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Nutritional knowledge, attitude, and practices among caregivers and nutritional status of children 6–24 months: evidence from Amuria and Soroti districts of Uganda

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Abstract

This study assessed the factors associated with caregiver's nutritional knowledge, attitude, and practices (KAP) as well as their implication on the nutritional status of children aged 6–24 months old in Soroti and Amuria districts, eastern Uganda. A cross-sectional research design was applied to collect primary data from 408 caregivers of children between 6 and 24 months. Data was collected using questionnaires and analyzed using descriptive and inferential statistics including regression analysis. Anthropometric approaches were used to assess the nutritional status of the reference child. Results showed that there was a generally low level of knowledge on complementary feeding (CF) among caregivers in this study. There was, however generally good attitude of caregivers towards CF. The findings on practices were mixed with both good practices such as feeding the child with colostrum and bad practices such earlier than recommended introduction of complementary foods. From this study, the average time for introduction of complementary foods was 4.4 months. This was less than the recommended 6 months with only 36% of the children being introduced to complementary feeding at the recommended 6 months. Caregiver's nutritional knowledge was predicted by child's sex, mother as caregiver and occupation of household head, while, caregiver's attitude was predicted by household occupation and farming as source of foods in the case caregiver's attitude. Results on influence knowledge and attitude on child nutritional status shows that attitude is a significant predictor of stunting and wasting, but not underweight, on the other hand, knowledge was not a significant predictor of child nutritional status. The study recommends the need to improve the level of knowledge of caregivers. This could be by introducing child nutrition education through available sources of information.

Keywords Nutritional KAP · Complementary feeding · Nutritional status · Child nutrition

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1 Introduction

According to the United Nations Children's Fund (UNICEF), globally, less than 20% of the children aged 6–24 months are receiving proper complementary feeding (CF) while one in three infants aged 6–8 months are usually not introduced to solid food [1]. Over 52% eat the minimum meal frequency, while, over 29% have the minimum dietary diversity with only 16% having acceptable diet as measured by the food consumption score (FCS) [2]. Reports have shown that, in Sub Saharan Africa (SSA), poor complementary feeding practices (CFP) have been shown to contribute to negative growth trends and is the immediate cause of under nutrition during the first two years of life [1]. In East and Southern Africa, only 45% and 35% achieve the minimum meal frequency and minimum dietary diversity, respectively. Only 11.5% have acceptable diets as measured by the FCS [2].

In Uganda, a report by World Health Organization (WHO), and partners indicated that only 25.7% of children usually eat the minimum meal frequency, while, 41.6% achieve the minimum dietary diversity [3]. Appropriate CF for children 6–24 months was reported at 14% while the prevalence of child under nutrition for children less than five years old was reported at 26%, 2.8% and 10.2% for stunting, wasting, and underweight, respectively, according to Uganda Bureau of Statistics (UBOS) [4]. Within the country, there are even wider variations in the proportion of stunted, wasted and underweight children [5–7].

Proper CF is important in improving child survival and promoting healthy growth [1]. As such appropriate CF is a major concern in many developing countries [8]. Achieving adequate CF requires among others, accurate information which can be realized through skilled support from the family, community and healthcare system to mothers and/or caregivers. Inadequate knowledge about appropriate food and poor CFP are determinants of child undernutrition [8, 9].

In Teso sub-region, inappropriate CFP are common for children aged 6–24 months. For instance, inadequate initiation of complementary foods before and after six (6) months is not recommended and increases the risk of undernutrition in children aged 6–24 months [10, 11]. There are several interventions such as nutrition education and policy on young child feeding practices which targets caregivers to improve adherences to proper CF with the aim of addressing undernutrition in Uganda [9, 12]. Similarly, caregiver's nutritional KAP has implications for CFP for children under their care as well as their nutritional status [8, 13, 14]. Despite the high prevalence of poor CFP and under nutrition (14% for stunting and 58.9% for anemia) in infants in Teso [4], there is scantiness of information on the relationship between caregiver's nutritional KAP on CF for children 6–24 months, and how these translates into better nutritional outcomes for the children. Similarly, there is a general lack of information on how the disparity of caregivers' nutritional KAP influences the nutritional status of children aged 6–24 months. As such, understanding nutritional KAP among different caregivers and how it contributes to nutritional status of children is key in addressing under nutrition. Therefore, this study investigated the variations in nutritional KAP towards CF among caregivers as well as nutritional status of children 6–24 months in Teso sub-region. The study also assessed predictors of knowledge and nutritional status of these children.

2 Materials and methods

2.1 Study design, area, and population

This study applied a community based cross-sectional design. The study was carried out in Amuria and Soroti districts in eastern Uganda. The districts were purposely selected because previous reports have documented poor CFP and high rates of under nutrition in children aged 6–24 years [12]. Both districts have a high burden of child malnutrition. For instance, reports indicate the prevalence of wasting in the region is over 14% [7]. This is above the global target of 5% [15] Soroti district is about 310 km north east of Uganda's capital, Kampala, while, Amuria is about 340 km north east of Uganda's capital, Kampala.

The study population consisted of caregivers of the reference child. The reference child was that child whose nutritional status was assessed in this study and was between 6 and 24 months at the time of the study. The caregiver was expected to answer all questions with respect CF of the reference child. The inclusion criterion was that only those caregivers (mothers, fathers, maids and grandmothers or any other person) taking care of the reference child

at the time of the study were interviewed. In this study, a caregiver was any household member who was in charge of taking care of the child at the time of the study [14]. This was either the mother or another person involves in the daily care of the reference child. In the event that the household had more than one child between 6 and 24 months, only one was randomly selected for inclusion in the study. The focus in the caregiver was due to the fact that this study was in knowledge, attitude and practice of complementary child feeding. Thus, in the event that more than one person was involved in the care of the reference child, the interviewed caregiver was the one who spent the most time with the child.

2.2 Sampling size and sampling framework

The number of participants for this study was determined using the Krejcie and Morgan [16] table of sample size determination. Given that the two districts have over 70,000 households [17], the ideal sample size was 382. However, due to the potential non-response that is common in survey research, this figure was increased by 10% to give 420. However, after data collection, response from 12 respondents could not be used due to incomplete responses. The effective sample size thus reduced to 408. Since the two districts is having almost the same population size, equal proportions of the sample participants were selected from each district. To select the study participants, a multi-stage sampling technique was used. In the first stage, two districts were purposively selected from Teso sub-region. In the second stage, two sub-counties were then randomly selected from each district. In the third stage, three parishes were randomly selected followed by random selection of two villages per parish. From each village, households with children within the reference age were profiled with the help of the local leaders. From this profile, study participants were then randomly selected using simple random sampling.

2.3 Study instruments

This study used a structured researcher administered questionnaire to collect primary data on KAP and child's nutritional status. The KAP questions were adopted with modifications from Marías and Glasauer [18]. The questionnaire consisted of four (4) sections. The first section consisted of questions on demography, social and economic factors. This included caregiver's status, caregiver's age, marital status, family type, family size, and education level and income status of the household. The second section had questions on nutritional knowledge. The third part had questions on nutritional attitude. Attitude questions followed Nassanga et al. [8], to include both positive and negatively framed questions. Respondents were expected to answer these questions on a three-point Likert scale where 0 = disagree, 1 = not sure, and 2 = agree. The fourth part consisted of questions on practices with respect to CF as well as child nutritional status that was measured through anthropometric procedures. The anthropometric measures were implemented by the researcher with permission from the parents of the reference child. This information was captured in the same household questionnaire. Before measurement of child nutritional status, the children wore minimal clothing and bare feet. The child's height, and weight were taken using the right equipment. Weight reading in kilograms (reported with 1 decimal) was taken and recorded using a standard calibrated digital weighing scale. Height reading in centimeter (reported with 1 decimal) was taken using a stadiometer. Both height and weight were taken twice and a difference of 0.1 cm in height and 100 g in weight were acceptable. The child's age was confirmed from the child health card. Where the card was not available, the right date of birth was obtained from the caregiver. These anthropometric readings were then used to compute the child's height for age (HAZ) to show level of stunting, weight for age (WAZ) to show level of underweight, and weight for height (WHZ), to show level of wasting. All the anthropometric measurements and assessment followed the guidelines on anthropometry by WHO [19]. The children were considered stunted, underweight or wasted, if the height-for-age (HAZ), weight-for-age (WAZ), or the weight-for-length (WHZ) Z-scores were outside the normal range for children aged 6–24 months old using the new WHO child growth standards [19]. The height, age and weight measurements are used to compute the respective z-scores. The cut-offs for the z-scores, followed WHO child growths standards [19, 20], and were computed using the WHO Anthro Survey Analyzer [21]. The WHO Anthro Survey Analyzer is an open source software.

