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Child nutritional status, mothers' nutritional knowledge and practice and Household food security status in Tehuledere Woreda, South Wollo, Ethiopia

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ABSTRACT: Child under nutrition due to household food insecurity remains critical issues in many households in Ethiopia. Literature in nutrition knowledge and practice of mothers and the nutritional status of their infants is scanty. This study aimed to assess the nutritional status of six to 23-month-oldchildren, mothers' knowledge, attitude and practice of child nutrition and household food security status in a semi-urban and a rural kebeles. A community based cross-sectional study was undertaken in semi-urban and rural *kebeles* in Tehuledere Woreda (district) to assess household food security and nutritional status of six to 23-month children. A total of 245 mother-child pairs were selected randomly from the two kebeles. Anthropometric indices were used to determine the nutritional status of under-two children. Child age, weight and height were measured and used to calculate weight-for-age, weight-for-height and height-for-age Z-scores. Composite Index of Anthropometric Failure (CIAF) was calculated to determine total malnutrition. Household food insecurity access scale (HFIAS) was used to assess food security status. Structured questionnaires were used to collect data on mothers' knowledge, attitude and practice in child nutrition, food diversity and child feeding. Data were statistically analyzed. Stunting was noted in 7.5% and 17% of under-two children in the urban and rural kebeles, respectively. Similar levels of thinness (6%) were observed in both kebeles. There were more under-weight children in the semi-urban (5.2%) than in the rural (3.6%) kebeles. Chronic energy deficiency was noted in 20% and 15% of the children in semi-urban and rural kebeles, respectively. CIAF was higher in children in the semi-urban kebele (48%) than in the rural kebele (31%). A small proportion of study households were food secure (17.9%). The rest were either mildly (54.4%) or moderately (27.8%) food insecure. Average knowledge of child nutrition among mothers in the semi-urban and rural kebeles was very low (about 34% and 37%, respectively).The low anthropometric measurements of the children in this study could be due to poor food diversity, insufficient food intake, and poor nutritional knowledge and practice of mothers. Creating awareness in child feeding practices and diet diversity is recommended.

Keywords: **Food Security, Nutrition, Knowledge, Practice, Nutritional status, under-two children**

INTRODUCTION

Undernourished infants and children are slow in their physical and mental development and have increased vulnerability to infections and early death. Nutrition has increasingly been recognized as a basic pillar for social and economic development. Malnutrition is a major cause of morbidity and mortality in low-income countries including Ethiopia (Wagnew *et al*., 2018). The reduction of infant and young child malnutrition is essential to achieve the sustainable development goals. To this effect, WHO (2002) recommended best feeding practices during the first year of life for maximizing growth, development, and survival. To meet their nutritional requirements, infants should receive nutritionally adequate and safe solid or semisolid complementary foods while breastfeeding continues for up to two years of age or beyond food insecurity and under nutrition remain critical issues in poor households (Liu *et al*., 2016). Poor nutritional status of mothers, infants and children has been a consistent problem in Ethiopia. According to Ethiopia Demographic and Health Survey (EDHS), undernutrition is an underlying cause of 53% of infant and child deaths (EPHI and ICF, 2021).

Although rates of stunting and underweight have decreased over the past decades in Ethiopia, 37% and 21% of infants and under-five children are still stunted or underweight, respectively (EPHI and ICF, 2021).). Lack of dietary diversity and inappropriate infant feeding practices contribute to the high rates of under-nutrition in infants. Only half of infants are exclusively breastfed with introduction of complementary foods at the appropriate time, and only 11% of young children are receiving a minimal acceptable diet (EPHI and ICF, 2021).).Children in rural areas are more stunted (40%) than those in urban areas (26%), and great regional variations persist in various regions in Ethiopia(EPHI and ICF, 2021).).Thus, This study aimed at assessing it would be interesting to assess child nutritional status and mother's KAP in

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child nutrition in a semi-urban and rural setting in Ethiopia.

The main objective of this study was, therefore, to assess household food security status, mothers' knowledge, attitude and practice (KAP) of child nutrition and nutritional status of six to 23-month-oldchildren in a semi-urban and a rural kebele in Tehuledere Woreda, South Wollo Zone. This study will help to come up with better intervention methods, such as giving adequate training, to improve the knowledge and practice of mothers in child nutrition and, consequently the health status of their children,

MATERIALS AND METHODS

Description of the Study Area

This study was carried out in a semi-urban and a rural kebele in Tehuledere Woreda (district), South Wollo Zone. The following description was based on information obtained from the woreda's agricultural office (TWOA, 2016). The worreda is located north of Addis Ababa at a distance of 430 km. It covers an area of 44,030 hectares and has a population of 143,445, consisting of 53% males and 47% females. According to the same source, the woreda is subdivided into 19 rural and two small semi-urban kebeles (kebele is the smallest administrative unit in Ethiopia).The semi-urban and the rural kebeles considered in this study had a population of 7,103 and 4,571, respectively; the total number of children in the woreda during the study period (2019) was 72,494; and the number of six to 23-month-oldchildren was 339 and 286 in the semi-urban and rural study kebeles, respectively. The most important crops in the area are sorghum, teff and maize, whereas among the pulses, the main are chickpea, grass pea and haricot bean, sometimes inter-cropped with sorghum and maize. Vegetables and fruits are produced where farmers have access to small-scale irrigation, especially around *Haik* and *Ardibo* lakes. They also use rivers and water ponds for the same purpose. A recent trend of the farming system in the area is the increasing production of cash crops, such as *khat*, as source of income for households.

