

Letter to the Editor

Long-Term Health Effects of Vitamins and Nutrients

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Academic Editor: Torsten Bohn

Submitted: 30 December 2024 Revised: 22 January 2025 Accepted: 29 January 2025 Published: 28 April 2025

Dear editor,

In recent years, awareness regarding the importance of vitamins, diet, and nutrition for maintaining good health and preventing chronic diseases has significantly increased. Ongoing research has provided evidence that vitamins, nutrients, and a well-balanced diet are necessary for normal physiological functions, optimal growth, and positive health outcomes. However, there are still many unanswered questions about how different dietary patterns affect these nutrients' efficacy and their long-term health effects. In this letter to the editor, we focused on the long-term health effects of vitamins and nutrients as well as the different dietary patterns that cause these nutrients to have varying effects on different people.

Current State of Research

Vitamins are crucial for cellular metabolism, and deficiencies are common in individuals with metabolic syndrome and cardiovascular diseases. Vitamins may help prevent disease because they alter signal transmission and gene expression [1]. Vitamins are necessary for the synthesis of collagen. Vitamin C aids in wound healing and is required for the synthesis of collagen fibers. Metabolism of the amino acids needed for collagen synthesis is aided by vitamin B6. For collagen fibers to remain strong and intact, proper amounts of vitamins A and E are essential [2]. Vitamins as an antioxidant can help counteract reactive oxygen species and lessen the harm that oxidative stress causes in spinal cord injury [2].

Vitamin A, which is called retinoic acid in its active form, helps control gene activity by connecting to special proteins known as retinoic acid receptors and retinoid X receptors. This interaction influences genes that control how cells grow, change, and help the immune system. Vitamin D, which is called calcitriol in its active form, connects with vitamin D receptors to help control how genes work. This process affects the balance of calcium in the body, how bones develop, and how the immune system works. Also, vitamin E can affect the expression of genes involved in protecting the body from damage and fighting inflammation [3,4].

Long-term adequate vitamin and nutrient intake significantly contributes to healthy aging. Consistent consumption of antioxidant vitamins (C, E) may help reduce oxidative stress and inflammation associated with age-related diseases. B vitamins, particularly B12 and folate, support cognitive function and may lower the risk of neurodegenerative disorders in older adults. Vitamin D and calcium intake throughout life contributes to maintaining bone density, reducing the risk of osteoporosis and fractures in later years. Moreover, a balanced nutrient intake supports immune system resilience, potentially reducing the incidence of age-related illnesses and promoting longevity [5–7].

Vitamin D regulates the immune system by suppressing the adaptive immune system and increasing the innate immunological response [8]. The ability of vitamin D to inhibit the adaptive immune system enhances immunological tolerance and may be beneficial for a number of autoimmune conditions [8]. Shortages of vitamins and other micronutrients can seriously hinder children's cognitive and physical development [9]. Vitamin B deficiencies, particularly B1, B2, and B12, can cause neurological symptoms, developmental delays, metabolic disorders, and anemia [10]. Fat-soluble vitamins (A, D, E, K) require dietary fats for optimal absorption. Vitamin C absorption is enhanced by the presence of dietary iron, particularly from plant sources [11,12]. The United States Department of Agriculture (USDA) Dietary Reference Intakes and European Food Safety Authority's (EFSA's) Population Reference Intakes provide evidence-based recommendations for vitamin and nutrient intake across different population groups [13,14].

Public Awareness

The relationship between various micronutrients and their dietary patterns that affects overall health outcomes is of great importance and more research is needed. The absorption pattern of various vitamins differs and depends on various factors. For instance, the absorption of fat-soluble vitamins A, D, E, K depends on intake of dietary fats and the absorption of vitamin C depends on plant-based sources of iron. Furthermore, studies have shown that the metabolism of different micronutrients also depends on genetic factors.



To raise awareness of these aspects of micronutrient metabolism, proper guidelines are needed regarding the dietary patterns of micronutrients and how their absorption can be increased to maximize positive health outcomes. Health professionals should support individualized dietary guidelines according to each person's age, lifestyle, health conditions, and genetic factors. In conclusion, the research community needs to take a more inclusive approach to the study of nutrition, diet, and vitamins by taking into account the complications of human metabolism and diet. In doing so, we will have a better understanding of how to maximize nutrition for greater health and a higher standard of living.

Availability of Data and Materials

Not applicable.

Author Contributions

SHA: Conceptualization, Writing - Original draft preparation, Validation and visualization; MLR: Supervision, Validation, Writing - Review & Editing. Both authors contributed to editorial changes in the manuscript. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Not applicable.

Acknowledgment

Not applicable.

Funding

This research received no external funding.

Conflict of Interest

The authors declare no conflict of interest.

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