2.4 Data collection

Data for this study was collected by a team of four research assistants, led by the first author, with supervision of the other co-authors. The research assistants were selected based on their previous experience in nutrition surveys as well as fluency in the local language (Ateso). Before involvement in data collection, the research assistants were taken through

the tools for a common understanding. During the training, the research assistants also participated in pre-testing the research tool. Pretesting of the questionnaires was done so as to assess validity and reliability of the questionnaire. The pretest for this study was conducted in the neighboring Kaberamaido districts. Following the pre-test, the necessary adjustments were made on the research questionnaire before final data collection. During data collection, informed consent was obtained from all participants selected for inclusion in the study. The parents/legal guardians provided informed consent for inclusion of themselves and their children in the study, while, informed consent was also obtained from the caregivers, if different from the consenting parent or guardian. Following informed consent, only consenting participants were interviewed. Specifically, the mothers or caregivers were interviewed depending on who spent more time with the child. The questionnaires were researcher administered. This was necessary so as to ensure that the participants were provided with any additional explanation, they may require to enable them understand the questions. After completing the structured questionnaire with the caregiver, anthropometry variables for the reference child (the child for which the caregiver was taking care of) were taken and recorded in the same questionnaire, following, the procedures described in the previous section. This was done so as to help link the caregiver's information to the child nutritional status.

2.5 Data analysis

After data collection, all the data collected were checked and verified for accuracy, completeness and eligibility daily in the field and upon returning. Data from questionnaires that passed the post-data collection evaluation stage were coded and entered in SPSS v25. After entry, the data was cleaned for any anomalies in data entry. Descriptive analyses were performed in SPSS, while, regression analysis was performed using STATA v14. Summary statistics of sociodemographic factors were obtained using frequencies, means and standard deviations. In order to show variation of sociodemographic factors across study location, the chi-square tests of association and student's t-test were used. Specifically, the chi-square test of association was used to assess significance of association between categorical socio-demographic factors and district, while, the student's t-test was used to assess significance difference of means between quantitative sociodemographic factors and district.

2.5.1 Nutritional KAP

The assessment of KAP of the respondents was done using descriptive statistics for each of questionnaire items for assessing level of KAP. This was following computation of a single score for knowledge and attitude. Each knowledge questions were scored on 2-point scale (0 for poor and 1 for good response). The level of knowledge was assessed by summing the knowledge related questions and expressing it as a percentage of the total score. Each attitude question was assessed on a 3-point scale as described in Sect. 2.3. The overall level of attitude was obtained by summing all the attitude questions and expressing as a percentage of the total points [22]. Knowledge and attitude percentage scores were classified into binary variables. The knowledge score was classified following Bas et al. [23] while attitude score was classified following Ul Haq et al. [24]. Specifically, for knowledge scores below 50% were classified as poor for knowledge while those above were classified as good knowledge [23], while, in the case of attitude, scores ≤ 57% were classified as poor attitude, while those above were classified as good attitude [24]. Practices associated with good CF were scored on different scales include 0 = no, 1 = yes; 0 = wrong practice, 1 = correct practice, as well as frequency of the some practiced based task. Based on the nature of the questions used to assess practice in this study, it wasn't possible to classify practices into the binary classification used for knowledge and attitude.

2.5.2 Assessing predictors of Knowledge, Attitude and child nutritional status

The final classification of knowledge and attitude gave a binary variable. This binary variable was coded as 1 for good knowledge or attitude, and 0 for poor knowledge or attitude. In order to assess the predictors of good knowledge and attitude, a binary choice logistic regression model was ideal. Consequently, the study performed a binary logistic regression model to ascertain the predictors of good knowledge or attitude towards CF of children under 24 months. The regression was performed with knowledge or attitude as dependent variables and demographics factors including caregiver's characteristics, child characteristics, household characteristics and practices. Table 1 presents a description of the independent variables. Two regressions models were run independently, one for knowledge as a dependent variable, and another for attitude as a dependent variable. Given that it wasn't possible to compute one score for practice-based

Table 1 Description of variables included in the regression to predict nutritional KAP and child nutritional status

Variable	Description/measurement	Apriori expectation	
		Knowledge and attitude	Nutritional Status
Age	Caregiver's age (complete years)	+	+
Household size	Number of individuals in the households	–	NA
Income source	Main source of income for the household	+	NA
Child sex	Sex of child (1 = male, 0 = female)	+	NA
Rural	Location of the caregiver (1 = rural, 0 = urban)	+	NA
Married	Caregiver's marital status (1 = married, 0 = otherwise)	+	NA
Caregiver is mother	Mother is the caregiver (1 = yes, 0 = no)	+	+
District	District of residence (1 = Amuria, 0 = Soroti)	±	±
Source of livelihood	Livelihood sources of the caregiver (1 = Farming, 0 = otherwise)	+	NA
Source of food	How food is obtained in the household (1 = Farming, 0 = otherwise)	+	NA
Attitude	Attitude of the caregiver (1 = good knowledge,	NA	+
Knowledge	Knowledge of caregiver	NA	+
Fed on complimentary	Daily frequency of feeding child on complementary food	+	+
Child breastfeeding	Children was ever breastfed (1 = yes, 0 = no)	NA	+
Still breastfeeding	Child still breastfeeding (1 = yes, 0 = no)	NA	+
Diarrhea	Child suffering or suffered from diarrhea in the past one week of the study (1 = yes, 0 = no)	NA	–
Solid food	Children given solid foods (1 = yes, 0 = no)	NA	+
Information	Source of information on CF (1 = hospital, 0 = no)	NA	+
Health card	Child having health card at the time of the study (1 = yes, 0 = no)	NA	+
Birth place	Place of birth (1 = hospital, 0 = no)	NA	+
6–8 months	Child is between 6–8 months old (1 = yes, 0 = no)	–	NA
9–12 months	Child is between 9–12 months old (1 = yes, 0 = no)	–	NA
13–18 months	Child is between 13–18 months old (1 = yes, 0 = no)	+	NA
19–24 months	Child is between 19–24 months old (1 = yes, 0 = no)	+	NA

NA not applicable for the model

questions, this study did not assess the predictors of practices. However, the practice-based questions were presented using descriptive statistics.

In order to assess the predictors of child nutritional status, a multinomial logistic regression was performed to assess the factors influencing child nutritional status. The multinomial logistic regression was ideal given that child nutritional status is a three-level variable which classifies children as having severe acute malnutrition (SAM), moderate acute malnutrition (MAM) or normal with respect to their height for age, weight for age and weight for height. Consequently, a separate model was predicted for each measure of child nutrition. The independent variables were the socio-economic factors, and household characteristics as described in Table 1.

3 Results

3.1 Socio demographic characteristics

Results in Table 2 shows that majority (83%) of the household heads were males, with household in Amuria having significantly ($p < 0.01$) more male headed households than households in Soroti district. In 90% of the households, the caregivers of the reference children were their biological mothers, with no significant association across districts. Majority (42%) of the household heads were not employed and only 12% had some form of employment, while, 15%, 9% and 4% were farmers, small scale traders and casual laborers, respectively. There was a significant ($p < 0.01$) association

Table 2 Socio demographic characteristics of caregivers

Variable	Category	Overall		District				Chi-square
				Amuria		Soroti		
		n	%	n	%	n	%	
Household head sex	Male	340	83.3	181	88.7	159	77.9	8.541***
	Female	68	16.7	23	11.3	45	22.1	
Nature of caregiver	Mother	366	89.7	187	91.7	179	87.7	3.498
	Maid	8	2.0	2	1.0	6	2.9	
	Grandmother	27	6.6	13	6.4	14	6.9	
	Father	7	1.7	2	1.0	5	2.5	
Marital status	Single	31	7.6	13	6.4	18	8.8	7.151*
	Married	331	81.1	175	85.8	156	76.5	
	Separated	33	8.1	13	6.4	20	9.8	
	Widowed	13	3.2	3	1.5	10	4.9	
Main occupation of the household head	Not Employed	170	41.7	109	53.4	61	29.9	33.919***
	Employed	50	12.3	20	9.8	30	14.7	
	Petty business	36	8.8	15	7.4	21	10.3	
	Casual labor	30	7.4	9	4.4	21	10.3	
	Farmer	60	14.7	33	16.2	27	13.2	
	Mechanic	3	0.7	0	0.0	3	1.5	
Main occupation of mother	Not Employed	291	71.3	165	80.9	126	61.8	29.699***
	Employed	13	3.2	5	2.5	8	3.9	
	Petty business	47	11.5	8	3.9	39	19.1	
	Casual labor	12	2.9	5	2.5	7	3.4	
	Farmer	42	10.3	21	10.3	21	10.3	
	Stone querying	1	0.2	0	0.0	1	0.5	
	Tailor	2	0.5	0	0.0	2	1.0	
Education level of household head	None	25	6.1	11	5.4	14	6.9	7.812*
	Primary	216	52.9	112	54.9	94	46.1	
	Secondary	118	28.9	51	25.0	67	32.8	
	Tertiary	49	12.0	20	9.8	29	14.2	
Education level of caregiver	None	30	7.4	18	8.8	12	5.9	14.058***
	Primary	239	58.6	133	65.2	106	52.0	
	Secondary	110	27.0	43	21.1	67	32.8	
	Tertiary	28	6.9	9	4.4	19	9.3	
Main source of household income	Formal employment	56	13.7	24	11.8	32	15.7	34.589***
	casual labor	55	13.5	16	7.8	39	19.1	
	small scale business	81	19.9	28	13.7	53	26.0	
	sale of agriculture produces	215	52.7	136	66.7	79	38.7	
	Others	1	0.2	0	0.0	1	0.5	
Source of food in the household	Farming	323	79.2	188	92.2	135	66.2	44.411***
	Purchase	84	20.6	15	7.4	69	33.8	
	Others	1	0.2	1	0.5	0	0.0	
Decision maker of income use	Husband/partner	250	61.3	139	68.1	111	54.4	11.02**
	Wife/mother	88	21.6	35	17.2	53	26.0	
	Equal decision	41	10.0	21	10.3	20	9.8	
	Relatives/grandparents	29	7.1	9	4.4	20	9.8	
Decision maker of food cooked	Husband/partner	45	11.0	17	8.3	28	13.7	7.680*
	Wife/mother	317	77.7	170	83.3	147	72.1	
	Equal decision	17	4.2	7	3.4	10	4.9	
	Relatives	29	7.1	10	4.9	19	9.3	
Farmer's location	Urban	91	22.3	15	7.4	76	37.3	52.628***
	Rural	317	77.7	189	92.6	128	62.7	
Gender of the reference child	Female	207	50.7	94	46.1	113	55.4	3.540*
	Male	201	49.3	110	53.9	91	44.6	