Study population:

The study population was composed of households withsix to 23-month-oldchildren, residing in both rural and semi-urban kebeles. Sample size was determined according to Cochran (1963). A total of 245 households (133 from the semi-urban and 112 from rural kebele) with mother–child pair were randomly selected for the study.

Sampling and sample size determination

The woreda was selected purposively due to high prevalence of food insecurity reported in the literature and for logistic reasons. The two kebeles were selected based on the Woreda's report about the shift in agricultural products towards cash crops (khat) and to study its effect on the household's food security status and child nutritional status (TWOA, 2016). Study households were selected randomly.

The representative sample for proportions was determined as in Cochran (1963) using the equation

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where: n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails (1 – α equals the desired confidence level, e.g., 95%), e is the desired level of precision (0.05), p is the estimated proportion of an attribute that is present in the population, and q is 1-p. The value for Z is found in statistical tables which contain the area under the normal curve (Z statistics: 1.96)

n_0= (1.96 x 1.96 x 0.46 x 0.54) / (0.05 x 0.05) = 382.

The sample size (n_0) was adjusted using the following equation (Cochran, 1963).

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where

n_0 – the initial sample size; n -adjusted sample size; and N -the population size.

n=382/1+ ((382-1)/625) =237

Finally, with 5% non-response rate, the size is 249 households each with mother – child pair (6-23 months). However, since more respondents than the planned were found, 245 households (133 from the semi-urban and 112 from rural kebele) with mother–child pair were randomly selected for the study.

A community-based cross-sectional study design was used to collect data on household food insecurity access (HFIA) and investigate food safety KAP of mothers in the study households in both kebeles. Information, consisting of household socio-economic and demographic parameters, such as age, sex, educational level, monthly income, and occupation, was also collected.

Data collection

Data on household socio-demographic characteristics, household food security status, and mothers' KAP on child nutrition were collected during face-to-face interviews using structured questionnaires.

Household food insecurity status was assessed by determining the household food insecurity access scale (HFIAS)(Coates et al., 2007) as validated for Ethiopia by Gebreyesus *et al*., 2015). A set of nine questions related to three different domains of food insecurity access were used: (i) anxiety and uncertainty about the household food supply; (ii)

insufficient quality in terms of variety and preferences of the type of food and (iii) insufficient food intake in terms of reducing quantity of food. The nine occurrence questions were asked along with the frequency of occurrence within a recall period of four weeks to determine whether a household was mildly, moderately or severely food insecure. Households which experienced none of the food insecurity conditions, or rarely experienced anxiety, were considered as food secure. Mildly food insecure households faced anxiety and uncertainty more frequently and sometimes compromised the quality of food they ate. Moderately food insecure households sacrificed more frequently the quality of food they ate, and/or rarely or sometimes reduced the size of meals or number of meals per day. Severely food insecure households often cut back on meal size or number of meals, and/or ran out of food, went to bed hungry, or went a whole day and night without eating (Coates *et al*., 2007). Food security status of households as food secure, mildly food insecure and moderately food insecure was determined according to (Coates *et al.*, 2007) using the formula:

$$\frac{\text{Number of households with HFIA category}}{\text{Total number of households with a HFIA category}} \times 100$$

Mothers' KAP in child nutrition was assessed with respect to child diet diversity and feeding practice. Qualitative data, collected through questionnaires, were converted to percentages and used as indicators for level of knowledge, attitude and practice on food safety. The assessment was based on the FAO guidelines on food safety and nutrition related KAP assessments (Macías and Glasauer 2014). The knowledge, attitude and practice of the population was calculated for each question by dividing the total number of correct responses by the number of respondents who answered the particular question (Macías and Glasauer 2014). Respondents who did not answer the question, or for whom information was incomplete, were excluded.

Percentage of total knowledge/attitude/practice among population =

$$\frac{\text{Sum of correct responses given by all respondents}}{\text{Total number of responses given by all respondents}} \times 100$$

KAP of mothers in child nutrition was classified using the Bloom's cut-offs for KAP studies, namely, ≥80% as good or positive; 60%-79% as moderate, neutral or fair; and (<60%) as poor or negative as used in Alrazeeni (2021).

Weight of the child was measured using a baby hanging scale. Height was measured without shoes by using either a horizontal length scale (for those who could not stand erect) or standing height scale (for infants above 13 months of age). Mid upper arm circumference (MUAC) was measured using tape at the midpoint between the shoulder and elbow of the child. Information on age was obtained from a written birth card or verbal information from the mother. Anthropometric analysis was made by using Emergency Nutritional Assessment Software. Height-for-age (H/A), weight-for-height (W/H), and weight-for-age (W/A) below -2SD, indicated stunting; wasting (thinness); and underweight, respectively. The data was analyzed using SPSS v22. Assessment was also made in the two kebeles with regards to knowledge, attitude and practice of mothers on child nutrition.

