Original Article

International Journal of Food, Nutrition and Dietetics
Volume 8 Number 1, January – April 2020
DOI: http://dx.doi.org/10.21088/ijfnd.2322.0775.8120.4

Climate Change and Childhood Malnutrition

Urmimala Baruah[1], Ruma Bhattacharyya[2]

How to cite this article:
Urmimala Baruah, Ruma Bhattacharyya. Climate Change and Childhood Malnutrition. Int J Food Nutr Diet. 2020;8(1):23–28.

Abstract

Malnutrition is the single biggest contributor of morbidity and mortality among children throughout the world. In the recent times the problem of child malnutrition has been further exacerbated by climate change. Therefore an attempt has been made to study the possible effects of climate change on child malnutrition. The study has been carried out by collecting secondary data from different books, journals and internet. The present study revealed a clear and alarming link between climate change and child malnutrition especially undernutrition.

Keywords: Climate change; Malnutrition; Children; Morbidity; Mortality.

Introduction

Malnutrition is a challenge to the health and productivity of populations, particularly in low- and middle-income countries. Over one third of the global annual 6.9 million deaths of children under age 5 years were attributable to undernutrition, either directly or via their increased susceptibility to succumb to other diseases (Horton et al., 2010; FAO, 2009). Although the proportion of malnourished children has decreased globally, particularly in China and other middle income countries, progress has been uneven and slow in sub- Saharan Africa and India. Moreover, there is evidence that climate change will slow this secular decrease, and it is projected that a world with a medium-high climate change will have an additional 25.2 million malnourished children than would the counterfactual world without climate change (SUN, 2010). According to the World Health Organization (WHO) (Black et al., 2008) and the fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2014), malnutrition is viewed as one of the five largest adverse health impacts of climate change (Nabarro, 2010; Bloem et al., 2010).

Malnutrition refers to both undernutrition (underweight, wasting, and stunting) and overnutrition (overweight and obesity) as well as to micronutrient deficiencies that may occur in both groups.

Our particular concern is stunting (height-for-age being 2 or more SD below the international median value in well-nourished children). In 2011, an estimated 165 million children under age 5 years were stunted worldwide. In Africa more than 36% of the children under 5 years of age are stunted (Easterling, 2007) with a relative increases in severe stunting of 31–55% in West sub Saharan Africa and 61% in South Asia, making it an impending epidemic (Tirado et al., 2013). Undernutrition is a primary cause of ill health and premature mortality among children in developing countries. In 2018,

Author Affiliation: [1]Ph.D Student, [2]Professor, Department of Food Science and Nutrition, College of Community Science, Assam Agriculture University, Jorhat, Assam 785013, India.

Corresponding Author: Ruma Bhattacharyya, Professor, Department of Food Science and Nutrition, College of Community Science, Assam Agriculture University, Jorhat, Assam 785013, India.

E-mail: rumab76@gmail.com

Received on 02.11.2019, **Accepted on** 04.01.2020

wasting continued to threaten the lives of an estimated 7.3 percent or 49 million children under 5 globally (UNICEF / WHO / World Bank Group Joint Child Malnutrition Estimates, 2019).

