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What's INSIDE

Protein deficiency
in Indians

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According to Indian Market Research Bureau (IMRB) survey, around 73% of Indian diets are protein deficient.¹ It also added that only 1/3rd of responders think that lack of protein can cause weakness and fatigue. Survey also reported that 93% of Indians being unaware of their ideal protein requirements.¹

- ⬆ In children, protein deficiency may results into stunting, wasting, underweight or increased risk of infections.^{2,3} In teenagers, it may influence growth and development.⁴
- ⬆ Under-nutrition in pregnant women is also associated with a range of detrimental effects to the developing fetus, including low-birth weight (LBW).⁵
- ⬆ India alone accounts for 33% of all new-borns with LBW and 40% of the world's LBW population.⁶
- ⬆ Globally, around 1/3rd of the children < 5 years are stunted.²
- ⬆ National Family Health Survey-4 India indicates a higher prevalence of severe wasting (7.5%) in children <5 years.³

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Protein in Pregnant Women

Role of protein in pregnant women

Fetal survival, growth and development is critically depends on the maternal nutrition during gestational period, in which protein has vital role.⁷ Growth of fetus and placenta also increases the protein demands in the pregnant woman. Protein also helps in breast and uterine tissue growth during pregnancy. Thus, additional protein is essential for the maintenance of a successful pregnancy.⁸ Protein also supports other important areas of the fetus development during pregnancy including:^{7,9}

- Growth and repair of new and damaged tissues
- Served as major component for proper muscles functioning
- Supports immune system by producing antibodies

- Transports oxygen through the blood
- Produces hormones and enzymes

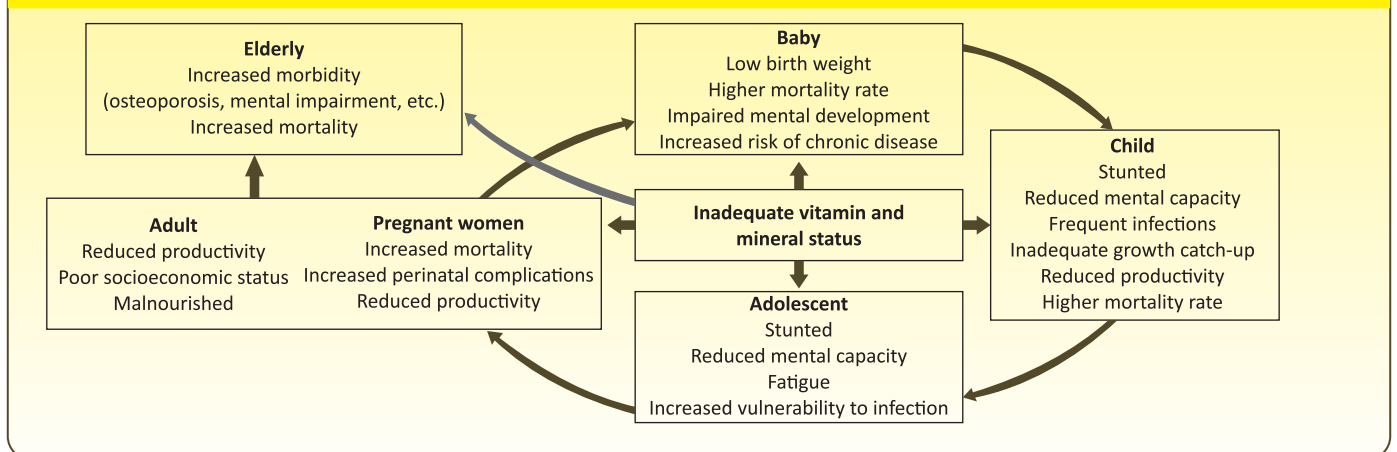
Consequences of protein deficiency

- Protein deficiency mainly affects fetus during pregnancy.
- Excessively low intake of protein is associated with potentially negative effects in terms of weight and length at birth.¹⁰
- Low protein intake can also lead to risk of stillbirth, LBW, intrauterine growth restriction (IUGR), premature delivery and malnutrition which has various future impacts (listed in figure 1).⁶

Protein intake in pregnant women

Protein from animal sources during pregnancy is believed to have an important role in infants born with normal body weights.¹² They are also considered as a 'complete protein' because it provides all essential

Figure 1: Malnutrition cycle and its impacts¹¹



amino acids in adequate amounts. It also provides numerous vitamins and minerals, whereas vegetable sources generally lack one or more of the essential amino acids.