Composite Index of Anthropometric Failure (CIAF) was used to assign our study subjects into 'failure' and 'no failure" groups, based on their growth status (Bejarano *et al*., 2019, Destaw *et al.*, 2021). 'No failure' groups attained normal growth status by all the three conventional indices, namely stunting, thinness, underweight/excess weight. Children who failed to attain a normal growth in, at least, one of the standard indices were categorized as "Failure" (Table 1).

Thus, proportion of Anthropometric Failure is the sum of the percentages of each failure groups indicated in Table 8, except group A, and can be calculated as in (Bejarano *et al*., 2019):

CIAF = (1 – A)%.

Table 1 CIAF categories for children of age group six to 23 months.

Categories	Description	Stunting	Under-weight	Thin-ness	Over-weight
A	Without anthropometric failure	No	No	No	No
B	Thinness only	No	No	Yes	No
C*	Thinnessand Underweight	No	Yes	Yes	No
D	Stunting, Thinness, and Underweight	Yes	Yes	Yes	No
E*	Stunting and Underweight	Yes	Yes	No	No
F	Stunting only	Yes	No	No	No
G	Overweight	No	No	No	Yes
H	Stunting and excess weight (overweight and obese)	Yes	No	No	Yes
Y*	Underweight only	No	Yes	No	No

Adatpted from Bejarano et al. (2019)

Data analysis

Descriptive analysis such as means, median and frequencies were used to analysevariables of household socio-demographic status. Inferential statistics such as Pearson's chi-square testwas used to see associations between categorical variables by cross tabulation. Significance was determined at p=0.01 or p=0.05. Student's t-test was used to compare means between semi-urban and rural households,

Ethical consideration

As measurements were taken from human subjects, research ethical issues were duly addressed. Study conditions regarding anonymity, confidentiality and willful participation were explained to respondents and informed oral consent was obtained from them.

RESULTS

In this study, only mothers with children six to 23-months were considered as they were the closest to their children and could properly answer questions regarding nutrition KAP at household level.

Socio-demographic information

The median age of mothers was 32 years and over 90% of the mothers were young adults between 20 to 40 years. Over 90% were married and Muslim in religion. More than half of the households had between four to five children and over 10% had more than six children. Only 13% of respondents from both kebeles were illiterate while the majority (80%) of the respondents could read and write or attended primary or secondary school (Table 2).

The majority of the mothers in both kebeles were farmers, although the proportion was higher (70%) in the rural kebele (Table 2). About 57% of the semi-urban and 75% of rural households had a monthly income of <etb 2000 (USD 1=ETB 30 during the study period).In general, the difference in socio-economic and demographic parameters between households in semi-urban and rural kebeles was not significant at p=0.05. A significant association was, however, observed between number of children and child under-nutrition (p<0.1).

Table 2. Socio-economic and demographic status of the study population.

Variables	Category	Semi-urban n=133 No. (%)	Rural n=112 No. (%)
Age group (mother)	20-40	133 (100 %)	106 (94.5%)
	41-50	0	6 (5.5%)
Marital status	Married	119 (89.5%)	103 (92%)
	Divorced/Widowed	14 (10.5 %)	9 (8%)
Number of children <2 years per household	Three or less	25 (18.8%)	27 (24.1%)
	Four to six	94 (70.7%)	72 (64.3%)
	>Six	14 (10.5%)	13 (11.6%)
Age of infant (months)	0-12	25 (18.8%)	34 (30.4%)
	Above 12	108 (81.2%)	78 (69.6%)
Religion	Muslim	124 (93.2%)	106 (94.6%)
	Orthodox	9 (6.8%)	6 (5.4%)
Education (mothers)	Illiterate	24 (18%)	8 (7.2%)
	Read and write	36 (27.1%)	31 (27.7%)
	Grades 1-8	62 (46.6 %)	66 (58.9%)
	Grades 9-12	11 (8.3%)	6 (5.4%)
Occupation	House wife	43 (32.3%)	28 (25%)
	Farmer	78 (58.6%)	79(70.5%)
	Merchant	12 (9.1%)	5 (4.5%)
Monthly household income (ETB)	<2000	76 (57.1%)	84 (75%)
	2001-4000	41 (30.8%)	28 (25%)
	4000 and above	16 (12.1%)	0

Household food security status

Findings of HFIAS indicated that a high proportion of households (>75%) in both kebeles rarely or sometimes experienced anxiety and uncertainty or ate insufficient quality of food during the four weeks prior to the interview. Although a higher proportion of households in the rural kebele (20%) had to eat insufficient quantity of food than those in the semi-urban (5%) kebele, the difference was, however not significant at p=0.05.(Table 3).

Table 3. Mean values of food insecurity experience among rural (n=112) and semi-urban (n=133) households.

Household food insecurity experience		Occurrence		Frequency		
	Location	No.	%	Rarely	Sometimes	Often
Anxiety and uncertainty	Rural (n=112)	103	77.4	36.8%	40.6%	0
	Semi-urban (n=133)	85	75.9	42%	33.9%	0
Reduced quality of food	Rural (n=112)	100	75.2	36.1%	39.1%	0
	Semi-urban (n=133)	85	75.9	41.1%	34.8%	0
Reduced quantity of food	Rural (n=112)	7	5.3	5.3	0	0
	Semi-urban (n=133)	23	20.5	13.4%	7.1%	0
Hunger	Rural (n=112)	0	0	0	0	0
	Semi-urban (n=133)	0	0	0	0	0

Rarely (1 or 2 times), sometimes (3 to 10 times), Often (more than 10 times)

Both semi-urbanand rural households belonged to different categories of food security. The proportion of mildly food insecure households in our study was slightly higher in the semi-urban (57%) than in the rural kebele (52%).Moderately food insecure households in both kebeles had comparable proportions (Table 4).There was, however, no severely food insecure household in both kebeles. In general, over 80% of the study population was in a state of some degree of food insecurity.

