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Possible Solutions to Malnutrition Among Children Under Five as Caused By Harsh Climate Change Impacts In Uganda

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Malnutrition due to food insecurity is proceeding to be a strong pandemic and one of the major public health problems in developing countries like Uganda. Harsh climatic change impacts such as heavy winds, and floods, often destroy crops and cause food insecurity among households in Uganda, which in turn leads to malnutrition that affects majorly children under five. The reviewer obtained the review articles from the internet through Google search and was able to review 17 articles whose information was in line with the study of possible solutions to malnutrition caused by climate change impacts in children under five years of age in Uganda. The government and the Hospital administrators may borrow from the findings of this review study to formulate policies that may enhance the proper management of malnutrition in the country. The objectives of this review were to find possible solutions to malnutrition as brought by harsh climatic change impacts especially in children who are below five years of age, caretakers to read and put into practice the best ways of controlling malnutrition and food security practices and also communicate the findings of this review to local communities for awareness about possible solutions to get liberated from the challenge of malnutrition as pointed out by different researchers. The findings of this review included; giving attention to the risks of malnutrition and climate harsh climate change impacts, educating mothers on how to prevent malnutrition and practice good farming methods, practice of climate change mitigation and adaption; and practice of large-scale agriculture to produce more food among others. To conclude, Sustainable Development Goals spell out how we can protect our environment and slow climate change, from forests to oceans to everywhere in between. Electricity should be used and cleaner production strategies practised during farm operations. Reusing of resources must be embraced and also actions to mitigate the changing climate should be embraced and this can result in good nutrition and health, especially in children under five.

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INTRODUCTION

Malnutrition according to the World Health Organization (2023) refers to deficiencies or excesses in nutrient intake, not well-balanced nutrients in the body or nutrients being poorly utilized. The serious burden of malnutrition consists of overweight, obesity and undernutrition including diet-related diseases. Malnutrition is shown majorly in four broad forms which include wasting, stunting, underweight, and micronutrient deficiencies (WHO, 2023)

Climate variability and extremes are strongly reversing the progress in stopping child hunger and malnutrition in Uganda. The increase in temperatures, floods, heat waves and droughts lead to a decrease in the yields of crops, fisheries, livestock animals as well as agroforestry and therefore affecting food quality, nutrient density, food safety, food diversity and prices in the food markets (Darius, 2023).

Based on observations resulting from the diagnosis of patients by nutritionists, there are different types of malnutrition in Uganda which include acute, chronic and micronutrient deficiency affecting persons mainly children below five years and also lactating and pregnant women. The elderly people are also in this category of being affected by malnutrition (WHO, 2023). Most of their search data has been based on small surveys done by a few non-government organizations and there has been little knowledge about micronutrient deficiency which exists in Uganda. As such, more and more

children under five years of age are still dying due to lack of knowledge on its management, inadequate intake of nutritious food, socio-economic factors such as low-income levels of the parents and finally improper medical care due to inadequate nutrition intervention programs in the country and also there is need to consolidate ideas from different scholars to come up with possible solutions to the challenge of malnutrition in Uganda (Gutaka, Odoki et al, 2023)

Problem Statement

Uganda is among the countries in East Africa with high levels of malnutrition whereby about 29 percent or 3 in 10 children below 5 years of age are stunted while about 3.5% of all children below 5 years of age in Uganda are faced with body wasting due to lack of body nutrients (WHO,2023)

Malnutrition due to climate change impacts continues to be a quiet pandemic and one of the major public health problems in developing countries brought up by poor accessibility of food by families. It is the most important risk factor for the burden of disease causing about 300,000 deaths per year directly and indirectly responsible for more than half of all deaths in children (WHO, 2023). In Uganda, it is the main cause of morbidity and mortality in infants and children under 5 years of age among other diseases (WHO, 2023).

In Uganda, Malnutrition, especially among young children, is not mirroring improvements due to food

insecurity, high rates of disease, lack of safe water and lack of access to basic health care (WHO, 2023)

Because mothers and other caretakers of children lack the knowhow and education about food security practices, must be one of the contributing things that poses malnutrition problems among infants in Uganda generally (Mohsen & Ali, 2020)

A high number of deaths related to malnutrition cases among children under five years have been reported in Ugandan referral hospitals according to the reports about the state of referral hospitals in Uganda (2022). Despite interventions by non-government organizations like USAID to train children caretakers on malnutrition prevention. Malnutrition has proceeded to become one of the major causes of death that are reported to occur in children majorly below the age of five years in Uganda.

