

# Complementary feeding hygiene practice and associated factors among mothers with children aged 6–24 months in tegedie district, Northwest Ethiopia: Community-based cross-sectional study

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## Research

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# Abstract

## Introduction

Hygienic practice of mothers during complementary feeding is crucial in the protection of vulnerable infants and children aged 6–24 months from childhood communicable diseases like diarrheal and malnutrition. However, sufficient evidence on hygienic practice of mothers during complementary feeding and its associated factors is limited.

## Objective

To determine the levels of complementary feeding hygiene practice and its associated factors among mothers of children aged 6–24 months in Tegedie district, northwest Ethiopia.

## Methods

A community-based cross-sectional study was conducted from March 17 to April 17, 2021, among 576 mothers with children aged 6-24 months in Tegedie district northwest Ethiopia. A multistage sampling technique was used to select the study participants. Data were collected using an interviewer-administered structured questionnaire and it entered into Epi-data version 4.6, and exported to SPSS version 20.0 for data cleaning and further analysis. Bivariate and multivariable binary logistic regressions analysis were employed to identify predictors of complementary feeding hygiene practice with p-value < 0.25 enter into the multivariable logistic regression model. Then variables with p-value  $\leq 0.05$  in multivariable logistic regressions were considered as statistically significance.

## Results

The prevalence of hygienic practice during complementary feeding of their children aged 6-24 months was, 33.6% with 95% CI: (29.7%, 37.6%) of them had good practice. Living in urban areas [AOR= 7.02, 95% CI: (4.14, 11.88)], presence of hand washing facility near the latrine [AOR= 3.02, 95% CI: (1.18, 7.70)], presence of separate area to store raw and cooked foods [AOR= 5.87, 95% CI: (2.84, 12.13)] and presence of three-compartment dishwashing system [AOR= 5.70, 95% CI: (3.41, 9.54)] were significant predictors of hygienic complementary feeding practice.

## Conclusion and recommendation

The prevalence of good hygienic practice during complementary feeding among mothers was still low; the district health office and health extension workers should work to improve the maternal hygienic practices during complementary feeding practice.

## Introduction

The World Health Organization (WHO) defines Complementary Feeding (CF) as the process that started when breast milk alone is no longer sufficient and foods and liquids are needed to meet the nutritional requirements, along with breast milk [1, 2]. Guidelines of infant and young child feeding indicators recommend that this should start after 6 months with continued breastfeeding up to two years or beyond in normal conditions and complementary foods should be hygienically prepared and stored and fed with clean hands using clean utensils and not bottles and teats [1, 3]. It is a transition from exclusive breastfeeding to family foods and a very critical time in which poor hygiene practices of CF in many young children contribute significantly to the high prevalence of gastrointestinal and respiratory illnesses [4]. Gastrointestinal diseases associated with preventable food-borne bacteria for children <2 years of age remain a global health challenge since they have immature immune systems and are vulnerable to infections with enteric pathogens [5].

Hygienic practices during CF of infants and children play a major role in the occurrence of childhood diarrheal diseases [6]. Studies have shown that diarrheal incidence increases at the age when complementary foods are usually introduced, as unhygienic preparation and handling of foods can be a source of diarrheal pathogens [7–9]. Diarrhea is associated with malabsorption of significant nutrients, fluid losses, and reduced appetite [10] which results in severe childhood nutritional problems such as wasting and stunting [11]. Although hardware components such as improved water supplies and sanitation facilities make it easier to practice it, better hygiene can make a huge difference to health especially in keeping children safe from infection through feeding contaminated foods [12]. Improving hygienic complementary feeding is special attention in the Sustainable Under nutrition Reduction in Ethiopia (SURE) program collaborated with multi sectors intervention to deliver a complex multi component intervention to improve child feeding and reduce stunting [13].