Table 2 (continued)

*, ** & *** implies significance at p < 0.1, p < 0.05 and p < 0.01, respectively. The statistical test for Table 2 is the chi-square test of association for two categorical variables

between employment status and districts. Most (71%) of the mothers were not employed and only 3% were employed with significant (p < 0.01) association across the districts.

Over 59% of the caregivers had primary education, more than a quarter (27%) had reached secondary and 12% tertiary level with significant (p < 0.01) association across districts. More than half (53%) of the households derives their livelihood from sales of agricultural produce, 20% from small scale business, 14% from casual labor and another 14% from formal employment. There was a significant (p < 0.01) difference in sources of household income across districts. More than three quarter (79%) of the respondents obtains their food from farming whereas 21% obtains their foods by purchase with significant (p < 0.01) differences across districts. In general, father in 61% of household decides how income is used in the household, mothers were responsible for decision making in 22% of the households. Most (78%) of households, mothers are the ones who makes decision on the foods to be cooked each day, and 11% by husbands with significant (p < 0.05) association across the districts (Table 2). About 78% of the households were located in the rural areas, while, only 22% were located in urban areas. There was a significant association (p < 0.01) between location and district of respondent with Soroti having more households located in urban areas than in Amuria. With respect to gender of the reference child, there 49% male children and 51% female children with a slight significant (p < 0.1) variation across study districts.

The average age of the caregivers was 28 years, with no significant difference across districts (Table 3). On average, each household had seven (7) members, with households in Amuria having significantly (p < 0.05) more members than households in Soroti district. Averagely, each household had 3 children aged from 1 to 17 years, contrarily; Amuria had significantly higher number of children aged 1–17 compared to Soroti. Each household in the two districts had at least 2 children age 5 and below with no significant difference between the two districts. Generally, each household had one child below two years of age and there was no difference between the two districts. This was expected given that it was part of the inclusion criterion. Households in Soroti allocated significantly larger proportion of their income on food purchases as compared to the households in Amuria.

The average age of the reference child was 14 months. Specifically, of the 408 children included in the study, 23% were between 6 and 8 months old, 20% were between 9 and 12 months old, while 30% were between 13 and 18 months old, while the rests were between 19 and 24 months old.

3.2 Caregivers' nutritional knowledge, attitude and practices

3.2.1 Caregivers' knowledge towards CF of children 6–24 months

Table 4 presents the percentage of caregivers providing correct responses with respect to the knowledge questions. Only less than 5% of the caregivers correctly answered knowledge question one on the definition of good nutrition. However, caregivers were more knowledgeable on the length of time of breast feeding (71%), time of initiation of breast

Table 3 Age, household size and income across study districts

Variable	Mean ± Standard Deviation			t-statistics
	Over all	District		
		Amuria	Soroti	
Age of caregiver	27.8 ± 9.1	27.9 ± 8.6	27.7 ± 9.6	0.250
Households size	7.2 ± 3.6	7.6 ± 3.4	6.8 ± 3.7	2.091 **
Number of children 1–17 years	3.1 ± 2.3	3.4 ± 2.5	2.7 ± 2.1	3.424 **
Number of children ≤ 5 years	1.8 ± 0.9	1.9 ± 0.8	1.7 ± 0.9	1.757 *
Number of children ≤ 2 years	1.0 ± 0.4	1.0 ± 0.4	1.0 ± 0.4	− 0.640
Household monthly food expenditure	47,152.0 ± 41,467.3	35,156.9 ± 27,069.1	59,147.1 ± 49,250.6	− 6.097 ***

*, ** & *** implies significance at p < 0.1, p < 0.05 and p < 0.01, respectively. The statistical test for Table 3 is the t-test mean separation test with the variable district used as the grouping variable. Household monthly food expenditure was reported in Uganda Shillings (UGX). At the time of the study, 1 United States Dollars was approximated equal to UGX 3660

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Table 4 Proportion of Caregivers' giving correct answers with respect knowledge towards complementary feeding of children between 6–24 months old

Knowledge aspect	Age group				
	6–24 months (n = 408)	6–8 months (n = 93)	9–12 months (n = 83)	13–18 months (n = 124)	19–24 months (n = 108)
	% of 408	% of 93	% of 83	% of 124	% of 108
Good nutrition is eating right portions according to age and health status	4.7	4.3	2.4	7.3	3.7
Mother should breast feed a child of 6–23 months on demand	47.3	45.2	43.4	53.2	45.4
The mother should breastfeed a child for 24 or more months before weaning him/her off	71.3	78.5	69.9	69.4	68.5
Complementary foods should be introduced at 6 months of age	70.8	67.7	77.1	68.5	71.3
Specially prepared foods that are soft, solid, semi-solid or liquid is given to children who are newly introduced to complementary foods	52.7	55.9	43.4	56.5	42.8
Complementary foods are introduced because the infant's need for energy and nutrients have increased	40.2	33.3	44.6	42.7	39.8
Starting complementary foods too late compromises the infant's need for energy and nutrients	25.2	22.6	25.3	28.2	24.1
Starting CF too early will increase the risk of diarrheal diseases	47.1	46.2	43.4	51.6	45.4
The number of times a breast-feeding child of 6–8 months should be fed on complementary foods is 2–3 times	69.4	72.0	65.1	66.9	73.1
The number of times a breast-feeding child of 9 to 23 months should be fed on complementary food is 3–4 times	61.5	53.8	66.3	64.5	61.1
A child who is not breast feeding should be fed on complementary foods 4 or more times daily	37.7	37.6	37.3	39.5	36.1
A child should consume different types of foods in order to get micronutrients for different foods	67.6	69.9	63.9	71.0	64.8
Animal foods like milk or eggs should be included in the child's diet because they are source of protein and minerals like calcium	48.3	52.7	45.8	48.4	46.3
A child of less than 6 months be fed on breast milk only	44.1	41.9	44.6	40.3	50.0
Ever participated in nutritional education	8.6	6.5	9.6	8.9	9.3

Values within the table are percentages. The percentages are out of the total number of observations for the respective age group

milk (71%), number of times that a breast-feeding child was fed on complementary food daily (69%) and on the reasons why should consume different types of foods (68%). About 53% of the caregivers answered correctly the kind of foods that should be given to a child at when introducing complementary foods. However, caregivers had poor knowledge on the number of times that a child who is not breastfeeding be fed on complementary foods (38%), the risk of starting complementary food too late (25%), the risk of starting complementary food too early and daily frequency a mother should breastfeed the child between 6 and 24 months old (47%), reasons for introducing complementary foods (40%), reason for including animal sourced foods in the child's diet (48%) and only 44% of caregivers answered correctly the question on what a child of less than 6 months be fed on. The responses of caregivers varied by the age of child they are taking care of. For instance, although about 5% answered the question on what constitutes good nutrition correctly, over 7% of the caregivers for children between 13 and 18 months answer this question correctly. This kind of variation is seen throughout Table 4 for the sub-groups for the child age (6–8 months, 9–12 months, 13–18 months and 19–24 months).

