
Assessing the Impact of Climate Change on Food Quality and Its Implications for the Nutritional Status and Health of College Going Girls

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Abstract

Climate change is profoundly impacting various facets of human existence, including food systems and nutritional outcomes. This abstract provides a comprehensive overview of the influence of climate change on food quality, dietary patterns, and nutritional status, along with its implications for human health and well-being. Climate change alters the availability, accessibility, and affordability of diverse food sources, thereby influencing dietary patterns. Shifts in temperature and precipitation patterns affect agricultural productivity, leading to changes in crop yields, nutritional content of crops affecting their protein, vitamin, and mineral levels and food availability. Additionally, climate-related extreme weather events such as droughts, floods, and storms disrupt food production, distribution, and access, exacerbating food insecurity and malnutrition. Furthermore, climate change impacts the quality of aquatic resources, including fish and seafood, through ocean acidification, rising sea temperatures, and habitat loss. These changes can disrupt marine ecosystems and alter the composition of seafood, potentially impacting human health due to shifts in omega-3 fatty acid levels and the presence of contaminants. Changes in food quality due to climate change impact the nutritional composition of foods, including alterations in macronutrient and micronutrient content. Furthermore, climate-induced environmental stressors affect the quality and safety of food supplies, contributing to food borne illnesses and nutritional deficiencies. In conclusion, understanding the influence of climate change on food quality and dietary patterns have significant implications for nutritional status and health outcomes. Vulnerable populations, including children, pregnant women, and marginalized communities, are particularly at risk of experiencing adverse effects on their nutritional status due to climate change-induced disruptions in food systems.

Keyword-Climate change, Food, Nutritional, Crops

Introduction

Climate change has been characterized as the biggest global health threat of the 21st century, with far-reaching implications for various aspects of life, including food security and nutrition. The phenomenon of climate change refers to long-term alterations in temperature, precipitation patterns, and other climatic variables, primarily driven by human activities such as burning fossil fuels and deforestation. These changes have profound effects on ecosystems, agricultural production, and ultimately, the quality and availability of food. Many consequences of climate change threaten food security and diet quality, thereby exposing vulnerable populations across continents to multiple forms of malnutrition. Poor diet is a major cause of mortality and morbidity. Currently, about 690 million people are hungry and the number is expected to surpass 840 million by 2030.

Amidst the complex web of consequences wrought by climate change, the impact on food systems is particularly significant. Food systems encompass the entire process of food production, distribution, and consumption, from farm to fork. They are intricately linked with environmental factors, making them

vulnerable to the disruptions caused by climate change. The repercussions of these disruptions extend beyond mere changes in food quantity; they also profoundly affect food quality, nutrient content, and ultimately, human health.

This research focuses on assessing the influence of climate change on food quality and its implications for the nutritional status of a specific demographic: college-going girls. Adolescence is a critical period of growth and development, marked by increased nutritional requirements to support physical growth, cognitive development, and overall well-being. College represents a unique stage in this journey, characterized by newfound independence, changes in dietary habits, and exposure to diverse environments.

1. Review of Literature

Canelón, S. P., & Boland, M. R. (2020) this study shows that climate change events, including increases in hurricanes, mud/landslides, and avalanches, and increases in extreme weather events could perturb the natural timing of menarche either through increased release of toxins and pollutants buried in soil and water or by impacting food availability via crop failure. Overall, these perturbations in timing of menarche are likely to increase the disease burden for women in four key areas: mental health, fertility-related conditions, cardiovascular disease, and bone health.

A., Govindan, M., Lemery, J., & Balbus, J. (2018). Low-middle income countries, such as India, have significant social, geographic, political, and environmental realities that make all citizens, but especially women, vulnerable to climate change. Simultaneously, India has a tremendous opportunity to guide the global trajectory on climate change by adopting sustainable development practices. While gender has been increasingly factored into international climate policy, progress has still been slow in India to reduce gender-based health disparities and to involve women in climate change mitigation, adaptation, and disaster risk reduction and management

Wright, M. L., Drake, D., Link, D. G., & Berg, J. A. (2023) The impact of climate change, from cell to society cannot be ignored and is one of the most pressing issues of our time. Although all aspects of population and planetary health are impacted, the negative effects disproportionately impact vulnerable populations. Women and girls have long been considered vulnerable to exposures due to societal norms and physiologic difference. These perceived and structurally created vulnerabilities will persist if sex and gender-specific impacts are not.

