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Immediate Risk Factor Associated with Child Malnutrition in Ghana; A Critical Analysis of the Ashiedu Keteke Sub-Metro Area in Accra

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Abstract This study investigates malnutrition and its associated risk factors among children under six years within the Ashiedu Keteke sub metro area of Accra. It seeks to determine immediate factors contributing to malnutrition in and around the study area. Specific immediate factors studied include breastfeeding practices and some selected disease. We found more males were malnourished than females. We found 54.0% of children that did not complete their immunization program still sufficiently nourished. With Pearson's chi-square values of $p < 0.001$, $p < 0.000$ and $p < 0.001$ for Wasting, Stunting and Underweight respectively, and with 74.7% of children who completed their immunization found to be well nourished, we conclude that immunization practices significantly reduces the incidence of child malnutrition moderately (Phi = 0.277). Sickle, Pneumonia, Sepsis, diarrhoea, fever and meningitis were all found not to be significant contributors to child malnutrition. We again conclude that over 53.9% of children with birth weight below 2.5kg were actually malnourished. We therefore recommend that, interventions directed to parents or caregivers, should include; nutrition counselling on feeding and care practices, the use of locally available food, improved access to quality foods through grants, the distribution of micronutrients and macronutrient supplementation.

Keywords Malnutrition, Micronutrients, Pneumonia, Immunization, Caregiver

1. Introduction

All over the world, malnutrition is a risk factor for illness and death. Millions of pregnant women and young children are affected due to infections, poor and inadequate diet. According to Müller and Krawinkel, malnutrition has the ability to increase the risk and worsens the severity of infections (Müller and Krawinkel, 2005). Torún and Chew also asserts that infants and young children are most affected by malnutrition as they have increased nutritional needs to support growth (Torún and Chew, 1994; Torún, 2006). Undernourished children, as well as children with severe malnutrition, have a higher risk of dying than children with an optimal nutritional status (Caulfield *et al*., 2004).

Literature on child malnutrition suggests that except for sub-Saharan Africa, the nutritional status of children is improving globally. From the account of Duggan and Golden, the expected progress is hindered by poverty, infection and ineffective governance (Duggan and Golden, 2005). Even though global data shows a decrease in under nutrition, the malnutrition statistics for Eastern Africa are increasing (Cartmell *et al*., 2005).

Prevalence of undernourishment in Ghana was last measured at 5% in 2010, according to the World health organization (WHO, 2010). Population below minimum level of dietary energy consumption (also referred to as prevalence of undernourishment) shows the percentage of the population whose food intake is insufficient to meet dietary energy requirements continuously. There is not enough information available on the prevalence of severe or oedematous malnutrition in communities. The data available from hospitals only shows the severe cases, hence, malnutrition in general is not always recorded because in most cases it is the secondary diagnosis (Duggan and Golden, 2005).

Cartmell *et al*. (2005) found that in the Central Hospital of Maputo the occurrence of malnutrition in the presence of infections, excluding measles, was greater in 2001 than in 1983. More children had marasmus than kwashiorkor in 2001. Possible explanations for this occurrence was attributed to the increase in HIV infection; with marasmic

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malnutrition occurring more commonly in HIV infected children in South Africa, Maputo and Malawi (Cartmell *etal.,* 2005).

Literature on child malnutrition abounds. However, despite the work done in malnutrition and the reduced prevalence of stunting and underweight in some regions, the number of cases hasn't changed over the last 10 years (Zere and McIntyre, 2003; Müller and Krawinkel, 2005) with about 30 percent of all children in low- and middle-income countries being underweight (Mother and child nutrition, 2007). Malnutrition therefore is and will continue to be a health threat to developing countries.

This study investigates malnutrition and its associated risk factors among children under six years within the Ashiedu Keteke sub metro area of Accra. It seeks to determine immediate factors contributing to malnutrition in and around the study area. Specific immediate factors studied include breastfeeding practices, weaning, dietary intake and disease.

2. Method

2.1. The Study Setting

Princess Marie Louise hospital is a Ghana health service healthcare institution located in Accra, within the Ashiedu Keteke sub metro of the Greater Accra region that provides medical care services, pursues diseases control and offers reproductive and child health (RCH), family planning (FP) and nutrition services. Ashiedu Keteke Sub-Metropolitan District Council is the smallest among the eleven Sub-Metropolitan Districts of Accra with a population of about 250,000 people (GSS, Census 2010). It was established by Legislative Instrument 1722. It consists of three electoral areas - Kinka, Ngleshie and KorleWokon.

