



A comparison of child nutritional status in two agro-ecological zones of Ghana: Is location an important determinant?



K Harding¹, GS Marquis^{1,2}, EK Colecraft^{2,3}, A Lartey³, O Sakyi-Dawson³

¹McGill University, Montreal, Canada, ²Iowa State University, Ames, IA, USA, ³University of Ghana, Legon, Ghana

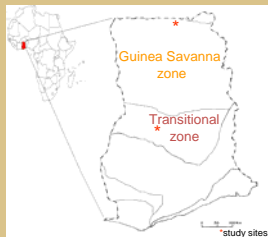
Abstract

Childhood malnutrition is a public health concern in Sub-Saharan Africa because of its negative impact on child health and survival. The prevalence of malnutrition was documented in two agro-ecological zones of Ghana: the mid-country Transitional and the drier northern Guinea Savanna. The study objective was to compare child nutritional status between zones to determine the importance of geographic location to child nutrition. Anthropometric data were collected on 390 children 2-5 y of age. The mean weight-for-age (-1.13 vs. -0.86; $p < 0.01$) and weight-for-height (-0.56 vs. -0.12; $p < 0.01$) Z-scores were significantly lower in the Guinea Savanna than in the Transitional zone. However, there was no significant difference in mean height-for-age Z-score (-1.29 vs. -1.38; $p = 0.44$). A significantly higher proportion of children in the Guinea Savanna were underweight (18.4% vs. 8.8%; $p < 0.01$), although there were no between-zone differences in rate of wasting (3.2% vs. 4.0%; $p = 0.65$) or stunting (24.2% vs. 29.4%; $p = 0.25$). Locale was not related to chronic indicators of nutritional status. Effective nutrition intervention programs in Ghana need to understand the selective influence that geographic location may have on child nutrition.

Introduction

Approximately half of all child deaths in low-income countries can be attributed to malnutrition, either directly or indirectly through increased susceptibility to and severity of illness^{1,2}. In Sub-Saharan Africa, where almost half of the world's child deaths occur³, child malnutrition is a major concern. Finding appropriate solutions to this public health problem requires an understanding of the contributing factors for this region. Ghana is an agro-ecologically diverse country in West Africa. Food availability varies greatly within the country. The north experiences only one annual rainfall and hence only one harvest, compared to the rest of the country which has two rainfalls and harvests in a year⁴. Understanding the contribution of the ecological limitations of locale to child nutritional status in Ghana will help inform interventions and policy initiatives aimed at improving child health and well-being.

1. Pelletier et al. Bull World Health Org 1995. 73(4):443-448
2. Scrimshaw J Nutr 2003. 133: 316S-321S
3. UNICEF 2008. www.unicef.org/sowc08/docs/figure-1.5.pdf
4. GMSD 2002. www.meteo.gov.gh/climatology.html



Objectives

- To determine whether there are differences in nutritional status and proportion of children with malnutrition between two zones in Ghana
- To examine factors, other than locale, associated with child nutritional status in Ghana

Methods

This project was carried out in selected communities of an on-going intervention study (ENAM: Enhancing child nutrition through animal source food management in Africa).

Study sites. Data were collected in six communities in two distinct agro-ecological zones of Ghana (four in the northern Guinea Savanna and two in the mid-country Transitional zone).

Participants. 390 children aged 2-5 y and their primary caregivers. In the Guinea Savanna zone, every household with a child aged 2-5 y was approached for participation. In the Transitional zone, half the children were chosen from daycare center attendance lists, to which non-daycare center children were matched based on age from community censuses. No ENAM intervention households were included in the study.

Data collection. Interviewer-administered questionnaires were used to collect information on household demographics and child morbidity. Child height and weight were measured in duplicate and hemoglobin (Hb) levels were assessed using a photometer (HemoCue Inc, CA, USA).



Data analysis. WHO ANTHRO (2005) was used to calculate Z-scores. Student's t-test was used to compare between-zone differences in WAZ (weight-for-age Z-score), WHZ (weight-for-height Z-score), HAZ (height-for-age Z-score) and other normally distributed variables. Wilcoxon Mann Whitney test was used for non-parametric continuous data. Pearson chi-square test was used to examine differences in proportion of underweight (WAZ < -2SD), wasting (WHZ < -2SD), stunting (HAZ < -2SD) and anemia (Hb < 11g/dl). Multiple linear regression was used to identify determinants of WAZ, WHZ and HAZ. Systat version 10 (2000) was used for all statistical analyses.

