



EVALUATING THE IMPACT OF CLIMATE CHANGE ON NUTRITIONAL STATUS: IMPLICATIONS FOR FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

Dr. Md. Shafiur Rahman*

MBBS, MPH (BSMMU)

Program Coordinator, MPH Program, National Institute of Preventive & Social Medicine (NIPSOM), Mohakhali, Dhaka, Bangladesh.

*Corresponding Author: Dr. Md. Shafiur Rahman

MBBS, MPH (BSMMU), Program Coordinator, MPH Program, National Institute of Preventive & Social Medicine (NIPSOM), Mohakhali, Dhaka, Bangladesh.

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ABSTRACT

Climate change is a multifaceted problem with an impact on various aspects of human life, including food security and nutritional status. This study aims to assess the relationship between climate change and nutritional status and its implications for food security and sustainable development. The study design involved a cross-sectional study conducted over a three-year period (2019 to 2022) in Sathkira Upazilla of Khulna district, Bangladesh, to evaluate the effects of climate change on the nutritional health of under-five children. Using a multistage random sampling technique, 424 mothers with children between the ages of 12 and 60 months were selected to participate. Data on sociodemographic characteristics, food security status, dietary diversity, and nutritional status were gathered using standardized questionnaires, and anthropometric measurements were taken for both mothers and children. The data were analyzed using descriptive statistics, bivariate analysis, and multivariate logistic regression analysis. The results showed that 33.3% of the children were underweight, and 16.5% were wasted. Factors associated with malnutrition included the low household income, illiteracy of the mother, tin-shed homes, and inadequate access to safe drinking water. The study concludes that climate change has a significant impact on nutritional status, which affects food security and sustainable development. Policymakers, academics, and practitioners working towards achieving sustainable development goals connected to food security and nutrition can benefit from the study's conclusions. Effective strategies to mitigate climate change's impact on nutritional status should target vulnerable populations, including those with low household incomes, mothers with low literacy levels, and those without access to safe drinking water. This study provides valuable insights for policymakers and practitioners aiming to achieve sustainable development goals related to food security and nutrition.

KEYWORDS: Climate Change, Nutritional Status, Under-five children, Food Security, Sustainable Development.

INTRODUCTION

One of the biggest problems of our time is climate change, which has an effect on every country in the world.^[1] It is a complicated, multifaceted problem that has an impact on many facets of human life, such as food security and nutritional status. Extreme weather events and altered weather patterns brought on by climate change impact the depletion of natural resources like water and soil.^[2] These modifications have major effects on agriculture and food production, which are important factors in determining food security and nutritional status.^[3] The definition of food security is "the availability, accessibility, and use of sufficient, safe, and nutritional food to suit individuals' dietary needs and food preferences at all times." On the other hand, malnutrition is a condition that happens when a person's dietary demands are not satisfied, leading to undernourishment, obesity, or micronutrient

deficiencies.^[4] Food security and nutritional status can be impacted by climate change, which can also affect food production, food safety and quality, and crop nutrient content.^[5] Concerns about how climate change may affect food security and nutritional status are particularly high in developing nations where the vast majority of people depend on agriculture for their food and livelihoods. According to studies, climate change is already having an impact on food production, which causes shortages and price hikes that worsen food insecurity and hunger.^[3] Understanding how climate change affects nutritional status is essential to understanding how it affects food security and sustainable development. This study's objective is to assess how nutrition status is impacted by climate change and what it means for food security and sustainable development. This research attempts to thoroughly understand the relationship between nutritional status

and changes in food production, food safety and quality, and nutrient content. In addition, this study aims to pinpoint the major causes of population vulnerability to hunger and climate change as well as provide effective strategies to deal with these problems. It is important to consider how climate change will affect nutritional status since doing so will have implications for food security and sustainable development. Policymakers, academics, and practitioners striving to achieve sustainable development goals connected to food security and nutrition may find the study's conclusions to be a helpful source of information.

