



Protein Paradox in India: Unraveling the Crisis, Debunking Myths, and Evaluation of Protein Content in Indian Foods

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Abstract. Protein is a crucial macronutrient required for growth, development, and tissue maintenance in the human body. However, protein deficiency is a prevalent issue in India, the inadequate protein consumption in India has led to various health issues, including poor muscle health and a decline in average height among the population. Misconceptions about protein intake and its effects on kidney function and hair loss further complicate the situation.

With around 60% of protein intake derived from cereals, which are considered inferior to animal proteins due to their low Digestible Indispensable Amino Acid Score (DIAAS). This score measures amino acid digestibility, absorption, and their ability to meet the body's amino acid and nitrogen requirements. Corn-based cereals rank the lowest on the DIAAS, while animal protein sources like milk, boiled eggs.

To address this protein deficit in vegetarian diets, a combination of dairy products and pulses can help. However, there has been a decline in pulse and milk consumption in India. Additionally, India's milk production rate is estimated to be the slowest in 15 years, posing a significant concern as milk and its products are the primary animal protein sources for vegetarians.

Addressing protein deficiency requires promoting awareness about proper protein sources and debunking myths surrounding protein-rich diets. It is essential to prioritize protein-rich foods, both plant-based and animal-based, to ensure adequate protein intake and improve overall nutrition in the Indian population.

Keywords: Protein deficiency, Dietary protein, Protein intake, Indian diet, Protein quality, Vegetarian diet, Protein sources, DIAAS.

1 Introduction

Protein is an essential macronutrient required in the human diet. It consists of amino acids, which are nitrogenous biomolecules that polymerize to form proteins. Dietary protein plays various roles in the body, including supporting growth and development in children, adolescents, and pregnant women, and maintaining and repairing tissues in the elderly and adults. Proteins are crucial structural components of muscles and are involved in the production of hormones and enzymes. They also contribute to the composition of blood, bone, skin, hair, nails, and neural tissue.

2. The Need for a Protein-Rich Diet

A diet rich in protein promotes muscle health and the maintenance of lean body mass in athletes and individuals of all age groups. The human body requires 20 amino acids for metabolism and growth, with 12 of them being synthesized internally (non-essential amino acids) and the remaining 8 (essential amino acids) obtained from dietary protein sources [1]. The current recommendations for protein intake in healthy adults are based on the RDA (Recommended Dietary Allowance) and DRI (Dietary Reference Index). In the United States and Canada, the recommended protein intake is set at 0.66 and 0.8 grams per kilogram of body weight per day [2]. The European Food Safety Authority (EFSA) recommends adults to consume at least 0.83 grams of protein per kilogram of body weight per day [3]. The Indian Council of Medical Research (ICMR) recommends an RDA of 0.8 to 1 gram of protein per kilogram of body weight per day [4]. However, the average protein intake for an adult in India is approximately 0.6 grams per kilogram of body weight [5].

3. Unraveling the Crisis of Inadequate Protein Consumption in India:

The dietary patterns across various states and income groups in India can be considered unhealthy. These diets tend to be excessive in simple carbohydrates and starchy foods, while lacking in proteins, iron, and calcium. Processed foods contribute a higher share of calories to the average Indian household's diet than fruits. Imbalances in the Indian diet are particularly prominent among households, even among the wealthiest, where insufficient amounts of fruits, vegetables, and non-cereal proteins are consumed [6]. Protein deficiency is observed in 91% of the vegetarian population and 85% of the non-vegetarian population in India [7]. A study conducted across eight Indian cities revealed that 71% of individuals between the ages of 30 and 55 suffer from poor muscle health due to dietary protein deficiency, with variations observed between states and cities. For instance, Lucknow has the highest percentage at 81%, while Delhi has a lower percentage at 64% [8]. Protein sources contribute only 6-8% of the calorie intake in the Indian diet, whereas the reference diet recommends a protein intake of about 29% of total calories [6]. Consequently, approximately 46 million children under the age of five in India suffer from undernutrition, while around 14 million individuals are classified as obese or overweight [9].

