

## Risk Factors for Malnutrition among Children 5-years and Younger in the Akuapim-North District in the Eastern Region of Ghana

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**Abstract:** Malnutrition remains a significant public health problem in developing countries. The aim of this study was to identify risk factors for malnutrition among preschool children in the Akuapim-North District in the Eastern Region of Ghana. This was a cross-sectional study. Mothers who brought their children to the “Well Baby Check-up” clinics were invited to participate. Anthropometric measurements (weight and height/length) and blood hemoglobin were measured. Mothers also completed a questionnaire consisting of closed and open-ended questions. A total of 305 pre-school-age children were included in this study. Of this sample, 43.3% were males, and 56.7% were females. The prevalence of wasting, stunting, and underweight was 6.2, 11.4 and 7.3%, respectively. The majority of the children (80.7%) were anemic. Children who were exclusively breastfed for 6 months showed slightly lower prevalence of both anemia (75.5% vs. 89.0%) and stunting (8% vs. 13%) but not wasting (8.3% vs. 4.3%) or underweight (8.3% vs. 5.2%) compared to their mixed feeding counterparts. Children under 12 months of age showed a higher prevalence of wasting (9.4%) compared to other age groups. Children from homes with electricity showed lower prevalence of stunting (9.7% vs. 17.6%,  $p = 0.050$ ), and children from households with a radio showed lower prevalence of wasting (5.3% vs. 19.0%,  $p = 0.033$ ). Nutrition education encouraging exclusive breastfeeding and adequate provision of animal protein to preschool children is important in semi-rural and farming communities in developing countries such as Ghana in order to combat the prevalence of childhood malnutrition (stunting, wasting, underweight and anemia).

**Key words:** Ghana, malnutrition, preschool children, stunting, wasting

### INTRODUCTION

Malnutrition continues to be a significant public health and development concern around the world with about one-third of the world's children malnourished. The World Health Organization estimates that approximately 150 to 200 million pre-school children (< 5-years) in developing countries are underweight and stunted, respectively. Interestingly, under 5 mortality is expected to increase in Sub-Saharan Africa where the prevalence of childhood malnutrition is about 41% compared to other regions of the developing world (Smith and Haddad, 2000; United Nations Children's Fund, 2000; United Nations, 2005). This current trend of malnutrition and under 5 mortality in Sub-Saharan Africa is far from that of the Millennium Development Goals (MDG) (United Nations, 2006). Malnutrition, especially micronutrient deficiency, adversely affects health, cognition, motor development, and general growth of children 5 years of

age and younger (Crawley, 2004). Malnutrition in early childhood is also associated with functional impairment in adult life, reduced work capacity, and decreased economic productivity of the individual (Schroeder and Brown, 1994; Mendez and Adair, 1999). Malnourished children have also been found to score lower on the Bayley Scales of Infant Development compared to their healthy counterparts (Keikhaei *et al.*, 2007).

Surprisingly, Ghana has not seen much improvement in childhood malnutrition and mortality even with the remarkable gains in health infrastructure and investment since independence. Gains in pre-school malnutrition in post-independence era were reversed at the turn of the 21<sup>st</sup> Century (Ghana Statistical Service, 2004). The past decade has witnessed an increasing trend of stunting but a slight decrease in underweight and wasting among children 5 years of age and younger in Ghana (Ghana Statistical Service, 2004; Shepherd *et al.*, 2006). The prevalence of childhood malnutrition is disproportional

according to region and socio-economic status of the family, as well as ecological zone with little known about children from semi-rural farming communities (Wagstaff and Watanabe, 2000; Hong, 2006). Previous studies have also linked childhood malnutrition with maternal education and employment, family support and social network (Frongillo *et al.*, 1997; Owor *et al.*, 2000; Reyes *et al.*, 2004). Others have also associated childhood malnutrition with a number of biomedical characteristics, such as birth interval (preceding and following each child birth), maternal age at child birth, child's age and gender (Vella *et al.*, 1992). It is therefore important to identify and understand factors that put children from rural or farming communities at a greater risk of malnutrition in early childhood compared to their urban counterparts.

