

Child factors associated with complementary feeding practices in Uganda

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Objectives: The objective of the study was to identify child factors that influenced complementary feeding practices in 2006 and 2011 in Uganda.

Design: Trend analysis of Uganda Demographic and Health Surveys (UDHS) from 2006 and 2011.

Subjects and setting: Children aged 6 to 23 months, Uganda.

Results: Between 2006 and 2011, the percentage of children in Uganda consuming an adequate complementary diet increased by 3.1%. Duration of breastfeeding increased in this time from 11 months to 12 months, with the percentage of mothers who were still breastfeeding their children at two years decreasing from 55.2% to 46.5%. Factors such as child's age, deworming for intestinal parasites and receiving DPT3 and measles vaccines, increased the likelihood of caregivers providing children with a minimum acceptable diet. Children aged 6 to 8 months and 12 to 17 months tended to receive adequate complementary in both 2006 and 2011. Although bottle-feeding was highest among the children aged 6 to 11 months, amongst those reported with a fever, acute respiratory infection (ARI) or diarrhoea, it had no statistically significant effect in either 2006 or 2011.

Conclusion: Caregivers who take their children for deworming and DPT3 and measles vaccinations are more likely to feed them adequate diets, especially those aged 6 to 17 months. This is probably due to the mothers' interaction with healthcare practitioners who teach and support complementary feeding. Telling caregivers about complementary feeding practices during immunisation and deworming consultations is likely to encourage beneficial complementary feeding practices in Uganda.

Keywords: child age, complementary feeding, deworming, immunisation, Uganda Demographic and Health Survey

Introduction

Complementary feeding is essential if children are to grow and develop properly. Adequate complementary feeding entails feeding children aged between 6 and 23 months with foods from four or more food groups at least twice a day.^{1,2} Bottle-feeding (bottle-feeding, herein, refers to the use of a bottle with nipple/teat), duration of breastfeeding, continued breastfeeding to one year and continued breastfeeding to two years are four of the eleven indicators recommended by the World Health Organisation (WHO) for assessing the quality of complementary feeding.¹ Inadequate feeding practices are among the main causes of under-nutrition among children of this age.³ Wasting and stunting typically accelerate between the ages of 6 and 23 months, the phase when complementary feeding is needed, partly because the child becomes increasingly independent and mobile and thus exposed to environmental contaminants.⁴ Common childhood illnesses, such as diarrhoea, affect complementary feeding by reducing a child's appetite.⁵ Health workers tend to advise caregivers on complementary feeding practices during immunisation consultations.⁶

At least 6% of deaths of children under five years of age could be prevented by adequate complementary feeding.³ Feeding children aged 6 to 23 months with diversified diets of four or more food groups at least twice a day can prevent micronutrient deficiencies, stunting and wasting.⁷⁻⁹ Supplementing breastfeeding with nutritious complementary foods can reduce stunting among children of this age by 20%.⁷

Understanding the child factors associated with complementary feeding practices is important to support governments and their partners in designing and implementing programmes to prevent child under-nutrition by promoting nutritious complementary feeding diets. Children of low birth weights tend to have low iron stores at 4 to 18 months of age.¹⁰ Breastfeeding beyond six months of age does not provide adequate haemoglobin as breast milk does not contain sufficient iron to meet the needs of children beyond six months.^{11,12} Bottle-feeding, on the other hand, poses risks of anaemia¹³ and contamination with harmful pathogens. Cows' milk, which is most commonly offered in bottle-feeding in developing countries, does not contain adequate iron for children aged 6 to 23 months. Thus, emphasising the role of introducing iron rich complementary foods with high iron content from the age of 6 months e.g. foods from animal sources such as eggs.^{14,15}

The age of the child is an important consideration in assessing the adequacy of complementary feeding practices.¹⁶⁻¹⁸ Eruption of teeth influences when to introduce complementary feeding, but the process typically leads to a loss of appetite which affects food intake. Secondary analysis of Demographic and Health Surveys in Ethiopia conducted by Melkam *et al.*¹⁹ and in Nepal by Khana *et al.*²⁰ indicated that as children grow older their diets typically become more diverse.