Table 4. HFIA prevalence among households in the study kebeles.

Category	Semi-urban (n=133)	Rural (n=112)	Total (n=245)
Food secure	17.8%	18%	17.9%
Mildly food insecure	56.5%	52.2%	54.4%
Moderately food insecure	25.7%	29.9%	27.8%
Severely food insecure	0	0	0

Knowledge, attitude and practice (KAP) of mothers on undernutrition

Knowledge: Average knowledge of child nutrition among mothers in the semi-urban and rural kebeles was very low (about 34% and 37%, respectively) (Table 5).Although a higher proportion of rural mothers (76%) had knowledge of how long breastfeeding should continue than mothers in semi-urban households (61%), there was no significant difference in general knowledge of child nutrition between mothers in semi-urban and rural households at p=0.05. Knowledge of when to start complementary feeding and the reasons for giving complementary foods at six months was quite high and similar in both kebeles (98%-100%).There was a wide gap between semi-urban (100%) and rural (30%) households in knowledge of appropriate consistency of meals. Most rural households thought that complementary meals should be watery in consistency because it was easier for the child to swallow thinner meals. Knowledge of the diverse foods that could be used to enrich starch-based meals (e.g., porridge) was poor. Almost all mothers in both kebeles (96%-100%) knew only about legumes as enrichment foods to the starch-based complementary child meals. All mothers in both kebeles knew of over five different ways to encourage children to eat.

Table 5. Mothers' knowledge on child nutrition.

	Correct response	
	Semi-urban (n=133)	Rural (n=112)
1: Continued breastfeeding	81 (60.9%)	84 (75.5%)
2: Age of start of complementary foods	130 (97.7%)	112 (100%)
3: Reason for giving complementary foods at six months	133 (100%)	112 (100%)
4: Appropriate consistency of meals	133 (100%)	33 (29.5%)
5: Reason for appropriate consistency of meals	133 (100%)	33 (29.5%)
6: Dietary diversity and ways of enriching porridge by adding:		
¨ Animal-source foods	0	0
¨ Pulses and nuts:	128 (96.2%)	112(100%)
¨ Vitamin-A-rich fruits and vegetables	0	0
¨ Green leafy vegetables	0	0
¨ Energy-rich foods	0	0
¨ Others	5 (3.8/%)	0
7: Responsive feeding: Number of ways to encourage young children to eat	5 (3.8/%)	6 (5.4%)
Average Knowledge	33.9%	36.6%

Attitude: Over 90% of mothers in both kebeles were self-confident in preparing food for the child and believed that it was good to give different types of food to child each day, to feed child several times each day and to continue breastfeeding beyond six months (Table 6). Moreover, they believed that continuing breastfeeding beyond six months was not difficult (>90%). Although the majority of mothers in both localities believed that it was good to feed a child with different types of foods several times each day, about 60% to 70%thought that this was difficult to achieve. When asked why, they responded that it was difficult because of low income of households. Average positive attitude towards appropriate child nutrition in the study kebeles ranged between 75% and 80%.

Table 6. Mothers' attitude towards child nutrition.

Perceived benefit or difficulty	% Positive attitude Semi-urban (n=133)	Rural (n=112)
Good to give different types of food to child each day	132(99.2%)	103 (92.0%)
Not difficult to give different types of food to child each day	33(24.8%)	49 (43.8%)
Goodto feed child several times each day	125 (94.0%)	86 (76.8%)
Not difficult to feed your child several times each day	58 (43.6%)	25 (22.3%)
Good to continue breastfeeding beyond six months	130(97.7%)	112 (100%)
Not difficult to continue breastfeeding beyond six months	130(97.7%)	103 (91.9%)
Self-confidence in preparing food for the child?	132 (99.2%)	109 (97.3%)
Support by health extension agents on child feeding	70 (52.6%)	61 (54.5%)
Average positive attitude	79.5%	74.9%

Practice: Over 98% of all mothers in both kebeles fed breast milk to their children. Almost all mothers in this study supplemented breast milk basically with starchy foods. Complementary meals were dominated by grains and legumes (>95%) followed by eggs (70-80%) animal milk (60-80%) and flesh foods (around 30%) in both kebeles (Table 7).Consumption of food groups such as vitamin A-rich fruits and vegetables was very low (<7%). However, more mothers in semi-urban (81%) than in rural kebele (56%) used other fruits and vegetables to supplement their child's meal. Average appropriate practice in child nutrition was low (<45% in both kebeles)

A low proportion (<15%) of mothers in both kebeles fed their child five times and less than 55% only three times during the previous day. In general, mothers in both study areas showed positive attitude towards appropriate child nutrition (75%-805).

Table 7. Mothers' practice in child nutrition.

