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Socioeconomic and Demographic Factors Influencing Feeding Practices, Morbidity Status, and Dietary Intakes of Children Aged 7–24 Months in Rural Uganda

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ABSTRACT

The objective of this study was to analyze the nutritional and morbidity patterns of children aged 7–24 months in relationship to household socioeconomic and demographic characteristics. Structured questionnaires and repeated 24-hour recalls were used to collect data. Maternal education and age influenced timing of complementary foods, dietary diversity score, meal frequency, and diarrhea incidences ($p < .05$). This resulted in 53%, 59%, 48%, 43%, and 22% of the study children having inadequate intake of energy, protein, vitamin A, iron, and zinc, respectively. Households need to be empowered to utilize available resources for improving nutrient intake and health among their children.

KEYWORDS

dietary intake; feeding practices; morbidity status; rural Uganda; socioeconomic and demographic characteristics

Introduction

Inadequate dietary intake from complementary foods results in nutrient deficiencies and poor growth even with optimum breastfeeding. Nutritional deficiencies during the first two years of life could lead to impaired cognitive development, compromised educational achievement, and low productivity (Aemro et al. 2013). Infant malnutrition is also correlated with inadequate immune response and increased risk of childhood mortality (Arimond and Ruel 2004). Globally, 26%, 16%, and 8% of the world's children under five years are stunted, underweight, and wasted, respectively (UNICEF 2012). More than half of these stunted children live in Africa and Asia. Deficiencies of vitamin A, iron, and zinc are also common, especially among children from developing countries (Sanghvi et al. 2007). Thirty-three percent of preschool children in Uganda are stunted, 14% underweight, 5% wasted, and 49% anemic (UBOS and ICF 2012). Zinc deficiency is estimated to range between 20% and 69% while 20% are vitamin A deficient (FANTA-2 2010). Children under five years have high energy and nutrient needs due to

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rapid growth and development (Compaore et al. 2011). When undernutrition interacts with repeated bouts of infectious diseases that are common in Uganda, it can result in death. Undernutrition in Uganda is associated with 40% of all deaths occurring in children below five years. The infant and child mortality rates in Uganda are high at 76 and 137 deaths per 1,000 live births, respectively. Critical stunting levels above 40% have been persistently reported in Western Uganda (UBOS and ICF 2012; Uganda Bureau of Statistics and ORC Macro 2001).

Among several other factors, the UNICEF conceptual framework identified dietary intake and morbidity characteristics as dependent variables, influenced by socioeconomic, demographic, and cultural factors in communities and households where malnourished children are nurtured (UNICEF 1990). Given the very high prevalence of child stunting in Western Uganda, data on households' socioeconomic and demographic characteristics, feeding practices, morbidity patterns, and dietary intakes among children are essential to help guide development of contextually appropriate interventions.

Methodology

Study area and population

This study was cross-sectional and analytical in nature. It was conducted in Bujenje **C**ounty of Masindi District in Western Uganda. Masindi District is one of the rural-based districts of Western Uganda. It is characterized by low household income and a high prevalence of infections (Ring and Develo 2009).

Sample size determination

The sample size was calculated according to the formula $n = Z^2pq/d^2$ (Israel 2003) where p = prevalence of stunting among children under five years in Western Uganda = 44% (UBOS and ICF 2012); $q = 1 - p$ = proportion not stunted = 55%; d = error of assumption = 5%; z = normal distribution at 95% confidence interval (1.96). The sample size according to the formula was calculated as 380 households.

Children were recruited from 23 clusters (n = 10 in Budongo; n = 13 in Bwijanga). This matched the national distribution and was representative of Bujenje County of Western Uganda (Ring and Develo 2009). A total of 636 children aged 7–24 months and their mothers/caretakers were recruited by probability cluster random sampling method (n = 273 in Budongo; n = 363 in Bwijanga). Only children from households with caretakers/mothers present at the visitation time were recruited for the study. In cases where many children below five years in the household were found, the youngest was selected, and for twins, both were selected for cultural reasons.