Although Uganda has prioritised appropriate complementary feeding as a key child development practice, very little research has been conducted on the generalised factors related to

complementary feeding practices and their impact on child nutrition. The national representative demographic and health surveys provide a hitherto unexplored opportunity to examine the relationship between child factors and complementary feeding practices over the past decade. Understanding the child factors associated with complementary feeding practices is important in designing and implementing programmes to promote adequate complementary feeding to overcome child under-nutrition in Uganda. The present paper identifies plausible child-related factors that could have influenced complementary feeding practices in Uganda in 2006 and 2011. This study also fills a knowledge gap, as there is scant information on child factors influencing complementary feeding practices in Africa.

Methods

Study design

The study used a comparative analysis of secondary data from the Uganda Demographic and Health Surveys (UDHS) conducted from May to October 2006 and June to December 2011, to show trends in the coverage of key indicators of complementary feeding and to establish the factors associated with complementary feeding practices during the two periods. The UDHS is a national representative survey of women aged 15 to 49 years and men aged 15 to 54 years, conducted every five years. It covered 8 830 households in 2006 and 10 086 in 2011, in nine regions in 2006 and ten in 2011. The regions covered by the two surveys were Kampala, Central 1, Central 2, East Central, Eastern, Karamoja, North, West Nile, Western and Southwest. In 2006, Karamoja was part of the northern region and was not included, but it was included in 2011 after the government made it a special region.²¹

The UDHS collects data on fertility and family planning; infant, child, and maternal mortality; maternal and child health; nutrition; and, knowledge on HIV/AIDS and other sexually transmitted diseases. The women in the sampled households with children between the ages of 6 and 23 months were asked about the liquid, semisolid and solid foods fed to their children in the 24 h prior to the survey.²¹ They were asked whether the child was still breastfed, and if the answer was no or the child had already been weaned, how many months the child had breastfed.²¹

Study setting

Uganda is a landlocked country in east Africa, bordering Kenya to the east, Tanzania to the south, Rwanda to the southwest, the Democratic Republic of Congo to the west, and South Sudan to the north. Uganda has sufficient food at aggregate level to feed its population,^{22,23} but has a high prevalence of stunting (33%).²⁵ Uganda has a relatively low prevalence of wasting (4%) among children under five years of age.²⁵ Stunting among Ugandan children under five years of age decreased by 4.7% between 2006 and 2011, and wasting by 1.4% over the same period, but these are relatively modest reductions.²⁵ Vitamin A deficiency in children between 6 and 59 months in Uganda increased from 20% in 2006 to 38% in 2011.²⁵ The level of anaemia (50%) among these children remains high (62%) and poses a serious public health problem.^{24,25}

The country continues to face a high prevalence of three common childhood illnesses among children under five years of age: acute respiratory infection (ARI), fever and diarrhoea. In the two weeks before the 2006 UDHS survey, 15% of children under five had shown symptoms of ARI, 41% had a fever and 26% had diarrhoea. In the two weeks before the UDHS survey in 2011, 15% of children

under five had shown symptoms of ARI, 40% had a fever and 23% had diarrhoea. The 2011 UDHS also showed that children aged 6 to 23 months were more prone to diarrhoea than older children.²⁵

Participants

The participants in the survey were women aged 15 to 49 years in all the surveyed households, and a sub-sample of men aged 15 to 54 years from one third of the households where there were women aged 15 to 49 years. The women were asked for demographic information, such as age and education, and for information on reproductive and maternal health, gender-based violence, breastfeeding and infant feeding practices, vaccinations and their children's illnesses. The men were asked for the same information apart from maternal and child health aspects. Anthropometry measurements were taken for all children aged 6 to 59 months in the sampled households, and also underwent haemoglobin tests. The present study used a subset of data from the 2006 and 2011 UDHS for mothers who were living with children aged 6 to 23 months.²⁵

Ethical considerations

The authors obtained approval from ICF International Inc. to use the secondary UDHS dataset. The UDHS 2006 and 2011 data downloaded from the ICF International Inc. website did not contain names or other individual identifiers of women or children that could have invaded their privacy.

