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Research Article

Food Security, Nutritional Challenges, and Prevention of Target Organ Damage in Afghanistan

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Abstract. Food security is a fundamental determinant of health and a critical factor in preventing chronic diseases and target organ damage. In Afghanistan, decades of conflict, economic instability, and climate-related crises have created severe food insecurity, limiting access to safe, nutrient-rich, and diverse foods. Insufficient nutrition contributes to malnutrition, micronutrient deficiencies, and unhealthy dietary patterns, which exacerbate metabolic dysregulation and organ impairment. This study employed a narrative literature review and secondary data analysis of publications between 2020 and 2025, sourced from PubMed, Scopus, Web of Science, and reports from the World Health Organization (WHO) and Food and Agriculture Organization (FAO). Evidence from epidemiological studies, systematic reviews, and global nutrition reports was synthesized to examine the biological and socio-economic mechanisms linking food insecurity to chronic disease and progressive organ damage. Findings indicate that food insecurity in Afghanistan is strongly associated with elevated risks of

cardiovascular disease, chronic kidney disease, type 2 diabetes mellitus, and metabolic liver disorders. Dietary insufficiency, particularly low intake of micronutrients and reliance on energy-dense, nutrient-poor foods, contributes to oxidative stress, chronic inflammation, and metabolic dysfunction, accelerating structural and functional impairment in the heart, kidneys, liver, and brain. Vulnerable populations—including children, women, the elderly, and displaced households—are disproportionately affected. Strengthening Afghanistan's food systems, expanding access to nutrient-rich foods, promoting balanced dietary patterns, and integrating nutrition-sensitive policies into chronic disease prevention strategies are essential to mitigate organ damage and improve long-term population health outcomes.

Keywords: Food security, Nutritional deficiencies, Target organ damage, Chronic disease, Afghanistan

INTRODUCTION

Food security is a fundamental determinant of human health, social stability, and sustainable development. The Food and Agriculture Organization (FAO) defines food security as the condition in which all individuals have reliable access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life. Globally, food insecurity remains a pressing challenge, disproportionately affecting low- and middle-income countries, where fragile economies, political instability, and environmental stressors exacerbate vulnerability [Babu SC, Looden J, Ajmal M, Rana AW, Srivastava: 2021., Yolchi J, Wang H, Pede V. 2024;78:, Pakravan-Charvadeh MR, Longworth Z, Lane G. 2025]**.**

In Afghanistan, decades of conflict, economic instability, and recurrent climatic crises have created one of the most severe food insecurity contexts worldwide. Reports indicate that over half of the population approximately 23 million people requires humanitarian assistance, with the most vulnerable groups including children, women, the elderly, and persons with disabilities [Fayemi PO, Muchenje V, Yetim H, Ahhmed A. 2018., Ehsan M. 2021. Edward Elgar; 2025., Lawrence T. 2021.]**.** Structural challenges such as fragile agricultural infrastructure, unreliable irrigation, limited market access, and high food price volatility further reduce the availability and affordability of nutrient-rich foods, increasing reliance on staple cereals and energy-dense, low-quality diets [New York: UNICEF; 2023., World Food Programme; 2023].

Nutritional inadequacy has profound biological consequences. Diets deficient in essential micronutrients (e.g., vitamins A and D, iron, zinc, and folate) and poor in high-quality proteins and bioactive compounds impair immune function, antioxidant defense, and metabolic regulation [Rahmat ZS, Rafi HM, Nadeem A, Salman Y. 2023; Levitt E. 2011. Zhu Y, Azami MR, Fazal M, Khuram D, Iannotti L. 2024; Samim SA, Hu Z, Stepien S, Amini SY, Rayee R, Niu K. 2021; Ahmed S, Ahmad K, Mohammadi H. 2022;]. Concurrently, reliance on highly processed, energy-dense foods contributes to insulin resistance, dyslipidemia, and chronic inflammation, which are key mediators of non-communicable diseases such as cardiovascular disease, hypertension, type 2 diabetes mellitus, and chronic kidney disease [Levitt E. 2011., Najam W, Ibiyemi T, Aziz S, Najam R. 2023., WFP. 2023., Islam MT, Rahman MM. 2020., Akbarzadeh A, Rezvani F. 2021]**.**

From a pathophysiological perspective, chronic nutritional stress can trigger oxidative stress and inflammatory pathways, gradually damaging cellular structures and functional tissues [Zhu Y, Azami MR, Fazal M, Khuram D, Iannotti L. 2024., Lawrence T, Samim SA. 2021].

