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NUTRITION AND GLOBAL FOOD SECURITY FOR HEALTH PRESERVATION

Abstract: Every individual deserves access to healthy, affordable, and quality nutrition. Such access is hindered by deep inequalities stemming from unjust systems that structure everyday living conditions. The transformation of the food system into safe, improved, and healthy nutrition accessible to all is a crucial global issue. Healthy nutrition can play a significant role in the sustainability of the food system. Childhood obesity is a significant health problem in the developed world and affects many countries with low and middle incomes, particularly in urban areas. Unfortunately, obese children often remain obese in adulthood, increasing the likelihood of developing numerous chronic non-communicable diseases at a younger age. There is a clear link between infant and young child feeding practices and the socio-demographic characteristics of households. Breastfeeding up to the age of one is less common in wealthier households, urban environments, or among highly educated mothers. Combating malnutrition requires political dedication and simultaneous actions across multiple sectors, along with significant investments in program implementation and monitoring progress towards sustainable healthy nutrition.

Key words: Nutrition, nutrients, health, disease

INTRODUCTION

Healthy eating habits are essential for maintaining health and well-being, while people often consume more food than necessary for survival. Food is deeply intertwined with culture, memories, lifestyle, and emotions. Families, schools, and employers shape social norms through policies and environments that can either

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support or hinder healthy eating habits. In contrast, the food and beverage industry influences choices and consumption through marketing strategies, portion sizes, food composition, nutrition information, store locations, restaurant offerings, and pricing (1). The entertainment and sports industry also plays a role in promoting, making available, and placing healthy food in sports, film, and other entertainment spaces. Poor nutrition has numerous consequences, linked to most chronic non-communicable diseases, including obesity, type 2 diabetes, cardiovascular diseases, hypertension, poor oral health, osteoporosis, iron-deficiency anemia, and various types of cancer (2).

Malnutrition in all its forms is closely linked, either directly or indirectly, to the leading causes of death and disability worldwide. This situation encompasses perinatal and infectious diseases, as well as chronic conditions (3). Ecological variations in disease rates include nutrition as one of the primary determinants. In the developing world, numerous nutrient-deficiency diseases persist and now coexist with the increasing incidence of nutrition-related chronic diseases. Developing societies bear a double burden of malnutrition with the emergence of so-called diseases of affluence amid persistent undernutrition in their populations (4).

In this paper, we focus on analyzing key challenges related to nutrition globally, to gain a deeper understanding of its impact on health and identify strategies to improve nutrition and prevent diseases.

HEALTH SAFETY OF FOOD

Achieving household food security requires the adequate provision of food for all members of the household, ensuring supply stability throughout the year, and emphasizing the importance of the right to produce and procure food. Food insecurity can stem from the unavailability of food, inadequate purchasing power, or improper food utilization at the household or individual level (4). This is a complex phenomenon attributed to a range of factors that vary in importance depending on the region, countries, and social groups, as well as over time (5). It is described in terms of the availability and stability of high-quality food, as well as access to food and its utilization.

All these criteria must be met to achieve the consumption of a healthy diet and attain nutritional well-being (6). The focus on nutrition encompasses the physiological requirements for various nutrients, determinants of their bioavailability and utilization, as well as aspects of care, healthcare services, and a healthy environment that impacts it. Food security can be defined as an adequate nutritional status in terms of protein, energy, vitamins, and minerals for all household members at all times (7). While this definition illustrates consideration for the need for food to ensure optimal nutrient supply, i.e., physiological needs, other definitions of food safety direct attention to vulnerable individuals and their needs related to non-nutritional factors.

Emphasizing the need for a paradigm shift in formulating food security policies at the individual level, Swaminathan (2008) defines food security as a physical, economic, and social approach to balanced nutrition, safe drinking water, environmental hygiene, primary healthcare, and basic education (8).