- Animal sources of protein can be meat, poultry, fish, eggs milk, cheese, and yogurt.

Proteins involved plants, legumes, grains, nuts, and seeds, vegetables tend to be deficient in one or more of the indispensable amino acids.⁷ Consumption of two or more vegetable foods with different amino acidic composition can help improving the overall quality of their protein component.¹⁰

Dietary guidelines and requirements of protein intake in pregnant women¹³

ICMR revised recommended dietary allowances for Indians in 2010. A report of the expert group of the Indian council medical research (ICMR) includes revised dietary allowances for Indians. They suggested that higher intake of protein recommended during pregnancy should come from, a normal, varied diet and not from commercial high-protein supplements. (Table 1)

Table 1: Recommended daily allowances (RDA) for protein in pregnancy (For women more then 55 kg body weight)	
Recommended daily allowances (RDA)	Proteins (g/day)
Pregnant women	78
Lactating women <6 months	74
Lactating women 6-12 months	68

National institute of nutrition also suggested that additional high quality protein is required for pregnant woman. (Table 2)

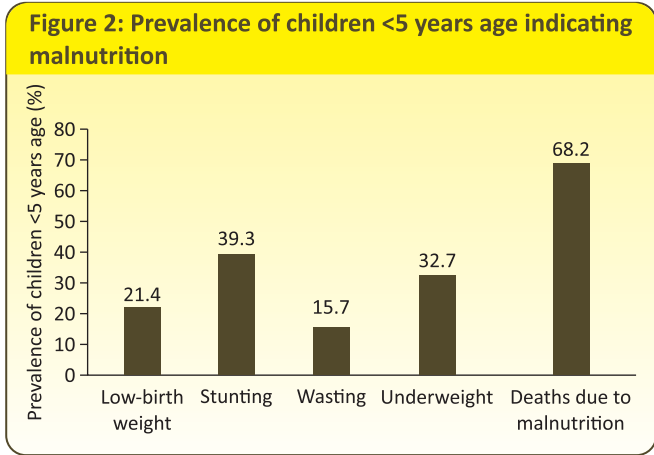
Table 2: Extra allowances of protein during pregnancy	
Women with 55 kg	Extra allowances of protein (g/day)
Pregnant	+23
Lactation 0-6 months	+19
Lactation 6-12 months	+13

Protein in Children

Impact of protein deficiency in children

Child growth stunting is common in low-income countries; possibly due to insufficient protein intakes. Stunting is related with an increased risk of child mortality, infectious diseases, impaired neurocognitive development, and metabolic diseases in later life. It can cause by multiple factors, including small-for gestational-age and preterm births, inadequate dietary quantity and quality. Among these multiple nutritional factors that affect growth, adequate protein is also needed for tissue synthesis, additionally for the amount required for maintenance of normal body functions.²

One of the studies conducted by state level malnutrition collaborators in India in 2017 suggested that malnutrition is a major contributor to disease burden in India and accounts for 68.2% for total <5years aged deaths. They also estimates prevalence of malnutrition (Figure 2).¹⁴



Role of protein in children

- Protein intake is mainly important for infancy and childhood, a period of substantial growth particularly for organs and muscles.¹⁵



- Protein is necessary to build and repair tissue, for adequate development in childhood to promote lean tissue gain.¹⁶
- It also has positive impact on weight and height of children.¹⁷
- It play important role in muscle health, hair growth of child hence, it is necessary to provide proper protein intake in early toddlers and childhood.^{15,18}

Breast milk and infant formula are the only sources of protein for an infant aged up to six months, and continue to be the main sources of protein until the infant is one year of age. Once an infant is of six-months age, complementary foods can be introduced to the infant's diets which provide some protein from meat, poultry, eggs, fish, etc. Such protein from animal sources tends to provide all nine indispensable amino acid that body cannot synthesized. Protein in breast milk and cow's milk-based formula has two types i.e. casein and whey.¹⁸

- Casein- It has significant physiological importance for body function relating to uptake of vitamins and nutrients. Casein is a complete protein and also contains the minerals calcium and phosphorous. It exists as micelles which in turn form gel or clots in the stomach and provides sustained release of amino acid into the blood stream.¹²
- Whey- It contains sufficient supply of branched chain amino acid cysteine, which has strong anti-oxidant property that can assist the body in combating various diseases. It also contains number of proteins that positively affects immune function.¹²

Dietary recommendations on protein intake in children

A report of the expert group of the Indian council medical research (ICMR) includes revised dietary allowances for Indians. ICMR provides recommendations for daily protein intake for children with different age group.