Currently, the hospital has a total of 265 staff with 6 permanent doctors and 81 nurses .The medical service of PML consists of 74 beds, an out-patient Department (OPD), Emergency ward, Laboratory unit/blood bank, X-Ray Unit, Dietetics and Environment Health Unit, Mothers' Hostel, Disease Control Unit, Family Planning and Reproductive and Child Health (RCH) units, among others.

2.2. The Study Design

The main focus of this study is to determine the immediate factors contributing to malnutrition in the Accra, precisely the Ashiedu keteke sub-metro where the PLM children's hospital in located. Data was collected with the help of a structured questionnaire. The questionnaire helped us to gather information regarding background information on mother and child to enable us determine the associations between variables under investigation.

The sampling methods consisted of a convenience sample of all children 0-60 months, admitted to paediatric wards / infant care of the PLM children's hospital, between January and February 2015. In all 163 children with their caregivers were sampled and studied. The inclusion criteria used in selecting the sample include:

1. All children 0-60 months who visited the paediatric or infant care units, whose mother/ caregiver was present.
2. All children 0-60 months with a mother / caregiver present that agreed to the verbal consent.

For the purpose of this study immediate factors contributing to malnutrition include the following: Breastfeeding and other feeding practices where exclusive breastfeeding and partial breastfeeding are classified as follows: **Exclusive breastfeeding**: where an infant receives only breast milk and no other liquids or solids, not even water, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicines (Bland, 2007). **Partial breastfeeding**: where an infant receives some breastfeeds and some artificial feeds, either milk or cereal, or any other food (Bland, 2007). Other immediate factors studied include dietary intake and some selected diseases.

The following standardized measurements was used as recommended by Gibson (2005): Weight, Height.

- Weight: Older children (above 24 months) were measured using a digital electronic scale, accurate to the nearest 0.1kg. All participants were weighed without shoes and with light clothing on and where possible before a meal and with an empty bladder. The scale was placed on a hard level surface; child stands in the middle and kept still until the measurement was taken (Gibson, 2005).
- Children below 24 months were weighed with an infant scale. The child was naked or ware minimal clothing during weighing. The child is then placed on the scale so that the weight was distributed evenly. The measurement would then be taken to the nearest 10g.
- Height / Length: children were required to remove their shoes, stand with their heels touching the back of the height measure, legs straight, arms alongside the body, shoulders relaxed and looked straight ahead with their chin level with the ground (Gibson, 2005).
- Length of children below 24 months would be measured from the crown to the heel using a paediatric measuring board to the nearest 0.1cm. The measurement would be taken only if the head is level with the headboard and the end of the measuring mat or board is against a flexed heal. The measurement would be taken at eyelevel (Gibson, 2005).

3. Results and Discussion

A total of 163 responses were sought through an in-depth interview with the respondents chosen by a non-probability convenient sampling with specific interest on caregivers with children between six months to five years.

In all, 90 out of the total 163 children studied were males representing 55.2% of total respondents while 73 out of the total 163 children studied were females representing 44.8% of the total respondents. Table 3.1 gives a tabular breakdown

of the demographic characteristics of Children and caregivers. From the table 3.1, the majority of parents (mothers and fathers) are appreciably educated to the extent that they can read and write. 116 (representing 71.2%) of the father of the surveyed children could read and write whereas 90 of the mothers (representing 55.2%) could also read and write. However, 47 of the fathers (representing 28.8%) and 73 of the mothers (representing 44.8%), could not read and write. Hence, the majority of illiterate caregivers were mothers.

Table 3.1. Demographic characteristics of Children and caregivers

Child's gender			
		Frequency	Percent
Valid	male	90	55.2
	female	73	44.8
	Total	**163**	**100.0**
Education of father			
		Frequency	Percent
Valid	can read and write	116	71.2
	cannot read and write	47	28.8
	Total	**163**	**100.0**
Education of mother			
		Frequency	Percent
Valid	can read and write	90	55.2
	cannot read and write	73	44.8
	Total	**163**	**100.0**
Marital status			
		Frequency	Percent
Valid	married	101	62.0
	not married	25	15.3
	divorced	1	.6
	separated	4	2.5
	consensual union	32	19.6
	Total	**163**	**100.0**

The marital status of the caregivers were also accessed. The majority of caregivers were married. 101 of them, representing 62.0% of caregivers were married. This is followed by 32 of them representing 19.6% of caregivers living together as though they were married but are not recognised by any of the known and accepted forms of marriage. Such are classified as being in a consensual union. 25 (15.3%) of them were never married, 4 (2.5%) of them were separated with 1 (0.6%) of them being divorced.