Undernutrition remains one of the world's most serious but least addressed socioeconomic and health problems (Horton et al., 2010; FAO, 2009; SUN, 201), hitting the poorest the hardest, especially women and children. The number of people suffering from hunger stood at 925 million in 2010, and maternal and child undernutrition persists (FAO, 2009; SUN, 2010; Black et al., 2008). In developing countries, nearly one-third of children are underweight or stunted, and undernutrition is the cause of more than one-third of deaths among children under 5 years of age (Horton et al., 2010; SUN, 2010; Black et al., 2008). Undernutrition, including micronutrient deficiencies, also referred to as "hidden hunger," is caused by inadequate dietary intake and disease, which in turn stem from food insecurity, poor maternal and child care practices, and inadequate access to clean drinking water and safe food, sanitation, and quality health services. The human and socioeconomic costs of undernutrition are enormous, falling hardest on the poorest, especially on women and children (Horton et al., 2010; FAO, 2009). Undernutrition interacts with infectious disease, causing an estimated 3.5 million preventable maternal and child deaths annually (SUN, 2010; Black et al., 2008). The millions of people who have experienced undernutrition early in life tend to face many challenges as they grow up (FAO, 2009). They encounter increased risks of illness, experience difficulties at school, and are often not able to make a full contribution to the social and economic development of their households, communities, and nations when they become adults (Nabarro, 2010). Undernutrition during the critical stages of fetal development and early childhood is very often the beginning of a vicious cycle of negative feedbacks, leading very often to social and economic vulnerabilities later in life, particularly in women, which then perpetuate undernutrition in the next generation. The resulting impacts in terms of lost national productivity and economic growth are huge. Recent food and economic crises and economic downturn have magnified the problems (Horton et al., 2010; SUN, 2010; Bloem, 2010). International and national nutrition stakeholders are now stepping up to address this urgent challenge, including through building up a global movement for Scaling Up Nutrition (SUN) actions at the country level (SUN, 2010). It is important to note here that the largest burden of current undernutrition is attributed to calorie insufficiency caused by lack of food intake.

Table 1: Number (in millions) of undernourished children under age 5 yrs in 2000 and 2050 using the National Center for Atmospheric Research climate model and the A2 scenario.

Region*	No. of undernourished children under age 5 yrs, in millions			Additional no. of children under nourished because of climate change, 2000–2050
	2000, base climate	2050		
		Without climate change	With climate change	
Sub-Saharan Africa	32.7	41.7	52.2	10.5
South Asia	75.6	52.3	59.1	6.8
East Asia/Pacific	23.8	10.1	14.5	4.4
Latin America & Caribbean	7.7	5.0	6.4	1.4
Middle East/North Africa	3.5	1.1	2.1	1.0
Europe and Central Asia	4.1	2.7	3.7	1.0
Total	147.9	113.3	138.5	25.2

Source: Phalkey et al.,(2015)

*Developing countries only.

Climate change amplifies threats to livelihoods and food security through its direct impacts on food availability, access, quality and utilization. Global crop production is expected to decline due to the projected decrease of staple food yield6, leading to negative impacts on availability of food, and farmers' incomes. Consequently, the structural rise and volatility of staple food prices will highly constrain food access for the poorest. Every year climate change is responsible for 4,00,000 annual