3.2.2 Caregivers' attitude towards CF of children 6–24 months

Results in Table 5 show that a large majority (96%) of caregivers agreed that introducing animal foods to a child's diet is important, 95% agreed that it is important for a child between 6 and 24 months of age should consume different types of foods. Similarly, 90% said they were mindful about the texture of the food they give to their children. About 85% of the caregivers agreed children between 6 and 24 month of age should be fed on demand. Most (81%) of caregivers agreed that initiating breast feeding to the child within an hour after birth was important for better child growth and nutrition. Similarly, 79% of the respondents agreed that introducing food late could negatively affect their children. Only 58% agreed that it is good to exclusively breast feed a child for 6 months. Additionally, about 55% of the caregivers agreed that it is embarrassing for them to feed their children for up to 2 or more years. The responses of caregivers' attitude varied by the age of child they were taking care of. For instance, on introduction of animal source foods to the child's diet, over 99% of children taking care of children between 19 and 24 months old agreed that it helps. This is opposed to about 89% of caregivers taking care of children aged 6–8 months old. Such variations suggest that caregiver's attitude could be dependent on the age of the child.

3.2.3 Caregivers' practices towards CF of children 6–24 months

About 73% of the caregivers breastfed their children within an hour of giving birth, 16% less than 24 h and 1% more than 24 h (Table 6). This figure was highest for caregivers with children between 19 and 24 months and lowest for caregivers with children between 13 and 18 months. During the first 3 days after delivery, over 96% of mothers gave their children colostrum. This response was also highest for caregivers with children between 19 and 24 months. About 54% of the children had had diarrhea in the last one week. The prevalence of diarrhea reduced with age of the child, being highest for children between 6 and 8 months and lowest among children between 19 and 24 months old. Results also show that 90% had eaten solid or semi-solid foods during the day or at night. The proportion of children fed on semi-solid foods during the day or at night prior to the study was least for children between 6 and 8-month-old and highest for children between 19 and 24 months old. On average, each child had eaten at least 3 times. Nighty one percent (91%) of the caregivers stated that the quantities of what they feed with their children increases as the child grows with 9% percent reporting that they don't increase the quantities. This result was least (82%) for caregiver's with children between 6 and 8 months but highest (97%) for children aged 19–24 months old. Only 32% of the caregivers had received information regarding CF from doctor or health workers while, 55% obtained information from friends and relatives. About 12% received information from the radio while, 2.5% received no information. Results on the source of information also varied across the different age groups of the children.

Results from this study also showed that 36% of the caregivers introduced CF at six months, while 61% had introduced CF at less than the recommended six months. Lastly about 3% of the children were introduced to CF after the recommended six months. Only 29% of the children between 6 and 8 were introduced to CF at the recommended six months, while, about 45% of children between 9 and 12 months old were introduced to CF at the recommended six months. To be specific, the average age for introduction of CF was 4.5 months, slightly varying across age group (Table 7). From this study, about 68% of the children had been breastfed on the day prior to the interview with the number reducing significantly for the older children 24%. In fact, about 67% of the children were still being breastfed at the time of the study (Table 6). Of the children who are no longer being breastfed, the average age of child when they stopped breastfeeding was 13.9 months. This figure varied significantly by the age group of the child. For caregivers with children less than

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Table 5 Caregivers' attitude towards CF of children 6–24 months Soroti and Amuria districts

Aspect of attitude	Age group														
	6–24 months (overall) (n = 408)			6–8 months (n = 93)			9–12 months (n = 83)			13–18 months (n = 124)			19–24 months (n = 108)		
	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A
It is important to initiate breast feeding to the child within an hour after birth	14.0	4.7	81.3	14.0	4.3	81.7	14.5	2.4	83.1	15.3	5.7	79.0	12.0	5.6	82.4
It is important to breast feed a child on demand	14.2	0.7	85.1	15.1	0.0	84.9	10.8	0.0	89.2	17.7	1.6	80.6	12.0	0.9	87.0
Breast feeding a child for 2 or more years is embarrassing	42.4	2.7	54.9	35.5	4.3	60.2	43.4	0.0	56.6	46.0	3.2	50.8	43.5	2.8	53.7
It is not important to give a child of less than 2 years other food apart from breast milk	29.4	3.9	66.7	24.7	4.3	71.0	28.9	1.2	69.9	27.4	5.6	66.9	36.1	3.7	60.2
I am so mindful about the texture of the food that I give to my child	5.6	4.4	90.0	6.5	2.2	91.4	8.4	8.4	83.1	5.6	3.2	91.1	2.8	4.6	92.6
It is good to breastfeed your baby exclusively for six months	38.0	3.9	58.1	38.7	1.1	60.2	33.7	3.6	62.7	38.7	6.5	54.8	39.8	3.7	56.5
It is important for my child to consume different types of foods	4.7	0.0	95.3	4.3	0.0	95.7	3.6	0.0	96.4	6.5	0.0	93.5	3.7	0.0	96.3
I feel that introducing animal's food to the child's diet helps	2.4	1.5	96.1	5.4	5.4	89.2	1.2	1.2	97.6	2.4	0.0	97.6	0.9	0.0	99.1
Introducing food late could negatively affect my child	17.9	3.4	78.7	19.4	2.1	78.5	15.7	1.2	83.1	16.1	7.3	76.6	20.4	1.8	77.8

Figures within the table are percentages. The percentages are out of the total number of observations for the respective age group

D Disagree, *N* Neither Agree nor Disagree, *A* Agree

Table 6 Caregivers' practices towards CF of children 6–24 months Soroti and Amuria districts

Variable	Response	Age group				
		6–24 months (n = 408)	6–8 months (n = 93)	9–12 months (n = 83)	13–18 months (n = 124)	19–24 months (n = 108)
Length of time from birth to first breast feeding	Within an hour	73.0	71.0	77.1	67.7	77.8
	Less than 24 h	16.2	22.6	8.4	19.4	13.0
	More than 24 h	1.0	0.0	1.2	1.6	0.9
	Does not recall	9.8	6.5	13.3	11.3	8.3
Child was fed colostrum within the first 3 days after delivery	Yes	96.1	96.8	92.8	95.2	99.1
	No	3.9	3.2	7.2	4.8	0.9
The child consumed breast milk a day prior to the study	Yes	67.6	93.5	90.4	71.0	24.1
	No	32.4	6.5	9.6	29.0	75.9
Child still breastfeeding	Yes	67.2	93.5	90.4	71.0	22.2
	No	32.8	6.5	9.6	29.0	77.8
The child had diarrhea in the last one week	Yes	54.2	65.6	59.0	49.2	46.3
	No	45.8	34.4	41.0	50.8	53.7
The child ate solid or semi-solid foods a day before the study	Yes	90.0	83.9	90.4	91.9	92.6
	No	10.0	16.1	9.6	8.1	7.4
What you feed to the child increase as the child grows	Yes	90.9	82.8	86.7	94.4	97.2
	No	9.1	17.2	13.3	5.6	2.8
When was complementary feeds introduced	At six months	36.0	29.0	44.6	37.9	33.3
	Before six months	61.0	69.9	54.2	58.9	61.1
	After six months	2.9	1.1	1.2	3.2	5.6
Caregiver's source of information on CF	No information	2.5	3.2	2.4	3.2	0.9
	Health worker or from health facility	32.4	36.6	26.5	34.7	30.6
	Friends and relatives	55.1	50.5	63.9	55.6	51.9
	Radio	10.0	9.7	7.2	6.5	16.7

Figures within the table are percentages. The percentages are out of the total number of observations for the respective age group

Table 7 Summary statistics for CFP reported by caregivers of children 6–24 months Soroti and Amuria districts

Variable	n	Mean ± Standard Deviation				
		6–24 months (overall)	6–8 months	9–12 months	13–18 months	19–24 months
Age of the child in months when you stopped breastfeeding	134	13.49 ± 6.79	4.50 ± 6.80	2.61 ± 3.54	10.40 ± 5.73	16.49 ± 5.08
Number of times the child ate solid or semi-solid foods a day prior to the study	408	2.72 ± 1.07	2.41 ± 1.24	2.87 ± 1.05	2.75 ± 1.06	2.84 ± 0.90
Quantity of foods given to the child per serving (ml or grams)	408	0.30 ± 0.15	0.26 ± 0.16	0.30 ± 0.14	0.30 ± 0.14	0.36 ± 0.14
The age of the child at which complementary foods was initiated	408	4.51 ± 1.59	4.40 ± 1.47	4.51 ± 1.56	4.46 ± 1.59	4.67 ± 1.72

n is the number observations for which the question applies to

12 months old, the average age when breastfeeding was stopped was less than six months, while, the average when breastfeeding was stopped was 10 months for children between 13 and 18 months old and 16 for children between 19 and 24 months old. On average, caregivers had fed their children 2.7 times a day prior to study.

Table 8 presents caregiver's responses to the nature of food given to the children under their care. Generally, the proportion of right answers for all child categories were below 40%. Specifically, about 38% of the caregivers taking care of children between 6 and 8 months old gave a correct response with response to the nature of food to be given to children of this age group. Similarly, about 38% of the caregivers taking care of children between 6 and 8 months old gave a correct response with response to the nature of food to be given to children of this age group. Similar results are also presented for caregivers of children between 9 and 11 months old and 12–23 months old.