		Appropriate practice Semi-urban (n=133)	Rural (n=112)
1. Continued breastfeeding		130 (97.7%)	111 (99.1%)
2. Dietary diversity			
Group 1: Foods made from grains, roots and tubers		132 (99.2%)	112 (100%)
Group 2: Foods made from Legumes and nuts		129 (97.0%)	101 (90.2%)
Group 3: Dairy products Infant formula(4x)			
Milk, (powdered or fresh animal milk (3x)		80 (60.2%)	87 (77.7%)
Yogurt or drinking yogurt (1x)		2 (1.5%)	0
Cheese or other dairy products (1x)		6 (4.5%)	0
Group 4: Flesh foods		41 (30.8%)	39 (34.8%)
Group 5: Eggs		106 (79.7%)	81 (72.3%)
Group 6: Vitamin A, fruits and vegetables			
Any dark green vegetables (kale)		2 (1.5%)	5 (4.5%)
Ripe mangoes, ripe papayas, musk melon		9 (6.8%)	0
Group 7: Other fruits and vegetables		107 (80.5%)	63 (56.3%)
Any oil, fats, or butter or foods made with these		15 (11.3%)	92 (82.1%)
Any sugary foods		0	0
Condiments for flavor		56 (42.1%)	54 (48.2%)
3. Minimum meal frequency			
Number of times the child ate foods the previous day during the day or at night?	2x	2 (1.5%)	0
	3x	73 (54.9%)	57 (50.9%)
	4x	48 (36.1%)	38 (33.9%)
	5x	10 (7.5%)	17 (15.2%)
Average appropriate practice		41.3%	45.4%

Child Nutritional Status

A total of 245six to 23-month-oldchildren from both kebeles were considered in this study. Distribution by sex was almost even (51% boys and 49% girls). Children belonging to the age group 18 to 23 months made up 44.1% of the under-two children (Table 8). About 12% of all children were stunted with those in the age group 12-17 months showing the highest proportion (18%).

Table 8 Nutritional status of six to 23-month-oldchildren in the study households.

Age (Months	Total	Thinness W/H, <-2 z-score	Stunting H/A, <2 z-score	Underweight W/A, <-2 z-score	MUAC <125 mm
6-11	59	5 (10.1%)	7 (14%)	6 (10.1%)	18 (30.5%)
12-17	78	4 (5.1%)	14 (17.9%)	3 (3.8%)	15 (19.2%)
18-23	108	5 (4.6%)	9 (8.3%)	2 (1.9%)	11 (10.2%)
Total	245	15 (6.1%)	30 (12.2%)	11 (4.5%)	44 (18%)

About 4.5%of under-two children in this study were underweight with higher proportion (11%) in infants under six months. MUAC measurements indicated that about 18% of the children suffered from, at least, moderate under nutrition with the highest proportion (56%) among children under six months old.

A total of 39% of all children considered in this study have an anthropometric failure (Table 9). Children in the semi-urban kebele had lower values (31%) of anthropometric failure when compared to those in the rural kebele (48%). The difference, however, was not significant ($p>0.05$). Most infants suffered from only one anthropometric failure. A few (about 5%) had combined failure of thinness and underweight or stunting and excess weight.

Table 9. CIAF among six to 23-month children in the study area.

Category		Semi-urban (n=133)	Rural (n=112)	Total
A	Without anthropometric failure(normal)	92	58	150
B	Thinness only	8	7	15
C	Thinness and Underweight	3	3	6
D	Stunting, Thinness, and Underweight	0	0	0
E	Stunting and Underweight	0	0	0
F	Stunting only	11	19	30
G	Excess weight (overweight and obese)	10	16	26
H	Stunting and excess weight	2	5	7
I	Underweight only	7	4	11
Total		133	112	245
Total anthropometric failure		41	54	95
CIAF		30.8%	48.2%	38.8%

DISCUSSION

In KAP studies, it is useful to consider socio-demographic factors as they affect consumption rate of diverse food groups and dietary diversity among children aged 6–23 months(Baek and Chitekwe (2019).The higher number of dependent children per household, in our study, could expose families to, at least, mild or moderate levels of food insecurity (Miskir *et al.,* 2017). The fact that only a small number of respondents from both kebeles were illiterate indicated that the communities, in both kebeles, were appropriate for training interventions on nutrition by health extension workers. According to Sultana and Hasan (2020),in Bangladesh, child health and nutrition depended on the mother's knowledge and beliefs child nutritional practices.

A large proportion of our respondents from the semi-urban and rural households had low monthly income. Increased monthly income was significantly associated with better child nutritional status ($p<0.1$). The general low income combined with high number of infants per household would put most households in a marginal situation. According to Nankinga *et al.*(2019), maternal income wasa significant determinant of child nutritional status in Uganda.Oh *et al.*(2019) also showed that family income had a strong relationship with healthy child nutritional practices in Senegal.

The proportion of food secure households in our study was low. This proportion was much higher than that reported from Boset woreda, East Shewa zone, Ethiopia (Moroda *et al.,*2018),but lower than that reported from Damot Gale woreda, Wolayta zone, Ethiopia (Mota *et al.*, 2019). In general, over 80% of the study population was in a state of some degree of food insecurity. Lower proportions of food insecurity were reported from other parts of Ethiopia (Mota *et al.*, 2019; Berra, 2020). Considering the fact that the survey was made immediately after harvest time, when food in farming communities is usually relatively abundant, the level of food insecurity was telling of what could happen during the slim months when amount of stored food in most households gradually dwindles to nil.