Household characteristics considered in this study included household size and number of children born to the caregiver. This is presented in table 3.2 below. From the table 3.2, the majority of households 95 (58.3%) out of 163 households were of size between 4 to 6 members. About 45 (27.6%) of them had household size being less than 3 members whereas 23 (14.1%) of them had more than 6 members in their households.

Table 3.2. Household characteristics of Children and caregivers

Household size			
		Frequency	Percent
Valid	<3 members	45	27.6
	between 4-6	95	58.3
	>6 members	23	14.1
	Total	**163**	**100.0**
Number of children			
		Frequency	Percent
Valid	1	50	30.7
	2	46	28.2
	3	46	28.2
	4	14	8.6
	5	3	1.8
	6	3	1.8
	7	1	.6
	Total	**163**	**100.0**

The majority of the children who participated in this study were the only children of their caregivers. 50 of them representing 30.7% of caregivers had only 1 child as at the time of this survey. This is followed closely by caregivers with 2 and 3 kids constituting 28.2% each.

3.1. Immediate Factors Contributing to Malnutrition

Immunization practices, diseases and infections like diarrhoea, fever, pneumonia, sepsis, meningitis, and sickle cell were considered to be immediate factors contributing to malnutrition together with breastfeeding practices, exclusive breastfeed and birth weight. The results obtained on them after rigorous analysis is as presented in tables 3.3, 3.4 and 3.5, respectively.

3.1.1. Immunization Practices

Immunization practices was the first to be considered by this study and results are seen in table 3.3 below. Our study found that, of the total 163 children, only 75 (representing 46.0%) completed their immunization dose with the remaining 88 (representing 54.0%) failing to complete theirs. According to James *et al*., (1999) there is a need for improved public health services and improved immunization and growth monitoring programmes. Ayaya *et al.* (2004) found that incomplete immunizations were a risk factor for the development of malnutrition and Iqbal *et al*. (1999)

found that incomplete Bacille Calmette-Guerin (BCG) vaccination against tuberculosis (TB) increased the risk for the development of severe protein energy malnutrition (PEM) in Bangladesh.

It is also observed that an appreciable percentage of children who completed their immunization were still found to be either stunting, underweight or wasting. For instance, 19, 35 and 19 of the total 75 children who completed their immunization were still found to be stunting, underweight and wasting, respectively. Surprisingly, an appreciable percentage of children who failed to complete their immunization were still found to be normal. For instance, 41, 24 and 43 of the total 88 children who failed to complete their immunization were found not to be neither stunting, underweight nor wasting, respectively. The education and promotion of important vaccinations can reduce the occurrence of PEM (Iqbal Hossain *et al*., 1999).

Table 3.3. Immediate factors affecting Malnutrition --1

			H/A-Stunting		Total	W/A-Underweight		Total	W/H-Wasting		Total
			Normal	Stunting		Normal	Underweight		Normal	Wasting	
immunization practice	complete	Count	56	19	75	40	35	75	56	19	75
		% within	57.7%	29.2%	46.3%	62.5%	35.4%	46.0%	56.6%	29.7%	46.0%
	incomplete	Count	41	46	87	24	64	88	43	45	88
		% within	42.3%	70.8%	53.7%	37.5%	64.6%	54.0%	43.4%	70.3%	54.0%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Sickle cell	Not diagnosed	Count	83	62	145	54	92	146	86	60	146
		% within	85.6%	95.4%	89.5%	84.4%	92.9%	89.6%	86.9%	93.8%	89.6%
	Diagnosed	Count	14	3	17	10	7	17	13	4	17
		% within	14.4%	4.6%	10.5%	15.6%	7.1%	10.4%	13.1%	6.3%	10.4%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Pneumonia	Not diagnosed	Count	88	58	146	58	89	147	90	57	147
		% within	90.7%	89.2%	90.1%	90.6%	89.9%	90.2%	90.9%	89.1%	90.2%
	Diagnosed	Count	9	7	16	6	10	16	9	7	16
		% within	9.3%	10.8%	9.9%	9.4%	10.1%	9.8%	9.1%	10.9%	9.8%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Sepsis	Not diagnosed	Count	90	60	150	61	90	151	91	60	151
		% within	92.8%	92.3%	92.6%	95.3%	90.9%	92.6%	91.9%	93.8%	92.6%
	Diagnosed	Count	7	5	12	3	9	12	8	4	12
		% within	7.2%	7.7%	7.4%	4.7%	9.1%	7.4%	8.1%	6.3%	7.4%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Meningitis	Not diagnosed	Count	97	64	161	64	98	162	99	63	162
		% within	100.0%	98.5%	99.4%	100.0%	99.0%	99.4%	100.0%	98.4%	99.4%
	Diagnosed	Count	0	1	1	0	1	1	0	1	1
		% within	0.0%	1.5%	.6%	0.0%	1.0%	.6%	0.0%	1.6%	.6%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