Food safety refers to whether food is safe for human consumption and does not contain biological and chemical contaminants that can cause illness. Growing concerns about food safety in the West present a paradox, as epidemiological evidence on food safety is quite contrary to the public and media perception that the currently available food is less safe than it used to be. Improvements in public health have practically eradicated predominantly foodborne infections that were previously associated with morbidity and mortality. Common diseases currently encountered in the West are usually linked to mild, self-limiting gastroenteritis. Risk perception studies suggest that the public becomes alarmed about health threats that are disproportionate to the actual disease-related risk, and this public concern is fueled by media turning health issues into health scares depending on the reporting of individual incidents (4).

BALANCED NUTRIENT INTAKE

Health professionals increasingly recommend a plant-based diet, enriched with fruits, vegetables, legumes, whole grains, and nuts, with a limited intake of red meat and moderate amounts of dairy products, eggs, poultry, and fish, which is beneficial for health and the environment (9). However, the current dietary system is not sustainable as global food production jeopardizes climate stability and ecosystem resilience. Additionally, a large portion of the global population suffers from malnutrition, with one in nine people undernourished or hungry, one in three people obese, and an estimated 2 billion people experiencing micronutrient deficiencies (10).

Unhealthy diets are a major cause of malnutrition, and both factors rank among the top ten risk factors contributing to the global burden of disease (11). Changes in body weight accompany the imbalance between calorie intake and expenditure. This fact is often misinterpreted, suggesting that obesity is caused by overeating and lack of physical activity and can be treated with simple advice to reduce food intake and increase physical activity. Different components of the energy balance are dynamically interconnected, and weight loss opposes physiological processes (12).

MACRONUTRIENTS

Macronutrients – fats, proteins, and carbohydrates - provide energy and essential components necessary for maintaining life. Fat consists of glycerol and fatty acids, proteins are composed of amino acids, while carbohydrates are simple sugars

occurring as monosaccharides or chains of linked monosaccharides (such as starch), which hydrolyze in the human small intestine into monosaccharides or are resistant to hydrolysis (such as dietary fibers). The combination of these macronutrients is essential for longevity and health, although it is not definitively established that there is an optimal combination that would provide the best health benefits. Throughout history, the human population has survived on diets with different proportions of these macronutrients (13). From an evolutionary perspective, humans are well adapted to digest starch. Although diets high in starch content, based on root vegetables, legumes, and whole grains, offer obvious health benefits, the macronutrient proportions provided by such diets are generally considered inconsistent with an acceptable range of macronutrients (14).

The percentage distribution of carbohydrates, proteins, and fats on our plates is well-known to those who strive for healthy eating behaviors. Each of the three macronutrients plays an important role in our body, either in energy production or as a building block, and there is a complex interplay allowing metabolites of one to enter the metabolic cycle dominated by another (15).

MICRONUTRIENTS

Micronutrient deficiency, also known as ‘hidden hunger’, results from the lack of adequate vitamins and minerals in a regular diet. The characteristic of such a diet is a high intake of staple foods and cereals, but a low intake of foods rich in bioavailable micronutrients, such as fruits, vegetables, animal, and marine products, resulting in a lack of diversity in nutrition. Micronutrient deficiencies have a significant impact on public health, affecting billions of people worldwide (4).

According to estimates from the World Health Organization (WHO), around 190 million children under the age of five (33.3% of the preschool-age population) suffer from vitamin A deficiency, with approximately 5.2 million experiencing night blindness (16). Infants and young children have increased needs for vitamin A to support rapid growth and immunity. Severe vitamin A deficiency in this group can lead to vision impairment, anemia, and weakened immune systems, increasing the risk of measles or diarrhea, and further contributing to an elevated risk of morbidity and mortality (17).

Anemia caused by iron deficiency represents the most common micronutrient disorder worldwide, negatively impacting the health and socio-economic well-being of millions of men, women, and children. This problem often becomes more severe due to limited access to appropriate healthcare and treatment. Iron deficiency arises from a prolonged negative balance, resulting in reduced or depleted iron stores. Iron, a crucial component of every living cell, plays a fundamental role in numerous biochemical reactions in the body. It is linked to the transport and storage of oxygen, energy production, DNA synthesis, and electron transport.