Muttarak, R., & Dimitrova, A. (2019)The study results shows that childhood under nutrition, especially the chronic one is likely to be heightened in the floods aftermath. It is still not too late to implement actions to reverse the course of this negative health consequence of floods. Nutritional and water and sanitation interventions should be particularly directed to households with pregnant women and infants, poor and middle-wealth households and mothers who are not literate. It is also important to ensure that there is no gender differential in feeding practice. With evidence showing the increased frequency of floods in India due to climate change, the study present the danger of short-term and long-term health consequences of floods on children and highlight how this can undermine.

Tiwari, I., Tilstra, M., Campbell, S. M., Nielsen, C. C., Hodgins, S., Vargas, A. R. O., ... & Yamamoto, S. S. (2022). Climate change impacts on the health of South Asian children and women subpopulations-A scoping review. *Heliyon*, 8(10).This review indicates that extreme weather events, meteorological factors and air pollution have affected the health of children and women living in South Asia. The evidence of the relationship between exposures and health impacts on children and women was consistent, except for extreme weather events where evidences was inconsistent across wasting, underweight, and stunting. The limited knowledge

concerning the relationship between exposure to extreme weather events, meteorological factors and air pollution and the risk of adverse health impacts, particularly in women, are critical knowledge gaps.

2. **Objective**

- To evaluate the effects of climate change on the quality and availability of food products consumed by college-going girls.
- To identify specific food items that are most affected by climate change and analyze their nutritional implications for college-going girls.
- To analyze the relationship between climate-induced changes in food quality and the nutritional health status of college-going girls.
- To recommend strategies for improving the nutritional health status of college-going girls in the context of changing food quality due to climate change.

3. **Methodology** **This research paper mode is descriptive and exploratory.** This study employs a secondary data analysis approach, gathering and synthesizing existing literature, reports, and datasets on climate change, food quality, and health. Data from academic journals, government publications, and global organizations (WHO, FAO) will be analyzed to assess the impact of climate change on food quality and its implications for the nutrition and health of college-going girls.

4. **Discussion**

5.1 Climate Change and Food Quality:

The effects of climate change on food quality are multifaceted and complex, encompassing various aspects of agricultural production, post-harvest handling, and food processing.

- **Changes in Crop Yields and Nutrient Content:** Climate change influences crop yields by altering temperature and precipitation patterns, leading to changes in growing seasons, water availability, and the prevalence of pests and diseases. These changes can directly affect the quantity and quality of food produced. For example, rising temperatures can reduce yields of certain crops, while increased carbon dioxide levels may alter the nutrient composition of plants. Studies have shown that elevated CO₂ levels can lead to reduced concentrations of essential nutrients such as protein, zinc, and iron in staple crops like rice, wheat, and soybeans. This decline in nutrient content can have significant implications for human nutrition, particularly in regions where these crops are dietary staples. Researchers have observed that under higher CO₂ conditions, the protein content of wheat can decrease by up to 8%, while zinc levels may fall by 9%. Iron concentrations can drop by as much as 5%. Such reductions have significant implications for populations that rely on wheat and rice as their primary sources of nutrition, particularly in regions where dietary diversity is low, and alternative sources of protein and micronutrients are scarce.
- **Impact on Food Safety:** Climate change can also affect food safety by creating favorable conditions for the proliferation of pathogens, toxins, and contaminants. Warmer temperatures and changes in precipitation patterns can promote the growth of bacteria such as Salmonella, E. coli, and Listeria, increasing the risk of food borne illnesses. These food safety hazards pose significant risks to public health and can undermine efforts to ensure food security in vulnerable populations.