3.1.2. Diseases and Infections

Most deaths of children 6-59 months old are related to malnutrition and infection (Torún, 2006, p.882). Caulfield *et al.* (2004) found that the principal causes of deaths in young children globally in 2004 were: diarrhoea (60,7%), pneumonia (52,3%), measles (44,8%) and malaria (57,3%). All of these can also worsen malnutrition. Some additional causes associated with child mortality were found by Müller and Krawinkel (2005) and UNICEF (2009, p. 12) and include perinatal causes, acute respiratory infections and others.

Our study found that, of the total 163 children, only 17 (representing 10.4%) were actually diagnosed of sickle cell with the remaining 146 (representing 89.6%) being found not to be sickle. It is also observed that, a large percentage of children who were found not to be sickle were either stunting, underweight or wasting. For instance, 62, 92 and 60 of the total 146 children who were found not to be sickle were still found to be stunting, underweight and wasting respectively. Surprisingly, an appreciable percentage of children who were actually diagnosed of sickle cell were found to be normal. For instance, 14, 10 and 13 of the total 17 children who were diagnosed with sickle cell were found not to be neither stunting, underweight nor wasting respectively.

On pneumonia, our study found that, of the total 163 children, only 16 (representing 9.8%) were actually diagnosed of pneumonia with the remaining 147 (representing 90.2%) being found not to be with pneumonia. It is also observed that, a large percentage of children who were found not to be pneumonia were either stunting, underweight or wasting. For instance, 58, 89 and 57 of the total 147 children who were found not to be with pneumonia were still found to be stunting, underweight and wasting respectively. Surprisingly, an appreciable percentage of children who were actually diagnosed of pneumonia were found to be normal. For instance, 9, 6 and 9 of the total 16 children who were diagnosed with pneumonia were found not to be neither stunting, underweight nor wasting respectively.

Also on Sepsis, our study found that, of the total 163 children, only 12 (representing 7.4%) were actually diagnosed of sepsis with the remaining 151 (representing 92.6%) being found not to be with sepsis. It is also observed that, a large percentage of children who were found not to be with sepsis were either stunting, underweight or wasting. For instance, 60, 90 and 60 of the total 151 children who were found not to be with sepsis were still found to be stunting, underweight and wasting respectively. Surprisingly, an appreciable percentage of children who were actually diagnosed of sepsis were found to be well nourished. For instance, 7, 3 and 8 of the total 12 children who were diagnosed with sepsis were found not to be either stunting, underweight or wasting respectively.

Finally on Meningitis, our study found that, of the total 163 children, only 1 (representing 0.6%) was actually diagnosed of Meningitis with the remaining 162 (representing 99.4%) being found not to be with Meningitis. It is also observed that, a large percentage of children who were found not to be with Meningitis were either stunting, underweight or wasting. For instance, 64, 98 and 63 of the total 162 children who were found not to be with Meningitis were still found to be stunting, underweight and wasting respectively. The only one child who was actually diagnosed with Meningitis was found to be severely malnourished.

3.1.3. Breastfeeding Practices

Even though diarrhoea causes about 30-50% of deaths in developing countries, the risk of death due to persistent diarrhoea is related to a lack of breastfeeding, systemic infections, malnutrition and young age (Ochoa *et al.,* 2004). From table 3.5 below, we sort to find out whether mother started breastfeeding the child immediately after birth, and did exclusive breast feeding. Insufficient dietary intake may refer to poor breastfeeding practices, early weaning, delayed introduction of complementary foods and insufficient protein in the diet. The inadequate intake can also be linked to neglect and abuse (UNICEF, 2004; Williams, 2005, p.405).

We found that, of the total 163 children, 106 (representing 65.0%) mothers started breastfeeding the child immediately after birth while 73 (representing 44.8%) completed exclusive breast feeding. This translates to the fact that, 57 (representing 35.0%) mothers failed to start breastfeeding the child immediately after birth with 90 (representing 55.2%) of them failing to take their children through exclusive breast feeding.

It is also observed that, of the 106 children whose mothers started breastfeeding them immediately after birth, 38, 61 and 35 were found to be stunting, underweight and wasting respectively. Also, 27, 38 and 29 of the total 57 children whose mothers failed to start breastfeeding the child immediately after birth were either stunting, underweight or wasting respectively.

