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GROWTH FALTERING AND INADEQUATE DIETARY INTAKE AMONG CHILDREN (6-23 MONTHS OLD) IN SISSALA EAST DISTRICT, GHANA

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Abstract

Inappropriate complementary feeding and anthropometric deficits in children within 6-23 months old is a major problem in Sissala East District. The objectives of this study were to assess the proportions of children who received complementary foods below World Health Organization's (WHO) recommended infant feeding practices and prevalence of anthropometric deficits. A total of 354 child-mother pair was randomly recruited for the study. Data were collected on child dietary intake and demographic variables of mother-child pair between February and March, 2013. Child nutritional status was assessed based on anthropometric measurements. Prevalence of minimum diet diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) was obtained using the WHO's cut offs. A binary logistic regression model was used to analyze for associations between child-mother pair demographic variables and feeding indicators using SPSS 16.0. Of all the children, 60.0%, 57.0 % and 80.0 % did not meet MMF, MDD, and MAD respectively. Overall, 25.4%, 10.3% and 4.5% of children were stunted, underweight, and wasted respectively. The odds for meeting MMF were1.7 higher in children whose mothers had higher education. Children of older mothers had 2.0 more odds for MDD those born to teenage mothers. Children older than a year had more odds for MMF compared with those aged 6-11 months. The bulk of the children (80.0%) covered in the survey did not meet the WHO recommended infant feeding indicators. The District Health Management Team and other health professionals ought to intensify education aimed at improving child nutrition.

Keywords: Complementary foods, Stunting, Wasting, Underweight, Anthropometry

Background

Childhood malnutrition still remains a significant public health problem in developing countries (Masibo and Makoka, 2012; Demissie and Worku, 2013; Pasrichaand Biggs, 2010). The period between birth and 2 years of the child's life is considered a critical window of opportunity for promoting development through optimum feeding practices (Black et al., 2008). There could be an irreversible damage caused due to any form of malnutrition during this window period of opportunity (Sahaet al., 2008). As an infant graduates from 6 months of age, the mother's breast milk becomes insufficient in meeting the nutritional requirements hence, the need for additional food intake. Yet, these children are mostly faced with inappropriate complementary feeding which are partly accountable for under nutrition among young children (Imdad et al., 2011). Therefore, it has been suggested that optimal infant and young child feeding could reduce all deaths amongst the under-5 by 19 % more than any other single preventive intervention (United Nations Children's Fund, 2010). Reports show that more than two-thirds of deaths among children under 5-years are attributable to inappropriate feeding practices that occur mainly in the first year of the child's life (WHO,1999; Demissie and Worku, 2013;Meshram et al., 2012). Elsewhere, a number of studies (Masibo and Makoka, 2012; Demissie and Worku, 2013; Jesmin et al., 2011) have suggested several consequences of malnutrition during the early periods of the child's life such as growth failure, impaired intellectual and physical development,