Over time, these mechanisms contribute to target organ damage, manifesting as structural and functional impairment in the heart, kidneys, liver, brain, and vascular system [Najam W, Ibiyemi T, Aziz S, Najam R. 2023., D'Souza A, Jolliffe D. Food price volatility and its implications for Afghanistan's food security. In: Food Security and Development. Springer; 2015., FAO, WFP, UNICEF. 2023]. In contexts like Afghanistan, where food insecurity and malnutrition are widespread, these processes are further amplified by socioeconomic deprivation, limited healthcare access, and recurrent environmental shocks [Fayemi PO, Muchenje V, Yetim H, Ahhmed A. 2018., Ehsan M. Poverty and food security in Afghanistan post 2021. Edward Elgar; 2025]**.**

Understanding the complex interactions between food insecurity, nutritional status, and target organ health is essential for designing effective interventions [Ahmed S, Ahmad K, Mohammadi H. 2022., FAO. 2023., Zia H, Samim SA. 2021., Rahmat ZS, Rafi HM, Nadeem A. 2023].

This study aims to analyze how food security can prevent chronic disease and target organ damage in the Afghan population, integrating insights from nutritional science, metabolic biology, and global health research. The findings are intended to guide evidence-based policies and programs that address both the structural and biological determinants of food insecurity in conflict-affected and resource-constrained settings.

Three major global food challenges

Rising global hunger

Despite decades of global development efforts, hunger remains a persistent and escalating challenge. After a period of improvement in the late 20th century, the number of undernourished individuals worldwide began rising in the 1990s, driven by economic instability, global financial crises, and disruptions in agricultural markets. Volatility in commodity prices, reduced trade flows, and limited access to international markets exacerbated food shortages, particularly in low-income countries [Babu SC, Looden J, Ajmal M, Rana AW, Srivastava N. 2021., Yolchi J, Wang H, Pede V. 2024., Sulaiman A, Ahmed A, Noor M. 2021., New York: UNICEF; 2023]**.**

Currently, approximately 969 million people globally live on less than one US dollar per day, with nearly three-quarters relying directly or indirectly on agriculture for their livelihoods. Severe poverty, combined with limited economic opportunities, prevents many households from escaping cycles of chronic undernutrition [Babu SC, Looden J, Ajmal M, Rana AW, Srivastava N. 2021., Yolchi J, Wang H, Pede V. 2024]**.**

In fragile contexts such as Afghanistan, prolonged conflict, population displacement, recurrent droughts, and underdeveloped agricultural systems compound these challenges. Food insecurity in such environments is not only a consequence of poverty but also a systemic issue affecting access, availability, and utilization of food. Households often face seasonal gaps in food supply, dependence

on humanitarian aid, and limited resilience to shocks, which intensifies both acute and chronic malnutrition [Fayemi PO, Muchenje V, Yetim H, Ahhmed A. 2018., Ehsan M. 2021., Edward Elgar; 2025]**.**

Imbalanced dietary patterns

The second major challenge is the global transition toward imbalanced diets, reflecting the double burden of malnutrition [Pakravan-Charvadeh MR, Longworth Z, Lane G. 2025., Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S. 2021]. While undernutrition and micronutrient deficiencies remain widespread in low- and middle-income countries, overconsumption of energy-dense, nutrient-poor foods has emerged as a major public health problem in both developing and industrialized nations [Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S. 2021].

Diet-related non-communicable diseases (NCDs), including obesity, type 2 diabetes, hypertension, cardiovascular disease, and certain cancers, are increasingly prevalent. This trend is amplified by sedentary lifestyles, urbanization, and socio-economic disparities, which limit access to nutritious food. The coexistence of undernutrition and overnutrition the so-called "double burden of malnutrition" places substantial pressure on healthcare systems, reduces workforce productivity, and contributes to long-term morbidity and mortality [Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S. 2021., Islam MT, Rahman MM. 2020., Rahmat ZS, Rafi HM, Nadeem A. 2023].

In Afghanistan, dietary imbalance manifests through limited intake of fruits, vegetables, and animal-source proteins, combined with reliance on staple grains. Micronutrient deficiencies such as iron, zinc, iodine, and vitamin A are widespread, while urban populations increasingly face rising rates of overweight and metabolic disorders, creating complex nutritional challenges [Rahmat ZS, Rafi HM, Nadeem A, Salman Y. 2023., Levitt E. 2011., Ahmed S, Ahmad K, Mohammadi H. 2022., Zia H, Samim SA. 2021]**.**

Environmental degradation and food production

Environmental degradation represents a third critical barrier to global food security. Unsustainable land use, deforestation, soil erosion, water pollution, depletion of freshwater resources, and climate change have significantly reduced agricultural productivity in many regions. These stressors not only limit food availability but also compromise nutrient quality, threatening the health and resilience of populations [New York: UNICEF; 2023].