Similarly, it is also observed that, of the 90 children whose mothers failed to take their children through exclusive breast feeding, 39, 55 and 39 were found to be stunting, underweight and wasting respectively. Whereas 26, 44 and 25 of the total 72 children who went through the exclusive breastfeeding were either stunting, underweight or wasting respectively.

Inadequate dietary intake and poor nutritional status go hand in hand. It is uncommon for well-nourished children to die from diarrhoea, therefore maintaining a good nutritional status can help with the improvement of child survival (Jackson *et al*., 2006).

Globally, the practice of breastfeeding is declining (Torún and Chew, 1994). When exclusive breastfeeding is not practiced it can contribute to a high prevalence of malnutrition. In addition, inadequate weaning practices and poor infant feeding practices lead to low protein and energy intake (Torún and Chew, 1994). On the other hand, babies are sometimes weaned too early because of another birth,

causing the mother to cease breastfeeding of the first baby. Babies are then often weaned on a thin cereal with low quality protein, causing the older child to become ill when the new baby arrives.

It is also observed that, of the 101 children having birth weight above 2.5kg, 29, 55 and 31 were surprisingly found to be stunting, underweight and wasting respectively. This means that over 28.7% of children with birth weight above 2.5kg were found to be malnourished. Also, 23, 27 and 21 of the 39 children with had birthweights below 2.5kg, were either stunting, underweight or wasting respectively. This means that over 53.9% of children with birth weight below 2.5kg were actually malnourished.

Table 3.4. Immediate factors affecting Malnutrition --2

			H/A-Stunting		Total	W/A-Underweight		Total	W/H-Wasting		Total
			Normal	Stunting		Normal	Underweight		Normal	Wasting	
Has your child suffered diarrhoea in the last two to four weeks	yes	Count	20	26	46	14	32	46	18	28	46
		% within	20.6%	40.0%	28.4%	21.9%	32.3%	28.2%	18.2%	43.8%	28.2%
	no	Count	77	39	116	50	67	117	81	36	117
		% within	79.4%	60.0%	71.6%	78.1%	67.7%	71.8%	81.8%	56.3%	71.8%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Has your child suffered fever in the last two weeks	yes	Count	43	41	84	26	58	84	42	42	84
		% within	44.3%	63.1%	51.9%	40.6%	58.6%	51.5%	42.4%	65.6%	51.5%
	no	Count	54	24	78	38	41	79	57	22	79
		% within	55.7%	36.9%	48.1%	59.4%	41.4%	48.5%	57.6%	34.4%	48.5%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 3.5. Immediate factors affecting Malnutrition --3

			H/A-Stunting		Total	W/A-Underweight		Total	W/H-Wasting		Total
			Normal	Stunting		Normal	Underweight		Normal	Wasting	
Did you start breastfeeding immediately after birth	yes	Count	67	38	105	45	61	106	71	35	106
		% within	69.1%	58.5%	64.8%	70.3%	61.6%	65.0%	71.7%	54.7%	65.0%
	no	Count	30	27	57	19	38	57	28	29	57
		% within	30.9%	41.5%	35.2%	29.7%	38.4%	35.0%	28.3%	45.3%	35.0%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exclusive breast feeding practices	yes	Count	46	26	72	29	44	73	48	25	73
		% within	47.4%	40.0%	44.4%	45.3%	44.4%	44.8%	48.5%	39.1%	44.8%
	no	Count	51	39	90	35	55	90	51	39	90
		% within	52.6%	60.0%	55.6%	54.7%	55.6%	55.2%	51.5%	60.9%	55.2%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Birth weight	<2.5	Count	16	23	39	12	27	39	18	21	39
		% within	16.5%	35.4%	24.1%	18.8%	27.3%	23.9%	18.2%	32.8%	23.9%
	>2.5	Count	71	29	100	46	55	101	70	31	101
		% within	73.2%	44.6%	61.7%	71.9%	55.6%	62.0%	70.7%	48.4%	62.0%
	dont know	Count	10	13	23	6	17	23	11	12	23
		% within	10.3%	20.0%	14.2%	9.4%	17.2%	14.1%	11.1%	18.8%	14.1%
Total		Count	97	65	162	64	99	163	99	64	163
		% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

4. Conclusions

More males were malnourished than females. With 74.7% of children who completed their immunization found to be normal, we conclude that immunization practices significantly reduces the incidence of child malnutrition moderately. Again, Sickle, Pneumonia, Sepsis, diarrhoea, fever and meningitis were all found to affect malnutrition badly. We again conclude that, over 53.9% of children with birth weight below 2.5kg were actually malnourished.

