}1$-$\bar{x}2$) is converted to students t-score which is then interpreted with the reference to the appropriate t-distribution.

The t-values is computed as follows:

$$T = (\bar{x}_1 - \bar{x}_2) / (SE_1 - SE_2)$$

STATISTICAL ANALYSIS OF THE DATA
SAMPLE-1

Table 1: Comparism of energy(kcal) of RDA & 1-4 years growing child

Value shows: Mean ±SE

Group	Energy(kcal)
RDA	1060
1-4 years	1087.26±45.418

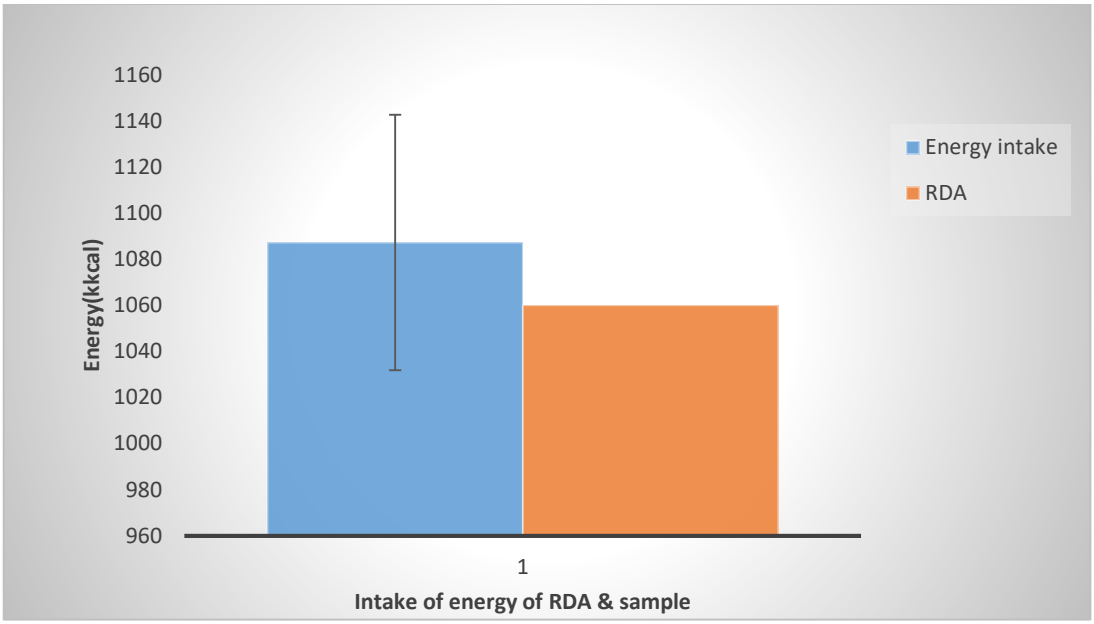


Figure 1: Graphical representation of Energy(kcal) of 1-4 years child with RDA in Mohanpur.