The design and ethics of the study were reviewed and cleared by The Aids Support Organisation (TASO) internal review board (TASOIRC/029/13-UG-IRC-009) and then approved by the Uganda National Council of Science and Technology (HS 1315). Verbal and written consent were obtained from the parents/caretakers of the study children.

Determination of household socioeconomic and demographic characteristics and children's dietary practices and morbidity patterns

Structured questionnaires were used for collecting data on household socioeconomic and demographic characteristics and children's dietary practices and morbidity patterns.

Dietary diversity

Dietary diversity data were collected using a seven foods/food groups questionnaire. It was categorized into three dietary diversity terciles: low (≤ 3 food groups), medium (4–5 food groups), and high (≥ 6 food groups) (Arimond and Ruel 2004). The proportion of children who received four or more foods/food groups of the seven foods/food groups were regarded to have received minimum dietary diversity (WHO 2005).

Dietary intake

Assessment of dietary intake was done quantitatively using repeated 24-hour recalls. For each child, two repeated 24-hour recalls were carried out on nonconsecutive days. All meals, dishes, food items, and beverages consumed in the last 24 hours were recorded by trained interviewers. Food models and common household measures were used to assist in recalling the portion size of the food (Gibson and Ferguson 2008).

Determination of nutrient intake

The East African Food Composition Tables (West et al. 1987) and NutriSurvey program (Juergen 2003) were used to estimate the energy, protein, vitamin A, iron, and zinc intakes from the 24-hour recall data. Calculation of usual nutrient intake from actual intake was done to validate the 24-hour recall data (Pereira et al. 2010). Since meals were mostly composed of plant foods and almost no fortified or animal foods, low levels of bioavailability were assumed (5% for iron and zinc) based on international guidelines (Doets et al. 2008). Iron and zinc supply from meat, fish, and poultry were considered twice as bioavailable as iron and zinc from vegetable sources. Iron and zinc intake was derived by multiplying the amounts obtained in the 24-hour recall by percentage absorption. Vitamin A intake from animal and plant sources was expressed as retinol equivalents based on Food and Agriculture Organization conversion factors (Schweiggert et al. 2011). A child's intake of a nutrient was classified as inadequate when the estimated usual intake of the individual was less than the corresponding estimated average requirement (EAR) value for the age and sex of the individual. The percentage of children with mean intake below the recommendations for each age and nutrient was analyzed using the EAR cutoff points (Dalmau et al. 2015; IOM 2005; Trumbo et al. 2002). Minimum meal frequency was categorized according to World Health Organization (WHO; 2005) recommendations as follows:

- 6–8 months: 2 meals
- 9–23 months: 3 meals
- 6–23 months (nonbreastfeeding): 4 meals

Statistical analysis

Data were entered, cleaned, and analyzed using SPSS (Statistical Package for Social Scientists) version 20.0 for windows. Descriptive frequencies and means were used to analyze data. Chi-square test was used to detect the influence of household socioeconomic and demographic characteristics on feeding practices, morbidity patterns, and nutrient intake. The effect of minimum dietary diversity score and meal frequency on nutrient intake was also assessed using chi-square tests. Level of significance was determined at $p < .05$.

Results

A total of 636 children were used in the analysis; 54% ($n = 346$) were males and 46% ($n = 290$) were females.

Socioeconomic and demographic characteristics of households

Table 1 shows data on the socioeconomic and demographic characteristics of the study children's households. About half of the households had less than five members, and almost a third of these were aged less than five years. The mean household size was 4.5. The majority of the mothers/caretakers were aged 18–35 years and were in monogamous marriages. Primary education was the highest level of education attained by the majority of mothers/caretakers of the study children.

Table 1. Distribution of Households in Bujenje County by Their Socioeconomic and Demographic Parameters.