We therefore recommend that, Decisions regarding nutrition related issues should be based on effective collection of data, monitoring and evaluation. International data is, however, also important for guiding national policies and programmes. If no data is available on important interventions, countries will never know if the coverage excludes those that are really in need of programme. Currently availability of reliable data is still a challenge. Infant feeding should not only be the responsibility of the mother. Programmes should address support and approval of the male partner and the maternal grandmother.

Interventions directed to parents or caregivers, should include nutrition counselling on feeding and care practices, the use of locally available food, improved access to quality foods through grants, the distribution of micronutrients and macronutrient supplementation.

Supplementary Tables for Significant Tests for Associations

NOTE: Phi and Cramer's V are both tests of the strength of association. It ranges from weak association (0.00) through moderate association (0.2-0.5) then to strong association (0.6 – 1.0).

Table 3.6. Chi-square test results for association between diseases and child malnutrition (wasting)

MALNUTRITION	**ITEM**	**Text**	**Criterion**	**Value**	**Asymp. Sig. (2-sided)**
WASTING	Immunization practice	**Chi-Square Tests**	**Pearson Chi-Square**	**11.305**	**.001**
		Symmetric Measures (Nominal by Nominal)	Phi	.263	.001
			Cramer's V	.263	.001
	Sickle cell	**Chi-Square Tests**	**Pearson Chi-Square**	**1.97**	**.160**
		Symmetric Measures (Nominal by Nominal)	Phi	-.110	.160
			Cramer's V	.110	.160
	Pneumonia	**Chi-Square Tests**	**Pearson Chi-Square**	**0.15**	**.699**
		Symmetric Measures (Nominal by Nominal)	Phi	.030	.699
			Cramer's V	.030	.699
	Sepsis	**Chi-Square Tests**	**Pearson Chi-Square**	**0.191**	**.662**
		Symmetric Measures (Nominal by Nominal)	Phi	-.034	.662
			Cramer's V	.034	.662
	Meningitis	**Chi-Square Tests**	**Pearson Chi-Square**	**1.556**	**.212**
		Symmetric Measures (Nominal by Nominal)	Phi	.089	.212
			Cramer's V	.089	.212

Table 3.7. Chi-square test results for association between diseases and child malnutrition (stunting)

MALNUTRITION	**ITEM**	**Text**	**Criterion**	**Value**	**Asymp. Sig. (2-sided)**
STUNTING	Immunization practice	**Chi-Square Tests**	**Pearson Chi-Square**	**12.716**	**.000**
		Symmetric Measures (Nominal by Nominal)	Phi	.280	.000
			Cramer's V	.280	.000
	Sickle cell	**Chi-Square Tests**	**Pearson Chi-Square**	**3.994**	**.046**
		Symmetric Measures (Nominal by Nominal)	Phi	-0.157	.046
			Cramer's V	.157	.046
	Pneumonia	**Chi-Square Tests**	**Pearson Chi-Square**	**0.097**	**.755**
		Symmetric Measures (Nominal by Nominal)	Phi	.024	.755
			Cramer's V	.024	.755
	Sepsis	**Chi-Square Tests**	**Pearson Chi-Square**	**0.013**	**.910**
		Symmetric Measures (Nominal by Nominal)	Phi	.009	.910
			Cramer's V	.009	.910
	Meningitis	**Chi-Square Tests**	**Pearson Chi-Square**	**1.502**	**.220**
		Symmetric Measures (Nominal by Nominal)	Phi	.096	.220
			Cramer's V	.096	.220

Table 3.8. Chi-square test results for association between diseases and child malnutrition (underweight)

MALNUTRITION	**ITEM**	**Text**	**Criterion**	**Value**	**Asymp. Sig. (2-sided)**
UNDERWEIGHT	Immunization practice	**Chi-Square Tests**	**Pearson Chi-Square**	**11.531**	**.001**
		Symmetric Measures (Nominal by Nominal)	Phi	.266	.001
			Cramer's V	.266	.001
	Sickle cell	**Chi-Square Tests**	**Pearson Chi-Square**	**3.045**	**.081**
		Symmetric Measures (Nominal by Nominal)	Phi	-.137	.081
			Cramer's V	.137	.081
	Pneumonia	**Chi-Square Tests**	**Pearson Chi-Square**	**0.023**	**.879**
		Symmetric Measures (Nominal by Nominal)	Phi	.012	.879
			Cramer's V	.012	.879
	Sepsis	**Chi-Square Tests**	**Pearson Chi-Square**	**1.105**	**.293**
		Symmetric Measures (Nominal by Nominal)	Phi	.082	.293
			Cramer's V	.082	.293
	Meningitis	**Chi-Square Tests**	**Pearson Chi-Square**	**0.65**	**.420**
		Symmetric Measures (Nominal by Nominal)	Phi	.063	.420
			Cramer's V	.063	.420