Sustainable food production requires improved resource management, adoption of environmentally friendly agricultural practices, and investment in climate-resilient crops. Efficient irrigation, soil fertility management, conservation agriculture, and crop diversification are essential to maintain productivity in the face of climate variability. Additionally, reducing post-harvest losses through improved storage, transportation, processing, and market systems is critical to ensure food availability, especially for perishable crops. Globally, roughly one-third of all food produced is lost or wasted, undermining both nutrition and economic outcomes [WFP. 2023].

For Afghanistan, environmental degradation intersects with socio-economic vulnerability. Limited irrigation infrastructure, mountainous terrain, recurrent droughts, and reliance on rain-fed agriculture exacerbate crop failure and food scarcity. Moreover, conflict-driven displacement and weak governance impede the establishment of sustainable agricultural practices, making the country particularly susceptible to food insecurity [Islam MT, Rahman MM. 2020].

Integrative Perspective: Interconnection of Challenges

The three challenges hunger, dietary imbalance, and environmental degradation are interconnected and mutually reinforcing. Rising hunger drives reliance on low-cost, low-quality foods, which exacerbates malnutrition and diet-related disease. Environmental degradation reduces agricultural productivity, increasing food scarcity and price volatility, which disproportionately affects vulnerable populations. Addressing one challenge without considering the others is unlikely to achieve sustainable food security [Ahmed S, Ahmad K, Mohammadi H. 2022., FAO; 2023., Zia H, Samim SA. 2021].

Achieving global and national food security therefore requires comprehensive, multi-sectoral approaches that integrate agricultural sustainability, nutrition-sensitive policies, social protection, and economic development. In Afghanistan, strengthening food systems is essential not only to alleviate hunger but also to prevent chronic diseases, reduce target organ damage, and improve long-term population health [Fayemi PO, Muchenje V, Yetim H, Ahhmed A. 2018., Samim SA, Zhiquan H. 2020., Ehsan M. 2021., Edward Elgar; 2025., Rahmat ZS, Rafi HM, Nadeem A. 2023]**.**

Recommendations for enhancing food security in Afghanistan

Food insecurity in Afghanistan results from a complex interplay of prolonged conflict, economic instability, environmental shocks, and weak agricultural infrastructure [Ahmed S, Ahmad K, Mohammadi H. 2022., FAO; 2023., Zia H, Samim SA. 2021]**.**Effective solutions require integrated, evidence-based interventions that strengthen food systems, reduce post-harvest losses, enhance access to nutrient-rich foods, and build resilience among vulnerable populations. The following recommendations are tailored to Afghanistan's socio-ecological and agro-economic context [Fayemi PO, Muchenje V, Yetim H, Ahhmed A. 2018., Samim SA, Zhiquan H. 2020., Ehsan M. 2021., Edward Elgar; 2025., Zia H, Samim SA. 2021., Rahmat ZS, Rafi HM, Nadeem A. 2023]**.**

Adoption of Climate-Smart and Sustainable Agricultural Practices

Afghanistan's agriculture is predominantly subsistence-based and rain-fed, making it highly vulnerable to climatic variability, drought, and erratic rainfall patterns. Implementing climate-smart agriculture (CSA) can enhance productivity while protecting natural resources. Key CSA interventions include:

- Crop diversification to reduce risk from climate shocks and pest outbreaks.
- Conservation tillage and soil management to preserve soil moisture, reduce erosion, and improve long-term fertility.

- Integrated pest and disease management to minimize chemical inputs and safeguard environmental health.
- Drought- and heat-tolerant cultivars to maintain yields under climate stress.
- Farmer field schools and participatory demonstrations to facilitate adoption of CSA practices by smallholders [Oskorouchi HR, Sousa-Poza A. 2021., Lawrence T. 2021., Human Capital Report 2023. Washington, DC. 2023]**.**

Rationale: Climate shocks and unpredictable rainfall significantly constrain Afghan farmers. CSA not only improves resilience and productivity but also enhances environmental sustainability, preserves biodiversity, and reduces greenhouse gas emissions from agriculture. By mitigating vulnerability, CSA contributes directly to household food security and nutritional stability.

Strengthening Post-Harvest Infrastructure and Value Chains

Post-harvest losses in Afghanistan are estimated at 20–40% for perishable crops, due to inadequate storage, poor handling, and limited transportation networks. Strategic investments are required to maintain food quantity and quality:

- Modern storage facilities, such as hermetic grain storage and off-grid cold chains for perishable crops.
- Improved rural feeder roads and transportation networks to connect farms with markets efficiently.
- Digital tracking systems and warehouse management to reduce spoilage and improve inventory control.
- Public-private partnerships (PPPs) to strengthen logistics, stabilize seasonal prices, and enhance rural market integration [Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S. 2021., UN. 2024., Kabul: UN OCHA; 2024]**.**

Rationale: Afghanistan's mountainous terrain, fragmented rural markets, and limited infrastructure exacerbate food losses and reduce rural incomes. Strengthening post-harvest systems ensures that food reaches communities, maintains nutritional quality, and improves economic returns for farmers.