The present study thus aims to identify factors contributing to malnutrition in children under age 5 in the Akwapim-North District in the Eastern Region of Ghana.

## MATERIALS AND METHODS

**Study design:** This was a cross-sectional study as part of needs assessment survey carried out in the Akwapim North District in the Eastern Region of Ghana. The study was conducted between June 2007 and August 2007. Subjects were mothers who brought their children to the "Well Baby Check-up" Clinics, organized by the Akwapim-North District Health Management Team (DHMT) on selected days of the week for the different towns in the district. Mothers of children 5 years of age or younger were eligible for participation and were recruited after they consented to participate in the study. The study was approved by the Institutional Review Board of the University of Georgia and the authorities at the Akwapim-North District Health Management Team. Participants received \$2.50 cash incentive after completion of interview and measurements.

**Study setting:** Participants for the study were recruited from the Akwapim North District, located in the south-eastern part of the Eastern Region and is about 58 km from Accra, the capital city of Ghana. The District covers a land area of about 450 km<sup>2</sup>, representing 2.3% of the total area of the Eastern Region. It has an estimated population of 2,194,508 and 3.1% growth rate as of 2004 (Ghana Health Services, 2004). The district is comprised of 19 towns, with Akropong as the district capital with a population of 112,294. Subjects for the study were recruited from 6 towns within the district, namely Akropong, Adawso, Dawu, Mampong, Mamfe and Obosomase, through the DHMT.

**Data collection:** A questionnaire containing open- and closed-ended questions was developed from instruments used in Ghana as part of the national census data

collection. The questionnaire was used to obtain information on socio-demographic (e.g. age, marital status, years of formal schooling, employment, parity, ethnicity and religion), biomedical (e.g. gestational age, delivery type, antenatal care, place of delivery, attendant at delivery), and socio-economic factors; infant and child feeding practices (e.g. time of initiation of breastfeeding and complementary feeding, colostrum feeding, reasons for not continuing breast feeding if the child was not being breast fed and frequency of breast feeding and types of weaning foods given (if any) in 24 h prior to the interview); reproductive health; protective behavior; and food habits and health care practices. Interviews were conducted by trained bilingual interviewers who were familiar with the study towns and the district as a whole. For the benefit of the participants, interviews were conducted in English or one of the local dialects ('Twi') based on the participant's language choice. Each interview session lasted between 30 and 45 min.

To assess nutritional status and physical growth of the children, we measured blood hemoglobin levels using HemoCue Hb 201<sup>+</sup>, and height/length and weight using calibrated stadiometer/infantometer and weighing scale, respectively. Blood hemoglobin levels were classified as normal or anemic using the WHO cut-off points. Height/length and weight measurements were converted to standardized values (z-scores); height-for-age (stunting [HAZ]), weight-for-age (underweight [WAZ]) and weight-for-height (wasting [WHZ]) using the WHO Anthro software and macros (World Health Organization, 2006). We used haz, waz and whz in this study in order to evaluate the different spectra of malnutrition among these children according to the WHO recommendations (Dibley *et al.*, 1987; World Health Organization Multicentre Growth Reference Study Group, 2006).

**Statistical analysis:** The World Health Organization guidelines and cut off points were used to assess the degree of wasting, stunting and underweight, determined respectively by WHZ, HAZ and WAZ minus two standard deviations or below (<-2 SD). Data analysis was done using the WHO Anthro version 3.0.1 and the SPSS for windows version 17.0 software programs. Data is reported as proportions and rates. Pearson Chi-squared test was used to compare the association between the independent variables and outcome variables (indicators of wasting, stunting and underweight). Criterion for statistical significance was set at  $p \leq 0.05$ .