Data collection

In both surveys for 2006 and 2011, the dietary intake of children 6 to 23 months of age was assessed using a 24 h food frequency recall questionnaire. The interviewers asked women with children 6 to 23 months whether the child was still breastfed; and, if not, how long the child had been breastfed, and what liquid, semi-solid and solid foods had been consumed by the child during the 24 h preceding the survey. Blood samples were collected from all children aged 6 to 59 months whose mothers consented to the tests.²⁵ Laboratory technicians carried out haemoglobin analysis on-site using a battery operated portable HemoCue[®] analyser. Participants received the results verbally and in writing. The data collectors advised parents of children with a haemoglobin level under seven grams per decilitre (g/dl) to take the child to a health facility for follow-up care. The Uganda Bureau of Statistics adjusted the results for altitude.²⁵

In both surveys for 2006 and 2011, children's heights were measured using recumbent length on a measuring board.²⁵ The data on the prevalence of ARI, fever and diarrhoea were gathered by asking mothers whether their child had had a cough accompanied by short, rapid breathing and fever (symptoms of ARI), been ill with fever or had diarrhoea in the two weeks preceding the survey. These data are subjective (i.e. based on the mother's perception of illness) and were not validated by a medical examination. The interviewers also asked whether the child had been dewormed for intestinal parasites in the six months preceding the survey and whether the child had received Vitamin A supplementation.

Independent and dependent variables

The dependent complementary feeding variables in this study were: a minimum acceptable diet; minimum dietary diversity; minimum meal frequency; bottle-feeding; continued breastfeeding at one year; continued breastfeeding at two years; and, duration of breastfeeding. Table 1 provides a summary of the WHO definitions of these indicators.²

Table 1: WHO complementary feeding indicators and their definitions²

Indicator	Definition
Continued breastfeeding at 1 year	Proportion of children aged 12 to 15 months fed on breast milk
Continued breastfeeding at 2 years	Proportion of children aged 20 to 23 months fed on breast milk
Duration of breastfeeding	Median duration of breastfeeding among children less than 36 months of age. However, for this study, the authors operationally defined the duration of breastfeeding as the median duration of breastfeeding among children less than 24 months since they studied only children of age 6 to 23 months
Minimum dietary diversity	Proportion of children 6 to 23 months who receive foods from 4 or more food groups
Minimum meal frequency	Proportion of breastfed and non-breastfed children 6 to 23 months who consume solid, semi-solid or soft foods (including milk feeds for non-breastfed children) the minimum number of times or more. Minimum number of times is defined as 2 times for breastfed infants 6–8 months, 3 times for breastfed children 9–23 months and 4 times for non-breastfed children 6–23 month
Minimum acceptable diet	Proportion of children 6 to 23 months who consumed the minimum dietary diversity and minimum meal frequency in the past 24 h
Bottle-feeding*	Proportion of children 0 to 23 months who are fed with a bottle with nipple/teat.

*Throughout this paper, bottle-feeding refers to the use of a bottle with nipple/teat.

The independent variables were child-related: age; sex; child morbidity status (fever, acute respiratory infection and diarrhoea); birth weight; nutritional status (anaemia, stunting and wasting); vitamin A supplementation; deworming; and, DPT3 and measles vaccinations.

Data analysis

For the sociodemographics of the study population, the authors analysed the entire weighted data subset, 2 958 cases in 2006 and 2 814 in 2011, of children between 6 and 23 months who lived with their mothers.