Expansion of Agro-Processing and Nutrition-Sensitive Value Chains

Agro-processing plays a dual role in food security and nutrition by extending shelf-life, reducing post-harvest losses, and improving dietary quality. Priority actions include:

- Development of small and medium-scale processing units for milling, drying, and preservation of fruits, vegetables, cereals, and tubers.
- Integration of nutrition-sensitive interventions, including fortification of staples and preservation of micronutrient-rich crops.
- Promotion of value-added products to diversify household incomes and generate employment, particularly for women and youth.
- Support for community-based processing hubs to reduce dependency on distant markets.

Rationale: Agro-processing strengthens rural economies, reduces food waste, and enhances access to nutrient-dense foods. Linking processing with nutrition objectives ensures that economic development translates into improved dietary

quality and reduced risk of diet-related chronic diseases [Samim SA, Zhiquan H. 2020., Pakravan-Charvadeh MR, Longworth Z, Lane G. 2025., Oskorouchi HR, Sousa, Poza A. 2021., FAO; 2023]**.**

Investment in Rural Research, Extension, and Education

Sustainable improvements in agricultural productivity require robust, context-specific knowledge systems:

- Expansion of agricultural research programs targeting soil fertility, water management, crop rotation, pest control, and post-harvest management.
- Strengthening extension services to provide on-farm guidance and technical support.
- Leveraging digital platforms, mobile-based advisory services, and decentralized training hubs to reach remote communities.
- Collaboration with universities, NGOs, and international research organizations to disseminate innovations and best practices.[FAO; 2023., Zia H, Samim SA. 2021., Noor M, Ahmad K, Rahimi F. 2022].

Rationale: Access to knowledge and technical support empowers farmers to adopt innovative practices, improve yields, and enhance food quality. Extension programs also promote nutrition-sensitive agriculture by guiding crop selection and management practices that support dietary diversity.

Enhancement of Storage, Sorting, and Processing Technologies

Reducing post-harvest losses and maintaining nutritional quality requires investment in modern handling and processing technologies:

- Grading, sorting, and quality assessment systems at collection centers and local markets.
- Solar-powered cold storage units for off-grid rural communities.
- Efficient processing timelines to minimize delays between harvest, storage, and consumption.
- Application of value-added preservation techniques to extend shelf-life while retaining micronutrient content [Lister E, Rahimi F. 2021., Rasool S, Noor M, Ahmad A. 2021., Ehsan M, Samim SA. 2023., Saif-Nijat J, Gholamrezai S. 2023]

Rationale: Efficient post-harvest management reduces spoilage, preserves nutrient content, maximizes economic returns, and ensures continuous food availability for households and local markets.

Strengthening Policy Frameworks and Institutional Coordination

Sustainable food security requires integrated policies and institutional frameworks linking agriculture, nutrition, climate resilience, and rural development:

- Social protection and safety nets to buffer households against food price shocks and acute shortages.
- Market reforms and subsidies to stabilize prices, incentivize production of nutrient-dense crops, and improve access for vulnerable populations.
- Land and water governance policies to ensure equitable access for smallholders and prevent resource conflicts.

- Development of national food security and nutrition strategies coordinated across ministries of agriculture, health, and rural development.
- Collaboration with international agencies such as FAO, WFP, and WHO to enhance technical capacity, mobilize resources, and support policy implementation [Saif-Nijat J, Gholamrezai S. 2023., Pakravan-Charvadeh MR, Azami MR. 2022]**.**

Rationale: Food security is not solely a production issue. Coordinated policies, institutional support, and social protection mechanisms ensure that gains in agriculture translate into improved nutrition, reduced vulnerability, and sustainable socio-economic development.

Integrative Approach: Linking Agriculture, Nutrition, and Health

Effective interventions must bridge agriculture, nutrition, and health systems:

- Promote nutrition-sensitive agriculture, emphasizing dietary diversity, micronutrient-rich crops, and fortified staples.
- Encourage community nutrition programs that complement food production initiatives with education on dietary practices.
- Integrate screening for food insecurity into primary healthcare to identify at-risk populations and link them to support services.
- Monitor food system performance using data-driven tools to optimize production, supply chains, and nutrition outcomes [Oskorouchi HR, Rahmat ZS. 2022., Lawrence T, Samim SA. 2021., Saif-Nijat J, Pakravan-Charvadeh MR. 2023].

Rationale: A holistic approach ensures that improvements in production and food access translate directly into better health outcomes, reduced malnutrition, and decreased risk of diet-related chronic diseases and target organ damage.