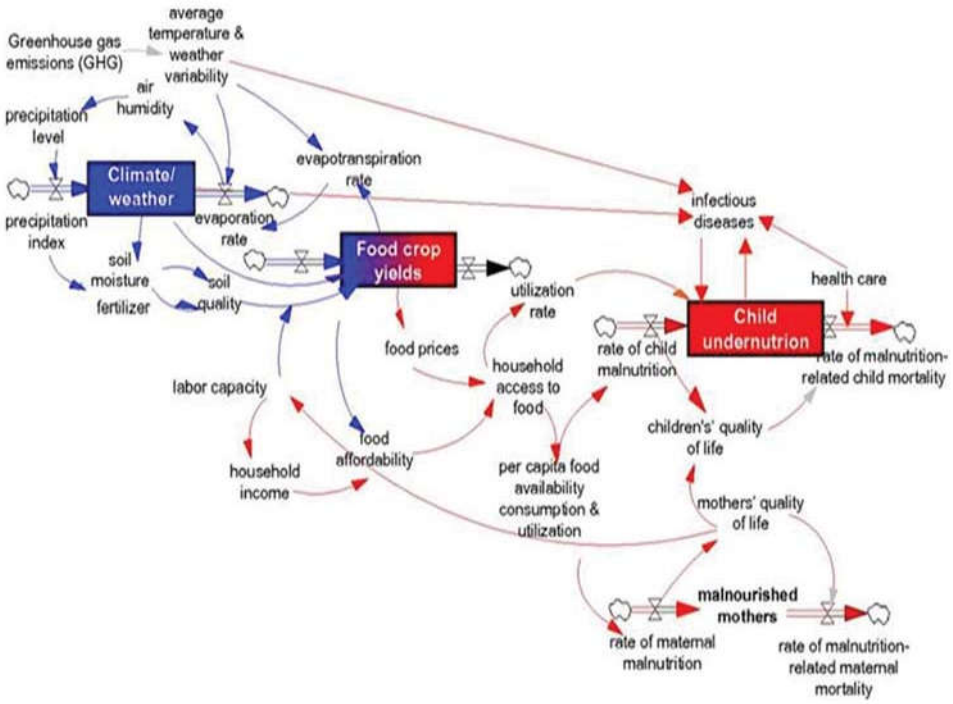

Fig. 1: Complex pathways from climate/weather variability to undernutrition in subsistence farming households (Phalkey et al., 2015).

deaths, mostly due to hunger that affect above all children in developing countries (DARA, 2012). Climate change increases the overall risk of hunger and undernutrition (Easterling 2007; WFP, 2009), and challenges the realization of the human rights to health and adequate food (UN, 2013; Caesens, 2009). Climate change is already affecting nutrition security through different causal pathways that impact food security, livelihoods, household food access, maternal and child care, health, water and sanitation, and many socioeconomic factors that determine nutrition security. Crop-yield variation induced by climate change has been suggested as one of the potential mechanisms leading to malnutrition (USNCN, 2010). This is particularly worrying, since children are especially vulnerable to environmental adversities because of their greater exposure, greater sensitivity to certain exposures and dependence on care givers (Shekhar, 2006; FAO, 2001). For this reason, increased weather variability predicted by climatic models is expected to lead to a rise in the health risks of this age group, associated with more frequent extremes such as droughts and floods (Shekhar, 2006; FAO, 2009). Climate change also reduces the nutritional value of staple crops thereby increasing the prevalence and spread of diseases. This is closely related to malnutrition in poor communities. Because of high rainfall, the fertility for the corn is not good, and it means that the plants get unhealthy to the point where they die. If the corn dies, it also means that the people will have a difficult economic situation. Livestock are also affected by the changing climate (both by gradual change and by the sudden impact of natural disasters) (UNICEF, 2013). Mongolia is highly dependent on pastoralism for sustaining livelihoods. The pastoral livestock sector engages more than half the population and provides food (meat and milk) and fibre to the majority of the population. Livestock rearing and crop production, as well as the grasslands and water resources on which they depend, areparticularly vulnerable to droughts and dzud (extreme snow) events. Because of climatechange areas unfavourable to grazing are expected to increase to 65–70 percent by 2050 and to 70–90 percent by 2080 (UNICEF, 2011). Some plant species are growing one to two months later as a result of declining precipitation, while others are growing with fewer leaves or at a reduced size. High-nutrient plants have also declined by 1.5–2.3 times since 1940 (UN, 2012). A study by UNDP after the 2010 dzud found that of 32,500 small subsistence-level herders (owning fewer than 250 animals) in the 14 worst-affected regions, 17 percent reported experiencing a shortage of food for daily consumption due to a lack of cash to buy food, resulting in hunger. The large number of livestock deaths (8.5 million) prevented families from selling

milk, meat and cashmere fur for income. Families reported using cash for children's school supplies on food for the household. The implication is that even a small risk of increased droughts and effects to livestock as a result of climate change and the knock-on effects related to poor nutrition (UNICEF, 2013).