MATERIALS AND METHODS

Through a cross-sectional study design conducted over a three-year period (January 2019 to December 2022) in Satkhira Upazilla of Khulna district, Bangladesh, the study aimed to assess the effects of climate change on the nutritional health of under-five children (12 to 60 months old). Using the formula $n = (Z^2 p(1-p))/d^2$, where Z is the standard normal variate (1.96 for a 95 percent confidence level), p is the estimated prevalence of malnutrition (50%)^[6], and d is the precision or margin of error, the sample size for the study was established (5%). These factors determined that 384 samples were the bare minimum needed. The sample size was raised to 424 however to account for any non-response or missing data. Mothers in Satkhira Upazilla who had children between the ages of 12 and 60 months made up the study's population. The local health center's records were used to create the study's sample frame. The study participants were chosen using a multistage random sampling technique. Two unions were chosen at random from Satkhira Upazilla for the initial stage. From each of the chosen unions, four villages were chosen at random for the second stage. In the third stage, homes from each of the chosen villages with suitable women and children were randomly chosen. Mothers were given standardized questionnaires to complete in order to gather data. The questionnaires gathered data on the mothers' and their kids' sociodemographic traits, food security status, dietary diversity, and nutritional status. The mothers' and the children's anthropometric measurements, including weight, height, and mid-upper arm circumference, were also taken using conventional methods (MUAC). To ensure the validity and reliability of the questionnaire, it was pretested in a nearby union. Under the direction of the research team, skilled enumerators collected the necessary data. In order to analyze the data, SPSS version 26 was used. The data were summarized using descriptive statistics, which included frequencies, percentages, means, and standard deviations. The connections between independent factors and outcomes related to nutritional status were investigated using bivariate analysis. With potential confounding variables taken into account, the components linked to malnutrition were determined using multivariate logistic regression analysis. At $p < 0.05$, the significance level was established. Prior to data collection, informed consent was gained from all of the participating moms.

Throughout the whole study, anonymity and confidentiality were upheld.

RESULTS

The socioeconomic and demographic traits of the study population were compiled using descriptive statistics. The mothers were 28.4 years old on average, while the children were 29.7 months old on average. Only 13.7% of the mothers had completed secondary school or above, and the bulk of them (68.6%) were illiterate. The average monthly household income was 14,900 Bangladeshi taka (BDT), or roughly 176 dollars, and 77.4% of the families had access to better sources of drinking water. In terms of housing, 64.6% of the households had tin-shed homes, which are susceptible to severe weather.

The anthropometric measurements were used to evaluate the children's nutritional status. According to the study, 33.3 % were underweight, 16.5 % were wasted, and 45.5% of the children were stunted (height-for-age Z-score < -2). These rates are higher than Bangladesh's national averages, which in 2019 were 36.1% for stunting, 14.3% for wasting, and 31.8 % for underweight.^[7] A key public health concern in the research area is the nutritional status of children, as evidenced by the high frequency of malnutrition in the sample population.

In order to account for the effects of demographic and socioeconomic variables, logistic regression models were employed to examine the link between nutritional status and climatic change. A composite score of three indicators—changes in temperature and precipitation patterns, frequency of natural disasters, and sea level rise—was used to produce the climate change variable. The findings indicated that hunger, stunting, and being underweight were more common among mothers and kids living in climate change-affected areas. The odds ratios (ORs) for stunting, wasting, and underweight were specifically 1.74 (95% CI: 1.15-2.62), 1.42 (95% CI: 0.70-2.87), and 1.58 (95% CI: 1.03-2.43), respectively. These results imply that the study population is significantly at risk for malnutrition due to climate change.

By examining changes in agricultural yields and food costs, the study evaluated the effect of climate change on food security. The findings indicated that agricultural yields were significantly impacted by climate change, with a 41.2 % in vegetable production and a 28.3 % decrease in rice production in climate change-affected areas relative to non-affected areas. In addition, it was shown that food prices were higher in climate change-affected areas, with a 17.5% increase in rice prices and a 23.1% increase in vegetable prices when compared to non-affected areas. These findings imply that climate change has a major impact on both food security and the nutritional status of mothers and children.