Value Shows: Mean ±SE

SAMPLE-2

Table 2: Comparism of Carbohydrate(gm) of RDA & 1-4 years growing child

Value shows: Mean ±SE

Group	Carbohydrate(gm)
RDA	130
1-4 years	197.079±31.640

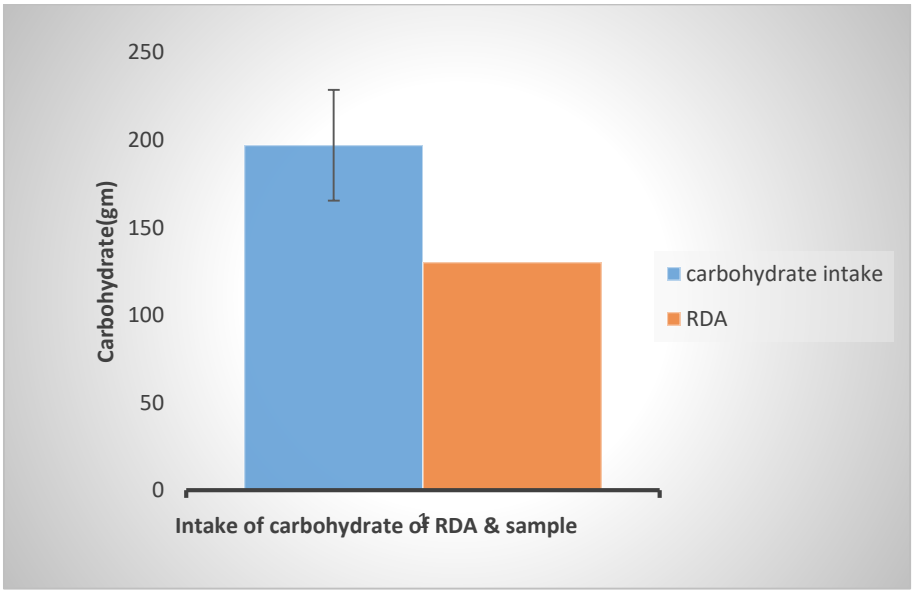


Figure 2: Graphical representation of Carbohydrate(gm) of 1-4 years child with RDA in Mohanpur.

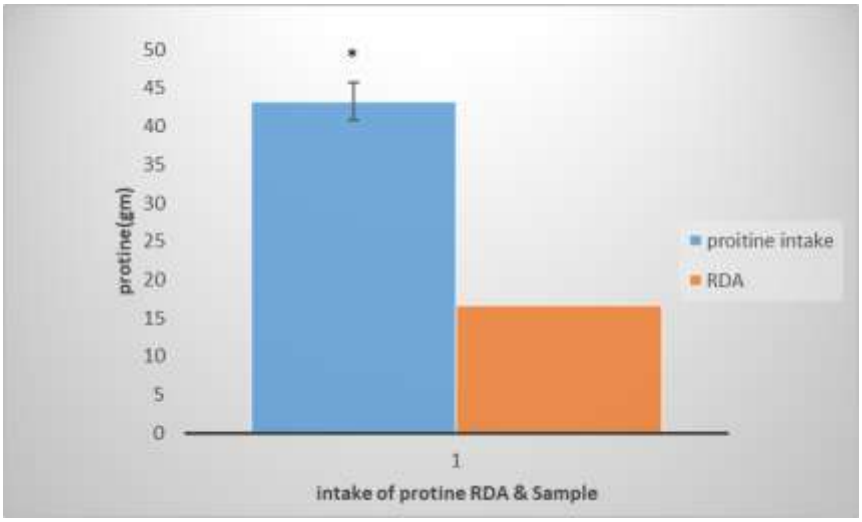
Value Shows: Mean ±SE

SAMPLE-3

Table 3: Comparism of Protine(gm) of RDA & 1-4 years growing child

Value Shows: Mean ±SE

Group	Protine(gm)
RDA	16.7
1-4 years	42.24±2.448



Significant at the level of p<0.001

Figure 3: Graphical representation of Protine(gm) of 1-4 years child with RDA in Mohanpur.

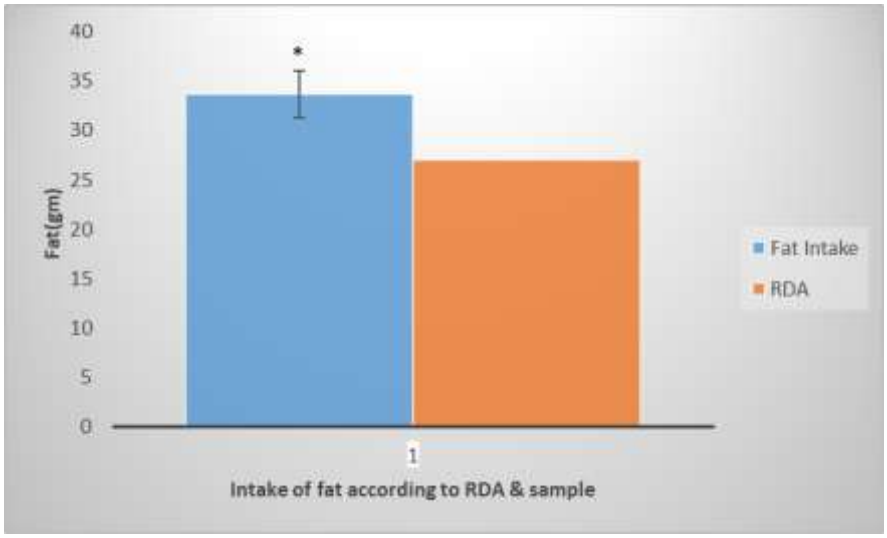
Value Shows: Mean ±SE

SAMPLE-4

Table 4: Comparism of Fat(gm) of RDA & 1-4 years growing child

Value shows: Mean ±SE

Group	Fat(gm)
RDA	27
1-4 years	33.641±2.355



Significant at the level< 0.05

Figure 4: Graphical representation of Fat(gm) of 1-4 years child with RDA in Mohanpur.