Significance of the Study

The government and the Hospital administrators may borrow from the findings of this review study to formulate policies that may enhance the proper management of malnutrition in the country. The Hospital administrations may gain an understanding from the study on malnutrition and the factors associated with it in children under five years of age. They may be able to devise ideal ways of improving the management of food insecurity, climate change disasters, malnutrition and also putting in place a proper nutrition intervention in Uganda. With the new knowledge, Management boards can make policy recommendations as well as policy implementation possible. The findings may be important for other scholars as a point of reference, and they can take up the recommendations of the study as a basis for this research article.

This review may give a strong recommendation based on its findings as it aimed at finding possible solutions to malnutrition in children under five in Uganda. Through the findings of this review, the school stakeholders may also develop good feeding programs for children to reduce malnutrition. Also,

through this review, farmers should be able to embrace climate change adaptation and mitigation strategies in food production.

Objectives of the Study

This review of literature study therefore intends to find possible solutions to the problem of malnutrition as brought up by harsh climatic change impacts especially in children who are below five years of age, caretakers to read and put into practice best ways of controlling malnutrition and food security practices and also communicate the findings of this review to local communities for awareness about possible solutions to liberated from the challenge of malnutrition as researched and pointed out by different researchers.

METHODOLOGY OF THE STUDY

The reviewer obtained the review articles from the internet through Google search and was able to review 17 articles whose information was in line with the study of possible solutions to malnutrition caused by climate change impacts in children under five years of age in Uganda.

The reviewer selected articles written by different researchers from different parts of Uganda and systematically reviewed them using a **narrative review criterion** whereby the literature was reviewed by and skewed towards a qualitative interpretation of prior knowledge. By using a narrative review criterion, the reviewer summarizes what has been written or synthesizes but does not seek generalization or cumulative knowledge from what is being reviewed. Instead, the reviewer undertakes reviewing by accumulating knowledge from what is being reviewed by synthesizing literature to demonstrate value of a particular point of view and as such, the reviewer selectively ignored and limited the attention paid to certain studies in order to make points as solutions to problem of malnutrition in children under five years of age in Uganda (Jacob, 2023)

In sampling the review articles, the reviewer used the purposive sampling technique to come up with 17 articles that have relevant information about the topic “Possible solutions to malnutrition in children under five years of age in Uganda”

Of the 17 articles selected, 14 of the articles were selected by reviewers as a research article done in various parts of Uganda and written by 14 scholars on malnutrition, 1 of the articles are report articles by the World Health Organization Globally while 2 articles were from other countries whose topics of study related to malnutrition among children under five in Uganda that enabled the reviewer to make a final judgment about the possible solutions to malnutrition in children under five in Uganda.

RESULTS AND DISCUSSION

A review was carried out about possible solutions to malnutrition in children under five years of age in Uganda by different scholars as included below;

Giving Attention to Risks of Malnutrition and Harsh Climate Change Impacts

According to a study done by Valence and Leonard et al. (2023) using a spatial analysis approach to nutrition among children under five years of age in Uganda, it was recommended that the intensity of different risks of malnutrition and climate change among children under five years of age should be given good attention to guide on prioritizing in making the situation of malnutrition in those children better in Uganda.

Darius (2023) points out that climate change leads to soil erosion, decline in organic matter, salinization, soil biodiversity loss, landslides, desertification and flooding. The effect of climate change on soil carbon storage can be related to changing atmospheric CO₂ concentrations, increased temperatures and changing precipitation patterns. All these impacts have a negative impact on food security in that the performance of food systems is lowered and also nutrient content of the foods is reduced. These negative climate change

impacts can be overcome by giving attention to such risks through the employment of climate smart agricultural strategies (Darius, 2023)

Educating Mothers About Malnutrition and Good Farming Methods

Gutaka, Odoki et, al (2023) carried out research at Kampala International University Teaching Hospital in Bushenyi district in western Uganda and concluded that educating mothers about the nutrition of babies is associated with good nutrition practices and farming to produce food on a large scale to feed all people, especially children under five years of age and this prevents and controls malnutrition challenge in those children.