A trend in the decline of average height among the young population in India has been observed between 1998 and 2015. This decline can be attributed to various genetic and non-genetic factors, such as socio-economic conditions, disease history, access to quality healthcare, and nutritional security. Among women aged 15-25, the average height

showed a decline of 0.12 cm, while among men in the same age group, there was a significant decline of 1.10 cm [10].

The achievement of an individual's genetic height growth is directly linked to adequate nutrition. The stunting of height during adolescence may be a result of malnutrition during early fetal life and infancy [11,12]. A study comparing the effects of a high protein diet versus a standard protein diet on malnourished children's height and various health issues demonstrated that children provided with a high protein diet showed an increase in height of 5.3 ± 1.0 cm, while those provided with a standard protein diet showed an increase of 4.1 ± 1.1 cm over a period of 6 months [13].

4. Protein Myths Debunked:

Over 90% of Indians are unaware of the daily recommended protein intake, and several myths surround the consumption of protein-rich diets, linking them to bodybuilding, athletics, weight loss, and as a remedy for diabetes [5]. Many individuals believe that leafy vegetables and fruits provide sufficient amounts of protein [7].

One prevailing myth suggests that a high protein diet negatively affects kidney function and can lead to kidney diseases. However, a study comparing high protein intake (more than 1.5 g/kg body weight or more than 20% energy intake or more than 100 g protein per day) with normal or lower-protein intakes (less than 5% less energy intake from protein per day) found no adverse influence on the glomerular filtration rate (GFR) of healthy adults with disease-free kidneys. In fact, high protein intake was deemed safe and beneficial, particularly for the elderly population [14]. Many experts have accepted that a protein intake slightly higher than current recommendations can offer health benefits for aging populations [15].

Another controversial myth suggests that a high protein diet, especially the consumption of whey protein, causes hair loss in males. However, research comparing the effects of whey protein isolate (a highly processed form of whey supplement) and whey protein concentrate reveals that only whey protein isolate has an indirect effect that may accelerate male balding in genetically predisposed individuals. On the other hand, a product containing whey protein concentrate (a more natural and less processed whey supplement) was strongly associated with perceived improvements in hair health [16].

5. Assessing Protein Quality in Indian Diets by the Insights from DIAAS Analysis

Around 60% of protein in India is derived from cereals [17]. The majority of plant proteins are considered inferior when compared to animal proteins due to their low ranking on the Digestible Indispensable Amino Acid Score (DIAAS). The DIAAS is a method used to assess amino acids based on their digestibility, absorption in the small intestine, and their ability to fulfill the amino acid and nitrogen requirements of the human body. Corn-based cereals rank the lowest on the DIAAS score, classifying them as low-quality protein sources. On the other hand, animal protein products such as whole milk concentrate, milk protein concentrate, hard-boiled eggs, and chicken breast rank the highest, making them high-quality protein sources [18].

	DIAAS (%)	Quality of Protein	Reference
Whole Milk Powder	143	High	FAO (2013)
Milk protein concentrate	118	High	FAO (2013)
Whole Milk	114	High	Phillips (2017)
Egg – hard boiled	113	High	Phillips (2017)
Beef	111	High	Ertl et al (2017)
Whey protein isolate	109	High	FAO (2013)
Chicken breast	108	High	Phillips (2017)
Soy protein concentrate	98.5	Good	Phillips (2017)
Whey protein concentrate	98.3	Good	Phillips (2017)
Pea protein	91.5	Good	Phillips (2017)
Soy protein	91.5	Good	Phillips (2017)
Wheat	91.5	Good	Phillips (2017)
Soy protein isolate	90	Good	Phillips (2017)
Chickpeas	83	Good	Phillips (2017)
Pea protein concentrate	82	Good	Phillips (2017)
Mixed diet: Wheat, peas and whole milk powder	82	Good	FAO (2013)
Peas - cooked	58	Low	Phillips (2017)
Rice - cooked	59	Low	Phillips (2017)
Rye	47.6	Low	Ertl et al (2017)
Barley	47.2	Low	Ertl et al (2017)
Wheat	40.2	Low	Ertl et al (2017)
Almonds	40	Low	Phillips (2017)
Rice protein concentrate	37	Low	Phillips (2017)
Corn-based cereal	10	Low	Phillips (2017)

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Fig 1: DIAAS score of various protein sources [18].