3.3 Predictors of caregivers' nutritional knowledge and attitude towards CF of children 6–24 months

The binary classification for knowledge shows that 40.4% (165) of the caregivers had good knowledge with respect to CF, while, the rest had poor knowledge. On the other hand, the binary classification for attitude shows that 89.5% (365) of the caregivers had good knowledge with respect to CF, while, the rest had poor attitude. Logistic regression results for predictors of caregiver's knowledge and attitude are presented in Appendix Table A1 and Table 9. Regressions results for factors influencing caregiver's knowledge reveals that sex of child and age of the child ($p < 0.1$), caregiver's marital status ($p < 0.01$), location of caregiver ($p < 0.01$) and farming as the main occupation ($p < 0.01$) significantly predicted good knowledge. However, caregiver's age, household size, source of income, mother as caregivers and others did not significantly predict knowledge of caregiver. The marginal effects analysis after logistic regression presented in Table 9 shows that, caregivers taking care of male children were 7% more likely to have good knowledge, as opposed to caregivers with female children. Caregivers who were mothers had 12% more likelihood of having good knowledge. Equally, married caregivers were 13% more likely to have good knowledge. On the other hand, caregivers who were residents of Amuria and in households where the main source of occupation was farming were 13% and 19% less likely to have good knowledge compared to their counterparts. However, caregivers in households where the main source of food was farming had 9% higher probability of having good knowledge. Lastly, results also showed that caregivers taking care of children between 13 and 18 months old were likely to have higher level of nutritional knowledge than those taking care of children between 6 and 8 months old.

With respect to predictors of caregiver's attitude, logistic regression results reveal that location of caregiver ($p < 0.05$), farming as the main occupation ($p < 0.1$), source of food ($p < 0.01$) and marital status ($p < 0.1$) significantly predicted attitude of caregivers towards CF (Table A1 in the supplementary material). However, age of the caregiver, age of the child, household size, income source and the number of children in a household had no significant prediction on the attitude of caregivers towards CF. The marginal effects of the explanatory variables on caregivers' attitude after logistic regression shows that, caregivers living in rural areas and those whose main source of food was farming were 7% less likely and 12% more likely to have good attitude, respectively as opposed to caregivers living in urban areas and getting their foods from other sources other than farming (Table 9).

3.4 Nutritional status and their predictors

3.4.1 Nutritional status of children 6–24

Figure 1 presents the nutritional status of children 6–24. Generally, 17% were moderately malnourished, while, 9% severely malnourished. Specifically, 15% were moderately stunted and 8% were severely stunted. Similarly, 18% were moderately underweight while 9% were severely underweight. The same trend was also noted in weight for height where, 18% were moderately wasted and 9% severely wasted. A comparison of the child nutritional status by child age group reveals that, generally, majority of the children could be classified as normal. However, with respect to weight for height and weight for age, the proportion of children classified as having normal nutrition status increased with increase in age.

3.4.2 Predictors of stunting

Multinomial logistic regression shows predictors of all the three levels of stunting (Table 10). Since the interests of the paper is in the predictors of stunting, results for the base category, normal height for age are not presented. Specifically, it shows that there was no significant predictor of moderate stunting. However, severe stunting was predicted

Table 8 Caregiver's knowledge on the nature of food to be given to the child

Nature of food to be given to child	Number of children in the category	Proportion of caregivers with:	
		Correct knowledge on the question	Wrong knowledge on the question
The nature of the food given to child 6–8 months old children a day prior to the study	93	37.6	62.4
The nature of the complementary food given to child 9–11 months old children a day prior to the study	58	37.9	62.1
The nature of the complementary food given to child 12–23 months old children a day prior to the study	257	28.4	71.6

Values within the last two columns are percentages. The percentages are out of the total number of observations for the respective age group

Table 9 Results for marginal Effects after binary logistic regression for predictors of caregiver's knowledge and attitude on CF

Variable	Knowledge		Attitude	
	Marginal effects (SE)	P >|Z|	Marginal effects (SE)	P >|Z|
Age	0.063 (0.088)	0.472	0.056 (0.054)	0.301
Household size	− 0.029 (0.045)	0.514	− 0.004 (0.030)	0.887
Income	0.026 (0.026)	0.312	0.009 (0.017)	0.597
Male child	0.069 (0.039)	0.079	0.010 (0.027)	0.704
Rural	0.051 (0.046)	0.267	− 0.067 (0.027)	0.012
Number of children ≤ 5 years old	− 0.009 (0.026)	0.720	0.016 (0.019)	0.394
Number of children ≤ 2 years old	− 0.053 (0.051)	0.303	− 0.002 (0.029)	0.935
Married caregiver	0.134 (0.037)	0.000	0.067 (0.046)	0.144
Mother as caregiver	0.120 (0.058)	0.039	0.050 (0.059	0.398
District (1 = Amuria)	− 0.127 (0.043)	0.003	-0.007 (0.027)	0.806
Farming as main occupation	− 0.186 (0.033)	0.000	-0.079 (0.053)	0.136
Farming as main source of food	0.086 (0.046)	0.059	0.123 (0.055)	0.026
Child Age group (Base = 6–8 months)				
9–12 months	− 0.016 (0.060)	0.794	− 0.046 (0.055)	0.397
13–18 months	0.113 (0.062)	0.068	− 0.040 (0.045)	0.372
19–24 month	0.014 (0.060)	0.816	− 0.017 (0.045)	0.705

SE Standard error in parentheses

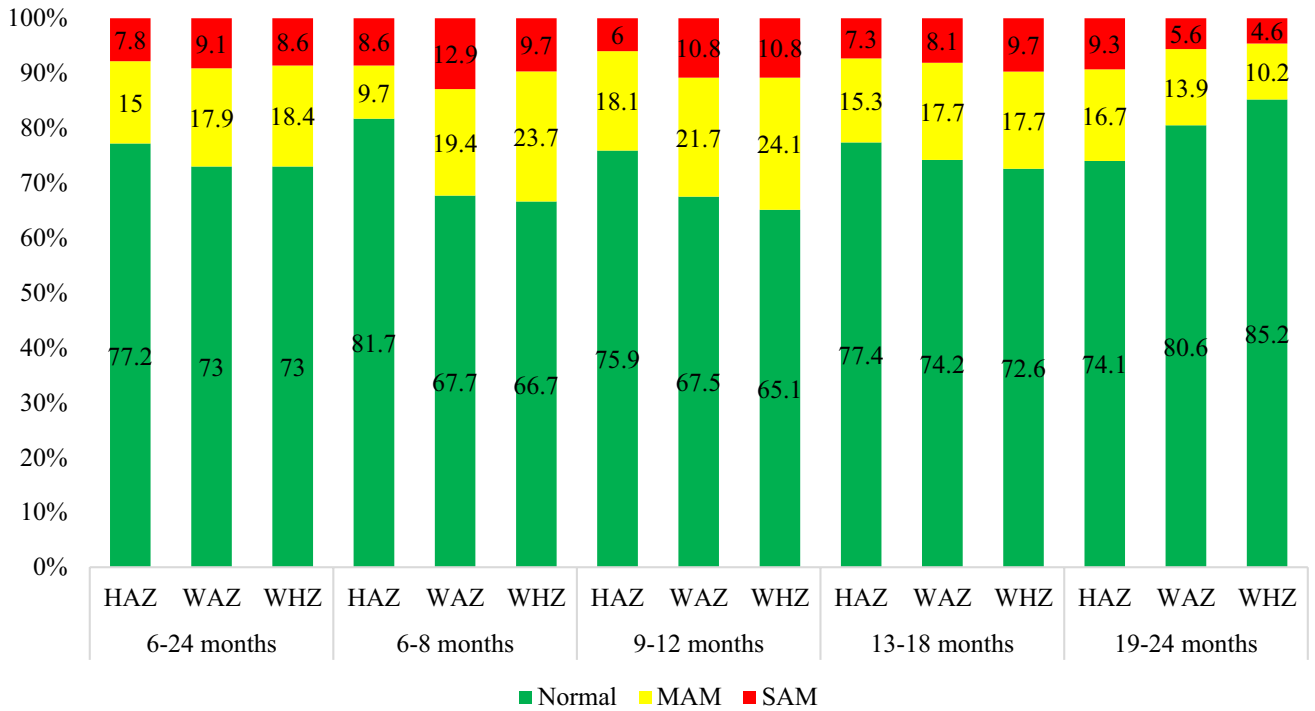

Fig. 1 Nutritional status of children 6–24. HAZ is Height for Age, WAZ is Weight for Age), WHZ is Weight for Height, MAM is Moderate Acute Malnutrition, SAM is Severe Acute Malnutrition

by several factors including caregiver's attitude ($p < 0.1$), children still breastfeeding ($p < 0.05$) and caregivers having child's health card ($p < 0.01$). Knowledge had no effect on the severe stunting (Table 10). Particularly, caregivers with good attitude were 9% less likely to have severely stunted children. Children still breastfeeding were 6% less likely to be severely stunted. Similarly, children having their health card at the time of the study were 6% less likely to be suffering from severe acute stunting.