The consequences of this deficiency are severe: stunted growth, impaired cognitive development, weak mental and motor performance, reduced work capacity, and an overall decrease in the quality of life. Prevention and control are typically achieved through fortifying staple foods, such as flour, rice, and pasta, with iron and/or the use of iron supplements, often in the form of iron tablets. While iron supplements are widely available, and fortified food is a key component of the diet in the developed world, access is limited in developing countries, and cost often serves as a barrier (18).

Infants and children under the age of five are susceptible to the risk of developing iron deficiency anemia, stemming from increased needs for rapid growth and a diet that often fails to provide iron in a well-absorbed form (19). Iron deficiency, whether accompanying anemia or not, can have serious health consequences for young children, including increased perinatal mortality, delayed mental and physical development, adverse behavioral outcomes, reduced hearing and visual function, as well as impaired physical capacity (20). Some of the negative effects of iron deficiency during early childhood are irreversible and may result in poor academic performance, diminished physical work capacity, and reduced productivity later in life (21).

The term 'iodine deficiency disorder' refers to the complex effects arising from insufficient iodine intake. Mountainous regions of the world are often prone to iodine deficiency as rain leaches this mineral from rocks and soil. Areas with significant deficiency include the Himalayas, Andes, European Alps, and vast mountainous regions of China. It also frequently occurs in the flooded river valleys of Eastern India, Bangladesh, and Burma (4). Iodine is easily absorbed from the diet and is necessary for the synthesis of thyroid hormones crucial for normal growth and development. Public health initiatives to correct iodine deficiency often involve iodizing salt, which has been the most common and effective method. This practice has significantly reduced the prevalence of iodine deficiency disorders in countries such as Switzerland, the United States, and New Zealand. Since its successful introduction in the 1920s in Switzerland, similar programs have proven successful in Central and South America, Europe, and Asia (22).

Zinc deficiency results from inadequate intake or absorption of zinc from the diet. Increased zinc loss during episodes of diarrhea also contributes to the deficiency. The composition of the diet can affect zinc bioavailability, as high levels of phytates in the diet can lead to poor absorption, while animal-based foods increase availability. Worldwide, zinc deficiency is responsible for approximately 16% of lower respiratory tract infections, 18% of malaria, 10% of diarrhea, and 1.4% of deaths (4).

Folate enables cell division and tissue growth. An adequate amount of folate in the diet helps prevent malformations affecting the neural tube and spinal cord, such as anencephaly and spina bifida, as well as congenital defects like cleft lip and palate. Without sufficient folic acid in the diet, two out of every 1000 pregnancies may result in a serious congenital defect. Folate deficiency is also associated with an increased

risk of premature birth, and low birth weight, and can contribute to anemia, especially in pregnant and lactating women (23).

DIETARY PREVENTION

The rapidly growing burden of chronic diseases represents a key determinant of global public health. Already, 79% of deaths attributed to chronic diseases occur in developing countries, mainly among middle-aged men (24). Increasing evidence suggests that the risks of chronic diseases begin in fetal life and continue into old age (25). Chronic diseases in adults, therefore, reflect cumulative diverse life exposures to harmful physical and social environments. There is growing evidence linking breastfeeding to significantly lower blood pressure levels in childhood in term infants and preterm infants (26).

A hypothesis has been proposed that a cholesterol-rich diet in early life may play a role in regulating cholesterol and lipoprotein metabolism in later life (27). However, establishing the existence of an independent effect of childhood weight can be challenging, considering that excess weight during this period is often maintained into adulthood. In a retrospective cohort study, relative weight in adolescence was significantly associated with an increased risk of colorectal cancer (28).