According to the World Health Organization report (2023) on good farming methods, Conservation tillage is a farming technique that reduces or eliminates conventional tillage activities to reduce soil disturbance and erosion. It includes methods like no-tiller reduced tillage, where farmers hardly disturb the soil and leave crop residue on top. Conservation tillage contributes to better soil health, moisture retention, erosion prevention, and carbon dioxide emissions reduction. Improving farming methods produces nutritious crops to feed children under five for better health.

Awareness About Good Nutrition Practices with Respect to the Changing Climate in Uganda

On average, across the 43 vegetables analyzed, calcium content declined by 16%, iron by 15% and phosphorus by 9%. The vitamins riboflavin and ascorbic acid both dropped significantly, while there were slight declines in protein levels. Similar decreases have been observed in the nutrients present in other food crops due to high temperatures caused by the changing climate in Uganda (Valence, Leonard et al, (2023)

Valence, Leonard et al, (2023) further recommend that where possible, nutrition-sensitive agriculture should be scaled up in affected areas. Also to organize and conduct a response analysis that

involves all health, nutrition, food security as well as water and sanitation. Stakeholders in these regions should identify appropriate interventions to address acute malnutrition in children under five years of age.

Strengthen Interactive Mechanisms About Nutrition and Climate Smart Agriculture

The very many burdens of malnutrition remain a major challenge across African countries with Uganda inclusive. In spite of the moving forward being made in many countries, undernutrition and, increasingly also overnutrition, is strongly affecting many people in African countries (WHO, 2023). To be able to deal with these challenges more effectively without fail, many African governments have recently invested in Cross sector governance. The core assumption behind these strategies is that the horizontal integration of nutrition concerns across relevant sector policies will increase the likelihood of attaining nutrition-related goals thereby fighting malnutrition in children majorly under five years in developing countries like Uganda which is a poor and slow-paced developing country.

According to Valence, Leonard et al, (2022), their research reveals that nutritional interventions should take into consideration the paths and also the interactive mechanisms of the risk factors of malnutrition as well as setting strategies against malnutrition in children under five years of age.

The Climate-Smart Agriculture concept reflects an ambition to improve the integration of agriculture development and climate responsiveness. It aims to achieve food security and broader development goals under a changing climate and increasing food demand. Climate-smart agriculture initiates sustainably increased productivity, enhances resilience, and reduces/removes greenhouse gases, and requires planning to address trade-offs and synergies between these three pillars: productivity, adaptation, and mitigation (WHO, 2023)

Planting Highly Nutritious Crops that are Resistant to Harsh Climatic Conditions.

According to Jacob (2023), it was recommended that governments should prioritise nutritious crops and strengthen extension and research services so as to improve nutrition thereby preventing malnutrition in the general public.

Valence, Leonard et al (2023) stress that reliance on a small number of crops has made agriculture vulnerable to pests, crops being less nutritious plant-borne diseases and soil erosion, which thrive on monoculture the practice of growing only one crop at a time. It has also meant losing out on the resilience other crops show in surviving drought and other harsh climate change disasters.

As the impacts of the climate crisis become starker, farmers across the world are rediscovering ancient crops and developing new hybrids that might prove hardier in the face of drought or epidemics, while also offering important nutrients and this can serve to improve nutrition (Darius, 2023).

Fighting Poverty Through Large-scale Agriculture With Emphasis on Climate-Smart Agriculture

Climate change impacts such as heavy floods, heavy winds, long dry spells, outbreaks of pests and diseases often destroy crops in the region where the hospital is found and crops are often destroyed as well as the death of animals. Also the production of poor quality livestock and crop products with a poor nutrient content that does not support proper growth of individuals especially children under five years of age because of malnutrition infections and living people in a poor state (Darius, 2023).

A study done by Tette, et al, 2015 shows that poverty remains the major cause of malnutrition in children. Therefore, specific Climate-Smart agriculture interventions should be targeted to address poverty so as to improve the nutrition of the children through good food accessibility.

Practice of Climate Change Mitigation and Adaptation

According to the WHO (2023), report on Greater Horn of Africa food insecurity, malnutrition and health-grade emergency situations, the practice of climate change adaptation and mitigation strategies increases and promotes food security as well as good nutrition for healthy living of children and growth as well.