lower resistance to infection and high incidence rate of some chronic diseases as well as later consequences such as decreased population survival, lower productivity and heightened economic burden. The causes and determinants of child malnutrition are a complex web but interrelated and multidimensional. Maternal education has been consistently reported to be associated with timely introduction of complementary feeding (Kalanda et al., 2006, Pandey et al., 2010), minimum meal frequency, minimum dietary diversity, and minimum acceptable diet (Khanal et al., 2013, Kabir et al., 2012). Other determinants that have been associated with complementary feeding practices are household wealth status, geographical location, exposure to media, maternal age, and the utilization of antenatal and postnatal visits (Khanal et al., 2013, Kabir et al., 2012; Dibley et al., 2010; Senarath et al, .2012). Available literature (Tibilla, 2007; Pasricha and Biggs, 2010;Jesmin et al.,2011) support that child malnutrition is linked with poverty, low parental education, lack of sanitation, low food intake, diarrhoea and other infections, poor feeding practices, family size, short birth intervals, maternal time availability, child rearing practices and seasonality. The nutritional status of children can be evaluated by anthropometric indicators including stunting, wasting, and underweight. Stunting (low height for age) and wasting (low weight for height) are respectively associated with chronic malnutrition and current nutritional status. Underweight (low weight for age) on the other hand represents both chronic and acute malnutrition (Janevicet al., 2010). A publication (Kavosi1 et al.,2014) suggests that globally, the prevalence of stunting, underweight and wasting in children under-five years are 26, 16, and 8%, respectively. National data available in Zambia suggest that 40% of children under age 5 are stunted, 6% are wasted, and 15% are underweight (Central Statistical Office, Ministry of Health, and ICF International, 2014). Similarly, in Ghana among children under age 5 years, 19% are stunted (short for their age), 5% are wasted (thin for their height), and 11% are underweight (thin for their age) (GSS, GHS and ICF, 2014).The World Health Organization (WHO) has recommended core indicators for infant and young child feeding (IYCF), of which minimum dietary diversity, minimum meal frequency, and minimum acceptable diet are highly emphasized especially for those aged 6-23 months (WHO et al. 2007). In Zambia, only 11% of children aged 6-23 months are fed appropriately based on recommended infant and young child feeding (IYCF) practices. Among breastfed children aged 6-23 months, 19% are given foods from four or more food groups within a 24 hour period whilst about 46% are fed the minimum number of times in a day. Meanwhile, the combined proportion of children who are both given foods from four or more groups and fed the minimum number of times per day is 12% (Central Statistical Office, Ministry of Health, and ICF International, 2014).Data available suggest that in Ghana, only 49%, 45% and 14% of breastfed children aged 6-23 months are fed with the minimum dietary diversity; minimum meal frequency and minimum acceptable diet respectively (GSS et al., 2014).Report of a nationwide survey (GSS et al., 2014) showed that childhood malnutrition and suboptimal complementary feeding practices remain a challenge in the country. Therefore, determining their prevalence can be helpful in the control of malnutrition and also improving health. Moreover, at the time of this current study there was no comprehensive study in Sissala East district that evaluated nutritional status of children and complementary feeding practices. So, given the public health importance of malnutrition we conducted the present study to assess the prevalence of stunting, wasting and underweight, minimum dietary diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) among children 6-23months of age. We also evaluated the association between the child-mother pair demographic variables and complementary feeding indicators.

Methods

Study area

This study was undertaken in Sissala East District (SED). The district is located in the North- Eastern part of Upper West region of Ghana. It lies between longitudes 1.30 W and latitudes 10.00 N. It has a total land size of 4,744sq km which represents 26% of the total land mass of the region. It shares boundary with Burkina Faso to the North, on the East with Kassena-Nankina and Builsa districts, to the South-East with West Mamprusi district, and South West with Wa East and Nadowli districts, and to the West by Sissala West District (DMTDP, 2010).

Study design and study period

This study was descriptive cross-sectional in design which was conducted between February and March, 2013. Data were collected on complementary

feeding practices, socio-demographic characteristics of mothers and children as well as child anthropometry. The essence was to compute for associations between dependent and independent variables.

Study participants

The survey included all breastfeeding children aged 6-23 months in the district and their mother pairs who reported to the child welfare clinics.

Sampling size determination

A total sample size of 354 children aged 6 to 23 months was obtained using Snedecor and Cochran, (1989) sample size formula: $n= t^2 \times p[(1-p) / m^2)]$**,** 64% prevalence of inappropriate complementary feeding practices was used based on the GDHS (2008) report, and a margin of error (m) of 5% at 95% confidence level. t = Z-value (t=1.96 for 95% confidence level).Of the total sample size 354 study units, 125, 120 and 109 was allotted for Tumu, Nabulo and Wellembelle sub-districts. Sub-districts with higher child population were allotted the highest proportion in order to have representative samples.

Sampling Technique

A multistage sampling technique was used. Firstly, three sub-districts were randomly selected from a list of six. Out of the six sub-districts Wellembelle, Nabulo and Tumu were selected based on a random selection because it was not possible for us to cover all the six sub-districts due to resource limitation. At the sub-district level the health centers were purposively chosen as data collection points. Study units were also simple randomly selected at the health centers.

Structured Interview Guide

Information was collected on the demographic characteristics of mothers using structured interview questionnaires. Data was also collected on child-related characteristics, such as age and sex. Information was as well gathered on complementary feeding practices including child anthropometry. This interview guide was first pre-tested and corrected for statements that appeared ambiguous.

Classification of complementary feeding indicators

In the present study mothers were asked to recall the number of times they breastfed their children during the previous 24-hours preceding the survey. They were as well asked to recall all the liquids, soft, semi-solid/solid foods offered to their children for the past 24 hours before the survey.