Suggestions for Addressing Food Insecurity in Afghanistan

Achieving sustainable food security in Afghanistan requires strategic institutional strengthening, evidence-based agricultural practices, and policy integration across health, nutrition, and economic sectors. The following recommendations outline a multifaceted approach to address structural, ecological, and socio-economic determinants of food insecurity

Strengthening Institutional Coordination and Policy Frameworks

One of the most critical steps toward national food security is enhancing the capacity of the Secretariat of the High Council for Health and Food Security. This council should establish a policy and research think tank comprising experts in nutrition, agriculture, economics, education, cultural studies, and related disciplines. Such a multidisciplinary body can:

- Formulate evidence-based strategies for national food security.
- Coordinate inter-ministerial and cross-sectoral policies.
- Monitor and evaluate implementation of food security programs.
- Facilitate integration of nutrition and health priorities into agricultural and economic development plans.

Within this structure, the Ministry of Agriculture should serve as the primary authority overseeing national food security programs, including crop production, supply chain management, and support for farmers). This institutional framework ensures cohesive governance, efficient resource allocation, and accountability, fostering resilience against both acute and chronic food insecurity [Rahmat ZS, Rafi HM, Nadeem A. 2023., Najam W, Ibiyemi T. 2022., Samim SA, Hu Z. 2021]

Promotion of Organic and Sustainable Agricultural Practices

Organic and ecologically sustainable farming offers a viable pathway to produce safe, nutrient-rich foods while preserving environmental integrity. Organic agriculture aligns with global trends emphasizing reduced reliance on chemical fertilizers and pesticides, protection of biodiversity, and maintenance of soil and water quality. Benefits include:

- Enhanced ecological balance through natural pest control and nutrient cycling.
- Reduction of chemical residues in food products, improving public health outcomes.
- Preservation of non-renewable environmental resources and natural habitats.
- Alignment with global consumer demand for healthier, sustainable diets.

Transitioning toward organic agriculture in Afghanistan could improve food safety, dietary quality, and environmental sustainability, while creating opportunities for value-added products and export-oriented markets [D'Souza A, Jolliffe D. 2015., UNDP Afghanistan. Kabul 2021-2023., WHO Afghanistan 2022].

Transition from Subsistence to Market-Oriented Agriculture

Current agricultural practices in Afghanistan are largely subsistence-based, limiting productivity, income generation, and resilience to shocks. Transforming subsistence agriculture into an economically productive system requires:

- Adoption of modern agronomic techniques and mechanization.
- Investment in high-value and nutrient-dense crops suitable for regional climates.
- Development of market linkages, agro-processing units, and supply chain infrastructure.
- Promotion of entrepreneurship and rural employment opportunities, particularly among women and youth.

Economic transformation in agriculture not only enhances household food security but also contributes to broader national economic stability and development goals [WFP 2022., FAO 2022].

Integrating Food Security with National Development and Political Stability

Food security is inseparable from political and economic stability. Strategic planning and efficient use of agricultural potential can generate systemic transformation in the sector. Key actions include:

- Formulating regional food security strategies to ensure equitable distribution of resources.
- Implementing sustainable land and water management policies to optimize agricultural output.

- Strengthening research, extension, and education systems to support innovation and capacity building.
- Integrating food security into national development programs, linking it to health, nutrition, and socio-economic resilience [FAO 2022., UNICEF/WFP; 2023].

Rationale: By addressing structural, ecological, and socio-economic determinants of food security, Afghanistan can strengthen its national resilience, promote sustainable development, and reduce vulnerability to food-related crises.

Holistic and Multisectoral Approach

Sustainable food security cannot be achieved solely through agricultural production. A holistic approach must integrate:

- Nutrition-sensitive agriculture, ensuring the production and availability of micronutrient-rich foods.
- Social protection mechanisms to buffer vulnerable households from food price shocks and seasonal shortages.
- Environmental stewardship, emphasizing climate-smart and resource-efficient farming.
- Technological innovation, including digital advisory services, precision agriculture, and mobile extension programs.

This integrated strategy aligns agriculture, nutrition, health, and economic development to create a resilient food system capable of meeting Afghanistan's long-term needs.

Strengthening governance, promoting sustainable agriculture, transitioning to market-oriented systems, and integrating food security into national development frameworks are critical to enhancing Afghanistan's resilience. Through these interventions, the country can achieve improved nutrition, economic growth, environmental sustainability, and reduced vulnerability to food insecurity, creating a foundation for long-term health and socio-economic stability [WFP Afghanistan. 2022., WFP; 2022., UNICEF/WFP; 2023., Ministry of Health Afghanistan. 2023., Washington DC: World Bank; 2023].

METHODS

Study Design

This study utilized a descriptive and analytical literature review combined with secondary data analysis to explore the relationship between food security, nutritional status, and the prevention of target organ damage. The design allowed for integration of findings from diverse sources, including epidemiological studies, systematic reviews, and global health reports, to identify patterns and mechanisms linking food insecurity with chronic disease and organ dysfunction.