Parameter	*n*	Percentage
Household size		
< 5 members	622	48.4
5–7 members	480	37.3
Above 7 members	185	14.3
Age of household members		
Members less than 5 years	431	33.5
Members above 5 years	856	66.5
Mother/caretaker age		
< 18 years	13	2.0
18–35 years	525	82.6
36–60 years	96	15.1
> 60 years	2	0.3
Marital status of household head		
Single/divorced/separated	119	18.7
Polygamous marriage	57	9.0
Monogamous marriage	460	72.3
Mother/caretaker education		
Informal education	53	8.3
Primary	460	72.3
Secondary	113	17.8
Postsecondary	10	1.6

Feeding practices of studied children

Table 2 shows the feeding practices of study children in Bujenje County. The majority of the children were exclusively breastfed. Less than a half of the children were breastfeeding at the time of the study while a small percentage of study children breastfed for two years and beyond. Complementary foods were introduced at the right time to only a small percentage of the children. Improper timing of complementary foods was associated with polygamous families, mothers with no formal education, and those aged less than 18 years at p = .033, .012, and .001, respectively. Less than half of the study children had the recommended minimum dietary diversity score (DDS) and meal frequency. Low levels of maternal education were associated with inadequate DDS and meal frequency at p = .005 and .001, respectively. About half of the study children used millet porridge as a complementary food while the rest relied mainly on family meals. The meals were mostly composed of cereals (72.6%); pulses, legumes, nuts (71.9%); and roots, tubers, plantain (66.5%). There was minimal composition of eggs (4.4%); fruits (7.5%); fish (13.5%); meat, poultry, offals (14.3%); and milk (17.5%).

Average nutrient intake among study children in Bujenje County by age

Table 3 shows the mean energy, protein, vitamin A, iron, and zinc intakes for different age groups of study children and the proportion of children with inadequate nutrient intake. The mean iron intake for children aged

Table 2. Distribution of Study Children in Bujenje County by Their Feeding Practices.

Feeding practice	*n*	Percentage
Exclusively breastfed		
Yes	450	70.8
No	186	29.2
Breastfeeding duration		
Less than 2 years	312	49
2 years and above	58	9.2
Still breastfeeding	266	41.8
Introduction of complementary foods		
Early introduction	335	52.7
Timely introduction	72	11.3
Late introduction	229	36.0
Common complementary foods		
Millet porridge	338	53.1
Milk	81	12.7
Maize porridge	24	3.8
Soya porridge	8	1.2
Cassava porridge	3	0.6
Family meal	182	28.6
Adequate DDS		
7–8 months	183	33.3
9–11 months	188	41.5
12–24 months	265	48.3
Overall (7–24 months)	636	41
Adequate meal frequency		
7–8 months	183	24.3
9–11 months	188	29.2
12–24 months	265	48.5
All children (7–24 months)	636	34

Note. DDS = dietary diversity score.

7–12 months was lower than the estimated average requirement. The percentage of children with inadequate protein, vitamin A, iron, and zinc intakes was significantly higher among children aged 7–12 months. Inadequate iron and vitamin A intakes in children were associated with lower levels of maternal education at $p < .001$ and $p = .039$, respectively. The majority of children from households with more than three children under five years had inadequate energy and protein intakes at $p = .001$ and .015, respectively. Inadequate energy, protein, vitamin A, iron, and zinc intakes were associated with low dietary diversity practice (< 3 foods/food groups). The odds ratio (OR) in all cases was greater than 1. Children with inadequate minimum meal frequency were also associated with inadequate energy and protein intake, OR > 1 (tables 4 and 5). DDS and meal frequency were therefore found to be important determinants for nutrient intake since children with inadequate DDS and meal frequency had high chances of inadequate nutrient intake.

Table 3. Mean Nutrient Intake and Proportion of Children with Inadequate Nutrient Intakes in Bujenje County.