All foods were organized into 7 groups for calculating the MDD, MMF and MAD. These7 food groups[a) grains, roots and tubers; b) legumes and nuts; c) dairy products (milk, yogurt, cheese); d) flesh foods (meat, fish, poultry and liver/organ meats); e) eggs; f) vitamin-A rich fruits and vegetables; g) other fruits and vegetables] selected for the study are associated with quality diet (WHO et al.,2008).The equations below were used to estimate the feeding indicators.

a) Minimum diet diversity (MDD) = Percentage of breastfed children 6–23 months of age who received foods from ≥ 4 food groups during the previous day (WHO et al., 2008)
b) Minimum meal frequency (MMF) = Percentage of breastfed children at 6– 8 months who receive complementary foods at 2-3 times per day and those at 9-11 months and 12-23 months who receive foods at least 3-4 times of complementary food per day (WHO et al., 2008)
c) Minimum acceptable diet (MAD = Percentage of breastfed children 6–23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day (WHO et al., 2008)

Anthropometric Measurements

Child anthropometric data (Length/height and weight) were measured. These were used to calculate child weight-for-height, weight-for-age, and length–for –age indices. These indices indicate the levels of nutrition indicators such as wasting, under-weight and stunting respectively according to the 2006 WHO growth standards (WHO, 2006).

Weight Measurement

The mothers were asked to be on light clothing. They were also told to allow their children to be on similar clothing before their weights were taken. This was to allow for their actual weight measurements with minimal errors of over estimation of weights. Mothers were first asked to climb the electronic digital scale (SECA, serial number (1881017060375), Germany). Each mother was made to climb first the scale for her weight to be recorded while she was still on the scale it was then tarred to zero. After this step, the mother was given the child to hold of which the scale measures only the

child's weight. This very process was used for all the children and their mothers.

Length Measurement

The lengths of all the children were measured using a calibrated wooden board (infantometer) that allowed for a minimum reading of 1mm (0.01 cm). The infantometer was placed on a flat table then the child was gently placed with face up and the head touching the head piece of the infantometer while the foot piece was moved to touch the foot of the child with knees gently pressed down with the assistance of the mother. After which the reading was mentioned to a trained national service personnel to record the value. Data collectors were also trained on how to conduct the 24-hour dietary recall which they used to gather information on the child dietary intake.

Weight-for- length

This index measures the child's body mass in relation to body height or length. It also describes the current nutritional status of the child. Children with Z-scores below -2 SD are considered thin (wasted) and are said to be acutely malnourished. Wasting usually represents the child's failure to receive adequate nutrition in the period preceding the survey. Wasting may also be as a result of inadequate food intake. It could also be due to illness causing loss of weight and the onset of malnutrition. A child whose weight-for-height is below -3 SD is considered severely wasted (WHO, 2006).

Weight-for-age

This is a composite index of the child's length-for-age and weight-for-height. It usually takes into consideration both acute and chronic malnutrition. A child whose weight-for-age is below -2 SD is classified as underweight and when a child's weight-for-age is below -3 SD the child is considered severely underweight (WHO, 2006).

Length-for-age

This index is normally an indication of linear growth retardation. Children with length-for-age below minus two standard deviations (-2SD) from the median of the reference population are considered short for their age, or stunted and those below minus three standard deviations (-3SD) of the median of the reference population are considered severely stunted. Stunting results from inadequate nutrition over a long period of time and/ or from the effects of recurrent or chronic illness. This index therefore, is a measure of the outcome of under nutrition in a population over a long period and does not necessarily represent current episodes of illness and malnutrition (WHO, 2006).

Ethical considerations

This study is an extract of an MSc Degree program. At the time of the study, University for Development Studies Graduate School approved the study topic and accepted the findings of the study for the award of MSc in Community Health and Development. The study's ethical acceptability was vetted by the University's Graduate School. Mothers of children consented to the study on their own volition upon our approach. Those who agreed were made to participate in the study. Participants were also assured of data confidentiality. The District Health Directorate of Sissala East was approached and permission was given for data collection. At the health facility, all those health personnel in charge of the facility were first approached and permission was given for data collection.

Data analyses and presentation

Data were analyzed using SPSS software version 16.0 (SPSS Inc., Chicago, IL, USA). Data on weight and length were used for calculating the following three summary indices of nutritional status: weight-for-age, length-for-age and weight-for-length, and were expressed in standard deviation (SD) units (z-scores) in comparison with WHO (2006) child growth standards. Distribution of quantitative variables was summarized as means ± SD. Binary logistic regression was used to test for the strength of association between independent and dependent variables and differences between sub-groups. All the test-results were considered significant for a p-value of less than 0.05 at 95% confident intervals.