Data Sources

A comprehensive search was conducted across multiple international scientific databases and organizational reports, including:

- PubMed

- Scopus
- Web of Science
- World Health Organization (WHO) reports
- Food and Agriculture Organization (FAO) reports

The search strategy focused on studies published between 2020 and 2025, ensuring inclusion of the most recent evidence relevant to food security, nutrition, and chronic disease outcomes.

Inclusion Criteria

Studies were considered eligible if they:

1. Examined the relationship between nutrition and organ health.
2. Investigated the impact of food security or food insecurity on health outcomes.
3. Reported associations with chronic diseases linked to target organ damage, including cardiovascular disease, chronic kidney disease, diabetes complications, and metabolic liver disorders.
4. Were published in peer-reviewed journals or authoritative organizational reports.

Studies focusing solely on acute illness or unrelated health outcomes were excluded.

Data Extraction and Analysis

Data from selected studies were systematically reviewed and extracted to identify common patterns and mechanisms connecting food insecurity, nutritional deficiencies, and organ-specific health outcomes. Key variables included study population, type of food insecurity, nutritional indicators, and reported organ-related morbidity or risk factors.

Findings were synthesized using qualitative comparative analysis, emphasizing biological, metabolic, and socio-economic pathways through which inadequate nutrition and food insecurity contribute to target organ damage. Emphasis was placed on integrating evidence from both global and regional contexts to provide a comprehensive perspective relevant to populations such as Afghanistan.

RESEARCH FINDINGS

Structural and Environmental Determinants of Food Insecurity in Afghanistan

Analysis of the literature and secondary data indicates that Afghan households face multiple intertwined structural and environmental barriers that severely compromise food security. Key determinants include:

- Market instability and price volatility: Irregular fluctuations in food prices reduce the purchasing power of households, particularly among low-income and rural populations. During 2007–2008, wheat and wheat flour prices nearly doubled, coinciding with national inflation of approximately 60%, which forced many families to reduce consumption of nutrient-rich foods.
- Fragile agricultural infrastructure: Limited irrigation networks, poorly maintained rural roads, and insufficient storage facilities reduce agricultural productivity and restrict market access.

- Climate-related disruptions: Recurrent droughts, delayed harvests, flooding, and other extreme weather events directly damage crops and exacerbate seasonal food shortages.
- Conflict and socio-political instability: Prolonged conflict and population displacement disrupt local food production, impede trade, and reduce access to humanitarian aid.

Together, these factors contribute to a situation in which household access to safe, diverse, and nutrient-dense food is severely constrained, particularly for rural and vulnerable populations.

Economic Vulnerability and Household Food Access

Empirical evidence underscores the high sensitivity of Afghan households to economic shocks. Price surges for staple foods, coupled with limited income sources, force families to rely on low-cost staples such as cereals, while reducing or eliminating consumption of meat, fruits, and vegetables. This dietary simplification results in inadequate micronutrient intake and increased reliance on energy-dense, nutrient-poor foods.

Winter conditions intensify these challenges: snowfall and icy roads isolate communities, restricting both market access and delivery of humanitarian assistance. The World Food Programme (WFP) has reduced aid coverage to nearly 10 million individuals due to funding shortages, further exacerbating food insecurity. Current estimates indicate that one in three Afghans experiences hunger, reflecting widespread deficits in both caloric and micronutrient intake.

The United Nations Humanitarian Response Plan 2024 projects that approximately 23.7 million Afghans over half of the population—will require humanitarian assistance, with particularly high vulnerability among children (52%), women (25%), persons with disabilities (11%), and the elderly (2%). Chronic poverty, climate crises, and the return of migrants further intensify household vulnerability.

Nutritional Deficiencies and Risk of Target Organ Damage

Households affected by food insecurity demonstrate widespread deficiencies in key micronutrients, including vitamins A and D, iron, zinc, and folate. These deficiencies compromise physiological homeostasis through:

- Impaired immune function, increasing susceptibility to infection and systemic inflammation.
- Reduced antioxidant defenses, heightening oxidative stress at the cellular level.
- Dysregulated metabolic pathways, contributing to insulin resistance, dyslipidemia, and other chronic metabolic disturbances.

These biological disturbances accelerate structural and functional impairment in vital organs, including the heart, kidneys, liver, and brain, highlighting a direct mechanistic link between inadequate nutrition and target organ damage.

Dietary Patterns and Chronic Disease Burden

Food-insecure households frequently depend on low-cost, energy-dense, and nutrient-poor diets, which elevate the risk of non-communicable diseases (NCDs). Observed health consequences include:

- **Hypertension**
- **Type 2 diabetes mellitus**
- **Cardiovascular disease**
- **Chronic kidney disease**

Mechanistic pathways connecting poor dietary patterns to progressive organ damage involve chronic inflammation, oxidative stress, endothelial dysfunction, insulin resistance, and lipid abnormalities. These interrelated processes underscore how food insecurity not only limits caloric intake but also actively contributes to metabolic dysfunction and chronic disease progression.