To compensate for this protein deficit in vegetarian diets, a proper combination of specific dairy products and pulses can be beneficial. However, there has been a decline in the consumption of pulses and milk among individuals [5]. In the 2022-23 fiscal year, India's milk production rate is estimated to be the slowest in the past 15 years [19]. This poses a concerning problem as milk and its products are the only animal protein sources available for vegetarians in India.

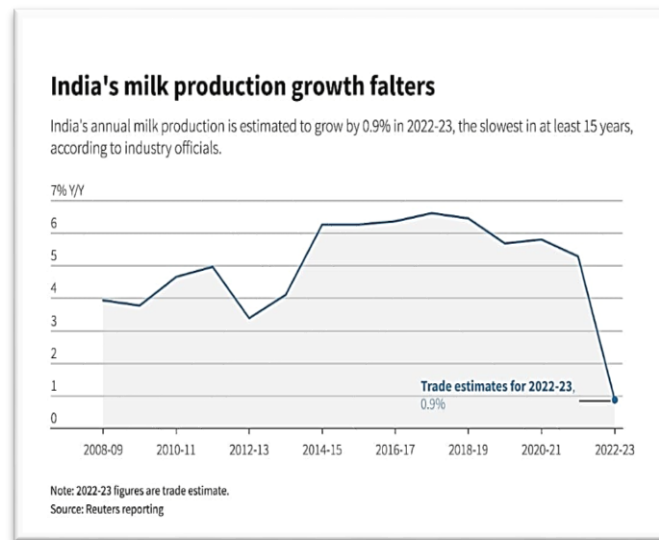


Fig 2: Graphical representation of India's milk production rate [19].

6. Conclusion

Protein deficiency is a significant concern in India, with inadequate consumption of protein-rich foods leading to various health issues, including poor muscle health, stunted growth, and nutritional deficiencies. The Indian diet, particularly among households, is imbalanced, being excessive in simple carbohydrates and lacking in proteins, iron, and calcium. Additionally, there are prevalent myths and misconceptions surrounding protein consumption, further contributing to the protein crisis in the country. It is crucial to address this issue and find effective solutions to ensure adequate protein intake for the population.

7. Solution:

To tackle the protein deficiency problem in India, several strategies can be implemented:

Increase awareness: Educating the population about the importance of protein in the diet and dispelling myths surrounding protein-rich foods is crucial. Public health campaigns and nutritional education programs should be conducted to raise awareness about the recommended daily protein intake and the benefits of consuming high-quality protein sources.

Diversify protein sources: Promoting a diverse range of protein sources

is essential, especially among vegetarian populations. Encouraging the consumption of pulses, dairy products, nuts, and seeds can help supplement the protein deficit. Additionally, exploring alternative protein sources, such as plant-based proteins and fortified foods, can provide more options for individuals with dietary restrictions.

Strengthen public distribution systems: Ensuring the availability and accessibility of protein-rich foods, particularly in rural and economically disadvantaged areas, is crucial. Strengthening public distribution systems, such as subsidized programs for pulses and dairy products, can help make these foods more affordable and accessible to the population.

Nutritional supplementation: In cases where it is challenging to meet protein requirements through dietary sources alone, nutritional supplementation can be considered. This approach should be implemented under the guidance of healthcare professionals and tailored to specific age groups and nutritional needs.

By implementing these strategies, it is possible to address the protein deficiency crisis in India and improve the overall health and well-being of the population. A multi-sectoral approach involving governing bodies, healthcare providers, educational institutions, and civil society is necessary to bring about sustainable changes and ensure adequate protein intake for all individuals in the country.

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