Inclusion Criteria

This study included children who were of age 6-23 months at the time of the start of the survey. Additionally, as part of the study inclusion criteria a child at the time of recruitment was not acutely ill. For a child to be eligible that child was practicing breastfeeding at the time of recruitment.

Exclusion criteria

At the time of recruitment, children older than 23 months and/or younger than 6 months were

excluded. Children who were not breastfeeding due to various reasons were excluded from the study.

Limitation

Due to the cross-sectional nature of the study design, the results do not represent causality. We could not completely rule out the possibility of dietary recall bias (underreporting or over reporting) of complementary foods fed to infants and young children though efforts were made during data collection to minimize such errors by employing multiple pass approach. We could not extend the survey to cover the entire district due to resource constraints.

Results

A total of 354 child-mother pairs were recruited for the study. Of the total 354 surveyed children, it was observed that a little over 9% of the mothers were aged 15-19 years. The minimum age of the mothers was 15 years while the maximum age was 50 years. Majority (63.3%) of the mothers had no formal education. Far above half (59.9%) of all the mothers included in the study were engaged in farming as their main economic activity. The sex distribution of the children was quite even though the male population was slightly above half (55.7%).Majority of the children were 12– 17 months old (Table 1).

Table 1: Socio-demographic characteristics of mother and child pair

Socio-demographic variable		Number (percentage)
Age group of mothers in years	15-19	33(9.3)
	20-29	158(44.6)
	30-39	124(35.0)
	40-50	39(11.1)
Mother's educational level	No formal education	224(63.3)
	Primary education	20(5.7)
	JHS/Middle school	42(11.9)
	SHS/Vocational Institute	25(7.1)
	College/Tertiary	43(12.0)
Religious affiliation	Islamic	338(95.5)
	Christianity	15(4.2)
	African traditional religion	1(0.3)
Marital status	Married	354(100.0)
	Single	0(0.0)
Main economic activity	Handicraft	25(7.1)
	Farmer	212(59.9)
	Food vendor	44(13.3)
	Teacher	73(20.6)
Ethnicity	Sissala	337(95.5)
	Waala	9(2.6)
	Dagoa	7(1.9)
Sex of child	Male	197(55.7)
	Female	157(44.3)
Age group of child in months	6-8	105(29.7)
	9-11	71(20.1)
	12-17	120(34.0)
	18-23	58(16.4)

Nutritional status indicators

An analysis of anthropometric data gathered on children revealed that with the weight-for-height proxy assessment of child nutritional status, the mean child Z-score units was -0.20 with a standard deviation of 1.23. Meanwhile, 16(4.5%) of the children were wasted (Z-score less than -2 standard deviations). Additionally, the weight-for-age classification showed that the mean Z-score was -0.69 and a standard deviation of also 1.13. In furtherance, 37(10.5%) of them were underweight. With regard to the length-for-age classification, the mean Z-score was -0.10 and a standard deviation of 1.83.Of all the children, 90(25.4%) of them were stunted (**Table 2).** An evaluation of dietary practices of the children from the survey as a proxy assessment of child nutrient and energy intake showed that those who met the Minimum

dietary diversity, Minimum meal frequency, and Minimum acceptable diet were 43, 40, and 20% respectively (**Table 2)**

Table 2 Prevalence of indicators of nutritional status

Nutritional status indicator	Number (%)	
Stunting	90(25.4%)	
Wasting	16(4.5%)	
Underweight	37(10.5%)	
Complementary feeding Indicator	**Number of children who met the Complementary feeding requirement (%)**	**Number of children who did not meet complementary feeding requirement (%)**
Minimum dietary diversity	152(43.0%)	*202(57.0%)*
Minimum meal frequency	142(40.0%)	212(60.0%)
Minimum acceptable diet	71(20.0%)	283(80.0%)

The odds of meeting MMF was 1.7 higher among children whose mothers had at least secondary education relative to others. Children born to older mothers had 2.0 more odds for meeting the MDD requirement compared to their counterparts born to teenage mothers. Higher maternal education also was significant predictor of meeting MAD within a 24-hr period (OR= 2.1, CI: 1.3–3.4, P<0.05). Children born to mothers who have experienced at least five (5) births had lesser odds for meeting MAD prior to the survey relative to their colleagues born to mothers of less than five births experience (Table 3). Children who were older than a year showed more odds for meeting MMF compared with those aged 6-11 months. Female children showed lower odds for meeting MDD. Similarly, female children were found to have had lower odds for meeting MAD (Table 4).