Complementary feeding indicators were expressed as dichotomous variables: '0' denoting breastfeeding for 0 to 11 months; and, '1' denoting consumption of the minimum acceptable diet, minimum dietary diversity, minimum meal frequency, breastfeeding for 12 to 23 months, and bottle-feeding.

The Pearson chi-square test (χ^2) was used to determine the binomial association between the child factors and whether the child consumed the minimum acceptable diet, minimum dietary diversity, minimum meal frequency and was bottle-fed. Stepwise backward multiple logistic regression was used to identify the independent variables that influenced complementary feeding practices. Only the independent variables with $p < 0.05$ were retained in the final model.

Odds ratios (ORs) with 95% confidence intervals (CIs) were used to estimate the strength of association between the independent variables and the dependent variables of the minimum acceptable diet and bottle-feeding. Statistical analyses were performed with IBM SPSS 19.0. Adjustments were made for the cluster sampling design. The Taylor series linearisation method was used to estimate the CIs of prevalence estimates. All associations with $p < 0.05$ were considered statistically significant.

Results

Trends in complementary feeding practices in 2006 and 2011

The results from the comparative analysis (see Table 2) indicated statistically significant differences in the probabilities of children consuming the minimum acceptable diet ($p = 0.027$), consuming diets of minimum dietary diversity ($p = 0.047$), continued breastfeeding at two years ($p = 0.024$), and bottle-feeding ($p < 0.001$) in 2006 and 2011. The probabilities of achieving the minimum meal frequency ($p = 0.065$) and continued breastfeeding at one year ($p = 0.060$) were not significantly different between 2006 and 2011.

Between 2006 and 2011 there were increases of 3.1% in the percentage of children in our sample receiving a minimum acceptable complementary diet, 3.1% in the percentage receiving diets of the minimum recommended dietary diversity, 2.8% in the percentage achieving the minimum recommended meal frequency, and 5.7% in the percentage who were bottle-fed. The percentage of children breastfed up to one year and those still breastfed at two years respectively decreased by 3.8% and 8.7% between 2006 and 2011. However, the median duration of breastfeeding in our sample increased from 11 months in 2006 to 12 months in 2011.

Association between child factors and complementary feeding practices in 2006 and 2011

The Pearson chi-square analysis (Table 3 and Table 4) showed that children who were dewormed were more likely to consume the minimum dietary diversity (27.4% and $p < 0.001$ in 2006 and 28.8% and $p < 0.001$ in 2011) than those who were not dewormed (21.1% in 2006 and 24.3% in 2011). Consuming the minimum acceptable diet in 2011 was also associated with having had DPT3 and measles vaccinations ($p < 0.001$). Minimum dietary diversity and minimum meal frequency were associated with the child's age, deworming, having had DPT3 and measles vaccinations, and receiving vitamin A supplementation. Consuming a diet with the minimum dietary diversity in 2006 and 2011 was associated with older children ($p < 0.001$) and being dewormed ($p < 0.001$). Younger children tended to consume meals more frequently ($p < 0.001$). Children with anaemia ($p = 0.033$), and those who had had a fever ($p = 0.032$) or ARI ($p = 0.009$) were the most likely age group to receive the minimum meal frequency in 2011 but not in 2006.

Children aged 18 to 23 months were less likely than those aged 6 to 8 months and 12 to 17 months to consume the minimum acceptable diet in both 2006 and 2011. The percentage of children aged 6 to 8 months consuming the minimum acceptable diet remained constant at 29.0% in 2006 and 2011. Children aged 12 to 17 months were more likely than the other age groups to consume the minimum acceptable diet and minimum dietary diversity in both years. The percentage of 12 to 17 month old children who consumed diets with the minimum dietary diversity increased from 63.1% in 2006 to 66.6% in 2011, suggesting a risk.