It is crucial for mothers to know that a child's body is nourished and its health influenced by different types of foods. In this respect, knowledge of what kinds of foods to choose for the child and how to prepare them is useful. For mothers, adequate knowledge of nutrition would help them to use appropriate alternatives to fight against child malnutrition using the means at hand. Moreover, nutrition education improved the appropriate complementary feeding knowledge and practice of mothers (Muluye *et al*.**,** 2020).Promotion of health and nutrition education to mothers could enhance child nutrition outcomes in Nigeria (Fadare *et al.,*. 2019).

Although the attitude of mothers towards giving different types of food to the child each day was considerably high, average appropriate practice in child nutrition was poor. Consumption of diversified diets and locally available nutrient-dense foods is recommended to achieve adequate intake of macro and micronutrients by infants and young children (Kinabo et al., 2019).

The positive attitude shown by mothers in both study areas towards appropriate child nutrition was, unfortunately, not translated into practice mainly due to low income of households. As nutritional requirement of infants is continuously evolving, infants should be fed with nutritionally adequate complementary foods while breastfeeding continues for up to two years of age or beyond(WHO, 2002).

Our observation of stunted children was lower than the stunting observed in under-two children of Orthodox Christian mothers in Tigray (Desalegn *et al.,* 2019). According to EPHI and ICF (2021),stunting of children under five years in Ethiopia was high. Stunting reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness. Height-for-age, therefore, represents the long-term effects of malnutrition in a population and is not sensitive to recent, short-term changes in dietary intake EPHI and ICF (2021). The proportion of children, in this study, who suffered from thinness was much lower than that reported among under-two children from elsewhere in Ethiopia (Derso *et al.,*. 2017).

The proportion of under-two children in this study who were underweight was higher than that observed in children of similar age group from North Ethiopia (Desalegn *et al.,* 2019). The proportion of moderate undernutrition among our under-two children, as measured by MUAC was much lower than that observed in northeast Ethiopia where a high prevalence of acute malnutrition was observed among under-two children (Gizaw *et al.,*. 2018).

CONCLUSION

The nutritional status of the children considered in this study could be the consequence of a range of factors such as poor food diversity, insufficient food intake, and poor nutritional knowledge and practice. Child diet was not adequately diversified, thus, leading to poor nutritional status of children. It is, thus, recommended to give appropriate training to mothers that can fill the gaps in child nutrition knowledge and practice.

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REFERENCES

1. Alrazeeni, D. 2021. Knowledge, attitude, and practice toward COVID-19 among paramedics in Saudi Arabia: Implications for educational program. *International Journal of Advanced and Applied Sciences*, **8**: 71-77.
2. Baek, Y., Chitekwe, S. (2019) Sociodemographic factors associated with inadequate food group consumption and dietary diversity among infants and young children in Nepal. *PLoS ONE* 14: e0213610. https://doi.org/10.1371/journal.pone.0213610
3. Bejarano, I., Oyhenart, E., Torres, M., Cesani, M., Garraza, M., Navazo, B. (2019). Extended composite index of anthropometric failure in Argentinean preschool and school children. *Public Health and Nutrition* **22**:3327-3335
4. Berra, W.(2020). Household Food Insecurity Predicts Childhood Undernutrition: A Cross-Sectional Study in West Oromia (Ethiopia). *Journal of Environment and Public Health*. Volume **2020**, Article ID 5871980, ttps://doi.org/10.1155/2020 /5871980;2020.
5. Coates, J., Swindale, A., and Bilinsky, P.(2007). Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator guide (v.3). Food and Nutrition Technical Assistance (FANTA) project.Washington DC.
6. Cochran,W.(1963). Cochran,. (1963). *Sampling Techniques*, 2nd Ed. John Wiley and Sons, Inc. NewYork.
7. Derso, T., Tariku, A., Biks, G.and Wassie, M.(2017). Stunting, wasting and associated factors among children aged 6-23months in Dabat health and demographic surveillance system site: A community based cross-sectional study in Ethiopia. *BMC Pediatrics* **17**: 96. doi: 10.1186/s12887-017-0848-2
8. Desalegn, B., Lambert, C., Riedel, S., Negese, T., and Biesalski, H.(2019). Feeding Practices and Undernutrition in 6–23-Month-Old Children of Orthodox Christian Mothers in Rural Tigray, Ethiopia: Longitudinal Study. *Nutrients*.**11:**138; https://doi.org/10.3390/nu11010138
9. Destaw, Z., Wencheko, E., Kidane, S., Challa, Y., Tiruneh, M., Fite, M., Shaleka, D., and Ashenafi, M. 2021. Use of modified composite index of anthropometric failure and MUAC-for-age to assess prevalence of malnutrition among school-age children and adolescents involved in the school feeding program in Addis Ababa, Ethiopia.

BMC Nutrition (in press) https://doi.org/10.1186/s40795-021-00471-x

10 EPHI and ICF, 2021. Ethiopia Mini Demographic and Health Survey 2019: Final Report. Ethiopian Public Health Institute (EPHI) [Ethiopia] and ICF. 2021. Rockville, Maryland, USA: EPHI and ICF.