Increased prevalence of elevated blood pressure has been observed not only in adults with low socioeconomic status but also in children. It is important to note that the latter is not always associated with later increases in blood pressure (29). However, research indicates that blood pressure can be tracked from childhood to predict the potential development of hypertension in adulthood (30). The presence and monitoring of high blood pressure in children and adolescents are often the result of an unhealthy lifestyle. This includes excessive intake of total and saturated fats, cholesterol, and salt, inadequate potassium intake, and reduced physical activity, often accompanied by a sedentary lifestyle (29).

In adolescence, the use of alcohol and tobacco contributes to increased blood pressure. Three key aspects of adolescence significantly influence the development of chronic diseases: first, the development of risk factors during this period; second, the tracking of risk factors throughout life; and third, in the context of prevention, the development of healthy or unhealthy habits that tend to persist throughout life, such as physical inactivity (31).

Three key questions related to adulthood have been identified to better understand the dynamics of chronic diseases. First, to what extent do risk factors continue to be significant in the development of chronic diseases? Second, to what extent will the modification of these risk factors impact the onset of diseases? Third, what is the role of reducing and modifying risk factors in secondary prevention and the treatment of the affected individuals? The strongest links between cardiovascular diseases or

diabetes occur between these diseases and key known risk factors in adults. These factors include tobacco use, obesity, physical inactivity, elevated cholesterol levels, high blood pressure, and alcohol use. Understanding and effectively addressing these risk factors plays a crucial role in the prevention and treatment of chronic diseases in adulthood (32).

DIETARY THERAPY

New dietary strategies for treating overweight and obesity have emerged and become popular, but they are often based on personal experiences and testimonials rather than solid scientific evidence. To develop an effective weight loss strategy, research has been conducted on animal models and clinical trials in humans to study changes in body composition and metabolic outcomes. It is important to note that successful weight loss and maintenance require lifestyle changes, including a diet that reduces energy intake, improves dietary quality, and increases physical activity (33).

The Academy of Nutrition recommends an approach that focuses on lifestyle change to achieve successful weight loss (34). This includes a diet that reduces calorie intake and improves diet quality while simultaneously increasing levels of physical activity (33). It is important to emphasize that approaches to treating overweight can vary, and some of them include cognitive-behavioral therapy, pharmacotherapy, and bariatric surgery, with each case needing analysis and customization. Regarding dietary interventions for weight loss, it is crucial to tailor the diet to the individual to achieve a negative energy balance. Diets often rely on including or excluding certain foods or food groups. There are three main categories of diets: those that manipulate the content of macronutrients (low fat, high protein, low carbohydrates), those that restrict specific foods/food groups (gluten-free, paleo diet, vegetarian/vegan, Mediterranean), and those that manipulate timing (intermittent fasting) (33).

DIETARY SUPPLEMENTS

The fundamental challenge in any discussion on the regulation of dietary supplements lies in the lack of global consensus on the definition of product categories such as dietary supplements, natural health products, complementary medicines, or nutritional supplements, which vary from country to country. Another challenge is that, although there is a general effort to protect consumers from potential harm, regulatory systems differ in each country, even in those with similar cultures, legal systems, and levels of economic development. The ultimate challenge is present in the fact that dietary supplements are often the subject of emotional and polarized debates. There is a wide range of opinions and perspectives, with some believing

that these products should be subject to the same standards as conventional drugs and food, while others believe that an adapted approach is necessary due to the often-present traditional or historical basis of evidence, as well as the higher constituent content in these products. It is important to emphasize that, despite similarities in cultures and legal systems, health products with a nutritional supplement component are subject to different rules and regulations worldwide. Without a global consensus on terminology and regulation, these issues remain challenging and require careful consideration to achieve a balance between consumer protection and support for product diversity (35).

In ideal circumstances, medical recommendations for medications or supplements should be based on rigorous studies. Most research involving dietary supplements is often not double-blind and placebo-controlled. Nevertheless, doctors should not automatically dismiss nutritional supplements solely for this reason. It is important to consider the extensive and valid clinical experience with dietary supplements, encompassing hundreds of millions of people across centuries and different cultures.