Table 2: Prevalence of complementary feeding practices in 2006 and 2011

Feeding practice	Survey year		Pearson χ^2 p-value
	2006	2011	
Minimum acceptable diet			0.027
No	n	1589	1406
	%	76.8	73.7
Yes	n	481	501
	%	23.2	26.3
Minimum dietary diversity			0.047
No	n	943	808
	%	45.0	41.9
Yes	n	1154	1122
	%	55.0	58.1
Minimum meal frequency			0.065
No	n	1315	1170
	%	64.7	61.9
Yes	n	717	721
	%	35.3	38.1
Bottle-feeding			<0.001
No	n	2424	2142
	%	82.1	76.4
Yes	n	529	662
	%	17.9	23.6
Continued breastfeeding at 1 year			0.060
Yes	n	451	377
	%	90.7	86.9
No	n	46	57
	%	9.3	13.1
Continued breastfeeding at 2 years			0.014
Yes	n	233	174
	%	55.2	46.5
No	n	189	200
	%	44.8	53.5

Children aged 6 to 8 months and 12 to 17 months were more likely than the other age groups to be fed with the minimum meal frequency in both 2006 and 2011. Children aged 18 to 23 months were the least likely group to be fed with the minimum meal frequency both in 2006 (28.8%) and 2011 (31.8%). The percentage of children aged 6 to 8 months who were fed with the minimum meal frequency increased by 2.8%, and the percentage of those aged 12 to 17 months who were fed with the minimum meal frequency increased by 2.0% in 2011.

Table 3 shows that bottle-feeding had a significant association with the sex and age of the child; birth weight; DPT3 and measles vaccination; fever, diarrhoea and ARI; vitamin A supplementation; and, deworming in the previous six months. In both 2006 and 2011, bottle-feeding was significantly higher among children aged 6 to 11 months and children with fever, ARI or diarrhoea

than among those aged 12 to 23 months and those who did not have these ailments.

In 2006, more children with normal birth weights (18.2%) were bottle-fed than children with low birth weights (17.2%). The reverse was the case in 2011, with 27.1% of children with low birth weights being bottle-fed compared with 23.2% of those with normal birth weights. In 2011, 25.7% of children who had had diarrhoea in the two weeks prior to the survey were bottle-fed. In 2006 the percentage of children who had or not had diarrhoea and were bottle-fed was about the same, about 18%. In 2011, more children who had received vitamin A supplementation (25.5%) were bottle-fed than those who had not received vitamin A.

Child factors that influenced complementary feeding practices in 2006 and 2011

The results from the multiple logistic analysis of the 2011 data are presented in Table 5. In 2011, child's age, DPT3 and measles vaccinations and deworming were significant predictors of consumption of the minimum acceptable diet ($p < 0.05$). Children who were vaccinated were 1.9 times more likely to be fed the minimal acceptable diet and 1.5 times more likely to be fed the minimum dietary diversity than those who were not vaccinated. Children who were dewormed were 1.3 times more likely to be fed the minimal acceptable diet and 1.4 times more likely to be fed the minimum dietary diversity than those who were not dewormed. Compared with children aged 6 to 8 months, children aged 9 to 11 months were 2.0 times more likely, those 12 to 17 months 2.5 times more likely, and those 18 to 23 months 1.9 times more likely to have been fed the minimum dietary diversity. Children who had been vaccinated were 1.7 times more likely, and children who had been dewormed 1.5 times more likely, to receive the minimum meal frequency.