## RESULTS

**Characteristics of children:** A total of 305 pre-school children from six different communities within the Akwapim-North District of the Eastern Region of Ghana were studied. Participants consisted of 132 (43.3%) males

versus 173 (56.7%) females. The average age of the participating children was  $13.31 \pm 12.67$  months with males ( $14.57 \pm 13.84$  months) being slightly older than their female ( $12.35 \pm 11.66$  months) counterparts. Overall, the prevalence of wasting, stunting and underweight was 6.2, 11.4 and 7.3%, respectively. There were disparities of malnutrition by gender with males having higher prevalence, although the differences were not statistically significant ( $p > 0.05$ ). The prevalence of wasting, stunting and underweight were 6.9% vs. 5.8%, 13.8% vs. 9.8%, and 9.2% vs. 5.8% for males and females, respectively. The mean blood hemoglobin level of the study children was  $9.38 \pm 2.27$  g.dL<sup>-1</sup> (range: 1.50 to 16.20 g.dL<sup>-1</sup>). The majority of the children (80.7%) were anemic with blood hemoglobin levels of less than 11.0 g.dL<sup>-1</sup>. There were differences in the proportion of anemic children by gender, although this was not statistically significant. Eighty-four point four percent (84.4%) of female compared to 76.0% of male children were anemic. By type of feeding received in the first 6 months of life, 75.5, 89.0 and 66.7% of children exclusively breastfed, mixed fed and formula fed, respectively, were anemic ( $p = 0.015$ ).

**Relationship between type of infant feeding, age and nutritional status:** For the type of feeding received during the first 6 months after delivery, 51.8% were exclusively breastfed, 37.5% were mixed fed (received both breastmilk and other foods) while the remaining 10.7% were exclusively formula fed. Type of infant feeding in the first 6 months postpartum did not differ by the gender of the child. Overall, the age adjusted nutritional status of the children was slightly better for those who were exclusively breastfed for the first 6 months compared to their counterparts who were either mixed fed or exclusively formula fed for the same period (Fig. 1). The prevalence of wasting was 8.3, 4.3 and 3.1% for children exclusively breastfed, mixed fed and formula fed for the first 6 months after birth, respectively, although the difference was not statistically significant. Children who were exclusively breastfed for the first 6 months after birth had lower prevalence rates of stunting than those either mixed fed or formula fed for the same period (Fig. 1). However, the prevalence of underweight was slightly lower among children mixed fed (5.2%) for the first 6 months compared to those exclusively breastfed (8.3%) and formula fed (9.4%).

Of the 170 children who were younger than 12 months of age, 16 (9.4%) were wasted, which was far higher than children in the other age categories (Fig. 2). The prevalence rates for stunting and underweight were highest for children between a year old and 3 years old (i.e., toddlers). Almost a quarter (23.8%) of children between 24 and 35 months were stunted, while the prevalence rate for stunting among the other age

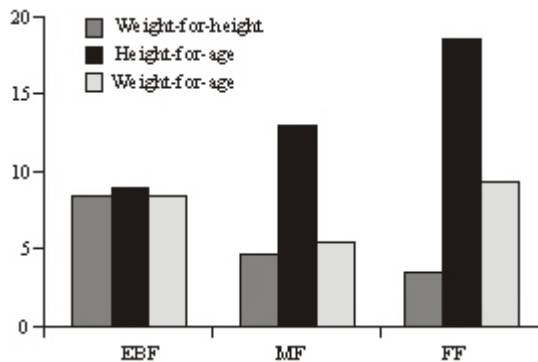


Fig. 1: Child nutritional status by type of infant feeding during the first 6 months postpartum

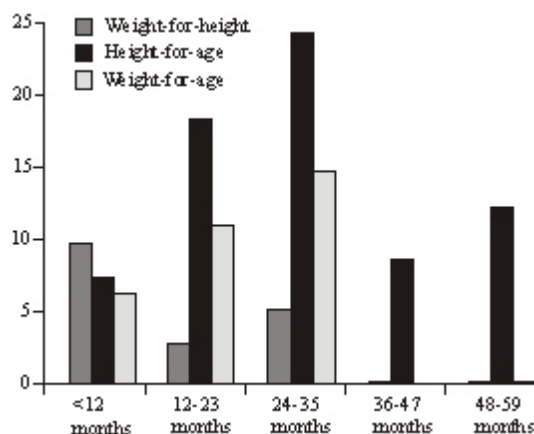


Fig. 2: Status of malnutrition in relation to age of index child

categories ranged between 7.1 to 17.9% ( $p = 0.043$ ). Although, the prevalence rate for underweight was again higher among children 24 to 35 months of age compared to those in the other age groups, the difference was not statistically significant (Fig. 2).