Protective Role of Balanced Nutrition

Conversely, diets rich in fruits, vegetables, whole grains, legumes, and high-quality proteins provide essential micronutrients and bioactive compounds that:

- Mitigate oxidative stress and chronic inflammation
- Support cellular metabolism and tissue repair
- Preserve organ function and reduce disease risk

Adequate nutrition thus serves as a key protective factor, highlighting the importance of dietary diversity and nutrient quality in preventing chronic disease and protecting target organs.

Public Health and Policy Implications

These findings emphasize that addressing food insecurity requires integrated interventions targeting both structural and biological determinants. Effective public health strategies should include:

1. Strengthening food systems and supply chains to enhance availability and affordability of nutrient-rich foods.
2. Nutritional education and counseling to promote healthy dietary behaviors.
3. Economic and social policies to stabilize prices, increase household purchasing power, and protect vulnerable populations.
4. Environmental and agricultural policies that build resilience to climate shocks and improve sustainable crop production.

By addressing these multi-level determinants, interventions can reduce the burden of chronic disease, prevent target organ damage, and improve long-term health outcomes among Afghan populations.

DISCUSSION

This study underscores the critical interplay between food security, nutritional status, and the prevention of target organ damage in Afghanistan. The findings highlight that structural, environmental, and socio-economic factors such as prolonged conflict, economic instability, underdeveloped agricultural infrastructure, climate variability, and market volatility—severely constrain access to safe, nutritious, and diverse foods [Babu SC, Looden J, Ajmal M, Rana AW, Srivastava N.

2021., Fayemi PO, Muchenje V, Yetim H, Ahhmed A. 2018., Ehsan M. 2021., Edward Elgar; 2025., Saif-Nijat J, Pakravan-Charvadeh MR, Gholamrezai S . 2021., Ministry of Public Health Afghanistan. 2022]. These challenges have a direct impact on household food security, limiting both caloric intake and the consumption of essential micronutrients, which are crucial for metabolic and organ health [Rahmat ZS, Rafi HM, Nadeem A, Salman Y. 2023., Zhu Y, Azami MR, Fazal M, Khuram D, Iannotti L. 2024., Samim SA, Hu Z, Stepien S, Amini SY, Rayee R, Niu K. 2021., New York: UNICEF; 2023].

Nutritional deficiencies and organ dysfunction: Populations experiencing food insecurity in Afghanistan are particularly susceptible to deficiencies in key micronutrients including vitamins A and D, iron, zinc, and folate [Rahmat ZS, Rafi HM, Nadeem A, Salman Y. 2023., Levitt E. 2011., Ahmed S, Ahmad K, Mohammadi H. 2022]. These deficits impair immune function, antioxidant defense mechanisms, and metabolic regulation, creating a biological environment conducive to oxidative stress and systemic inflammation [Zhu Y, Azami MR, Fazal M, Khuram D, Iannotti L. 2024., Samim SA, Hu Z, Stepien S, Amini SY, Rayee R, Niu K. 2021., UNICEF; 2023]. Over time, these processes contribute to structural and functional deterioration of vital organs, manifesting clinically as target organ damage affecting the heart, kidneys, liver, and brain [Najam W, Ibiyemi T, Aziz S, Najam R. 2023., D'Souza A, Jolliffe D. 2015., FAO; 2023].

Dietary patterns and chronic disease risk: Food-insecure households often rely on low-cost, energy-dense, nutrient-poor foods, which not only fail to meet nutritional needs but also promote metabolic disturbances such as insulin resistance, dyslipidemia, and hypertension [Levitt E. 2011., WFP. Afghanistan. 2023., Islam MT, Rahman MM. 2020., Akbarzadeh A, Rezvani F. 2021]. These metabolic perturbations serve as key mediators linking inadequate nutrition to the development of non-communicable diseases (NCDs) and progressive target organ injury [Levitt E. 2011., Najam W, Ibiyemi T, Aziz S, Najam R. 2023., WFP. 2023]. In Afghanistan, these risks are further amplified by poverty, limited health literacy, and restricted access to healthcare services, compounding the vulnerability of these populations [Fayemi PO, Muchenje V, Yetim H, Ahhmed A. 2018., Samim SA, Zhiquan H. 2020., Ehsan M. 2021., Edward Elgar; 2025].