Value Shows: Mean ±SE

SAMPLE-5

Table 5: Comparism of Height(cm) of RDA & 1-4 years growing child

Value shows: Mean ±SE

Group	Height(cm)
RDA	89.313
1-4 years	92.86±3.624

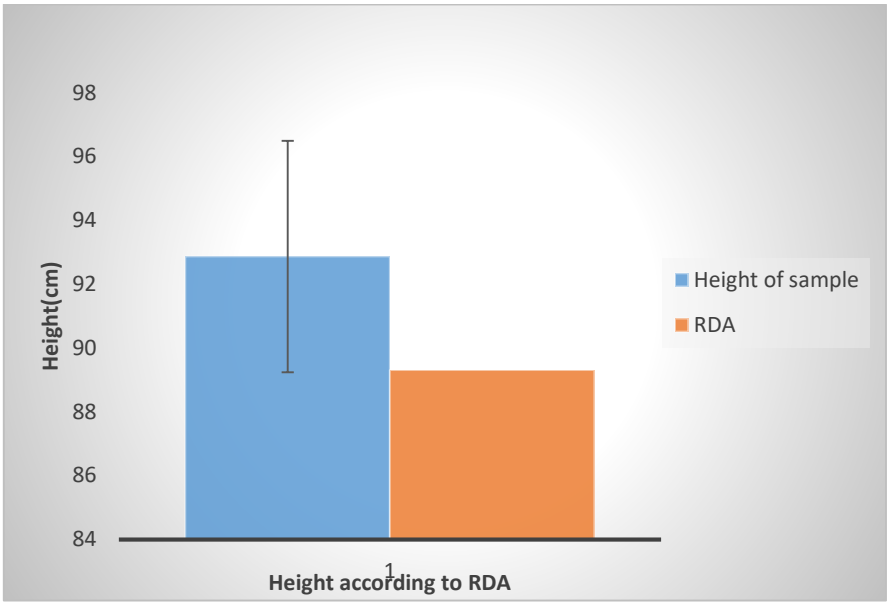


Figure 5: Graphical representation of Height(cm) of 1-4 years child with RDA in Mohanpur.

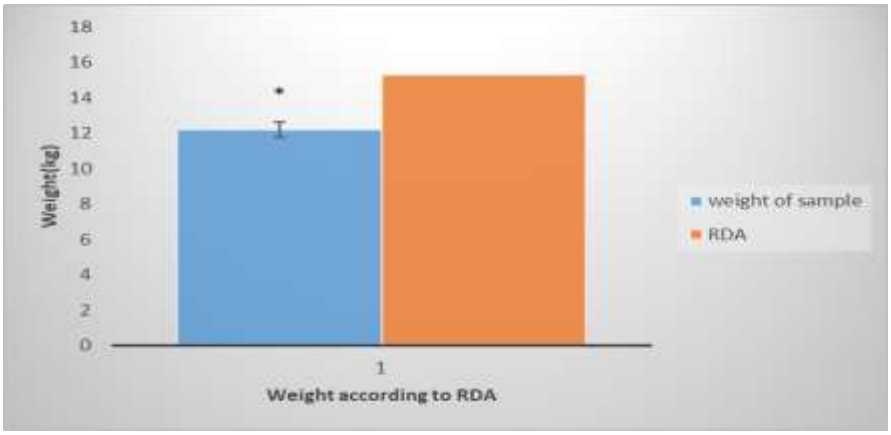
Value Shows: Mean ±SE

SAMPLE-6

Table 6: Comparism of Weight(gm) of RDA & 1-4 years growing child

Value shows: Mean ±SE

Group	Weight(gm)
RDA	15.28
1-4 years	12.2±0.434



Significant at the level of p< 0.01

Figure 6: Graphical representation of Weight(gm) of 1-4 years child with RDA in Mohanpur.