Nutrient per day	EAR	Mean intake (95% CI)	Median	% < EAR
Energy (kcal)				
7–12 months	615[a]	535.28 (469.35–601.22)	453.80	48
13–24 months	894[a]	845.14 (799.91–890.37)	836.20	57.8
Overall energy				52.9
Protein (g)				
7–12 months	1 g/kg	18.80 (15.71–21.90)	14.30	75.2*
13–24 months	0.87 g/kg	30.23 (27.95–32.51)	26.50	43.3*
Overall protein				59.3
Vitamin A (μg)				
7–12 months	190	341.85 (267.53–416.17)	185.00	55.4*
13–24 months	210	420.68 (370.53–470.82)	305.70	40.6*
Overall vitamin A				48
Iron (mg)				
7–12 months	6.9	5.47 (4.50–6.44)	5.00	72.5*
13–24 months	3	7.70 (7.22–8.18)	7.40	14.5*
Overall iron				43.4
Zinc (mg)				
7–12 months	2.5	3.01 (2.58–3.44)	2.35	35.9*
13–24 months	2.5	4.84 (4.52–5.16)	4.40	7.2*
Overall zinc				21.6

Note. CI = confidence interval; estimated average requirements (EAR) = average daily nutrient intake level estimated to meet the requirement of half the healthy individuals in a particular life stage and sex group.
[a]Calculation of the EAR was based on the age and sex of the child (Dalmau et al. 2015; Dewey & Brown 2003 Trumbo et al. 2002).
*Significantly different percentages

Table 4. Influence of Dietary Diversity Score on Kilocalorie Energy, Protein, Vitamin A, and Zinc Intake.

	Minimum dietary diversity score		
Nutrient	Adequate	Inadequate	OR (95% CI)
Kilocalorie energy			
Greater than recommended	57.2	42.8	2.56 (1.85–3.53), p < .001
Less than recommended	34.3	65.7	
Protein			
Greater than recommended	69.8	30.2	3.66 (2.63–5.09), p < .001
Less than recommended	38.7	61.3	
Vitamin A			
Greater than recommended	64.6	35.4	1.98 (1.41–2.78), p < .001
Less than recommended	47.9	52.1	
Iron			
Greater than recommended	89	11	4.41 (2.87–6.79), p < .001
Less than recommended	64.6	35.4	
Zinc			
Greater than recommended	96.7	3.3	8.04 (4.10–15.79), p < .001
Less than recommended	78.6	21.4	

Note. OR = odds ratio; CI = confidence interval.

Table 5. Influence of Meal Frequency on Kilocalorie Energy and Protein Intake.

Nutrient	Minimum meal frequency		OR (95% CI)
	Adequate	Inadequate	
Kilocalorie energy			
Greater than recommended	62.8	37.2	2.72 (1.93–3.84), p < .001
Less than recommended	50.4	49.6	
Protein			
Greater than recommended	62.8	37.2	1.66 (1.18–2.34), p = .002
Less than recommended	50.4	49.6	

Note. OR = odds ratio; CI = confidence interval.

Table 6. Distribution of Study Children in Bujenje County by Their Morbidity Characteristics and Health-Seeking Practices.

Parameter	*n*	Percentage
Sick in last 2 weeks to study		
7–12 months	127	82.5
13–24 months	219	77.4
Respiratory infections		
7–12 months	84	54.5
13–24 months	129	45.6
Diarrhea		
7–12 months	53	65.6
13–24 months	70	24.7
Malaria		
7–12 months	54	64.9
13–24 months	111	60.8
Health-care practices		
Visited health center when sick	347	68
Fully immunized	196	50
Received vitamin A supplements in last 6 months	429	67.5
Dewormed in last 6 months	429	67.5

Morbidity characteristics of study children in Bujenje County by age

The majority of children were sick in the two weeks preceding the survey, and diarrhea and malaria were the most common sicknesses among the study children (table 6). Diarrhea was most prevalent among children aged 7–12 months. Prevalence of diarrhea in children was significantly noted among households with mothers/caretakers less than 18 years of age and with low levels of maternal education at $p = .035$ and .011, respectively. More than half of the study children that fell sick in the two weeks preceding the survey sought medical treatment. About half of the study children were fully vaccinated against tuberculosis, polio, and measles while more than half of the children had received vitamin A supplements and deworming tablets in the past six months.

