

The Role of Nutrition in Human Growth and Development

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Abstract

Nutrition provides the energy and nutrients required for human growth, tissue formation, metabolism, immune function, and development. Adequate nutrition is especially important during infancy, childhood, adolescence, pregnancy, and other periods of increased physiological demand. Proteins, carbohydrates, fats, vitamins, minerals, water, and other dietary components contribute to distinct biological functions. Both nutrient deficiencies and excessive intake can affect growth and health. This paper examines nine major dimensions of nutrition and human development, including energy, proteins, carbohydrates, fats, micronutrients, bone development, brain development, childhood nutrition, and lifelong health.

Keywords

Nutrition; Human Growth; Human Development; Proteins; Carbohydrates; Fats; Vitamins; Minerals; Brain Development; Child Nutrition

Introduction

Growth and development require a continuous supply of energy and nutrients. Nutrition provides the materials needed to build tissues and the substrates and cofactors required for metabolism.

Nutritional needs change across life stages because body size, developmental demands, activity, and physiological states vary.

Adequate nutrition supports physical growth, cognitive development, immune function, and long-term health.

1. Energy and Nutritional Requirements

Energy from food supports basal metabolism, physical activity, thermoregulation, tissue synthesis, and other physiological processes. Energy needs vary with age, body size, activity, and physiological state.

2. Proteins and Tissue Growth

Proteins provide amino acids needed for muscle, enzymes, structural tissues, hormones, and immune components. Adequate protein is particularly important during periods of rapid growth and tissue repair.

3. Carbohydrates and Energy Metabolism

Carbohydrates are major sources of energy, especially for the brain and during physical activity. Their metabolism contributes to the production of ATP and storage of energy as glycogen.

4. Dietary Fats and Development

Dietary fats provide concentrated energy and essential fatty acids and support cell membranes, signaling molecules, and absorption of fat-soluble vitamins.

5. Vitamins and Human Growth

Vitamins participate in numerous biochemical reactions. Deficiencies can impair growth, metabolism, immunity, vision, blood formation, or other physiological functions depending on the nutrient.

6. Minerals and Skeletal Development

Calcium, phosphorus, vitamin D, and other nutrients contribute to skeletal development. Adequate mineral availability is especially important during childhood and adolescence.

7. Nutrition and Brain Development

The developing brain requires adequate energy, essential fatty acids, iron, iodine, zinc, and other nutrients. Nutritional inadequacy during critical developmental periods can affect cognitive and neurological outcomes.

8. Childhood Nutrition and Physical Development

Childhood nutrition supports linear growth, muscle development, immune function, and learning. Balanced diets and appropriate feeding practices are important throughout childhood.

9. Nutrition Across the Life Course and Long-Term Health

Nutritional needs continue to change throughout adulthood and older age. Long-term dietary patterns influence body composition, metabolic health, bone health, and risk of chronic disease.

Illustration

The following illustration summarizes the major biological relationships discussed in the paper.

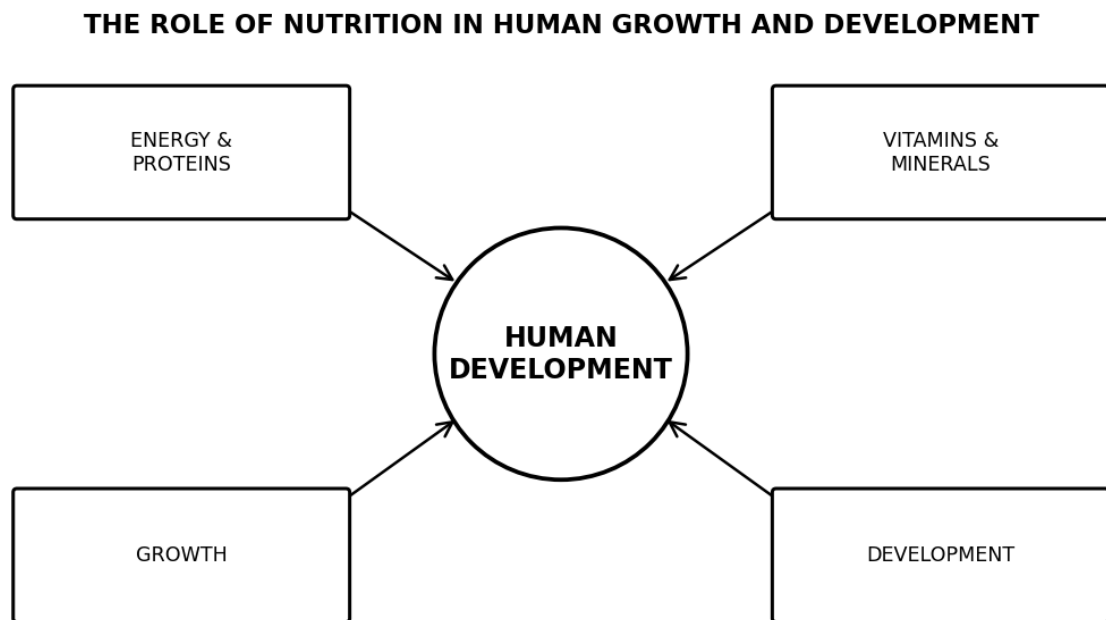


Figure 1. Simplified overview of the major biological processes and relationships.

Conclusion

Nutrition supplies the energy and essential materials required for human growth and development. Adequate protein, carbohydrates, fats, vitamins, minerals, and water support tissues, metabolism, brain development, and immune function.

Nutritional requirements change across developmental stages, and both deficiency and excessive intake can impair health. Early-life nutrition can have lasting consequences for growth and well-being.

Balanced nutrition, food security, and appropriate dietary practices are therefore important foundations of healthy development across the life course.

References

- Mahan, L. K., & Raymond, J. L. (2020). *Krause's food & the nutrition care process* (15th ed.). Elsevier.
- Black, M. M., Trude, A. C. B., & Lutter, C. K. (2020). All children surviving and thriving: Re-envisioning UNICEF's conceptual framework of malnutrition. *Maternal & Child Nutrition*, 16, e13062.
- Victora, C. G., Adair, L., Fall, C., et al. (2008). Maternal and child undernutrition: Consequences for adult health and human capital. *The Lancet*, 371, 340–357.

Prado, E. L., & Dewey, K. G. (2014). Nutrition and brain development in early life. *Nutrition Reviews*, 72, 267–284.

Black, R. E., Victora, C. G., Walker, S. P., et al. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, 382, 427–451.

Georgieff, M. K. (2017). Iron assessment to protect the developing brain. *The American Journal of Clinical Nutrition*, 106, 1588S–1593S.

Wahl, D. A., Cooper, C., Ebeling, P. R., et al. (2012). A global representation of vitamin D status in healthy populations. *Archives of Osteoporosis*, 7, 155–172.