Alderman et al. (2010) noted that exposure to drought in the first 5 y of life may contribute to a decline in mean height of 1% of the median reference in Tanzania. Woldehanna et al. (2010) also found that prenatal exposure to drought had a significant and negative effect on stunting, particularly in rural areas (−0.200, $p < 0.01$) in Ethiopia, indicating regional variations in the effect. Children in flooded households in India were most likely to be stunted and underweight but not wasted (FAO, 2009). Early exposure also was rated as a higher risk. In contrast, Stewart et al. (2008) did not observe a significant difference in the anthropometric measurements of children from inside or outside the embankment for the degree of flood damage in Bangladesh, even in the postharvest season. They report that other factors such as landlessness and maternal education were significantly associated with anthropometry. However, Wright et al. (2001) did not observe seasonality as a determinant of underweight children in Zimbabwe. They instead noted geographic factors, diarrhea, poor household food access, and increased workload for women during the weeding and harvest seasons as the main contributors. Changes in weather averages, climate variability, and extreme weather events (particularly floods and droughts) determine the quantity, quality, and stability of crop yields (Porter et al., 2005). The steady rise in the world population, food wastage, and increasing diversion of cereal crops to feed livestock will put an additional strain on food systems. Climate change is likely to reduce agricultural production and affect more than 30% of the farmers in developing countries that already are food insecure (Lobell et al., 2008). Both Asia and Africa are projected to experience continuing decreases in per capita food availability from these negative productivity impacts (Neison et al., 2010; Knok et al., 2012). Although economic growth may help offset some of these pressures, declining per capita harvested area affects per capita food production and therefore creates a deficit in per capita calorie availability (hence leading to undernutrition). The impacts are borne disproportionately by smallholder subsistence farming households, as already noted in parts of Africa (Brown et al., 2008; Bernstein et al., 2011).

Skoufias et al. (2012) assessed the growing degree days (GDD) for crops instead of the ambient

temperature and observed that positive GDD (8°C to 32°C) during previous wet season or in the 2 year before the survey had insignificant impacts on children's nutrition status. Mueller et al. (1999) reported that in Papua New Guinea none of the environmental or agricultural factors were significant predictors of underweight children, and the socioeconomic status was the most important factor determining children's growth (1990). In contrast, no association was noted between household variables and children's weight in Swaziland (1994).

Recent data (Climate Change Vulnerability Index 2013) showed that the poorest people already suffering from the highest rates of undernutrition will be the most vulnerable to climate change. Vulnerability will increase with climate change: exposure to climate change-related effects and dependence on climate-sensitive resources will rise, as adaptive capacity (Parry et al., 2007) decreases. They rely on small-scale rain-fed farming systems and agricultural labour as their main source of food and income, making them highly dependent on climate-sensitive natural resources. Climate change is increasingly and simultaneously eroding their livelihoods assets and access to natural resources and services, while at the same time eroding their capacity to cope with climate-related crises, and adopt sustainable solutions to climate change. The hungry poor, especially women and children, are already the main victims of the changing climate. They live in areas that are prone to weather- and climate-related disasters. Indeed, when facing a disaster, people have no choice but to resort to negative coping strategies (reduction of food intake, sale of productive assets etc. (Reaching Out to Women When Disaster Strikes, 2008) that hinder their resilience, increase their vulnerability to climate threats, and exacerbate their food and nutritional security. Under nutrition undermines the ability and capacity of vulnerable populations to implement resilient climate coping strategies. Food insecure people are the hardest hit by climate change: they require increased attention.

Effects of climate change have already irreversibly affected many populations and their livelihoods. This is why the international community needs to dramatically invest resources in creating adaptive strategies for the poorest, specifically to guarantee sustainable access to sufficient and nutritious food, drinking water, and natural resources in order to thrive. (ACF-International, 2012).