Worldwide, the lives of approximately 525,000 children are lost each year from 1.7 billion cases of different infectious diseases like childhood diarrhea with the highest mortality rates reported among children aged less than 2 years in south Asia and sub-Saharan Africa [14]. Furthermore, 230,000 die every year globally because of diarrheal diseases associated with complementary food contaminations [3]. The contaminated complementary feeding process is directly related factors to malnutrition which is estimated to be the underlying cause of 45% of all deaths in children under the age of 5 years [15]. About 88% of child deaths were as a result of a diarrheal disease that is attributed to poor access to Sanitation, Water, and Hygiene (WASH) services, which may be prevented through improvements in WASH [16].

Epidemiological data indicate that food could be more important than water in transmitting diarrheal disease, and it is estimated that 40% of the burden of food-borne disease lies with children aged less than 5 years in Africa countries [4]. This corresponds with reports that at least 70% of diarrhea-related pathogens among children could be caused by contaminated complementary food [15]. In Africa, more than 30% of fewer than 5 years of age children suffered from different microbial pathogen diseases. Scientific evidence indicates that poor hygienic practices during complementary feeding can have profound consequences for the growth, development, and survival of infants and children [17, 18]. These explained by a study conducted in Malawi reported that 27% of 6-24 month children were reported to

have had diarrhea in the 2 weeks after initiation of CF that resulted from 80% suffer from reduced height, growth rate, 20% are underweight[19]. Across the three studies in rural India, show that the prevalence of child stunting ranged from 25–50% [20]. Descriptive study in Malawi showed that the prevalence of diarrhea among the under-fives was 43.4%, of this diarrhea among children of mothers who prepared child's food on the floor 45.5% and the table 40.7%, and those who were (48.2%) used only water and 40.3 used soap and water for hand washing[19]. Hand washing and basic hygiene behavior during the preparation of complementary food could minimize the spread of germs and as such prevent diarrhea, acute respiratory infections such as influenza, and skin infections[21].

According to Mini Demographic and Health Survey, 2019 of Ethiopia current prevalence of CF was 13% in addition to breast milk and infant mortality was 43% by preventable bacterial pathogen causing diseases. Inadequate food hygiene is considered to be one of the major contributors to diarrhea [22]. Appropriate CF practice requires good hygienic preparation of complementary preparation, sufficient household-level food availability, and adequate nutritional knowledge application by caregivers[23]. Many studies explained that the incidence of diarrheal diseases is especially high after initiation of complementary feeding which is the result of the consumption of contaminated complementary foods may introduce diarrhea-causing pathogenic microorganisms[24, 25].

Understanding the risk of hygiene practices of complementary feeding is the major concern to prevent and control food-borne diseases of 6–24 months children in Ethiopia. However, the implementation of these conditions is often limited in Ethiopia. On top of this, there is the problem of real hygiene practices of complementary feeding, resulting in serious consequences of poor health outcomes. Scholars suggested that evidence-based awareness creation on poor practice of complementary feeding, increasing the accessibility of health education for caregiver mothers are recommended to reduce child morbidity and mortality[25]. As far as my knowledge, there is a limited study done on the level and associated factors of complementary feeding hygiene practice among mothers of children aged 6–24 months in Ethiopia. Improving food hygiene practices play a great role in child morbidity and mortality. However, determinant factors of poor complementary feeding hygienic practice is not well addressed which may be important to offer the proper information about those who are vulnerable child age groups. Therefore, the present study aimed to assess the on level and associated factors of complementary feeding hygiene practice among mothers of children aged 6–24 months in Tegedie District Northwest, Ethiopia.

## **Materials And Methods**

### **Study area, design and period**

This study was conducted in Tegedie district which is located 115 km from central Gondar and 748 km from Addis Abeba (capital city of Ethiopia). The district has one primary hospital, four governmental health centers, 24 health posts, seven private medium clinics. The district is structured into 21 (2 urban and 19 rural) Kebeles. According to Tegedie district health office reports, a total of 96,035 (48,497 male

and 47,537 female) population is living in the district. The number of breastfeeding mothers in the district was 4026. A community-based cross-sectional study was employed in Tegedie district from March 17 to April 17, 2021.