Discussion of results

Socioeconomic and demographic characteristics of households in Bujenje County

The mean household size of 4.5 in the study is lower than the reported 4.7 for Masindi district and the national mean of 4.9 (Ring and Develo 2009; UBOS and ICF 2012). Household size of 4.5 is fairly good to allow better child-care practices. However, the large percentage of children under five years of age in some households can create a dependency burden. The majority of the mothers/caretakers had attained primary education. This is the basic level of education for many people with minimal income in Uganda (UBOS and ICF 2012). The majority of the households were monogamous. This could perhaps promote better child-care practices that are very important in early childhood. The majority of the mothers being aged between 18 and 35 years reflects maturity and ability to care for children well. According to Girma and Genebo (2002), younger women from 15 to 19 years and older women 45–49 years are the most affected by malnutrition, and this can influence child care.

Feeding practices of study children

The importance of breastfeeding to a child cannot be overstated. Breast milk provides ideal nutrition for infants. All children in the study had been breastfed. Exclusive breastfeeding requires a child to receive breast milk without any additional food or drink and is recommended by the World Health Organization for the first six months (Dewey 2003). Exclusive breastfeeding promotes motor development in children (Kramer and Kakuma 2012) and protects infants from gastrointestinal infections (Dewey 2003). The percentage of exclusively breastfed children was higher than the national reports of 63% perhaps because this was a rural-based community where the majority of mothers had no formal employment. The percentage of children who breastfed for two years and beyond in the county was lower than the national figure of 47%. Shorter duration of breastfeeding among the study children could be due to early introduction of complementary foods by the majority of mothers. Such a practice displaces breast milk (WHO 2005). Longer duration of breastfeeding is associated with greater linear growth. This approach, if combined with timely introduction of complementary foods, could be instrumental in reducing the high stunting levels that were reported in this part of Western Uganda (Simondon et al. 2001). Some mothers introduced complementary foods late, and yet infants are developmentally ready for complementary feeding at six months (Naylor and Morrow 2001). Such a practice deprives the child of the required nutrients in addition to breast milk since after six months it becomes increasingly difficult for infants to meet their nutrient requirements from breast milk alone (Kramer and Kakuma 2012).

About 41% of the study children were able to meet the minimum recommended dietary diversity of four or more foods/food groups. This is higher than the 13% in the national reports for children aged 6–24 months and could be due to better food security in the rural setting compared to urban places in Uganda (UBOS and ICF 2012). Current study findings are also comparable to a study in Bangladesh where 41.9% of children aged 6–23 months had adequate DDS (Kabir et al. 2012) and a study in Ethiopia where 34.7% of the children aged 6–23 months had a minimum recommended dietary diversity and meal frequency (Aemro et al. 2013). The percentage of children with adequate DDS lowered with a decrease in age. This indicates the complexity of obtaining suitable complementary foods for the younger age in this study area. The percentage of children aged 7–11 months with low dietary diversity scores can be compared with 81% in Bangladesh and 82% in Nepal (Joshi et al. 2012; Kabir et al. 2012). Such comparatively low percentages in the present study findings could be due to few varieties of infant foods in rural areas, cultural practices, and poor economic status among the study population. Meal frequency in this study improved with increase in age and can be compared to the national reports of 45% among children aged 6–23 months (UBOS and ICF 2012). However, it is much lower than the 99.7% reported in Ghana (Pelto and Armar-Klemesu 2011) and 90% reported in Bangladesh (Kabir et al. 2012) among infants and young children, and such a sharp difference can be attributed to differences in food habits and available foods. The association of high levels of maternal education with adequate DDS and meal frequency have been reported by other studies. This shows the role played by maternal education and care in meeting the recommended dietary diversity, meal frequency, and adequate nutrient intake in this study population.