The results from the multiple logistic analysis of the 2006 data are presented in Table 6. The likelihood of being fed the minimum acceptable diet increased among children from 9 to 11 months and 12 to 17 months. Children who had been dewormed were 1.4 times more likely to be fed the minimum acceptable diet than those who were not dewormed. Children who had been vaccinated were 1.5 times more likely to be fed the minimum acceptable diet than those who had not been vaccinated. The minimum dietary diversity indicator was influenced by the child's age, DPT3 and measles vaccination and vitamin A supplementation. Children who had been vaccinated were 1.4 times more likely to be fed the minimum dietary diversity than those who had not been vaccinated. Children who had been dewormed were 1.3 times more likely to be fed the minimum dietary diversity than those who had not been dewormed. Children who received vitamin A supplementation were 1.2 times more likely to be fed the minimum dietary diversity than those you did not receive the vitamin A supplements. Children aged 12 to 17 months had the highest odds of being fed the minimum dietary diversity (OR = 2.648), followed by those aged 9 to 11 months (OR = 2.227). More children aged 9 to 11 months and 12 to 17 months were being fed the minimum dietary diversity than those aged 6 to 8 months and 18 to 23 months. The findings from the multiple logistics analysis showed there were no significant associations between child factors and bottle-feeding in 2006.

Table 3: Association between child factors and complementary feeding practices in 2006

Independent variable	Complementary feeding indicators, <i>n</i> = 2958							
	Min. acceptable diet		Min. dietary diversity		Min. meal frequency		Bottle-feeding	
	%	<i>p</i> -value	%	<i>p</i> -value	%	<i>p</i> -value	%	<i>p</i> -value
Sex		0.152		0.168		0.327		<0.001
Male	24.6		56.6		36.3		18.0	
Female	21.9		53.6		34.3		17.8	
Age in months		<0.001		<0.001		<0.001		<0.001
6–8	29.1		37.9		51.2		24.2	
9–11	21.7		56.2		29.1		24.2	
12–17	25.6		63.1		35.8		19.7	
18–23	17.9		55.4		28.8		16.3	
Birth weight		0.731		0.793		0.624		<0.001
Normal	23.1		54.9		35.6		18.2	
Low	24.0		55.7		34.3		17.2	
DPT3 + measles		0.349		0.627		0.056		<0.001
No	23.4		54.9		35.7		17.8	
Yes	19.7		57.1		27.0		18.8	
Diarrhoea past 2 weeks		0.936		0.229		0.242		<0.001
No	23.3		56.2		36.4		18.0	
Yes	23.2		53.5		33.9		17.9	
Fever past 2 weeks		0.449		0.933		0.100		<0.001
No	24.1		55.2		37.2		19.1	
Yes	22.6		55.0		33.7		16.7	
ARI past 2 weeks		0.902		0.926		0.155		<0.001
No	23.4		54.9		36.9		18.5	
Yes	23.2		55.1		33.9		17.4	
Vitamin A past 6 months		0.416		0.508		0.448		<0.001
No	22.2		57.0		32.9		19.6	
Yes	24.5		59.1		35.2		19.6	
Deworm past 6 months		0.001		<0.001		0.106		<0.001
No	21.1		52.2		34.0		16.9	
Yes	27.4		61.0		37.6		21.0	

Discussion

This study showed that the proportion of Ugandan children aged 6 to 23 months who consumed a minimally adequate diet increased significantly between 2006 and 2011. However, the proportion remains low. This can be attributed to the failure of the majority of mothers to feed their children complementary diets at least twice a day for children aged 6 to 8 months and three times a day for those aged 9 to 23 months, irrespective of their breastfeeding status. The findings showed that in both 2006 and 2011 children aged 6 to 23 months were consuming foods from four or more food groups, but only a small fraction of them consumed such diets at least twice a day.

The study also showed that while the overall quality of complementary feeding improved, the practice of bottle-

feeding increased between 2006 and 2011. This could be indicative of mothers not having enough time to breastfeed their children. Caregivers, who bottle-feed their children as they have busy schedules, are likely to leave the children with other caregivers who may fail to provide them with sufficiently diverse diets. Cow's milk, the most common substitute for breast milk, does not contain sufficient iron for children aged 6 to 23 months. Bottle-feeding with cow's milk, compounded by inadequate complementary feeding diets, could aggravate anaemia in these children. Bottle-feeding can also expose these children to diarrhoeal diseases, which in turn contribute to anaemia, wasting and stunting through reduced utilisation of iron by the body.