Table 10 Predictors of stunting

Variable	MAM		SAM	
	Marginal effects (SE)	p >|Z|	Marginal effects (SE)	p >|Z|
Attitude	0.035 (0.050)	0.485	− 0.087 (0.049)	0.072
Knowledge	0.042 (0.046)	0.364	0.003 (0.023)	0.887
Mothers as caregiver	− 0.084 (0.077)	0.270	− 0.017 (0.038)	0.656
Number of children ≤ 2 years	− 0.023 (0.053)	0.664	− 0.031 (0.024)	0.186
Child breastfed	− 0.162 (0.159)	0.307	− 0.181 (0.124)	0.144
Time of initiation of breastfeeding	0.019 (0.038)	0.621	− 0.011 (0.026)	0.675
Child still breastfeeding	0.001 (0.040)	0.996	− 0.060 (0.026)	0.020
Diarrhea	− 0.023 (0.036)	0.526	− 0.008 (0.021)	0.704
Child given Solid food	− 0.040 (0.068)	0.557	− 0.050 (0.043)	0.238
Hospital as source of caregiver's information	0.030 (0.041)	0.461	− 0.009 (0.019)	0.631
Child has Health card	0.058 (0.053)	0.278	− 0.058 (0.017)	0.001
Amuria	− 0.055 (0.039)	0.158	− 0.021 (0.019)	0.264
Hospital as place of birth	− 0.052 (0.053)	0.323	0.002 (0.024)	0.943

SE Standard error in parentheses

3.4.3 Predictors of underweight

Multinomial logistic regression shows predictors of all the three levels of underweight (Table 11). Since the interests of the paper is in the predictors of stunting, results for the base category, normal height for age are not presented. Specifically, the predictors of moderate underweight (MAM) were a child being breastfed or ever breastfed ($p < 0.01$), a child suffering from diarrhea ($p < 0.1$) and child being fed solid foods ($p < 0.05$). Caregivers attitude and knowledge did not significantly predict weight for age of children (Table 11). Particularly, children who were being breastfed or ever breastfed were 1% less likely to suffer from MAM. The predictors of severe underweight were mothers as caregivers ($p < 0.05$) with 21% less likelihood of their children suffering from severe underweight and children with health card ($p < 0.01$). Children with health card were 6% less likely to suffer from severe underweight.

3.4.4 Predictors of wasting

Table 12 presents the predictors of wasting. The predictors of moderate wasting are children still breastfeeding ($p < 0.1$) and children born in hospital ($p < 0.05$). The predictors of severe wasting were attitude of caregivers ($p < 0.01$) where caregivers with poor attitude were 5% more likely to have their children suffering from severe wasting, mothers as

Table 11 Predictors of underweight

Variable	MAM		SAM	
	Marginal effects (SE)	P >|Z|	Marginal effects (SE)	P >|Z|
Attitude	0.022 (0.041)	0.588	0.036 (0.026)	0.179
Knowledge	0.026 (0.038)	0.486	− 0.036 (0.025)	0.148
Mothers as caregiver	− 0.073 (0.066)	0.268	− 0.212 (0.098)	0.031
Number of children below 2 years	− 0.041 (0.037)	0.276	− 0.015 (0.018)	0.418
Child breastfed	0.183 (0.020)	0.000	− 0.284 (0.191)	0.136
Time of initiation of breastfeeding	0.007 (0.033)	0.834	− 0.022 (0.033)	0.505
Child still breastfeeding	0.001 (0.031)	0.963	− 0.003 (0.027)	0.906
Diarrhea	0.053 (0.029)	0.071	− 0.016 (0.024)	0.509
Child given Solid food	− 0.139 (0.070)	0.046	− 0.047 (0.050)	0.346
Hospital as source of caregiver's information	− 0.038 (0.030)	0.200	− 0.033 (0.024)	0.164
Child has Health card	0.010 (0.039)	0.798	− 0.058 (0.021)	0.007
Amuria	0.024 (0.029)	0.412	− 0.031 (0.025)	0.213
Hospital as place of birth	0.013 (0.036)	0.706	0.022 (0.028)	0.430

Table 12 Predictors of wasting

Variable	MAM		SAM	
	Marginal Effects (SE)	P >|Z|	Marginal Effects (SE)	P >|Z|
Attitude	0.018 (0.058)	0.753	0.049 (0.017)	0.005
Knowledge	− 0.005 (0.048)	0.921	− 0.010 (0.024)	0.678
Mothers as caregiver	− 0.069 (0.079)	0.381	− 0.268 (0.093)	0.004
Number of children below 2 years	0.019 (0.054)	0.719	− 0.015 (0.017)	0.376
Child breastfed	− 0.150 (0.190)	0.430	− 0.047 (0.070)	0.501
Time of initiation of breastfeeding	0.024 (0.045)	0.597	− 0.013 (0.025)	0.594
Child still breastfeeding	0.071 (0.042)	0.090	0.002 (0.020)	0.919
Diarrhea	0.060 (0.041)	0.140	0.011 (0.020)	0.580
Child given Solid food	− 0.087 (0.076)	0.253	− 0.029 (0.039)	0.447
Hospital as source of caregiver's information	− 0.031 (0.042)	0.457	− 0.053 (0.020)	0.008
Child has Health card	− 0.023 (0.050)	0.644	− 0.026 (0.020)	0.184
Amuria	0.030 (0.040)	0.451	− 0.012 (0.020)	0.563
Hospital as place of birth	0.102 (0.045)	0.022	0.040 (0.019)	0.037

caregivers ($p < 0.01$) where caregivers who were mothers were 27% less likely to have their children suffer from severe wasting, hospital as the source of information on CF ($p < 0.01$) and has 5% less likeliness of suffering from severe wasting and hospital as the place of birth ($p < 0.05$) with 4% less likelihood of their children suffering from severe wasting. Knowledge of caregivers had no signification prediction of the severe wasting of children.

4 Discussions

4.1 Caregivers' knowledge, attitude and practices towards CF

Generally, the mean level of knowledge of caregivers in this study was about 50%, with caregivers being highly knowledgeable in some aspects and less knowledgeable in others. Specifically, caregivers were more knowledgeable in the length of time before weaning and the time of initiation of breast milk, but less knowledgeable on the kind of foods that should be given to a child of less than six months. This finding is similar to that of earlier studies conducted in Uganda [6, 8, 13, 25] and elsewhere [26–28]. In this study, caregivers who were married were found to have good knowledge of CF. The married caregivers were most likely also the mother of the reference child. From this study, 84% of the caregiver mothers were also married. Additionally, 44% of the caregiver grandmothers and 38% of the caregiver maids were married. This is in line with a study conducted in Lamwo district of northern Uganda which found that caregivers who were married had good knowledge [29].

Nearly all the caregivers gave their children colostrum and about three-quarter of the caregivers also had good knowledge of the importance of different food types in child's nutrition; however, this good knowledge was not put into practice as only about a half of the caregivers fed their children correctly. Similar study conducted in Southwestern Ethiopia found that good knowledge and attitude were not translated into practice among mothers [30, 31].

In this study, caregivers had the poorest (4.7%) knowledge on what constitutes a good nutrition, risk of starting complementary food too late (25%) and the number of times that non-breastfeeding children are meant to be fed on complementary foods. According to Elolu et al. [32], poor child CFP is common in rural areas, as opposed to urban areas [33]. Of great significance is that only one-third of caregivers received their information regarding CF from health workers whereas more than half got their CF information from friend or relatives. This could probably be the reason for poor practices especially on administration of CF noticed in this population. This finding matches with one conducted by [34] on exploration of CF and information sources found out that ninety one percent of caregivers received their information on CF from friends.

With respect to CF, there was generally poor practice. Our results show that, only a third of the caregivers introduced complementary foods to the children at the recommended 6 months. Although, this varied by age of the child, a large majority of the children were introduced to complementary feeding at about 4.4 months of age. Additionally, irrespective of the child age group, only a small proportion of the caregivers were giving the right type of complementary foods

to the child for the respective age group. Results also showed that the types of foods being feed to the children were also wrong for most caregivers. Only less than three quarter were still breast feeding, 44% exclusively breastfed, 54% of the children had had diarrhea. Some mothers stopped breastfeeding as earlier as 0 month whereas the maximum length of time was 24 months. These poor practices, and level of knowledge could be explained by the fact that only (8.6%) had ever participated in nutritional training coupled with low level of education of caregivers; with 6% having no formal education, primary (53%) level of education, secondary education (29%) and only 12% had reached tertiary institutions. Thus, the low level of knowledge among caregivers could explain the poor feeding practices and low level of knowledge among caregivers.

