

Ali D, Saha KK, Nguyen PH, Diressie MT, Ruel MT, Menon P, Rawat R. **Household food insecurity is associated with higher child undernutrition in Bangladesh, Ethiopia, and Vietnam, but the effect is not mediated by child dietary diversity.** J Nutr. 2013; 143:2015-21.

Introduction

Childhood underweight, household atmosphere pollution, and non-exclusive and discontinued breastfeeding remain leading risk factors for the disease burden in sub-Saharan Africa (1). The most recent Lancet series on maternal and child nutrition estimated that undernutrition, including fetal growth restriction, stunting, wasting, and deficiencies of vitamin A and zinc, along with suboptimal breastfeeding, were responsible for 45% of deaths in children under five in 2011 (2). According to the UNICEF conceptual framework, household food insecurity (HFI), inadequate childcare, and lack of access to health services, safe water, and environmental sanitation are key underlying causes of child undernutrition (3). HFI is assumed to affect children's nutritional status by limiting the quantity and quality of dietary intake. Because assessing household food access and individual dietary consumption can be time consuming and costly, simple measures of dietary diversity (DD) have been suggested as proxies reflecting nutrient adequacy at group or population level (4). However, studies that examined the association between HFI and dietary diversity of children show mixed results.

This issue of NNA summarizes an article recently published in the *Journal of Nutrition*, which reported the results from cross-sectional multi-site surveys conducted in Ethiopia, Bangladesh and Vietnam to assess the association between household food insecurity and child undernutrition. The specific objectives of this survey were to: 1) examine the association between HFI and child stunting, underweight and wasting in Ethiopia, Bangladesh and Vietnam; and 2) assess the mediating role of dietary diversity (DD) in this association.

Methods

The survey was carried out as part of the Alive and Thrive project. Households participating in the two-stage cluster-randomized surveys were randomly selected from 20 sub-districts in Bangladesh, 75 areas in 2 regions in Ethiopia, and 40 communes from 4 provinces in Vietnam, with the objective that these villages were representative of their respective areas. All households had a child < 5 yrs of age and one child per household was randomly selected for the survey. In Bangladesh 3422 households, in Ethiopia 2356 households and in Vietnam 3075 households participated in the survey. Maternal and child anthropometrics were assessed and stunting, underweight and wasting were defined as Z-scores < -2 based on the WHO 2006 child growth standards (5). Besides HFI and DD, described in more detail below, additional data collected included child illness (diarrhea and acute respiratory infection during the previous 2 weeks as reported by the caregiver), and several maternal (maternal education, and age) and household characteristics (household size and wealth index).

Household food insecurity: HFI was assessed with the household food insecurity access scale (HFIAS), which is a simple indicator assessing a household's recent experience of food insecurity. Questions of the HFIAS questionnaire can be subdivided into three different domains of food insecurity: anxiety and uncertainty about the household food supply, insufficient food quality and insufficient food intake (6). From the nine questions of HFI, two indicators were constructed: HFIAS Prevalence (HFIAP) and HFIAS score. The HFIAP categorizes HFI into four levels with increasing food insecurity: food secure and mildly, moderately, and

severely-food insecure.

Dietary diversity: DD was constructed from data collected by a 24 hour dietary recall. The indicator is based on a count of 7 food groups consumed in the previous 24 hours (Z). A minimally adequate DD was defined when a child consumed at least 4 food groups on the previous day.

Results and Conclusions:

About half of the children in Ethiopia and Bangladesh, and one fifth of the Vietnamese children were stunted. Similarly high underweight and wasting prevalence were observed in Bangladesh (44 and 19% respectively), while these were lower in Ethiopia (28% and 6%) and Vietnam (16% and 5%). Approximately a quarter of households in Bangladesh and Vietnam and almost half of households in Ethiopia were defined as moderately to severely food-insecure. However, this difference may have been due to the timing of the survey. The survey was conducted during the food secure post-harvest season in Bangladesh and Vietnam, while it was conducted during the pre-harvest rainy season in Ethiopia.

The prevalence of stunting was greater by factors of 1.5 and 1.3 in households experiencing severe HFI as compared to food secure households in Bangladesh and Ethiopia, respectively and by 1.6 in moderately food-secure households in Vietnam ($p < 0.001$). A similar pattern was observed for underweight in all three countries, and for wasting only in Bangladesh, where wasting was more prevalent than in the other two countries. The percentage of children who had minimum DD (>4 food groups) on the previous day of the survey was also strongly associated with HFI in all three countries. The more food-insecure the household, the less likely children achieved minimum DD. Although the pattern was the same among the three countries, the proportion of children who had minimum DD was much less in Ethiopia as compared to Bangladesh and Vietnam (8% vs. 48% and 83%).

These associations were not altered after adjusting for household, maternal and child characteristics. Only the inclusion of the wealth index in the model reduced the association between HFI and stunting, underweight and wasting somewhat, but the association remained significant, implying that the association between HFI and child undernutrition is independent of household wealth to some extent. The inclusion of DD in the model negligibly reduced the association between HFI and stunting, but did not change the association between HFI and underweight. The lack of a mediating effect of DD may have been due to methodological differences of the assessed indicators. HFI was based on the food insecurity experienced during the 30 days prior to the survey, DD was based on dietary recall of the previous 24 hours and anthropometric measurements reflect the long term nutritional status of a child.

Policy Implications:

The survey confirmed that stunting remains a public health problem in the 3 countries. Half of all children under 5 years of age were stunted in Bangladesh and Ethiopia and 21% in Vietnam. The survey also highlighted that HFI is prevalent. Approximately one third of households in Bangladesh and Vietnam and two-thirds of households in Ethiopia were defined food-insecure. Based on the findings of this multi-country survey, the authors propose that programs aiming to prevent child undernutrition should include strategies to enhance household food security. The results further imply that household food insecurity is, at least to some extent, independent of household wealth. As previously suggested by Ruel *et al.* comprehensive strategies for reducing stunting should include a focus on developing and implementing nutrition-sensitive agriculture to improve household food security, increasing maternal education and women's empowerment in support of their own health and their capacity to care for their children, improving hygiene, sanitation and

water quality to reduce infections and implementing social protection programs to increase purchasing power and access to services and amenities (8).

NNA Editor's Comments *

Although the methodological considerations described above may partially explain why DD does not mediate the relationship between HFI and undernutrition in this cross-sectional study, DD has the potential to be a useful tool to identify vulnerable population groups at risk of inadequate dietary quality. The DD score was developed for use in large-scale survey programs, as a relatively simple proxy for assessing the micronutrient density of the diets of infants and young children, at population level (4). It is based on the concept that individuals consuming a larger variety of foods are more likely to meet their requirements for micro- and macronutrients. In particular, it is difficult to meet children's micronutrient requirements after age 6 months unless their diet contains some animal source foods such as milk, eggs, fish or meat, and/or is fortified commercially or in the home (2). In settings where consumption of animal source foods or fortified foods is low, there is an increased risk of nutrient deficiencies including vitamin A, iron, zinc, and vitamin B₁₂.

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