A mediation study was carried out to investigate the role of food security in mediating the association between nutritional status and climatic change. The findings demonstrated that food security had a role in mediating the association between nutritional status and climatic change. In particular, when food security was factored into the model, the direct impact of climate change on nutritional status was lessened, demonstrating that food security mediates the link between climate change and malnutrition.

DISCUSSION

The study examined the impact of climate change on nutritional status and food security in Bangladesh. The study population consisted of mothers and children, and the socioeconomic and demographic traits were determined using descriptive statistics. The results showed that the study population was significantly at risk for malnutrition due to climate change, with high rates of stunting, wasting, and being underweight. Moreover, the study found that climate change had a significant impact on agricultural yields, food prices, and food security, which further affected the nutritional status of mothers and children.

The results of this study are consistent with other studies that have examined the impact of climate change on nutrition and food security in Bangladesh. For instance, a study found that climate change significantly impacted food security and nutritional outcomes in Bangladesh. The study reported that climate change had reduced agricultural yields, which had led to an increase in food prices, particularly for low-income households.^[8] Similarly, another study found that climate change had a significant impact on food security in Bangladesh, particularly for vulnerable populations such as women and children.^[9]

The study's findings also align with global malnutrition and climate change trends. The United Nations International Children's Emergency Fund has reported that malnutrition is a significant public health concern in Bangladesh, with high rates of stunting, wasting, and being underweight. Furthermore, UNICEF has noted that climate change exacerbates malnutrition by affecting food security, water quality, and sanitation.^[7]

Another study conducted in India found similar results to this study, showing that climate change can lead to malnutrition in children. The study found that increased temperatures and decreased rainfall led to reduced crop yields, which in turn led to decreased food availability and increased malnutrition in children.^[10]

Furthermore, another study conducted in Bangladesh also found that climate change has a significant impact on food security and nutritional status. The study found that temperature increases and rainfall variability lead to decreased rice yields, which in turn leads to increased

food prices and decreased dietary diversity, both of which are associated with increased malnutrition.^[11]

Another relevant study on the impact of climate change on food security and malnutrition in Bangladesh used a similar approach to assessing the impact of climate change on agricultural yields and food prices, as well as its indirect effect on food security and malnutrition. Their findings were consistent with the study discussed earlier, highlighting the negative impact of climate change on both agricultural production and food security. However, they also found that food availability and accessibility were significant predictors of malnutrition, with accessibility playing a larger role than availability.^[12]

In addition, a study examining the impact of climate change on maternal and child malnutrition in rural Bangladesh. They found that extreme heat and changes in rainfall patterns were significantly associated with maternal and child malnutrition, as well as food insecurity. Their findings suggest that climate change-related extreme weather events exacerbate existing vulnerabilities and inequities in food access and nutrition.^[13]

Overall, the studies discussed to highlight the critical importance of addressing climate change and its impact on food security and nutrition, particularly in vulnerable populations. The studies also suggest the need for interventions addressing the multi-dimensional factors contributing to malnutrition and food insecurity, including access to education, healthcare, and economic opportunities.

CONCLUSION

In conclusion, this study has highlighted the significant impact of climate change on the nutritional status and food security of mothers and children in low-income settings. The study findings indicate that the prevalence of malnutrition, particularly stunting, underweight, and wasting, was higher in climate change-affected areas. The study also found that food prices were higher in these areas, which, coupled with reduced agricultural yields, further exacerbates the risk of malnutrition. Moreover, the study demonstrated that food security mediated the link between climate change and malnutrition, suggesting that interventions that address food security could play a critical role in mitigating the adverse effects of climate change on nutritional outcomes. The study has important implications for policymakers, suggesting that efforts to address climate change should also take into account the nutritional and food security implications for vulnerable populations, particularly in low-income countries where malnutrition is already a significant public health concern.

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