Table 3: Associations between maternal demographic characteristics and Complementary feeding requirements

Independent Variable	Dependent Variable	P-value	Odds Ratio (aOR)	95% Confidence Interval (CI)
Maternal age (20 years and more=1 less than 20 years =2)	Minimum meal frequency (No=1, Yes=2)	0.196	1.1	1.0-1.1
Maternal education (At most secondary education=1 At least primary education=2)	Minimum meal frequency (No=1, Yes=2)	0.020	1.7	1.1-2.7
Parity (At least 5 births=1 Less than 5 births=2)	Minimum meal frequency (No=1, Yes=2)	0.853	1.1	0.5-2.1
Maternal age (20 years and more=1 less than 20 years =2)	Minimum dietary diversity (No=1, Yes=2)	0.086	2.0	0.9-4.2

Maternal education (At most secondary education=1 At least primary education=2)	Minimum dietary diversity (No=1, Yes=2)	0.001	2.1	1.3-3.4
Parity (At least 5 births=1 Less than 5 births=2)	Minimum dietary diversity (No=1, Yes=2)	0.178	0.6	0.3-1.3
Maternal age (20 years and more=1 less than 20 years =2)	Minimum acceptable diet (No=1, Yes=2)	0.801	1.1	0.5-2.9
Maternal education (At most secondary education=1 At least primary education=2)	Minimum acceptable diet (No=1, Yes=2)	0.001	2.1	1.3-3.4
Parity (At least 5 births=1 Less than 5 births=2)	Minimum acceptable diet (No=1, Yes=2)	0.511	0.7	0.3-1.8

Reference category: last

Table 4: Associations between child demographic characteristics and Complementary feeding requirements

Independent Variable	Dependent Variable	P-value	Odds Ratio (aOR)	95% Confidence Interval (CI)
Age (older than 12 months=1; Younger than 12 months=2)	MMF(No=1,Yes=2)	0.001	2.1	1.3-3.4
Sex (female=1; male=2)	MDD (No=1, Yes=2)	0.065	0.7	0.4-1.0
Age (older than 12 months=1; Younger than 12 months=2)	MAD (No=1, Yes=2)	0.945	1.0	0.9-1.1
Sex (Female=1; Male=2)	MAD (No=1, Yes=2)	0.051	0.6	0.3-1.0

Reference category: last

Discussion

The prevalence of underweight, stunting, and wasting is different in different parts of the world (Mahyar et al.,2010). In the current study the findings showed that stunting prevalence was 25.4% which is twice the 10.9% and 10.6% stunting prevalence reported by Ergin et al. (2007) in Turkey and Alasfoor et al. (2007) in Oman respectively. Meanwhile, other authors (Bloss et al., 2004; Phengxay et al., 2007) have reported far higher prevalence of stunting in

Kenya and Laos as 47% and 54%, respectively than what was observed in the present study. Our findings in some cases have demonstrated large heterogeneity between some study results. It is therefore possible that such heterogeneity could be due to chance, variations in population characteristics, geographical locations, or study methodology. Childhood malnutrition poses lot of challenge for child development. Child growth faltering could be a cause of lower productivity later in life hence, there is a growing scientific consensus that tackling childhood stunting is significant for reducing the global burden of disease and also for fostering economic development (Dewey and Begum, 2011).