Table 3: Recommended dietary allowances for protein intake in children¹³

Children (Body weight)	Protein intake (g/day)
Age 1-3 years (12.9 Kg)	16.7
Age 4-6 years (18 Kg)	20.1
Age 7-9 years (25.1 kg)	29.5

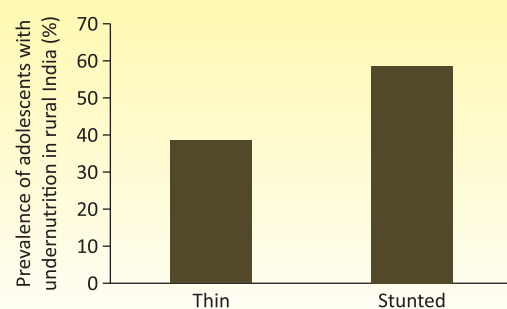
Protein in Teenage

Protein deficiency in teenagers

Adolescence is a time of transition when habits are formed that persist into adult life. Good habits, such as exercise and a healthy diet, are likely to bring many benefits, including improved performance in school. There is huge burden of children with undernutrition as compared to adolescents. In the least developed countries, the prevalence of adolescent underweight is 22% and is associated with various health risks. Undernourished adolescents have commonly experienced stunted growth in childhood.¹⁹

Thomas, et al (2013) studied 409 adolescent students in rural India and found that 39 % were thin and 59 % were stunted and states that acute and chronic measures of malnutrition were high amongst adolescent students attending the school.²⁰

Figure 3: Prevalence of adolescence with undernutrition in rural India



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Role of protein in adolescence

Adolescence is an important time for gains in height as well as weight.²¹ In the period between years and adulthood 18- 19% of the total body weight is consists of proteins.²² Protein requirement during adolescence significantly increases due to increases in muscle mass, need for erythrocyte and myoglobin, and hormonal changes. While both muscle and fat increase, girls gain relatively more fat, and boys gain relatively more muscle. Thus, the requirement of energy as well as proteins increases considerably during this period.²¹

Amount of protein required for growth is higher in girls during 11-14 years and in boys during 15-18 years. 30% or more protein loss from protein storage may cause reductions in muscle mass, immune functions and organ functions; and if reaches to advanced stage it may even cause death.

When adequate protein intake is not acquired, retardation of linear growth and sexual maturation; and reduction in fat-free body mass may occur. Insufficient energy intakes in nutrition cause growth-development

retardation due to depletion of proteins for energy. In conditions with insufficient energy intake and increased vegetative protein consumption; protein requirement is increased.²²

Dietary recommendations for the protein intake in adolescents

Daily protein intake requirement for adolescents according to the World Health Organization are 0.8 g/kg/day for girls and 1.0 g/kg/day for boys.²²

A report of the expert group of the Indian council medical research (ICMR) includes revised dietary allowances for Indians. ICMR provides recommendations for daily protein intake for teenagers with different age group.¹³

Table 4: Recommended daily allowances (RDA) for protein in adolescence¹³

	Age (Weight in Kg)	Protein (g/day)
Boys	13-15 years (47.6)	54.3
	16-17 years (55.4)	61.5
Girls	13-15 years (46.6)	51.9
	16-17 years (52.1)	55.5

Protein plays vital role in growth and development of individual throughout the life. Pregnancy is physiologically and nutritionally a highly demanding period. Additional protein and other nutritional intake benefits fetal growth and development and reduce risk of long term effects. Hence, it is important to ensure proper nutrition along with protein in pregnant and lactating women. It further improves health of children.

As, protein intake is mainly important for childhood and adolescents, a period of substantial growth particularly for organs and muscles. Thus, all the age group must consume recommended daily protein for the proper development and health benefits.

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