Generally, caregivers had good attitude towards CF. For instance, 96% had good attitude towards giving their children animal foods, 95.5% dietary diversity, 90% minded about the texture of the foods they give to their children and 85% on the important of breastfeeding a child on demand. However, 58% had poor attitude on exclusive breastfeeding for 6 months, 55% towards breastfeeding for 24 months or more. This was majorly common among caregivers who were farmers and those living in rural areas. This implies that farmers and rural household in Teso region in Uganda have inadequate knowledge towards exclusive breastfeeding. A closer look at Table 6 reveals that most caregivers had poor knowledge (44%) on exclusive breastfeeding; the study conducted in Acholi sub region of Uganda found out that good nutritional attitude was significantly influenced by age and education level [25]. There is a known fact that knowledge of CF influences attitude that eventually affect the good practice of CF [35–37].

4.2 Predictors of nutritional knowledge and attitude towards CF

From this study, the greatest predictor of knowledge was farming as the occupation of the caregivers. It shows that household who were farmers were 54.9% more likely to have poor knowledge. To the contrary, they had good attitude towards CF of children; that is 21.8% more likely to have good attitude towards CF. In the study conducted by Abiyu and Belachew [38] and Nassanga et al. [8], nutrition education was found to significantly influence the level of caregivers knowledge. The low level of knowledge in this region can be attributed to the small number of caregivers getting information on CF from doctors or health workers (32.4%) and 55.1% from friends and relatives. Significant level of knowledge was also seen among caregivers with male children; where they were 18% more likely to have good knowledge compared to their counterparts. This is in line with a study conducted in Acholi sub-region, northern Uganda by Nassanga et al. [8], other predictors of knowledge were caregivers who were mothers of the children also had significantly good knowledge compared to those who were not mothers, marital status of the caregivers and district of location of caregivers.

Caregiver's in Amuria district also had poor attitude toward CF, where about 20% of caregivers in the rural areas were less likely to have good attitude compared to those in Soroti. This could be due to low level of education and occupation of caregivers in Amuria district as compared to Soroti district. Similarly, households whose heads were farmers had poor attitude towards CF and household who obtain their food from the farming also had poor attitude toward CF. Zeidu [39] found that caregiver's occupation was found to be the only factor significantly associated with their nutritional knowledge and attitude.

With respect to child age, our results have shown that caregivers of children aged between 13 and 18 months old were likely to have higher CF knowledge than caregivers of children aged between 6 and 8 months old. These findings suggest that the level of knowledge of caregivers could be age-specific. Whereas child age was not a significant predictor of caregiver's attitude, descriptive results showed variations in the level of knowledge, attitude and practices across child age group. In the case of knowledge, this variation wasn't significant, while, caregivers of older children appeared to have better level of attitude and practices for most of the questions. Nassanga et al. [8] reported a slightly significant influence of child's age on attitude. This observation could be attributed to self-learning that caregivers go through. As the child grows, the caregiver's level of experience, manifested in their knowledge and attitude is expected to mediate child feeding practices [40].

4.3 Predictors of nutritional status among children 6–24 months

In this study, the prevalence of malnutrition stunting was 22.97%, underweight was 26.96% and wasting was 17.89%. These figures are above the acceptable cut-off values for public health significance. The figures observed in this study are higher than previously observed for eastern Uganda [4]. Whereas knowledge and attitude are important, this study, finds no significant influence on the nutritional status of children 6–24 months. It thus appears that nutritional statuses of children 6–24 months were predicted by different factors. For instance, results have shown that children who ever

suffered from diarrheal diseases two weeks prior to the time of the study had a significant effect to underweight. This is in line with a study conducted by Makamto-Sobgui et al. [41] in Agricultural regions of Mali on predictors of nutritional status who reported diarrhea as a determinant of underweight. In another study conducted to determine under nutrition among Kenyan children revealed diarrhea and currently breastfeeding as predictors of underweight [42].

Another determinant of underweight was hospital as source of information on CF. Children whose caregivers received the information from hospital on CF were less likely to suffer from severe acute wasting. In another study conducted on the level and predictors of mother's knowledge and attitude on optimal CF in northwest Ethiopia, confirms the result of this study [38], the possible reason could be mothers who gave birth at health Centre had access to appropriate CF information that can improve the nutritional status of their children. Consequently, early introduction of solid foods to children was seen as a determinant of child underweight. This is in line with a study conducted by Udoh and Amodu [43] in Nigeria on timing of introduction of solid and non-solid foods found that younger mothers and less educated mothers were more likely to give their children solid foods before 6 months.

The predictors of wasting were attitude of the caregivers towards child feeding practices, mothers as caregivers, children still breastfeeding at the time of the study and children born in hospital Abiyu and Belachew [38], reported that place of delivery predicted the level of attitude towards CF; this in turn predicted nutritional status of the children. Nutrition education has been shown to positive influence on nutritional status of children as well as overall household nutrition outcome [8, 41, 44]. The predictors of stunting were attitude, children ever breastfed, child still breastfeeding, children having their health cards and district of location. This is in agreement with study conducted in Kenya which found that children ever breastfed, children still breastfeeding at the time of the study, and location as being the predictors of stunting [42].

5 Conclusions

This study was set out to test three hypotheses. They were: Caregivers have high levels of nutritional KAP towards CF among caregivers of children 6–24 months; Socio-economic factors, and household characteristics significantly affects nutritional knowledge and attitude of caregivers; and. Socio-economic factors, and household characteristics significantly predicts nutritional status of children aged 6–24 months. Finding from this study partially confirms these hypotheses. For, instance, not all caregivers had good knowledge on complimentary feeding, although they had a positive attitude. The average time for initiating the complementary foods and weaning were also less than the recommended. There were however some good practices, such as feeding of children with colostrum immediately after birth. A number of factors could be harnessed to change the level of knowledge and attitude observed in the study. However, the main predictors of knowledge and attitude were occupation of household head, source of food and geographical location of the households. About a quarter of the children were either moderately or severely malnourished. There were also a number of factors that could be linked to influence the nutritional status. However, the main predictors of nutritional status were breastfeeding, place of birth, source of information, and place of birth. Caregivers attitude significantly predicting stunting and wasting, but not underweight. However, caregiver's knowledge was not a significant predictor of nutritional status of children in this study.

Based on the findings, our study recommends the need for deliberate efforts to improve the level of knowledge of care givers. This is due to the observation of a generally low level of knowledge of caregivers with respect to CF. This low level of knowledge, was manifested in the poor CF practices reported in this study. Efforts to improve caregiver's level of knowledge could be achieved by introducing nutritional education through hospitals which was the main source of information for most caregivers.

Despite the findings of this study, two limitations are worth noting. First, given the cross-sectional approach of the study as well as the small geographical coverage, it is expected that the findings of the study may only be applicable to circumstances that existed in the study area as well as during the time of study. The extent of application of this study's findings should thus be limited to circumstances similar to those of this study. Secondly, we collected data from caregivers. Although this was appropriate given that the study wanted to understand the existing KAP with respect to CF, in some households, more than one person is involved in child care. Although we chose the caregiver who is most involved in the care of the reference child, we expect that the findings of our study are only valid to the extent which the caregiver interviewed was well informed about the care of the reference child. Additionally, in some households, child caregivers are not necessarily the decision makers with respect several aspects of the households including child

feeding. We thus expect that the application of the findings of our study should take into consideration the role of the decision-making household member.

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Declarations We declare that this manuscript in any form has not been submitted elsewhere for publication.

Author contributions In producing this manuscript, CA and IO conceptualized the study; CA, DMO and ENM developed and executed the methodology; CA and DMO conducted formal analysis and investigation, CA and ENM prepared the original draft, DMO and ENM reviewed the initial draft, IO supervised the whole process. All authors approved the final draft.

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Data availability The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate Ethical clearance to conduct this study was obtained from Gulu University Research Ethic Committee (GUREC-092-20). The research was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki, as well as following guidelines provided by Gulu University Research Ethical Committee. Participation in this study was on voluntary basis. Prior to the study, inform consent was obtained from all participants. The inform consent form, approved by GUREC was first read and interpreted to the participants before seeking their consent. The informed consent document was prepared in both English and the local Ateso language. Participants were assured of confidentiality of the information they provided, codes were used for personal information such as names and location to ensure anonymity.

Consent for publication All authors have consented to the publication of this manuscript in this Journal.

Competing interests The authors declare no competing interests.