Summary and Conclusion

Assessing the pathways through which climate change impacts undernutrition is, without doubt, a complex and daunting challenge but is one that must be addressed. The impact of climate/

weather variability on crop yields has been documented and widely acknowledged, as have the direct impacts of crop yields on childhood undernutrition, especially acute undernutrition. Current evidence, although limited, does suggest a strong link between weather variables and childhood stunting. Understanding and quantifying associations between climate variability, crop yields, and childhood undernutrition, ideally at both the macro and the micro levels, is necessary. Documenting these associations systematically over the next years, even "with associated uncertainties," may help generate more realistic estimates for the future and therefore should be done (Phalkey et al., 2015).

Also, there is an urgent and immediate need to apply resources to fight against undernutrition and help the most vulnerable build their resilience to the changing environment. Increased funding for nutrition-specific and nutrition-sensitive programs is more urgent than ever. Climate change mitigation should remain a high priority. We cannot yet figure out what the consequences of a +4°C world would be. Even if major mitigation efforts are made, the most at-risk populations will suffer from the climate change impacts and will have no choice but adapting. But adaptation to climate change is costly. Governments and donors should urgently increase their financial and technical support toward adaptation in least developed countries, as currently, financial contributions remain insufficient to meet adaptation needs. The further the delay, the higher the price will be: economically, environmentally, and socially. Immediate additional public funding is required in order to support the adaptative strategies of the world's poorest to climate change (AICF International, 2012).

References

1. Alderman H. Safety nets can help address the risks to nutrition from increasing climate variability. J Nutr 2010;140(1):148S–152S.
2. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: Global and regional exposures and health consequences. 2008;371:243–60.
3. Bloem MW, Semba RD, Kraemer K. Castel Gandolfo. Workshop: an introduction to the impact of climate change, the economic crisis, and the increase in the food prices on malnutrition. J Nutr 2010;140:132S.
4. Easterling WE, Aggarwal P, Batima P, et al. Food, fibre and forest products. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE, eds. Climate change impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge and New York: Cambridge University Press, 2007.pp.273–313.
5. Food and Agriculture Organization. The state of food insecurity in the world 2009. Rome: FAO. 2009.
6. FAO. . The State of Food Insecurity in the World. 2013.
7. Horton S, Shekar M, McDonald C, Mahal A, Krystene B. Scaling up nutrition: what will it cost? Washington DC: World Bank, New York: World Bank. 2010.
8. Lancet, 2013, Maternal and child nutrition series
9. MC Tirado et al. Climate change and nutrition: creating a climate for nutrition security. Food Nutr Bull. 2013 Dec;34(4):533–47
10. Maplecroft, Climate Change Vulnerability Index (2013).
11. Muller O, Krawinkel M. Malnutrition and health in developing countries. CMAJ 2005;173(3):279–286.
12. Nabarro D. Introducing the policy brief "Scaling Up Nutrition: a framework for action." 2010. Availableat:http://siteresources.worldbank.org/NUTRITION/Resources/042410DavidNabarroIntroducingtheSUN.pdf. Accessed 13 August 2013.
13. Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. & Hanson, C.E., eds. (2007). Climate Change: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK, Cambridge University Press.
14. Phalkey R.K., Aranda-Jan C., Marx S., et al. (2015). Systematic review of current efforts to quantify the impacts of climate change on undernutrition. Proceedings of the National Academy of Sciences.
15. UNICEF.The impacts of climate change on nutrition and migration in Indonesia. 2011.
16. UN. Millennium Development Goals Report. 2012.
17. UNICEF. Humanitarian Action Report. 2013.

18. Woldehanna T. Do Pre-Natal and Post-Natal Economic Shocks Have a Long Lasting Effect on the Height of 5-Year-Old Children? Evidence from 20 Sentinnel Sites of Rural and Urban Ethiopia. Working Paper No. 60 (Young Lives, Department of International Development, University of Oxford, Oxford, UK). 2010.

19. Women and children are 14 times more likely to die than men during natural disasters (Soroptimist International of the Americas. "Reaching Out to Women When Disaster Strikes." White Paper: Disaster Relief. Philadelphia, PA). 2008.