Darius (2023) stresses that humanity is faced with the greatest challenge in the world—climate change, affecting all aspects of life and human development. Severe weather events, such as droughts and floods, have historically imposed heavy costs in Uganda. The projected impacts of human-induced climate change are likely to add to the toll, potentially undermining further advancements in critical development areas such as food security, water resources management, health, and economic growth. In recognition of this, the Government of Uganda and its donor community have initiated activities to determine vulnerability and adaptation priorities and integrate adaptation considerations into development and sectoral planning. However, adaptation challenges remain, including mainstreaming adaptation into the country's medium-term development framework. Accomplishing these will require addressing challenges regarding data availability and accessibility, as well as a need for strengthened capacity to predict future climate change and measure sector impacts (Mohsen & Ali, 2020).

Uganda's climate is naturally variable and susceptible to flood and drought events which have had negative socio-economic impacts in the past. Human-induced climate change is likely to increase average temperatures in Uganda by up to 1.5°C in the next 20 years and by up to 4.3°C by the 2080s. Such rates of increase are unprecedented. Changes in rainfall patterns and total annual rainfall amounts are also expected but these are less certain than changes in temperature. The climate of Uganda may become wetter on average and the increase in

rainfall may be unevenly distributed and occur as more extreme or more frequent periods so intense rainfall. Regardless of changes in rainfall, changes in temperature are likely to have significant implications for water resources, food security, natural resource management, human health, settlements and infrastructure. In Uganda, as for the rest of the world, there are likely to be changes in the frequency or severity of extreme climate events, such as heat waves, droughts, floods and storms (Darius, 2023).

Uganda is highly vulnerable to climate change and variability its economy and the well-being of its people are tightly bound to climate. Human-induced climate change in the coming century has the potential to halt or reverse the country's development trajectory. In particular, climate change is likely to mean increased food insecurity; shifts in the spread of diseases like malaria; soil erosion and land degradation; flood damage to infrastructure and settlements and shifts in the productivity of agricultural and natural resources. It will be the poor and vulnerable who feel these impacts the hardest, though climate change has serious implications for the nation's economy, with for example, a shift in the viability of coffee growing areas potentially wiping out US\$265.8 million or 40% of export revenue and malnutrition (WHO, 2023). Exacerbating poverty and triggering migration as well as heightened competition over strategic water resources, climate change could lead to regional insecurity. Recently however, the high precipitation within the East African region caused a lot of floods when the Lake Victoria level rose up by one meter causing flooding in Lakes Kiyoga, and Albert thus displacing so many people and households in Uganda (WHO, 2023).

Uganda is in the process of planning how to progress its development goals over the next 5-6 years, a valuable opportunity to ensure that the implications of climate change are considered. However, the current mechanisms for consideration of climate change in the planning process for the National

Development Plan are flawed and conspire against the sophisticated level of multi-sectoral deliberation which is required while embracing nutritional development (WHO, 2023)

Overcoming Bad Cultural Beliefs that Influence Climate Change

Operational principles and modalities for safeguarding tangible cultural heritage in emergencies were adopted in 2020 by the General Assembly of States Parties to the 2003 Convention. They highlight the dual role of intangible cultural heritage in emergencies, both as being under threat and as a valuable resource drawn on by communities to help them prepare for, respond to and recover from various types of emergency situations, including those related to climate change and malnutrition in individuals (Darius, 2023).

Mohsen and Ali (2020) point out that poor cultural farming beliefs such as monoculture do not lead to food security therefore, in order to prevent malnutrition, the predisposing factors should be pointed out and worked on and adopted policies should be serious based on the availability of the key stakeholders. Most of the existing problems of malnutrition in children are a result of culture and beliefs which hinder climate change mitigation by their parents which has to be addressed for example due to monoculture, the lands are left bare by the peasant farmers leading climate change due to accumulation of greenhouse gasses in the atmosphere (Darius, 2023)

Religious factors can have a major influence on what foods we buy. For example, Muslims will not eat meat such as beef or lamb that has not been slaughtered by the halal method, while those of the Jewish religion will only eat foods that are Kosher (Darius, 2023)

Nutritional Education and Advocacy in Communities with Respect to Changing Climatic Conditions

Climate change impacts such as heavy floods, heavy winds, long dry spells; an outbreak of pests and diseases often destroy crops in the region where the hospital is found and crops are often destroyed as well as the death of animals also the production of poor quality livestock and crop products with poor nutrient content which does not support proper growth of individuals especially children under five years of age who are often admitted because of malnutrition infections (Jacob, 2023).