Table 3.9. Chi-square test results for association between diseases (diarrhoea & fever) and child malnutrition

MALNUTRITION	ITEM	Text	Criterion	Value	Asymp. Sig. (2-sided)
WASTING	Has your child suffered diarrhoea in the last two to four weeks	**Chi-Square Tests**	**Pearson Chi-Square**	**12.545[a]**	**.000**
		Symmetric Measures (Nominal by Nominal)	Phi	-.277	.000
			Cramer's V	.277	.000
	Has your child suffered fever in the last two weeks	**Chi-Square Tests**	**Pearson Chi-Square**	**8.377**	**.004**
		Symmetric Measures (Nominal by Nominal)	Phi	-.227	.004
			Cramer's V	.227	.004
STUNTING	Has your child suffered diarrhoea in the last two to four weeks	**Chi-Square Tests**	**Pearson Chi-Square**	**7.19**	**.007**
		Symmetric Measures (Nominal by Nominal)	Phi	-.211	.007
			Cramer's V	.211	.007
	Has your child suffered fever in the last two weeks	**Chi-Square Tests**	**Pearson Chi-Square**	**5.479**	**.019**
		Symmetric Measures (Nominal by Nominal)	Phi	-.184	.019
			Cramer's V	.184	.019
UNDERWEIGHT	Has your child suffered diarrhoea in the last two to four weeks	**Chi-Square Tests**	**Pearson Chi-Square**	**2.095**	**.148**
		Symmetric Measures (Nominal by Nominal)	Phi	-.113	.148
			Cramer's V	.113	.148
	Has your child suffered fever in the last two weeks	**Chi-Square Tests**	**Pearson Chi-Square**	**5.021**	**.025**
		Symmetric Measures (Nominal by Nominal)	Phi	-.176	.025
			Cramer's V	.176	.025

Table 3.10. Chi-square test results for association between diseases (breastfeeding practices & birth weight) and child malnutrition

MALNUTRITION	ITEM	Text	Criterion	Value	Asymp. Sig. (2-sided)
WASTING	Did you start breastfeeding immediately after birth	**Chi-Square Tests**	**Pearson Chi-Square**	**4.957**	**.026**
		Symmetric Measures (Nominal by Nominal)	Phi	.174	.026
			Cramer's V	.174	.026
	Exclusive breast feeding practices	**Chi-Square Tests**	**Pearson Chi-Square**	**1.396**	**.237**
		Symmetric Measures (Nominal by Nominal)	Phi	.093	.237
			Cramer's V	.093	.237
	Birth weight	**Chi-Square Tests**	**Pearson Chi-Square**	**8.196**	**.017**
		Symmetric Measures (Nominal by Nominal)	Phi	.224	.017
			Cramer's V	.224	.017
STUNTING	Did you start breastfeeding immediately after birth	**Chi-Square Tests**	**Pearson Chi-Square**	**1.921**	**.166**
		Symmetric Measures (Nominal by Nominal)	Phi	.109	.166
			Cramer's V	.109	.166
	Exclusive breast feeding practices	**Chi-Square Tests**	**Pearson Chi-Square**	**0.868**	**.351**
		Symmetric Measures (Nominal by Nominal)	Phi	.073	.351
			Cramer's V	.073	.351
	Birth weight	**Chi-Square Tests**	**Pearson Chi-Square**	**13.493**	**.001**
		Symmetric Measures (Nominal by Nominal)	Phi	.289	.001
			Cramer's V	.289	.001
UNDERWEIGHT	Did you start breastfeeding immediately after birth	**Chi-Square Tests**	**Pearson Chi-Square**	**1.293**	**.256**
		Symmetric Measures (Nominal by Nominal)	Phi	.089	.256
			Cramer's V	.089	.256
	Exclusive breast feeding practices	**Chi-Square Tests**	**Pearson Chi-Square**	**0.012**	**.913**
		Symmetric Measures (Nominal by Nominal)	Phi	.009	.193
			Cramer's V	.009	.193
	Birth weight	**Chi-Square Tests**	**Pearson Chi-Square**	**4.525**	**.104**
		Symmetric Measures (Nominal by Nominal)	Phi	.167	.104
			Cramer's V	.167	.104

REFERENCES

[1] Ashworth, A. 2004. Eight out of ten hospital deaths from childhood malnutrition in developing world are avoidable, and linked to clinical errors and weak health systems. University of London: London School of Hygiene and Tropical Medicine. [Internet] Avalable from http://www.lshtm.ac.uk.