References

1. UNICEF. Child food poverty: a nutrition crisis in early childhood. New York: United Nations Children's Fund (UNICEF); 2022.
2. White JM, Bégin F, Kumapley R, Murray C, Krasevec J. Complementary feeding practices: current global and regional estimates. Matern Child Nutr. 2017;13(S2): e12505.
3. World Health Organization. Defining competent maternal and newborn health professionals. Geneva: World Health Organization; 2018.
4. UBOS. Uganda demographic and health Survey 2022. Kampala: Uganda Bureau of Statistcs; 2023.
5. Maniragaba VN, Atuhaire LK, Rutayisire PC. Undernutrition among the children below five years of age in Uganda: a spatial analysis approach. BMC Pub Health. 2023;23(1):390.
6. Nahalomo A, Iversen P, Andreassen B, Kaaya A, Rukooko A, Tushabe G, Nateme N, Rukundo P. Malnutrition and associated risk factors among children 6–59 months old in the landslide-prone Bududa District, Eastern Uganda: a cohort study. Curr Dev Nutr. 2022;6(2):nzac005.
7. Adebisi YA, Ibrahim K, Lucero-Prisno DE III, Ekpenyong A, Micheal AI, Chinemelum IG, Sina-Odunsi AB. Prevalence and socio-economic impacts of malnutrition among children in Uganda. Nutr Metab Insights. 2019;12:1–5.
8. Nassanga P, Okello-Uma I, Ongeng D. The status of nutritional knowledge, attitude and practices associated with complementary feeding in a post-conflict development phase setting: the case of Acholi sub-region of Uganda. Food Sci Nutr. 2018;6(8):2374–85.
9. Kimere NC, Nambooze J, Lim H, Bulungu AL, Wellard K, Ferguson EL. A food-based approach could improve dietary adequacy for 12–23-month-old Eastern Ugandan children. Matern Child Nutr. 2022;18(2): e13311.
10. Bégin F, Aguayo VM. First foods: Why improving young children's diets matter. Matern Child Nutr. 2017;13(S2): e12528.
11. Michaelsen KF, Grummer-Strawn L, Bégin F. Emerging issues in complementary feeding: global aspects. Matern Child Nutr. 2017;13(S2): e12444.
12. Bekele H, Turyashemererwa F. Feasibility and acceptability of food-based complementary feeding recommendations using trials of improved practices among poor families in rural Eastern and Western Uganda. Food Sci Nutr. 2019;7(4):1311–27.

13. Achiro E, Okidi L, Echodu R, Alarakol SP, Nassanga P, Ongeng D. Status of food safety knowledge, attitude, and practices of caregivers of children in northern Uganda. Food Sci Nutr. 2023;11(9):5472–91.
14. Martin SL, McCann JK, Gascoigne E, Allotey D, Fundira D, Dickin KL. Engaging family members in maternal, infant and young child nutrition activities in low-and middle-income countries: a systematic scoping review. Matern Child Nutr. 2021;17(S1): e13158.
15. Development Initiatives. 2022 Global nutrition report: stronger commitments for greater action. Bristol: Development Initiatives; 2022.
16. Krejcie R, Morgan D. Determining sample size for research activities. Educ Psychol Measur. 1970;30:607–10.
17. Uganda Bureau of Statistics. The national population and housing census 2014—main report. Kampala: Uganda Bureau of Statistics; 2016.
18. Marías YF, Glasauer P. Guidelines for assessing nutrition-related knowledge, attitudes and practices. Rome: Food and Agriculture Organization of the United Nations; 2014.
19. World Health Organization, WHO child growth standards and the identification of severe acute malnutrition in infants and children. 2009. https://www.who.int/publications/i/item/9789241598163. Accessed 8 Apr 2022.
20. Cashin K, Oot L. Guide to anthropometry: a practical tool for program planners, managers, and implementers. Washington: Food and Nutrition Technical Assistance III Project (FANTA)/FHI 360; 2018.
21. World Health Organization. WHO anthro survey analyser–quick guide. Geneva: World Health Organization; 2019.
22. Masuku SK, Lan SJJ. Nutritional knowledge, attitude, and practices among pregnant and lactating women living with HIV in the Manzini region of Swaziland. J Health Popul Nutr. 2014;32(2):261–9.
23. Baş M, Ersun AŞ, Kıvanç G. The evaluation of food hygiene knowledge, attitudes, and practices of food handlers' in food businesses in Turkey. Food Control. 2006;17(4):317–22.
24. Ul Haq N, Hassali MA, Shafie AA, Saleem F, Farooqui M. A cross sectional assessment of knowledge, attitude and practice towards Hepatitis B among healthy population of Quetta, Pakistan. BMC Pub Health. 2012;12:692.
25. Okidi L, Odongo W, Ongeng D. The mix of good nutritional attitude and poor nutritional knowledge is associated with adequate intake of vitamin A and iron from wild fruits and vegetables among rural households in Acholi subregion of Northern Uganda. Food Sci Nutr. 2018;6(8):2273–84.
26. Neme K, Olika E. Knowledge and practices of complementary feeding among mothers/caregivers of children age 6 to 23 months in Horo Woreda, Horo Guduru Wollega Zone, Oromia Region, Ethiopia. J Biomed Res Rev. 2017;1(1):1–10.
27. Agbozo F, Colecraft E, Ellahi B. Impact of type of child growth intervention program on caregivers' child feeding knowledge and practices: a comparative study in Ga West Municipality, Ghana. Food Sci Nutr. 2016;4(4):562–72.
28. Anand D, Puri S. Nutritional knowledge, attitude, and practices among HIV-positive individuals in India. J Health Popul Nutr. 2013;31(2):195–201.
29. Aber H, Kisakye AN, Babirye JN. Adherence to complementary feeding guidelines among caregivers of children aged 6–23 months in Lamwo district, rural Uganda. Pan Afr Med J. 2018;31(1):17.
30. Tadele N, Habta F, Akmel D, Deges E. Knowledge, attitude and practice towards exclusive breastfeeding among lactating mothers in Mizan Aman town, Southwestern Ethiopia: descriptive cross-sectional study. Int Breastfeed J. 2016;11:3.
31. Kaleem R, Adnan M, Naveed S. Association of mothers' socio-demographic characteristics with their knowledge and practices about complementary feeding. J Fatima Jinnah Med Univ. 2018;12(2):76–80.
32. Elolu S, Agako A, Okello DM. Household food security, child dietary diversity and coping strategies among rural households. The case of Kole District in northern Uganda. Dialogues Health. 2023;3:100149.
33. Olatona FA, Adenihun JO, Aderibigbe SA, Adeniyi OF. Complementary feeding knowledge, practices, and dietary diversity among mothers of under-five children in an urban community in Lagos State, Nigeria. Int J MCH AIDS. 2017;6(1):46–59.
34. Garcia AL, Looby S, McLean-Guthrie K, Parrett A. An exploration of complementary feeding practices, information needs and sources. Int J Environ Res Pub Health. 2019;16(22):4311.
35. Fanta M, Cherie HA. Magnitude and determinants of appropriate complementary feeding practice among mothers of children age 6–23 months in Western Ethiopia. PLoS ONE. 2020;15(12): e0244277.
36. Semahegn A, Tesfaye G, Bogale A. Complementary feeding practice of mothers and associated factors in Hiwot Fana Specialized Hospital, Eastern Ethiopia. Pan Afr Med J. 2014;18:143.
37. Birhanu M, Abegaz T, Fikre R. Magnitude and factors associated with optimal complementary feeding practices among children aged 6–23 months in Bensa District, Sidama Zone, South Ethiopia. Ethiop J Health Sci. 2019;29(2):153–64.
38. Abiyu C, Belachew T. Level and predictors of mothers' knowledge and attitude on optimal complementary feeding in West Gojjam Zone, Northwest Ethiopia. Nutr Diet Suppl. 2020;12:113–21.
39. Zeidu A. Knowledge, Attitude And Feeding Practices Of Caregivers' Of Malnourished Children Admitted To Savelugu Hospital In the Savelugu/Nanton Municipality, Afribary, 2021.
40. Oduor FO, Boedecker J, Kennedy G, Mituki-Mungiria D, Termote C. Caregivers' nutritional knowledge and attitudes mediate seasonal shifts in children's diets. Matern Child Nutr. 2019;15(1): e12633.
41. Makamto-Sobgui C, Kamedjie-Fezeu L, Diawara F, Diarra H, Afari-Sefa V, Tenkouano A. Predictors of poor nutritional status among children aged 6–24 months in agricultural regions of Mali: a cross-sectional study. BMC Nutr. 2018;4:18.
42. Gewa CA, Yandell N. Undernutrition among Kenyan children: contribution of child, maternal and household factors. Public Health Nutr. 2012;15(6):1029–38.
43. Udoh EE, Amodu OK. Complementary feeding practices among mothers and nutritional status of infants in Akpabuyo Area, Cross River State Nigeria. Springerplus. 2016;5:2073.
44. Lomira B, Nassanga P, Okello D, Ongeng D. "Non-attitudinal and non-knowledge based factors constrain households from translating good nutritional knowledge and attitude to achieve the WHO recommended minimum intake level for fruits and vegetables in a developing country setting. BMC Nutr. 2021;7:68.