Common complementary foods

Millet porridge was the most common complementary food in this study area as in Harvey, Rembeloson, and Dary (2010) findings in Southwestern Uganda. This was because it was available and therefore affordable. Finger millet porridge is recommended as a weaning food since it is one of the least allergenic, most non–acid forming, and easiest-to-digest cereal foods (Singh and Raghuvanshi 2012). However, it has low energy and nutrient density (Singh and Raghuvanshi 2012), limited amino acids (Usha and Lakshmi 2010; Bachar et al. 2013), and a high content of antinutrients such as phytates and tannins. These can influence its utilization in nutrition. Most of the porridges were of low viscosity compared to the recommendation by the

World Health Organization. This suggests inadequate nutrient intake, especially for children aged 7–12 months, who strongly relied on these porridges.

Introduction of a child to a family meal immediately after exclusive breastfeeding by some mothers is commendable since children have to adjust to family meals gradually. However, if done with no special complementary food for the child, as in this study, it may not be able to meet the specific needs of this vulnerable group. Infants and young children require special foods of adequate nutrient density, consistency, and texture (WHO 2005). This is necessary not only to promote digestibility of foods in infants but also to increase nutrient intake among young children since they have high nutrient requirements with limited gastric capacity (Compaore et al. 2011). Family meals were mainly plant based with minimal vegetables and fruits. This is contrary to World Health Organization's recommendation that children aged 7–24 months should receive animal source foods, vitamin A rich fruits, and vegetables daily (WHO 2005). Consumption of milk, which is strongly recommended in young children, was very low even among nonbreastfeeding children. Such feeding practices could soon affect growth, physiological maturation, and development in children. This could result in growth faltering and serious health consequences, the effects of which may be irreversible.

Nutrient intake among study children

The percentage of children with inadequate nutrient intake in this study reflects the poor quality complementary foods given to children in this county. Global figures also show that malnutrition among children mainly occurs from 6 to 18 months because of the introduction of poor quality complementary foods (Michaelsen et al. 2009; Victora et al. 2010). These results are comparable to a study in Southwestern Uganda by Harvey, Rambeloson, and Dary (2010), where the mean energy and protein intakes among children aged 24–59 months were 996 k calories and 17.7 g, respectively. The percentage of children with inadequate vitamin A, iron, and zinc intakes in this study can also be compared to 52%, 57%, and 78%, respectively, among children aged 24–59 months in Southwestern Uganda (Harvey, Rambeloson, and Dary 2010). Minimal consumption of vegetables and fruits deprived children of the cheap and abundant sources of vitamin A and iron in this study locality. Such practices are common in most communities with limited nutritional knowledge, and they limit nutrient intake (Michaelsen et al. 2009). The percentage of children with inadequate protein, vitamin A, zinc, and iron intakes was significantly high among those aged 7–12 months. This was due to the relatively high protein and iron requirements for this age group, together with the limited gastric capacity. The significantly low DDS and meal frequency among children with less than recommended nutrient intake worsened these deficiencies among study children. The majority of children with a low dietary diversity score (< 3 foods/food groups) had inadequate intakes of energy, protein, vitamin A, iron, and zinc since dietary diversity score reflects dietary quality and adequacy (Arimond and Ruel 2004). A study in Somalia showed a strong association between low DDS and inadequate energy intake among children in rural areas of Eastern Cape in South Africa (McGarry and Shackleton 2009). Association of low DDS with inadequate vitamin A, iron, and zinc shows that DDS can be used as a measure of micronutrient adequacy among children from low socioeconomic status households (Steyn et al. 2006). Since this is a farming community of low socioeconomic status, households need to be mobilized to utilize available food resources like vegetables and fruits for improvement of their children's micronutrient status. Study reports have also shown a strong association of diets with acceptable meal frequency and dietary diversity score with high adequacy ratios for energy, protein, zinc, and iron in developing countries (Ruel 2003). Meeting the minimum recommended dietary diversity score in this study location was therefore of special importance since consumption of a variety of foods/food groups of plant origin resulted in significantly higher nutrient intake compared to children with few food/food groups. Less than two meals were associated with inadequate energy and protein intake. This corresponds with reports by McGarry and Schackleton (2009) among children in rural areas of Eastern Cape in South Africa. Since the nutrient content of the meals was low, children benefited greatly from frequent uptake. Increase in number of meals helped children to build up the quantities consumed in a day, and this promoted higher energy and protein intake. Meal frequency is considered as a proxy for energy intake from foods for nonbreastfeeding children aged 6–24 months (WHO 2005).