It is therefore important to take steps to address these harsh impacts of climate change to make sure that people and communities have good access to stable and reliable sources of food materials (Jacob, 2023). It has been reported that malnourished children particularly those with severe acute malnutrition have got higher risk of death from common childhood sicknesses like diarrhoea, malaria and pneumonia (WHO, 2023).

Many acutely malnourished children must be reached as much as possible so as to achieve maximum coverage of the programs and this depends on community involvement in all aspects of the program with emphasis on climate change resilience so that more nutritious and resistant crops are grown that are highly nutritious. This is best known as community outreach which includes assessment of nutritional status, community mobilization, training on climate-smart agriculture and active case finding of malnourished children, referral and case follow-up (WHO, 2023).

Community volunteers must work directly with malnourished children to teach their families about good nutrition alongside local health professionals and volunteer teams which assess the nutritional status of children and identify new cases of malnutrition as early as possible so that timely interventions are carried out to prevent further deterioration (Umijati, & Kardjati, 2021).

By also working in partnerships with local health services, actions against hunger will aim at integrating the treatment, assessment and prevention of malnutrition into national; and regional healthcare systems (Valence & Leonard, 2023).

Children who are malnourished, especially those with acute malnutrition are then provided with support which may include food and micronutrient supplements, medical treatment if needed and also nutritional advice for parents and caregivers for children under five (Ratib & Steven, 2020).

Nutritional education should include good information on optimal child under five feeding and care practices, advice on hygiene and sanitation, prevention of illness and also psychosocial support to prevent deterioration, the weight and height of a child under five with moderately acute malnutrition are monitored on regular basis (WHO, 2023).

Increasing Food Intake in Children Under Five: for example, when a child suffers from kwashiorkor which is caused by a lack of proteins in the body of the child. The child will have to show signs like hair thinning, oedema, low growth rate and loss of weight (Tette & Narty, 2015). Not having enough food taken in the body therefore leads to such conditions and other forms of protein and energy as a form of malnutrition. Harsh climatic conditions such as floods have been destroying crops reducing the quantity of the food to be taken in by both caretakers and the children. Feed additives should be included in children's food to step up their appetite, increase the nutrient content of the food and increase food intake by the children (Darrius, 2023)

CONCLUSIONS

Based on articles reviewed about possible solutions to malnutrition in children under five years of age in Uganda as written by different scholars, the following conclusions can be made as the greatest possible solutions to malnutrition in children under five in Uganda;

Sustainable Development Goals spell out how we can protect our environment and slow climate change, from forests to oceans to everywhere in between. Electricity should be used and cleaner production strategies practiced during farm operations. Reusing of resources must be embraced.

Greenhouse gas emissions per person vary greatly among countries. In the United States of America, per capita emissions are more than double the world average of 6.5 tons of CO₂ equivalent, while in India they are less than half the world average. Globally, the 10 percent of the population with the highest income accounts for nearly half of all emissions that lead to the changing climate and cause malnutrition. Actions to mitigate greenhouse gasses in the atmosphere should be embraced.

Recommendations

Potential mothers have to be educated about nutrition as well as climate change mitigation and adaptation strategies before they become mothers so that their born children are properly fed on balanced diets to prevent malnutrition as pointed out by a number of scholars.

Women and other caretakers should be empowered so that they can have some income that can drive them out of poverty which indirectly predisposes their born children to malnutrition as this will enable food accessibility by the mothers and other caretakers of children.

Communities should be trained on good feeding practices and crop production so that they can feed their under-five children well to avoid malnutrition.

Farming should be focused on highly nutritious crops so that they can provide children and adults with good nutrients to avoid malnutrition.

Water supply, sanitation and health practices should be taught to mothers and caretakers of children under five and also mothers should observe high order hygiene when feeding their children under five years of age.

The reviews and conclusions drawn, imply that there is much research work needed to point out prominent solutions to malnutrition in children under five years of age. The question of whether parents, health workers and other stakeholders' are aware of malnutrition and its causes has not been addressed therefore more research for this cause is required to address the malnutrition challenge and its adverse effects in children under five years of age in Uganda.

Areas for Further Research

Though the Malnutrition problem as linked to climate change and food insecurity in Uganda majorly affects children below five years, there are also other factors that may bring about food insecurity leading to malnutrition to both children and adults in Uganda therefore more research has to be undertaken to find solutions to the causes of malnutrition in Uganda as linked to other factors such as social-economic and demographic factors.

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