## Study population

All mothers/caregivers with children aged 6–24 months in the randomly selected kebeles in the district were considered as the study population. Mothers with children aged 6–24 months who were seriously ill and unable to hear, and those mothers who lived a minimum of six months & did not start complementary feeding at the time of data collection were also excluded from the study

## Sample Size and sampling technique

The sample size (n) was determined by using the formula for a single population proportion taking an estimate of  $P=38.9\%$  from previous research conducted in Bahir Dar Zuria district Northwest Ethiopia[26],  $Z_{\alpha/2}=1.96$  is the critical point for the standard normal tabulated value at 95% confidence interval, and  $d=5\%$  of margin of error.

The final sample size including a 5% non-response rate and considering 1.5 design effects was 576.

The multistage sampling technique was used to get the study participants. Out of 21 Kebeles in Tegedie District, 7(30%) Kebeles were selected using a simple random sampling technique. The sample size was proportionally allocated to each selected kebele based on the size of the population of mothers with 6-24 months aged children in each kebele. The list of mothers with 6-24 months aged children in each kebele was used as a sampling frame which was found in health posts in the respective kebeles. A systematic random sampling technique was used to select the study participants after proportional allocation. The sampling interval  $K^{\text{th}}$  value was determined by dividing the total number of mothers with 6-24 children in each by the sample size allocated for each kebele.

## Variables

Dependent Variables: Complementary feeding hygienic practice

### Independent variables

Socio-demographic factors (age, marital status, place of residence, and a number of children), socioeconomic factors (occupation, level of education, income, residence, and access to media (radio and TV)), Knowledge and attitude of mothers about hygienic complementary feeding of children, and household and environmental-related factors like (presence and type of latrine, presence of hand washing facility near latrine, water source and Quantity of water use per day, presence of separate kitchen and three-compartment dishwashing system).

# Operational definition

## Complementary feeding hygienic practices

Respondents were asked 16 questions (6 questions related to hand washing with water and soap with 3-scales; 1- always, 2- sometimes, 3- wash only with water and 10 questions related to safety measures during food preparation with “Yes” or “No” response). The responses forwarded by study participants for the 6 questions related to hand washing with water and soap were dichotomized as 1 “for always” and 0 “for sometimes and wash only with water”. The responses forwarded by study participants for 10 questions related to safety measures during food preparation were dichotomized as 1 “for correct” and 0 “for incorrect responses”. Those study participants who had the correct response for  $\geq 75\%$  of the questions were reported as having good hygienic practice during complementary feeding and otherwise, they were reported as having poor hygienic practice during complementary feeding[26].

## Knowledge about hygienic complementary feeding

Respondents were asked 20 questions (Cronbach’s alpha 0.83) about their knowledge of hygienic complementary feeding such as; whether they know how to keep hands safe/clean during food preparation, the critical times for hand washing, the importance of hand washing with soap at critical times, whether respondents know the best way of hand washing during food preparation, knowledge on the importance of separate storage of raw and cooked foods, whether they know contaminated water can contaminate foods, and fruits and vegetables should be washed before eating. The correct answers were coded as 1 and the wrong answers were coded as 0. The respondent’s knowledge questions responses were computed to get the total knowledge score. Those study participants who scored mean (17.04) and above mean of the sum of the knowledge questions were considered as having good knowledge[27].

## Improved water source

Water source which includes piped water, boreholes or tube well, protected dug wells, protected springs and packaged or delivered water. Whereas unimproved water sources include unprotected wells, unprotected springs, and surface water[28].