**Relationship between household possession and nutritional status:** As shown in Table 1, there was a trend in the association between selected household possessions and the nutritional status of the child with ownership of the selected items protecting against malnutrition. These possessions are proxy for the socioeconomic status of the household. Children from households that have access to electricity within the home, own a radio, television, and refrigerator and own their house had lower prevalence rates for all 3 measures of nutritional status. The prevalence of stunting was 9.7% among children from households with electricity compared to 17.6% of children from households without electricity ( $p = 0.050$ ). Prevalence of wasting was higher among children from households without a radio (19.0% versus 5.3%,  $p = 0.033$ ) or television (10.8% versus 3.9%,  $p = 0.021$ ) compared with those from households with

Table 1: Malnutrition status using Weight-for-Height Z-score (WHZ), Height-for-Age Z-score (HAZ) and Weight-for-Age Z-score (WAZ)

Nutritional status	WHZn (%)	HAZn (%)	WAZn (%)
Normal (> -2.00 SD)	286 (93.8)	270 (88.5)	283 (92.8)
Mild to moderately malnourished (-2.00 to -2.99 SD)	15 (4.9)	19 (6.2)	20 (6.6)
Severely malnourished ( $\leq$ -3.00 SD)	4 (1.3)	16 (5.2)	2 (0.7)

Table 2: Child nutritional status in relation to household possession

	Wasting (whz < -2.0) n (%)	Stunting (haz < -2.0) n (%)	Underweight (waz < -2.0) n (%)
Household access to electricity			
Yes	14 (5.9)	23 (9.7)***	16 (6.8)
No	5 (7.4)	12 (17.6)	6 (8.8)
Household own a radio			
Yes	15 (5.3)*	33 (11.6)	19 (6.7)
No	4 (19.0)	2 (9.5)	3 (14.3)
Household own a TV			
Yes	8 (3.9)**	22 (10.8)	11 (5.4)
No	11 (10.8)	13 (12.7)	11 (10.8)
Household own a fridge			
Yes	5 (3.2)	12 (7.6)	8 (5.1)
No	14 (9.5)	23 (15.6)	14 (9.5)
Household own or rent home			
Own	8 (4.8)	17 (10.1)	10 (6.0)
Rent	11 (8.0)	18 (13.1)	12 (8.8)

\*: p = 0.033; \*\*: p = 0.021; \*\*\*: p = 0.050

radio and television ownership (Table 2). An interesting finding from this study, which is out of trend, is that the prevalence of stunting of children from households that own a radio was slightly higher (11.6% versus 9.5%) than their counterparts from households that did not own a radio, although the difference was not statistically significant. The prevalence of underweight among children from households that own a television set was half (5.4% versus 10.8%) that of those from households without television.

## DISCUSSION

This study which was part of a needs assessment survey conducted in the Akuapim-North District of the Eastern Region of Ghana found the prevalence of malnutrition, namely wasting, stunting and underweight, similar to those reported for other districts of the region (Ghana News Agency, 2010). Although breastfeeding is the common infant feeding practice in the studied communities and Ghana as whole, the recommendation by WHO to exclusively breastfeed the infant for the first 6 months after delivery is not being followed by a portion of the mothers. In this part of the country, only 51.8% of the children were being exclusively breastfed for the first 6 months, which is lower than the country average of 63.0% (United Nations Children's Fund, 2009). It is important to mention that the observed rate of exclusive breastfeeding for the first six months of life in these communities and Ghana as whole is higher than those of the neighboring countries (Abidoye and Ihebuzor, 2001; Odunayo and Oyewole, 2006) and other developing countries (United Nations Children's Fund, 2009). With

the known benefits of breastfeeding, especially exclusive breastfeeding, it is important to intensify breastfeeding education and encourage mothers in the study communities, as well as other farming and low-income communities in Ghana, to practice exclusive breastfeeding.