Despite the lack of ideal studies, available information on many popular dietary supplements allows for reasonable recommendations for their use. It is crucial to emphasize that the individual response to supplements varies, and before using any dietary supplement, especially for medical purposes, consultation with a specialist is advisable. Continuous monitoring of research and advancements in the field of dietary supplements contributes to a better understanding of their effects and safety (35).

PREVENTION OF DISEASES

The leading risk factor for global DALY in 2019 was childhood and maternal malnutrition, significantly affecting health in the youngest age groups, accounting for 295 million (253–350) DALY (11.6% [10.3–13.1] of all global DALY that year). The burden of risk factors varied significantly in 2019 between age groups and locations. Among children aged 0 to 9 years, the three leading risk factors for DALY were associated with malnutrition (11).

Quantitative and qualitative changes in our dietary patterns leading to dramatic shifts in life expectancy result in issues of diet-related chronic diseases. Diet-related chronic diseases typically manifest in middle and later adulthood and can increase the incidence of premature mortality, and slow the increase in life expectancy. More importantly, they lead to morbidity and resulting disability-adjusted life years (DALY) and contribute to economic losses and reduced quality of life (4).

Strategies to improve the nutritional status and growth of children must be comprehensive and include interventions that support pregnant and lactating women.

Early initiation of breastfeeding, recommended during the first six months of life, should be promoted, with continued breastfeeding along with adequate complementary feeding until the age of two. Micronutrient supplementation should be applied whenever necessary.

The World Health Organization (WHO) recommendations from 1999, in partnership with UNICEF and BASICS, contain effective, feasible, and affordable interventions (36). These interventions are most effective when combined with measures to reduce infections, further emphasizing the importance of a holistic approach.

A focus on essential nutrition measures can significantly contribute to reducing mortality among newborns and children, improving physical and mental growth and development, and enhancing overall productivity. These key actions include:

- Emphasizing the importance of exclusive breastfeeding during the first six months of life.
- Adequate complementary feeding starting at six months while continuing breastfeeding for two years.
- Proper nutrition for sick and malnourished children.
- Adequate intake of vitamin A for women and children.
- Adequate iron intake for women and children.
- Adequate iodine intake for all household members.

Improving nutrition requires collaborative efforts at the healthcare facility and within the broader community, including monitoring nutrition, identifying at-risk subpopulations, updating policies and protocols, and providing resources for implementing nutrition practices.

CONCLUSION

In this paper, we have thoroughly explored and analyzed the complex topic of nutrition, focusing on key aspects such as macro- and micronutrients, iron deficiency, anemia, childhood nutrition issues, iodine deficiency, and the role of dietary supplements. We have presented a comprehensive picture of the challenges faced by global health related to nutrition and its impact on various segments of society.

Hunger, particularly household food insecurity, is a crucial determinant of poverty in societies and a significant challenge for global health. Access to healthy, affordable food and quality nutrition should be a universal right for every individual. However, existing injustices in systems and processes structure everyday living conditions, creating profound inequalities in access to nutrition.

In 2021, between 720 and 811 million people faced hunger worldwide, emphasizing the urgency of transforming the food system to achieve food security, improved

nutrition, and accessible healthy nutrition for all. Healthy nutrition plays a crucial role not only in addressing hunger but also in enhancing the sustainability of the food system.

Malnutrition, in all its forms, is closely linked to major causes of death and disability worldwide. Nutrition is one of the key determinants of variations in disease rates, directly or indirectly impacting human health. In developing countries, we face a double burden - malnutrition coexists with the rise of nutrition-related chronic diseases.

Combating malnutrition requires a comprehensive approach that involves political commitment, cross-sectoral actions, and significant investments in data systems for monitoring and evaluation. Connecting optimal nutrition with development goes beyond traditional health interventions, paving the way to improving population health. This holistic approach is crucial for achieving global goals in the fight against malnutrition and enhancing the quality of life worldwide.

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