11. Fadare, O., Amare, M., Mavrotas, G., Akerele, D. and Ogunniyi, A. (2019) Mother's nutrition-related knowledge and child nutrition outcomes: Empirical evidence from Nigeria. *PLoS ONE***14**: e0212775. https://doi.org/10.1371/journal.pone.0212775

12. Gebreyesus, S., Lunde, T., Mariam, D. Woldehanna, T., and Lintjorn, B. (2015). Is the adapted Household Food Insecurity Access Scale (HFIAS) developed internationally to measure food insecurity valid in urban and rural households of Ethiopia? *BMC Nutrition* **1**: 2. https://doi.org/10.1186/2055-0928-1-2

13. Gizaw, Z., Woldu, W., and Bitew, B.(2018). Acute malnutrition among children aged 6-59 months of the nomadic population in Hadaleala district, Afar region, northeast Ethiopia. *Italian Journal of Pediatrics***44**: 21. doi: 10.1186/s13052-018-0457-1.

14. Kinabo, J., Mamiro, P., Mwanri, A., Bundala, N., Kulwa, K., Picado, J., Ntwenya, J., Nombo, A., Mzimbiri, R., Ally, F., Salmini, A., Juma, A., Macha, E., Cheung, E., and Msuya, J. (2019). Adequacy of macro and micronutrients in infants and young children's diets in Zanzibar, Tanzania. *African Health Sciences*, **19:** 3063–3077. https://doi.org/b10.4314/ahs.v19i4.28.

15. Liu, L., Oza, S., Hogan, D., Chu, Y., Perin, J., Zhu, J., Lawn, J., Cousens, S., Mathers, C, and Black, R. (2016). Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. *Lancet*; **388**: 3027–3035.

16. Macías, Y. and Glasauer, P. (2014).Guidelines for assessing nutrition-related Knowledge, Attitudes and Practices. Guidelines for assessing nutrition-related Knowledge, Attitudes and Practices. Food and Agriculture Organization of the United Nations, Rome

17. Miskir, A., Godana, W., Girma, M., and G/Miskel, F.(2017). Determinants of Acute Malnutrition among Under-Five Children in Karat Town Public Health Facilities, Southern Ethiopia: A Case Control Study. *Quality in Primary Care***25**: 242-252.

18. Moroda, G., Tolossa, D., and Semie, N. (2018). Food insecurity of rural households in Boset district of Ethiopia: A suite of indicators analysis. *Agriculture and Food Security*. **7**: 65 https://doi.org/10.1186/s40066-018-0217-x 7(1).

19. Mota, A. Lachore, S.and Handiso, Y.(2019). Assessment of food insecurity and its determinants in the rural households in Damot Gale Woreda, Wolaita zone, southern Ethiopia. *Agriculture and Food Security***8**: 11 https://doi.org/10.1186/s40066-019-0254-0.

20. Muluye, S., Lemma, T. and Diddan. T. (2020). Effects of nutrition education on improving knowledge and practice of complementary feeding of mothers with 6- to 23-month-old children in daycare centers in Hawassa town, Southern Ethiopia: An institution-based randomized control trial. *Journal of Nutrition and Metabolism* https://doi.org/10.1155/2020/6571583

21. Nankinga,O., Kwagala, B., Walakira, E. (2019) Maternal employment and child nutritional status in Uganda. *PLoS ONE***14**: e0226720. https://doi.org/10.1371/journal.pone.0226720

22. Oh, H., Kang, S., Cho, S., Ju, Y. and Faye, D. (2019) Factors influencing nutritional practices among mothers in Dakar, Senegal. PLoS ONE 14(2): e0211787. https://doi.org/10.1371/journal.pone.0211787

23. Sultana, P. and Hasan, K. (2020). Mother's Nutritional Knowledge and Practice: A study on Slum Area of Khulna City.*European Journal of Medical and Health Sciences*http://dx.doi.org/10.24018/ejmed.2020.2.6.582.

24. TWOA (2016). Tehuledere Woreda Office of Agriculture (TWOA). Tehuledere, Ethiopia.

25. Wagnew, F., Tesgera, D., Mekonnen, M. and Alemu, A. 2018. Predictors of mortality among under-five children with severe acute malnutrition, Northwest Ethiopia: an institution based retrospective cohort study. *Archives of Public Health* **76**, 64. https://doi.org/10.1186/s13690-018-0309-x

26. WHO (2002). Complementary feeding: report of the global consultation, and summary of guiding principles for complementary feeding of the breastfed child. Geneva, Switzerland: World Health Organization.

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Appendix I. Chi-square distribution of variables for nutritional status of children in semi-urban, Tehuledere Woreda.