Results

Child characteristics by zone

| Characteristic | Mid-country Transitional (n=199) ¹ | Northern Guinea Savanna (n=191) | p-value |
|--|---|---------------------------------|---------|
| | <i>mean ± SD</i> | | |
| Age (mo) | 40 ± 11 | 46 ± 10 | <0.001 |
| | <i>% (n)</i> | | |
| Female | 53.3 (106) | 49.7 (95) | 0.486 |
| Fever in past 2 wk | 33.0 (63) | 73.7 (140) | <0.001 |
| | <i>median</i> | | |
| Symptoms in past 2 wk (#) ² | 1 | 2 | <0.001 |

¹Minimum sample size was 378 for both groups

²Fever, cough, diarrhea and appetite loss

Children in the Guinea Savanna were older and their caregivers were more likely to report them having a fever and a higher number of illness symptoms in the past two weeks.



Household and caregiver characteristics by zone

| Characteristic | Mid-country Transitional (n=199) ¹ | Northern Guinea Savanna (n=191) | p-value |
|-----------------------------------|---|---------------------------------|---------|
| | <i>mean ± SD</i> | | |
| People in household (#) | 6.4 ± 2.7 | 6.2 ± 1.9 | 0.310 |
| | <i>% (n)</i> | | |
| Low wealth rank ² | 56.8 (113) | 44.7 (85) | 0.018 |
| Educated household head | 62.6 (124) | 33.7 (63) | <0.001 |
| Female household head | 8.0 (16) | 8.4 (16) | 0.904 |
| Caregiver marital status | | | 0.361 |
| Married | 76.9 (153) | 70.5 (134) | |
| Married (husband has other wives) | 17.1 (34) | 21.6 (41) | |
| Other ³ | 6.0 (12) | 7.9 (15) | |
| Caregiver earns money | 76.1 (150) | 37.2 (71) | <0.001 |

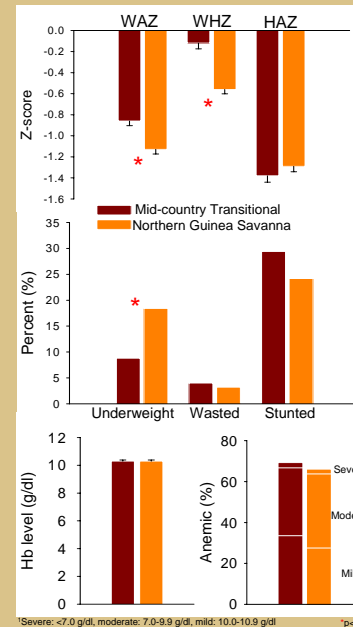
¹Minimum sample size was 385 for both groups

²Within-community wealth rankings were performed by community members

³Includes single, divorced, widowed and separated

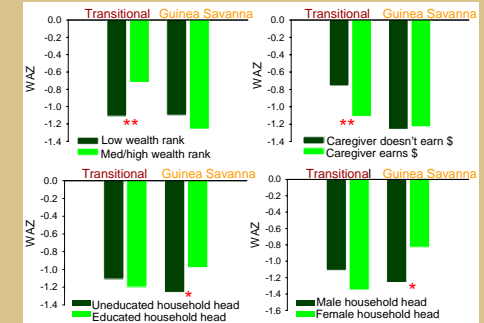
Transitional households were more likely to be low wealth rank and to have an educated household head. Caregivers in the Transitional zone were more likely to earn money.

Indicators of nutritional status by zone



Children in the northern Guinea Savanna had lower weight-related Z-scores and a higher proportion of underweight.

Results of WAZ multiple regression analysis by zone¹



¹WAZ regression was performed separately for each zone, because when pooled together, zone was the only significant determinant

$p < 0.05$ * $p < 0.01$

In the Transitional zone, low wealth rank and having a caregiver who earns money were associated with lower WAZ. In the Guinea Savanna zone, having an educated household head and female household head were both associated with higher WAZ.

WHZ multiple regression analysis (n=380, adj. R²=0.075, $p < 0.001$)

| Model | b | Std. error | p-value |
|---------------------|-------|------------|---------|
| Constant | 0.10 | 0.09 | 0.290 |
| Guinea Savanna zone | -0.39 | 0.10 | <0.001 |
| Female child | -0.24 | 0.10 | 0.014 |
| Fever in past 2 wk | -0.21 | 0.10 | 0.044 |

After controlling for sex of child and recent illness in multiple regression, locale remained an important determinant of WHZ.

After using multiple regression to control for significant determinants of HAZ (including sex and recent illness of child, wealth rank, household size and marital status of caregiver), locale was still not associated with HAZ.

Conclusions

Children in the northern Guinea Savanna zone of Ghana had lower weight-related Z-scores, and a higher prevalence of underweight than those in the Transitional zone

After controlling for other factors, locale remained an important determinant of weight-related Z-scores

High levels of child malnutrition should be addressed in Ghana and interventions focused in the north should pay special attention to investigating determinants of and reducing acute malnutrition