The study showed that receiving vitamin A supplementation increased the likelihood of children aged 6 to 23 months

Table 4: Association between child factors and complementary feeding practices in 2011

Independent variable	Complementary feeding indicators, <i>n</i> = 1907							
	Min. acceptable diet		Min. dietary diversity		Min. meal frequency		Bottle-feeding	
	%	<i>p</i> -value	%	<i>p</i> -value	%	<i>p</i> -value	%	<i>p</i> -value
Sex		0.414		0.313		0.615		<0.001
Male	25.4		57.0		37.6		23.2	
Female	27.1		59.3		38.7		24.0	
Age in months		0.005		<0.001		<0.001		<0.001
6–8	29.0		37.1		54.0		32.4	
9–11	24.6		59.0		33.0		31.5	
12–17	29.9		66.6		37.8		26.2	
18–23	21.5		61.2		31.8		20.0	
Birth weight		0.449		0.097		0.390		<0.001
Normal	26.4		58.8		38.5		23.2	
Low	24.4		53.8		35.9		27.1	
DPT3 + measles		<0.001		<0.001		0.065		<0.001
No	22.6		22.6		36.4		23.5	
Yes	31.7		31.7		40.6		23.9	
Diarrhoea past 2 weeks		0.563		0.843		0.628		<0.001
No	26.7		58.0		38.6		22.5	
Yes	25.6		58.4		37.5		25.7	
Fever past 2 weeks		0.341		0.889		0.032		<0.001
No	27.2		58.3		40.5		23.1	
Yes	25.3		58.0		35.7		24.4	
ARI past 2 weeks		0.285		0.112		0.009		<0.001
No	27.5		56.1		41.4		22.6	
Yes	25.3		59.7		35.5		24.6	
Vitamin A past 6 months		0.123		0.037		0.638		<0.001
No	24.4		55.2		37.5		21.5	
Yes	27.6		60.0		38.6		25.5	
Deworm past 6 months		0.025		<0.001		0.104		<0.001
No	24.3		52.3		36.5		22.6	
Yes	28.8		65.5		40.2		25.7	

consuming a diverse diet in 2006. It also showed that deworming for intestinal parasites and the administration of DPT3 and measles vaccinations increased the chances of children receiving an adequate complementary diet in both 2006 and 2011. This finding may reflect the benefits of increased efforts by the Ugandan government to provide complementary feeding education and to encourage and support mothers during deworming and immunisation sessions.

The study found that children aged 9 to 17 months were more likely to consume complementary diets of four or more food groups at least twice a day than those aged 6 to 8 months and 18 to 23 months. According to the Ugandan Ministry of Health and WHO guidelines, children aged 6 to 9 months should consume

diverse diets more than three times a day. But the present study shows that this was not the case in Uganda in 2006 and 2011. Teething, a loss of appetite during teething and weight loss due to increased infections could explain changes in feeding practices among children 6 to 8 months. One plausible explanation for the observation that older children (18 to 23 months) consumed inadequate complementary diets may be the transition from complementary diets to the family's normal diet. Furthermore, it is likely that mothers of children aged 18 to 23 months perceived them as old enough to eat with the rest of the family during established adult mealtimes. This perception is inappropriate, as children aged 18 to 23 months still need complementary feeding support due to their small appetites and dislike of certain foods.