The prevalence of stunting, an indication of chronic malnutrition, was higher compared to wasting and underweight in the study communities. This observation cuts across the type of feeding received during the first 6 months after delivery, as well as the age of the child. Although, the prevalence of stunting observed in the current study is lower than the regional average of 38.0% (Ghana News Agency, 2010) and national average of 29.6% (Hong, 2007), it is still a significant public health problem as the residents of the study communities are predominantly farmers. Being a farming community, it is expected that food production will be enough and accessible to the majority of the households, which will then translate into optimal nutritional status of the children. Observations and personal communication suggest that most of the food produced is transported to other market towns and Accra, which is the capital city of Ghana, to be sold, therefore limiting what is left for household consumption. Another important observation from the study communities is that the consumption of animal and other protein rich foods, especially among children, is very low, which could be a contributor to the high prevalence of stunting and anemia. It is also important to mention that persistent intestinal infection and malaria (Weinberg, 1977; Ministry of Health, 1998; Asibey-Berko *et al.*, 1999; Grantham-McGregor and Ani, 2001), as well as the limited consumption of animal-based

foods, may be contributing to the poor nutritional status of the children observed in this study.

Although the differences in the prevalence of malnutrition were not significant between the different feeding groups, children who were either mixed fed or formula fed for the first six months of life were disproportionately stunted. This is a confirmation of findings from a similar study conducted with Chilean children (Castillo *et al.*, 1995). In the Chilean study, children who were fed milk substitutes or formula during infancy were about 1.2 to 5 times more likely to be malnourished. Our finding is also in agreement with earlier studies suggesting early introduction of non-breastmilk foods is associated with malnutrition in children (Haider *et al.*, 1996; Davies-Adetugbo and Adetugbo, 1997; Abidoye and Ihebuzor, 2001). However, findings from the current study contradict findings from a Nigerian study (Odunayo and Oyewole, 2006). The findings from the study by Odunayo and Oyewole (2006) suggest that introduction of infant formula before 6 months of age is protective against stunting whereas introducing formula after age 6 months increases the risk for stunting by about 5 times (Odunayo and Oyewole, 2006). These differences in findings between studies may be due to how infant or child feeding was assessed, as well as other geographical factors.

Previous studies have shown socioeconomic inequalities in childhood malnutrition, especially in Sub-Saharan Africa (Van de Poel *et al.*, 2008). An interesting finding from our study is the association between household possession, an indicator of socioeconomic status, and under age 5 malnutrition. This not only confirms previous studies but also suggests that property owned by the family, as well as resources available to them, could influence the household's nutritional status. With mothers in the study communities being predominantly farmers and petty traders, they are out of the home at their various farms or trading during the daytime so access to electricity is very important during the evenings for community or public health meetings. Some of the non-governmental organizations operating in the area of maternal and child health are able to meet the community members during the evenings after their day's work to educate mothers on ways of improving the health and nutritional status of their children. Also, ownership of radio and television sets by the household was associated with the reduction of wasting by about 4 and 3 times respectively. These two media are avenues for Public Service Announcements (PSA) and educational tidbits by the Ghana Health Services and other public health organizations to reach mothers with healthy nutrition information. Although the child welfare clinics housed within the district health offices are doing a great job educating mothers on appropriate nutrition for children, most of the time the fathers are left out, as it is not a

cultural practice for fathers to accompany their wives to these clinic sessions. So radio and television are a means for reaching these fathers through PSAs or local drama sketches on appropriate child feeding to gain both the interest and support of fathers to ensure children receive optimum nutrition.

In summary, attention needs to be given to infant/child feeding practices, maternal empowerment, and community resources to ensure optimal childhood nutrition. These can be achieved if the rules underpinning the right to food are adhered to, with all stakeholders playing their roles efficiently. The children are the future of a nation and the entire world. Early inadequate nutrition and the resulting malnutrition have significant negative impact on the future productivity of these individuals and the country as a whole. There is the need to encourage feeding animal protein and other nutrient dense foods to children in these areas. It is very important for public health interventions, such as nutrition education, appropriate child feeding and care practices, to be taken out of the clinics and placed into the communities and the homes of these underserved audiences for the maximum benefit. Also, it is very important for donor organizations to deal directly with these communities and households and avoid dealing with governments and the health ministries of developing countries in order to limit the bureaucracy and corruption that hinder these aids from reaching those that need them most.

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