Variable	Category	weight-for-age			weight-for height			Length/height for age			MUAC (cm)			
		Under weight	normal	P	wasting	Normal	P	Stunting	normal	P	Chronic energy deficiency		normal	p
Sex of child	Female	5(62.5%)	59	ns	4(50%)	60	Ns	6(50%)	58	ns	15(55.5%)		49	ns
	Male	3(37.5%)	66		4(50%)	65		6(50%)	63		12(44.4%)		57	
	total	8	125		8	125		12	121		27		106	
Household income	500-1000	2(25%)	31	ns	4(50%)	29	ns	5(41.6%)	28	ns	15(55.5%)		20	.021
	1001-1500	2(25%)	21		2(25%)	21		2(16.6%)	21		5(18.5%)		18	**
	1501-2000	1(12.5%)	18		1(12.5%)	18		3(25%)	16		1(3.7%)		18	
	2001-2500	1(12.5%)	10		0	11		1(8.3%)	10		2(7.4%)		9	
	2501-3000	0	16		0	16		0	16		4(14.8%)		12	
	3001-4000	1(12.5%)	14		1(12.5%)	14		1(8.3%)	4		2(7.4%)		13	
	>4000	1(%12.5)	15		0	16		0	16		0		16	
	total	8	125		8	125		12	121		27		106	
Education (mothers)	Illiterate	1(12.5%)	23		0	24		2(16.6%)	22		10(37%)		14	
	Read &write	3(37.5%)	33	ns	3(37.5%)	33	ns	3(25%)	33	ns	6(22.2%)		30	ns
	Grades 1-5	1(12.5%)	11		1(12.5%)	11		1(8.3%)	11		3(11.1%)		9	
	Grades 6-8	3(37.5%)	47		4(50%)	46		6(50%)	44		6(22.2%)		44	
	Grades 9-12	0	10		0	10		0	10		2(7.4%)		8	
	College/univ	0	1		0	1		0	1		0		1	
	Total	8	125		8	125		12	121					
Number of children	Two	0	3		0	3		0	3		0		3	
	Three	1(12.5%)	21		2(25%)	20	.ns	2(16.6%)	20	ns	5(18.5%)		17	ns
	Four	3(37.5%)	32	ns	3(37.5%)	32		3(25%)	32		12(44.4%)		23	
	Five	2(25%)	37		2(25)	37		2(16.6%)	37		7(25.9%)		32	
	Six	2(25%)	18		1912.5%)	19		1(8.3%)	19		2(7.4%)		18	
	>six	0	14		0	14		0	14		1(3.7%)		13	
	Total	8	125		8			12	121		27			
DD	<4 food item	4(50%	4	.000*	1(12.5%)	7	Ns	4(33.3%)	4	.000*	2(7.4%)		6	ns
	>= food item	4(50%)	121		7(87.5%)	118		8(66.7%)	117		25(92.6%)		100	
	Total	8	125		8									

Chi-square significance: * = p < 0.01, ** =p < 0.05; n. s. not significant

Appendix II. Chi-square distribution of variables for nutritional status of children in a rural kebele, Tehuledere Woreda.

Variable	Category	Nutritional status of children											
		weight-for-age			weight-for-height			Length/height for age/			MUAC (cm)	Chronic energy deficiency (%)	
		Under nutrition	normal	P	Wasting	Normal	P	Stunting	normal	P	Yes	Normal	p
Sex	Female	1(33.3%)	57	ns	3(42.9%)	55	n.s	4(22.2%)	54	.006	9(52.9%)	49	n.s
	Male	2(66.7%)	52		4(57.1%)	50		14(77.8%)	40	**	8(47.1%)	46	
	Total	3	109		7	105		18	94		17	95	
Household income	500-1000	3(100%)	38	n.s	4(57.1%)	32	n.s	5(27.8%)	36	n.s	9(52.9%)	32	n.s
	1001-1500	0	26		2(28.6%)	24		5(27.8%)	21		4(23.5%)	22	
	1501-2000	0	18		1(14.3%)	12		5(27.85)	13		3(17.6%)	15	
	2001-2500	0	13		0	13		1(5.6%)	12		0	9	
	2501-3000	0	11		0	11		2(11.1%)	9		1(5.9%)	13	
	3001-4000	0	3		0	3		0	3		0	10	
	Total	3	109		7	105		18	94		17	95	
Education (mothers)	Illiterate	0	8	n.s	0	8		2(11.1%)	6		1(5.9%)	7	n.s
	Read & write	1(33.3%)	30		1(14.3%)	30	n.s	5(27.8%)	26	n.s	7(41.2%)	24	
	Grades 1-5	1(33.3%)	27		2(28.6%)	27		5(27.8%)	23		5(29.4%)	23	
	Grades 6-8	1(33.3%)	37		4(57.1%)	37		5(27.8%)	33		3(17.6%)	35	
	Grades 9-12	0	6		0	6		1(5.6%)	5		1(5.9%)	5	
	Total	3	109		7	105		18	94		17	95	
Number of children	Two	0	9		0	9	n.s	1(5.6%)	8		4(23.5%)	5	
	Three	2(66.7%)	16	n.s	0	18		1(5.6%)	17	n.s	4(23.5%)	14	.026**
	Four	0	30		4(57.1%)	26		7(38.9%)	23		1(5.9%)	29	
	Five	0	30		1(14.3%)	29		5(27.8%)	25		5(29.4%)	25	
	Six	0	12		0	12		2(11.1%)	10		0	12	
	>six	1(33.3%)	12		2(28.6%)	11		2(11.1%)	11		3(17.6%)	10	
	Total	3	109		7	105		18	94		17	95	
DD	<4 food items	0	10	n.s	4(57%).	4	.000*	4(5.6%)	4	.000*	9(23.5%)	5	n.s
	>= 4food items	3(100%)	99		3(42.9%)	99		8(94.4%)	96		85(76.5%)	84	
	Total	3	109		7	103		12	100		17	89	

Chi-square significance: * = p < 0.01, ** =p < 0.05; n. s. not significant