Value Shows: Mean ±SE

SAMPLE-7

Table 7: Comparism of BMI (kg/m²) of RDA & 1-4 years growing child

Value shows: Mean ±SE

Group	BMI (kg/m²)
RDA	15.073
1-4 years	15.589 ±1.527

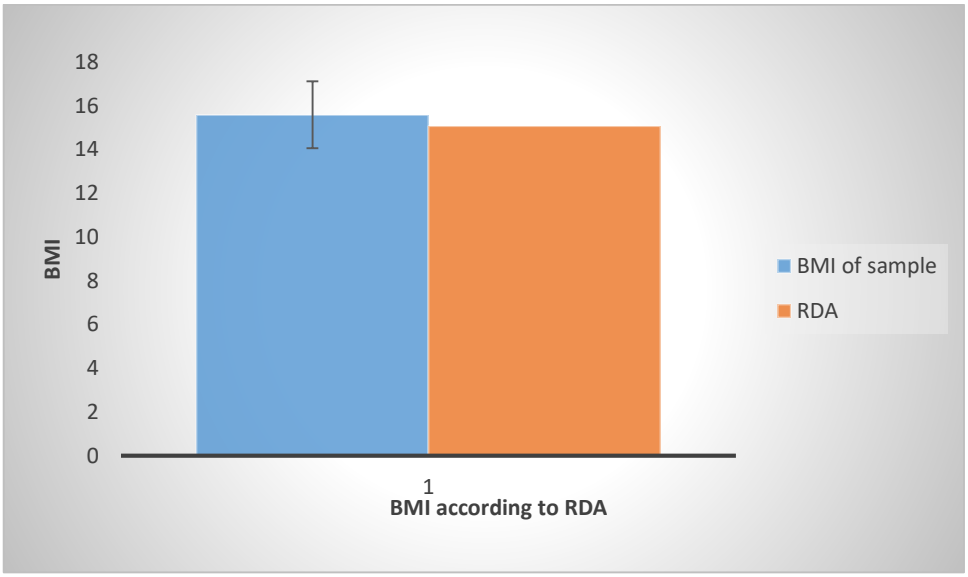


Figure 7: Graphical representation of Weight BMI (kg/m²) of 1-4 years child with RDA in Mohanpur.

Value Shows: Mean ±SE

FINDINGS

a) The nutritional status of the individual growing child:

WEIGHT

It is found that the child weight is lower than RDA(Sample-6). As the mean ± SE was12.2 ± 0.43406451.

It is significant (*) at the level of p<0.01(Fig-6). Details of the results regarding weight shows in table-6.

HEIGHT

It is found that the child height is high than RDA(Sample-5). P value of height of child is 0.0312910416. Mean ± SE 92.86666667±3. 624085675. It is not significant. Details of results regarding Height shows in table-5.

BMI

It was found that child's BMI is high than RDA(Sample-7). P value of BMI of child is 0.695195856. Mean ± SE 15.58933333± 1.527734142(kg/m²) is not significant. The results are shown in table -7.

ENERGY

It was found that child's energy is high than RDA(Sample-1).P value of Energy of child is 0. 5663620999.Mean±SE 1087.26±1060(kcal) is not significant. The results is shown in table-1.

CARBOHYDRATE

It was found that child's carbohydrate is high than RDA(Sample-2).P value of carbohydrate of child is 0. 22806201.Mean±SE 197.079±31.64096125(gm) is not significant. The results is shown in table-2.

PROTINE

It was found that that the child protine level is low than RDA(Sample-3). As the mean ±SE 43.24133333± 2. 448819351.It is significant (*) at the level of p<0.001(fig-3). Details of result regarding protine shows in table-3.

FAT

It I s found that the child fat level is low than RDA(Sample-4).As the mean± SE 33.641±2. 355605.It is significant (*) at the level of p<0.01(fig-4). Details of result regarding fat shows in table-4.

b) The nutritional deficiency in growing children's daily diet:

Through the information obtained from the dietary assessment, I find that some children are nutritionally deficient as they don't not follow proper healthy diet. Some of them are not interested in taking healthy foods because of they don't like their taste. Lack of nutrition in their diet is a major cause of their retardation of physical & mental growth , because they don't show any other significant medical condition. So, in this condition if they get proper dietary supplements through their daily diet, their retarded growth can be scaled up according to their biological age.