Protective role of balanced nutrition: Conversely, diets enriched with fruits, vegetables, whole grains, high-quality proteins, and bioactive compounds provide essential micronutrients and antioxidants that mitigate oxidative stress, modulate inflammation, and support cellular homeostasis [D'Souza A, Jolliffe D. 2015., FAO, WFP, UNICEF. Afghanistan. 2023., Ahmad M, Rasool S, Anwar T. 2022., Ehsan M, Samim SA. 2023., Pakravan-Charvadeh MR, Azami MR. 2022]. In contexts like Afghanistan, improving access to nutrient-rich foods can play a pivotal role in preventing metabolic dysfunction and preserving organ function, thereby reducing the incidence and progression of NCDs [World Bank. Afghanistan. 2023., Washington, DC: World Bank; 2023., Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S. 2021., Kabul: UN OCHA; 2024].

Socioeconomic and public health implications: Addressing food insecurity in Afghanistan requires a multifaceted approach that integrates agricultural, nutritional,

economic, and policy interventions [Ahmed S, Ahmad K, Mohammadi H. 2022., Habib Z, Rahimi F. 2021., Zia H, Samim SA. 2021., Rahmat ZS, Rafi HM, Nadeem A. 2023., Najam W, Ibiyemi T. 2022., Kabul: UNDP; 2023]. Strategies such as climate-smart agriculture, improved post-harvest storage and logistics, nutrition-sensitive value chains, and investment in rural research and extension services can enhance both the availability and quality of food [Ahmed S, Ahmad K, Mohammadi H. 2022., FAO; 2023., Zia H, Samim SA, Lister E, Rahimi F. 2021., Ehsan M, Samim SA. 2023]. Policy measures including social protection programs, equitable land and water governance, market stabilization, and inter-agency coordination—are critical to mitigate household vulnerability and ensure sustained access to diverse, nutrient-dense foods [Samim SA, Zhiquan H. 2020., Pakravan-Charvadeh MR, Longworth Z, Lane G. 2025., Oskorouchi HR, Sousa-Poza A. 2021., Kabul: UNDP; 2023., WHO Afghanistan. 2022., WFP; 2022].

Linking food security to target organ protection: The evidence from Afghanistan reflects global trends: inadequate nutrition and food insecurity are strong determinants of chronic disease risk and progressive organ damage [Rahmat ZS, Rafi HM, Nadeem A, Salman Y. 2023., Levitt E. 2011., Najam W, Ibiyemi T, Aziz S, Najam R.. 2023., Zhu Y, Azami MR, Fazal M, Khuram D, Iannotti L. 2024]. By simultaneously addressing structural determinants (agriculture, food systems, and policy) and biological consequences (nutrient deficiencies, oxidative stress, and metabolic dysregulation), interventions can effectively reduce the burden of NCDs and protect vital organs [D'Souza A, Jolliffe D. 2015., FAO, WFP, UNICEF. Afghanistan. 2023., Ahmad M, Rasool S, Anwar T. 2022., Washington, DC: World Bank; 2023., Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S. 2021].

In summary, improving food security in Afghanistan is not merely a matter of providing calories; it is central to preserving organ function, reducing chronic disease, and enhancing population health. Comprehensive, context-specific strategies that bridge agriculture, nutrition, and health policy are essential for mitigating the long-term impacts of food insecurity and achieving sustainable development in the region [Fayemi PO, Muchenje V, Yetim H, Ahhmed A. 2018., Samim SA, Zhiquan H. 2020., Ehsan M, Edward Elgar; 2025., Ahmed S, Ahmad K, Mohammadi H. 2022., FAO; 2023., Zia H, Samim SA. 2021., Rahmat ZS, Rafi HM, Nadeem A. 2023., Afghanistan. Kabul: UNDP; 2023].

CONCLUSION

Food security is a critical determinant of population health and a foundational element in the prevention of chronic diseases and target organ damage. In Afghanistan, prolonged conflict, economic instability, environmental challenges, and underdeveloped agricultural infrastructure have created persistent food insecurity, resulting in widespread malnutrition and micronutrient deficiencies. These nutritional inadequacies, coupled with reliance on inexpensive, energy-dense foods, contribute to metabolic dysfunction, systemic inflammation, and oxidative stress, ultimately accelerating damage to vital organs including the heart, kidneys, liver, and brain.

Addressing these challenges requires a multifaceted strategy that integrates climate-smart and sustainable agricultural practices, robust post-harvest infrastructure, nutrition-sensitive value chains, and investment in research, education, and extension services. Strengthening institutional frameworks, policy coordination, and social protection mechanisms is equally essential to ensure equitable access to nutrient-rich foods.

By targeting both the structural determinants of food insecurity and the biological mechanisms linking nutrition to organ health, comprehensive interventions can significantly reduce the burden of chronic disease, enhance resilience, and improve long-term health outcomes for vulnerable populations. Ensuring sustainable food security in Afghanistan is not only a matter of public health but also a critical step toward social stability, economic development, and national well-being.

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