[2] Ayaya, S.O., Esamai, F.O., Rotich, J. And Olwambula, A.R. 2004. Socio-economic factors predisposing under five-year-old children to severe protein energy malnutrition at the Moi Teaching and Referral Hospital, Eldoret, Kenya. Eastern African Medical Journal. August, Vol. 81, No. 8, pp. 415-421.

[3] Ghana Statistical Service, Population and Housing Census 2010.

[4] Mother and Child nutrition. 2009b. Detection and referral of children with acute malnutrition. [Internet] Available from http://motherchildnutrition.org.

[5] Müller, O. and Krawinkel, M. 2005. Malnutrition and health in developing countries. Canadian Medical Association Journal [Internet] August, vol. 173, no. 3. Available from: http://www.cmaj.ca.

[6] Bland, R.M. 2007. Exclusive breastfeeding – what is its place in HIV prevalent areas? Continuing Medical Education. Vol. 25. No. 4. pp.164-167.

[7] Gibson, R.S. 2005. Principles of Nutritional Assessment. 2nd ed. New York: Oxford University Press.

[8] Torún, B. and Chew, F. 1994. Protein-Energy Malnutrition in, Modern Nutrition in health and disease. 8th ed. Vol. 2. pp. 950 – 975. United States of America: Lea & Febiger.

[9] Torún, B. 2006. Protein-Energy Malnutrition in, Modern Nutrition in health and disease. 10th ed. pp. 881-906. United States of America: Lippincott Williams & Wilkins.

[10] Jackson, A.A. and Golden, M.H.N. 1991. Protein Energy Malnutrition: Kwashiorkor and Marasmic Kwashiorkor, Part 1: Physiopathology in, Clinical Nutrition of the Young Child. pp. 131 – 141. New York: Raven Press Ltd.

[11] Jackson, A.A., Ashworth, A. and Khanum, S. 2006. Improving child survival: Malnutrition Task Force and the paediatrician's responsibility. Archives of Disease in Childhood. Vol. 91. nr. 8. pp. 706-710.

[12] Ochoa, T.J., Salazar-Lindo, E. and Cleary, T.G. 2004. Management of Children with Infection - Associated Persistent Diarrhea. Seminars in Pediatric Infectious Diseases. Vol. 15, pp. 229 – 236.

[13] United Nations Children's Fund (UNICEF). 2008. Management of Severe Acute Malnutrition in children: Programme and supply components of scaling-up an integrated approach. New York: USA.

[14] United Nations Children's Emergency Fund. 2009. Child malnutrition and household food insecurity remain major concerns for Bangladesh. Press Centre. [Internet] Available from: http://www.unicef.org/media/media_48981.

[15] Williams, A.F. 2005. Pediatric Nutrition in, The Nutrition Society Textbook Series, Clinical Nutrition. pp. 378 – 411. United Kingdom: Blackwell Publishing.

[16] Caulfield, L.E., De Onis, M., Blössner, M. and Black, R.E. 2004. Undernutrition as an underlying cause of child deaths associated with diarrhea, pneumonia, malaria and measles. American Journal of Clinical Nutrition. Vol. 80. pp. 193 – 198.

[17] Iqbal Hossain, M., Yasmin, R. and Kabir, I. 1999. Nutritional and immunization status, weaning practices and socio-economic conditions of under five children in three villages of Bangladesh. [Internet][Abstract) Indian Journal of Public Health, January – March, Vol. 43, No. 1, pp. 37-41.

[18] James, W.P.T., Ferro-Luzzi, A., Sette, S. and Mascie-Taylor, C.G.N. 1999. The potential use of maternal size in priority setting when combating childhood malnutrition. European Journal of Clinical Nutrition. Vol. 53, no. 2, pp. 112 – 119.

[19] Zere, E. and McIntyre, D. 2003. Inequities in under-five child malnutrition in South Africa. International Journal for Equity in Health, [Internet] September, Vol. 2, no. 7. Available from: http://www.equityhealthj.com.

[20] Cartmell, E., Natalal, H., François, I., Ferreira, M.H. and Grahnquist, L. 2005. Nutritional and Clinical Status of Children Admitted to the Malnutrition Ward, Maputo Central Hospital: A Comparison of data from 2001 and 1983. Journal of Tropical Pediatrics. Vol. 51. no.2. pp.102-105.

[21] Duggan, M and Golden, B. 2005. Deficiency diseases, in Human Nutrition. 11th ed. pp. United Kingdom: Elsevier Churchill Livingstone.

[22] WHO. 2010. Micronutrient deficiencies: Iron deficiency anemia. [Internet] Available from http://www.who.int/nutrition/topics.