➤ **Altered Nutritional Profiles:**

Climate change can alter the nutritional profiles of food crops, affecting their vitamin, mineral and phytonutrient content. For instance, changes in temperature and precipitation can influence the synthesis of secondary metabolites in plants, including antioxidants and photochemical. These bioactive compounds play a crucial role in human health, providing protection against chronic diseases such as cancer, cardiovascular disease, and diabetes.

➤ **Water and Soil Quality:**

Climate change affects water availability and quality, which are essential for agricultural production and food processing. Droughts, heatwaves, and changing precipitation patterns can lead to water scarcity, reducing irrigation capacity and compromising crop yields. Additionally, changes in temperature and rainfall can affect soil health and fertility, impacting the nutrient content and quality of food crops. Soil degradation, erosion, and salinization are common consequences of climate change, further exacerbating challenges related to food production and quality. Poor soil quality can limit the uptake of essential nutrients by plants, resulting in lower yields and decreased nutritional value in food crops.

5.2 Food item affected by climate change

Climate change significantly impacts various food items, altering their availability, quality, and nutritional content. For college-going girls, Here are some specific food items particularly affected by climate change:

- **Fruits and Vegetables:** Rising temperatures and erratic rainfall patterns can reduce the yield and nutritional quality of fruits and vegetables. For instance, studies indicate that climate change may lower the levels of vitamin C and other antioxidants in crops like tomatoes and peppers. Reduced availability of these nutrient-dense foods can lead to deficiencies, impacting immune function and overall health.
- **Whole Grains:** Climate change can affect the growth conditions for staple grains like wheat, rice, and corn. Increased carbon dioxide levels can reduce the protein and micronutrient content in these grains. Whole grains are essential for energy and nutrients, and a decline in their quality can lead to lower dietary fiber intake, affecting digestive health and increasing the risk of
- **Dairy Products:** Changes in climate can affect livestock health and productivity, leading to reduced milk production and quality. Dairy products are vital sources of calcium and vitamin D, which are essential for bone health. A decline in dairy consumption can increase the risk of osteoporosis in young women.
- **Legumes:** Beans and lentils are crucial sources of protein, fiber, and essential micronutrients. Climate change can affect their growth patterns and yield due to extreme weather events and changing pest dynamics. A decrease in legume availability can lead to inadequate protein intake, particularly for vegetarian or vegan college students.

Climate change poses significant challenges to the availability and nutritional quality of key food items consumed by college-going girls. Understanding these implications is crucial for developing strategies to promote nutritional health and resilience in the face of environmental changes.

5.3 Climate change Implications for the Nutritional Health Status of College Going Girls:

Climate change has far-reaching implications for the health status of college-going girls, affecting various aspects of nutritional, physical, mental, and reproductive health. Here are some key implications:

1. **Heat-related illnesses:** As temperatures rise due to climate change, college-going girls may face an increased risk of heat-related illnesses such as heat exhaustion and heatstroke, particularly during outdoor activities or sports events. Prolonged exposure to high temperatures can also exacerbate existing health conditions such as asthma and allergies.
2. **Respiratory problems:** Increasing atmospheric CO₂, increasing temperatures and changes in precipitation patterns contribute to poor outdoor air quality, which in turn negatively impacts human cardiopulmonary health (Fann et al., [2016](#)). Physiologically, ozone and PM_{2.5} inflame airways and enter the bloodstream where they cause endothelial cell dysfunction and oxidative injury, aggravating cardiopulmonary disease, and contributing to premature death. Women are at higher risk of cardiovascular complications, as demonstrated in a recent study where intima media thickness of arteries in women was significantly correlated with ambient levels of PM_{2.5}, whereas in men it was not. Furthermore, women may be more hematologically sensitive to toxicologic influences of airborne pollution than males because they have higher rates of anemia. Poor air quality can exacerbate respiratory conditions such as asthma and allergies, leading to respiratory symptoms and decreased lung function among college-going girls.
3. **Vector-borne diseases:** Changes in temperature and precipitation patterns can affect the distribution and abundance of disease-carrying vectors such as mosquitoes and ticks. College campuses located in areas prone to vector-borne diseases may experience an increased risk of infections such as dengue fever, Zika virus, and Lyme disease, posing health risks to students.
4. **Impact on dietary diversity:** Climate change may affect the availability of certain food groups, leading to shifts in dietary patterns and reduced dietary diversity among college-going girls. Limited access to fruits, vegetables, and other nutrient-rich foods can contribute to deficiencies in essential vitamins, minerals, and antioxidants.
5. **Food and waterborne illnesses:** Climate change can impact food and water safety, increasing the risk of foodborne and waterborne illnesses among college students. Changes in temperature and precipitation patterns can promote the growth of pathogens such as bacteria, viruses, and parasites, leading to outbreaks of food poisoning and gastrointestinal infections.
6. **Reproductive health risks:** Climate change can pose risks to reproductive health among college-going girls, affecting menstrual health, fertility, and pregnancy outcomes. Environmental factors such as heat stress, air pollution, and exposure to environmental toxins can disrupt hormonal balance and reproductive function, potentially impacting menstrual cycles and fertility.
7. **Impact on mental health and eating behaviors:** Climate change-related stressors such as extreme weather events, environmental degradation, and concerns about the future can affect college students' mental health and eating behaviors. Stress, anxiety, and depression may influence dietary choices, leading to changes in food intake patterns and nutrient intake.
8. **Extreme weather events:** College campuses located in regions prone to extreme weather events such as hurricanes, floods, and wildfires may face disruptions to campus infrastructure, transportation systems, and essential services. These events can pose immediate risks to the safety and well-being of college students and may have long-term impacts on mental health and community resilience.

9. **Water scarcity and hydration:** Climate change can exacerbate water scarcity in some regions, affecting access to safe drinking water for college students. Dehydration can impair cognitive function, concentration, and physical performance, impacting academic performance and overall well-being

5. Potential Solutions and suggestion

Improving the nutritional health status of college-going girls amidst changing food quality due to climate change requires a multifaceted approach:

1. **Educational Initiatives:** Implementing nutrition education programs in colleges can empower students with knowledge about healthy eating, food sourcing, and the impact of climate change on food quality. Workshops and seminars can promote awareness about seasonal and locally sourced foods.
2. **Sustainable Sourcing:** Colleges can partner with local farmers and sustainable food producers to ensure a steady supply of fresh, nutrient-rich foods. Farm-to-table initiatives not only support local economies but also improve the quality of food available on campus.
3. **Meal Planning and Diversification:** Encouraging meal planning that incorporates a variety of food groups can help mitigate the impact of food shortages or quality declines.
4. **Community Support:** Strengthening local food systems through community gardens or urban agriculture can increase access to fresh, locally sourced food despite climate disruptions.
5. **Policy Advocacy:** Advocating for policies that address climate change and its impact on food systems can create a supportive environment for nutritional health. This includes pushing for regulations that promote sustainable agricultural practices.
6. **Conclusion** In conclusion, the impact of climate change on food quality has significant implications for the health status of college-going girls. Throughout this study, we have explored the various ways in which climate change disrupts agricultural production, alters food availability and accessibility, and affects the nutritional composition of food crops. These changes have profound implications for the dietary patterns, nutrient intake, and overall health of college girls, who are at a critical stage of growth and development. Climate change-induced disruptions to food systems can lead to reduced availability of nutrient-rich foods such as fruits, vegetables, and whole grains, exacerbating existing challenges related to malnutrition, micronutrient deficiencies, and diet-related diseases. Additionally, changes in food safety, water quality, and environmental conditions can increase the risk of food borne illnesses, respiratory problems, and mental health issues among college girls. Addressing the impact of climate change on food quality and health status requires coordinated efforts across multiple sectors, including agriculture, public health, education, and policy. Sustainable agriculture practices, food system interventions, and climate adaptation strategies are essential for promoting resilient food systems, improving access to nutritious foods, and safeguarding the health and well-being of college girls. In conclusion, addressing the impact of climate change on food quality and health status requires a holistic approach that prioritizes sustainability, resilience, and health equity. By working together to implement evidence-based interventions and promote climate action, we can create healthier and more resilient communities, ensuring a brighter future for college-going girls and generations

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