Table 5: Child factors that influenced complementary feeding practices in Uganda in 2011

Dependent variable	Independent variable	p-value	Odds ratio	95% CI for odds ratio	
				Lower CI	Upper CI
Minimum acceptable diet	Age in months	<0.001			
	6–8		1.0		
	9–11	0.007	0.621	0.440	0.878
	12–17	0.026	0.694	0.504	0.958
	18–23	<0.001	0.419	0.295	0.595
	Measles + DPT3	<0.001	1.881	1.488	2.377
	Deworming	0.016	1.308	1.052	1.626
Minimum dietary diversity	Age in months	<0.001			
	6–8		1.0		
	9–11	<0.001	2.137	1.570	2.909
	12–17	<0.001	2.529	1.887	3.390
	18–23	<0.001	1.921	1.416	2.606
	Measles + DPT3	<0.001	1.535	1.237	1.906
	Deworming	0.001	1.433	1.167	1.759
Vitamin A	0.992	0.999	0.807	1.237	
Minimum meal frequency	Age in months	<0.001			
	6–8		1.0		
	9–11	<0.001	0.335	0.244	0.461
	12–17	<0.001	0.356	0.265	0.479
	18–23	<0.001	0.249	0.181	0.342
	Measles + DPT3	<0.001	1.743	1.395	2.177
	Deworming	<0.001	1.456	1.180	1.796
Vitamin A	0.092	0.828	0.655	1.031	
Bottle-feeding	Age in months	0.021			
	6–8		1.0		
	9–11	0.484	1.269	0.651	2.475
	12–17	0.311	0.725	0.390	1.350
	18–23	0.034	0.490	0.254	0.946

Conclusion

Overall, this study showed an improvement in the proportion of Ugandan children who were fed at least four food groups at least twice a day between 2006 and 2011. The study showed that children aged 6 to 8 months and those aged 12 to 17 months tended to receive adequate complementary diets in both 2006 and 2011. Caregivers who take their children for vaccinations and deworming are more likely to provide more adequate diets than those who do not – at least for the children aged 6 to 17 months. It appears there is a positive and encouraging benefit in the contact between caregivers and healthcare practitioners who provide advice on adequate complementary feeding

Table 6: Child factors that influenced complementary feeding practices in Uganda in 2006

Dependent variable	Independent variable	p-value	Odds ratio	95% CI for odds ratio	
				Lower CI	Upper CI
Minimum acceptable diet	Age in months	<0.001			
	6–8		1.0		
	9–11	0.001	0.665	0.522	0.846
	12–17	0.012	0.764	0.619	0.944
	18–23	<0.001	0.467	0.371	0.588
	Deworming	<0.001	1.423	1.219	1.661
	Measles + DPT3	<0.001	1.534	1.285	1.830
Minimum dietary diversity	Age in months				
	6–8		1.0		
	9–11	<0.001	2.106	1.700	2.610
	12–17	<0.001	2.633	2.168	3.199
	18–23	<0.001	1.954	1.601	2.387
	Measles + DPT3	<0.001	1.359	1.152	1.603
	Deworming	<0.001	1.290	1.121	1.485
Vitamin A	0.012	1.199	1.040	1.382	
Minimum meal frequency	Age of child in months	<0.001			
	6–8		1.0		
	9–11	<0.001	0.376	0.301	0.470
	12–17	<0.001	0.451	0.371	0.548
	18–23	<0.001	0.317	0.258	0.391
	Measles + DPT3	<0.001	1.372	1.162	1.619
	Deworming	<0.001	1.407	1.216	1.619

practices and diets during consultations for child immunisation and deworming. Nationwide efforts to encourage healthcare service providers in postnatal care contact points, such as immunisation clinics, to provide complementary feeding education and counselling to caregivers are likely to improve complementary feeding practices in Uganda. Such efforts will require active provision of immunisation and deworming at both health facilities and community centres so that more caregivers can receive feeding advice from the healthcare service providers. Healthcare workers should actively discourage bottle-feeding and encourage breastfeeding.

Strategies are needed to ensure that all children from 6 to 23 months of age are provided with meals consisting of four or more food groups several times a day. A practical step would be to adjust labour policies so that mothers can spend more time with their children during the work day. Another approach would be to encourage the development of affordable complementary foods to save caregivers time and money in preparing foods for children.

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