C) Dietary supplements for growth retarded children (with no underlying medical condition) from 1 to 11 years of age:

In children and adolescents, growth plates are areas of developing tissue located near the end of long bones. Each long bone has at least two growth plates – one at each end. After the bone growth is completed, the growth plates close and are replaced by solid bone. Growth plates determine the length and shape of child's bones. They increase in width during the growing years, by providing the bones with the strength and support to grow in length. Growth plates plays an important role as it determines the child's chronological age is matches with their biological age, ascertaining the growth rate of a child, establishing the time when girls are likely to hit puberty, learning about the vulnerability of child's bones, and take steps to protect them from injuries and fractures.

Child's growth plates are made of soft tissue and therefore, are extremely vulnerable. Hence, it becomes important to strengthen them by providing them with a healthy and nutritious diet. Ensuring that, Children are getting sufficient amount of Calcium, Vitamin D, Proteins, Zinc, Iron, and Phosphorus by including food items like meat, dairy products and green vegetables in their diet.

Nutritional Requirements:

The amou nt of calories, protein, fat & minerals that child needs depend on both their age and weight.

Calories:

From birth to age 3: about 100 calories per kg

Age 4 to 6: about 90 calories per kg

Age 7 to 11: about 70 calories per kg

Protein:

From birth to age 3: about 1.2 grams per kg

Age 4 to 6: about 1.1 grams per kg

Age 7 to 11: about 1 gram per kg

Vitamins and minerals: Childs does not need to take extra vitamins or minerals if they takes a balanced diet.

Food Group Choices:

Food have been classified into different groups depending upon their nutritive value, for the convenience of planning diets. Basic four food groups suggested by ICMR, they are a) Cereals, millets & Pulses; b) Milk & animal products; c) Vegetables & fruits; d) Oils, fats & nuts.

a) Cereals, millets & Pulses:

- Millets are considered as superior to cereals when it comes to some nutrients they contain. There are a variety of millets available such as wheat, ragi, maize, bajra, jowar etc.
- Pulses like Bengal Gram, black gram, cowpea, soyabeans etc are the rich source of thiamine, riboflavin, iron & fiber.

b) Milk & animal products:

- Until age 2, children should have whole milk and full fat dairy products to make sure their nervous system grows well. After age 2, children should take low-fat dairy foods to limit saturated fat intake.
- Consuming lean meats, goat liver, fish, and poultry products in daily basis helps to fulfil their protein & fat requirement.
- child's diet plays a crucial role in his/her development. An important component of this diet is Calcium. Calcium is widely known to be associated with the formation and maintenance of bones, especially in growing kids. Over 99% of body's Calcium is found in bones and teeth. Calcium is also an important and indispensable micronutrient for muscle function, nerve transmission and hormonal secretion. Inadequate intake of Calcium can make their bones weak and lead to problems like Osteoporosis later in life. Hence, including Calcium-rich foods in child's diet is obvious & mandatory. Milk is the number one source of Calcium in the diets

of children aged from 2 to 18. Regular intake increases mineral content and bone mineral density. In addition to building healthy bones. Consuming milk, cheese, and yogurt lowers blood pressure, boosts immunity, and reduces the risk of juvenile diabetes. Besides it is a good source of proteins, Vitamins A and D as well.

c) Vegetables & fruits:

- Child's diet should include with at least a high vitamin C rich food as one serving per day. Examples are citrus fruits like Amla, Guava, Grapes etc.
- Child's diet should also include with high vitamin A food, like spinach, winter squash, carrots, or sweet potatoes etc.

d) Oils, fats & nuts:

- If child doesn't like milk and other dairy products, tree nuts can be a good alternative since they are rich in Calcium. Some nuts to include in growing kid's diet are almonds, cashew nuts, and walnuts. Almonds contain 248 mg Calcium per 100g, cashew nuts contain 37mg/100g, and walnuts contain 98mg/100g.

FINAL RESULT

After providing them proper dietary supplements individually (according to their height, age, food choices) through their daily diet, a significant change in their growth can be noticed.

CONCLUSION

Height cannot be altered once someone has stopped growing. Treatment can only change the height of children in very limited circumstances, and, almost always where treatment is for an underlying medical condition. Dietary modification can be helpful if nutrient deficiency is the underlying cause behind their growth retardation. There are so many parents who are concerned about their children height. But in most of the cases, the situation cannot be altered only by doing dietary modification, growth hormone treatment is also needed under medical supervision beside this and the situation should not be considered as unnatural.

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