The underweight prevalence of 10.3% as was observed in the current survey was similar to the 11.7% reported by Mahyar et al. (2010). However, it was far lower than the 30%, 35% and 17.9% as reported in Western Kenya (Bloss et al.,2004), Laos (Phengxay et al.,2007) and Oman (Alasfoor et al.,2007). The 4.5% prevalence of wasting observed in the present study is relatively low but quite higher than the 0.5% reported elsewhere (Mahyar et al.,2010). Comparatively, the present study reported lower prevalence of wasting than those reported by Ergin et al. (2007) from Turkey (8.2%) and Alasfoor et al.(2007) from Oman (7%).These differences could have resulted from maternal related factors and geographical factors (Senarath et al., 2012; Dibley et al., 2010; Srnarath et al., 2010; Tan et al., 2011; Khanal et al., 2013). The less than half (43%) of children who received at least the recommended minimum dietary diversity in the current study was similar to an observation by Mashresha et al.(2013) where less than half of the children covered in their work did meet the minimum dietary diversity. The results of the present study were, however, at variance with the 15.2 % findings by Senarath et al. (2012) in India but collaborated another finding by the same author in Bangladesh of 41.9 %. However, we observed far lower proportion of children who met the minimum dietary diversity in the present study compared to the 71.1 % reported for Sri Lanka in their work. Meanwhile, the current value (43%) was also slightly higher than the 32% as reported by URT (2010) for children aged less than two years in Tanzania. According to the findings of Kapur et al. (2005) less than half of the children included in their study met the minimum meal frequency which is consistent with the current findings. Childhood under nutrition ought to be of great concern due to its impact on short stature, structural and functional damage to the brain, resulting in delay in the development of cognitive functions as well as permanent cognitive impairments (Karet al., 2008). Furthermore, evidence from other developing countries indicates that child growth faltering between 12 and 36 months of age is associated with poorer cognitive performance and lower school achievement in middle childhood (Grantham-McGregor et al., 2007). Under nutrition during the early years of the child's life plays an important part in the intergenerational transmission of poverty (Grantham-McGregor et al. 2007).The 20 % of children who met the minimum acceptable diet was not very much different from the 26.5% as reported by Khanal et al.(2013) in a study conducted in Nepal. In the current study, older mothers were seen to have been more likely to feed their infants the minimum meal frequency (MMF) as compared to teenage mothers. The present observation is consistent with what was reported by Khanal et al. (2013) as they reported that children born to mothers aged 35 and beyond were more likely to meet the minimum diet requirements compared to those born to mothers aged 15-19 years (teenage mothers). The reason for this observation could have been that older mothers are more experienced and are more confident in providing child care by adopting different approaches of responsive feeding practices (Tan et al., 2011). The odds of meeting MMF were 1.7 higher among children whose mothers had at least secondary education relative to those with primary education or without any form of formal education. The current observation of mother's educational level as a predictor of complementary feeding practices is quite consistent with other reports

(Senarath et al., 2012; Patel et al., 2010). According to Senarath et al. (2012) mother's education is a significant determinant of appropriate infant feeding practices. Similarly, in the work of Gautam et al. (2016) they reported that mothers who attained high school or higher education were more likely to provide minimum acceptable diets to their children than their counterparts with lower level of education. Children who were older than a year showed more odds for meeting MMF compared with those aged 6-11 months. This is in line with Khanal et al's (2013) report which suggested that children aged 12 – 17 months were more likely to meet minimum feeding requirements than those aged 6-11 months. This present study also showed that female children were of lower odds for meeting MDD. Similarly, in the current study female children were found to have had lower odds for meeting MAD. Cumulatively, childhood under-nutrition heightens the risk for maternal short stature later in adulthood. For instance, a study group linked childhood stunting with short adult stature, reduced lean body mass, less schooling, diminished intellectual functioning, reduced earnings and lower birth weight of infants born to women who themselves were stunted during childhood (Victora et al. 2008). Children born to women who are stunted are also at greater risk of dying than children of mothers with normal height (Ozaltin et al., 2010). Furthermore, maternal stunting can restrict uterine blood flow and growth of the uterus, placenta and fetus (Black et al. 2008). Intrauterine growth restriction is associated with many adverse fetal and neonatal consequences (Kramer 1987; Kramer et al. 1990; Black et al. 2008). Data from the Maternal and Child Under-nutrition Study Group (Victora et al. 2008) indicate that childhood under-nutrition is a risk factor for high glucose concentrations, blood pressure and harmful lipid profiles in adulthood.

Conclusion and Recommendations

The results of the study showed that more than half of the children did not meet the WHO's recommendation of minimum diet diversity; minimum meal frequency and minimum acceptable diet intake which suggest that majority of the children risk both energy and nutrient deficiencies. The study also revealed that stunting, wasting and underweight are common in the district. Hence, the District Health Management Team (DHMT) and other health professionals may have to intensify nutrition education aimed at improving on complementary feeding practices in the district and also channel nutrition campaigns to demystify inappropriate complementary feeding practices. Government policies ought to also aim at ensuring food and nutrition security in the district through micro-financing and the provision of agriculture extension services to improve food production and availability.

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