Morbidity patterns among study children

Malaria, respiratory infections, and diarrhea were common ailments in the study children as in national reports (UBOS and ICF 2012). Malaria, diarrhea, and acute respiratory infections are highly associated with child malnutrition in Uganda. Infections reduce both appetite and food intake (FANTA-2 2010). In Uganda, diarrhea is associated with a decrease in dietary intake of 40%–50% for energy and protein (FANTA-2 2010). The occurrence of diarrhea was significantly high among children aged 7–8 months. Similar findings have been noted in the Uganda Demographic and Health Survey report of 2012. Reports of poor sanitary facilities have been made in Bujenje County of Western Uganda (Ring and Develo 2009). In most households, prepared porridge was consumed by children in bits over a period of a day. Such a practice under poor sanitation could easily result in diarrhea given the vulnerable nature of this stage of growth among children. The percentage of children taken to a health facility when sick is lower than the national figure of 72% and could be due to long distances to health centers. Immunization, vitamin A supplementation, and deworming medication are some of the government programs aimed at addressing health aspects in children. The percentages of children who were immunized, given vitamin A supplements, and given deworming tablets were better than the national figures of 40%, 57%, and 50%, respectively. However, such coverage is still low, and in many places it was inconsistent. Health practices such as visiting a health facility when sick, deworming, immunization, and giving of supplements can reduce the magnitude and severity of infections and promote good health.

Socioeconomic and demographic factors influencing dietary practices, nutrient intake, and morbidity status of study children

Inadequate energy and protein intake in this study were associated with three or more children under five years in a household. Child health in early age is very sensitive to exposure to infection, feeding/weaning, and care practices (Girma and Genebo 2002), which may not be possible if the children have short birth intervals between them. In this study, lower levels of maternal education were associated with poor feeding practices such as early introduction of complementary foods, low dietary diversity score (< 3 foods/food groups), and inadequate meal frequency. They were also associated with inadequate iron and vitamin A intakes and high diarrhea incidences. According to Girma and Genebo (2002), mothers who are educated can utilize available resources for improving their children's feeding practices and therefore nutrient intake (Girma and Genebo 2002). The Uganda demographic and health survey (UBOS and ICF 2012) reported that mothers of higher educational level frequently dewormed and immunized their children. This could partly reduce diarrhea incidences during this vulnerable age. Polygamous families were associated with early introduction of complementary foods and early weaning. Short birth intervals among polygamous families in this study area were noted and could be responsible for this. In this study, early introduction of complementary foods, less than two meals, low dietary diversity score, frequent diarrhea incidences, and inadequate energy and protein intake were common among children of mothers aged less than 18 years. Such young mothers lack nutritional knowledge and experience concerning child-care practices.

Limitations of the study

The major limitation of this study was the use of the 1987 East African food composition table (West et al. 1987) for estimation of dietary intake. The present food composition table is over 27 years old and therefore needs urgent review.

Conclusion

Low levels of maternal education and maternal age less than 18 years influenced feeding practices such as timing of complementary foods, dietary diversity score, and meal frequency and diarrhea incidences. This resulted in more than half of the study children aged 12–36 months having inadequate energy intake while the protein, vitamin A, iron, and zinc intakes of more than half of the children aged 7–12 months were less than recommended. Households need to be empowered to utilize available resources for improving nutrient intake so as to avert health complications in early childhood.

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