# Data collection and quality control

Data were collected by interview and observation using a structured questionnaire. The questionnaire was prepared by reviewing previous studies conducted on the hygienic practice of mothers with children 6-24 months during complementary feeding of their children[26, 29, 30]. The questionnaire comprised of five parts: socio-demographic, household and environmental-related variables, maternal knowledge and attitude about hygienic complementary feeding, and self-reported hygienic practices of mothers during complementary feeding. The questionnaire was developed in English then translated into Amharic (local language) then back to English to ensure consistency. Five health extension workers as data collectors and one BSC in environmental health as supervisors were recruited for the data collection process.

The pre-test was done on 5 % of the sample size (29 participants) in kebele the district where the main study was not undertaken. The training was given for the data collectors and the supervisor on the aim of the study, inclusion and exclusion criteria, data collection technique going through the questionnaires, the art of interviewing, a way of collecting the data, and clarification before the actual data collection. Every day after data collection, questionnaires were reviewed by supervisors and principal investigator for ensuring completeness of questions. The completeness of questionnaires was checked before data entry by the principal investigator. Incomplete questionnaires were discarded from the analysis.

## **Data processing and analysis**

Data was entered Epi-Data version 4.6 software and exported to SPSS statistical package version 20.0 for further analysis. Descriptive statistics were used to describe data. Bivariate and multivariable logistic regressions were used to identify predictors of hygienic complementary feeding practice. In Bivariate logistic regression, p-value < 0.25 was considered to retain variables for multivariable logistic regression model. The Hosmer and Lemeshow test were checked to assess the model fitted to conduct logistic regression. A backward stepwise variable selection method was used during multivariable logistic regression to control the confounding effect. Crude and adjusted odds ratios with 95% confidence intervals were computed to assess the association between independent predictors and outcome variables. A p-value < 0.05 was considered as level statically of significance.

## **Results**

### **Socio-demographic characteristics of participants**

A total of 572 mothers who have children aged 6-24 months/caregivers were participated in this study with a response rate of 99.3%. The mean age of mothers/caregivers was 29.74 years with SD( $\pm$  5.719). Nearly two-thirds 374 (65.4%) of mothers/caregivers who participated in this study was living in urban areas. Nearly two-thirds 345 (60.3%) of the mothers/caregivers had no formal education. Similarly, the occupation of more than 329 (57.5%) of the mothers/caregivers was housewives. Around more than 338 (59.1 %) of the households had five or more family sizes. Nearly all 551(96.3%) of the mothers/caregivers who participated in this study had one child aged 6-24 months (Table 1).

Table 1  
Socio-demographic characteristics of participants in Tegedie district,  
northeastern Ethiopia, March 2021

<b>Variable/categories</b>	<b>Frequency (n)</b>	<b>Percent (%)</b>
<b>Ethnicity</b>		
Amhara	559	97.7
Tigray	8	1.4
Others	5	0.9
<b>Religion</b>		
Orthodox	488	85.3
Muslim	78	13.6
Catholic	2	0.3
Others	4	0.7
<b>Maternal educational status</b>		
No formal education	345	60.3
Primary level	81	14.2
Secondary level	58	10.1
Diploma and above	88	15.4
<b>Maternal occupation</b>		
Civil servant	88	15.4
Merchant	52	9.1
Unemployed	64	11.2
Daily laborer	38	6.6
Housewife	329	57.5
Student	1	0.2
<b>Marital status of mothers</b>		
Married	519	90.7
lives separately	4	0.7
Single	9	1.6
Divorced	31	5.4

<b>Variable/categories</b>	<b>Frequency (n)</b>	<b>Percent (%)</b>
Widowed	9	1.6
<b>Husband educational status (N=523)</b>		
Diploma and above	105	20.1
Secondary level	68	13.0
Primary level	151	28.9
No formal education	199	38.0
<b>Husband occupational status (N=523)</b>		
Civil servant	109	20.8
Merchant	166	31.7
Unemployed	9	1.7
Daily laborer	66	12.6
Farmer	173	33.1
<b>Family size</b>		
less than 5	338	59.1
5 and above	234	40.9
<b>No. of under two children</b>		
One	551	96.3
More than one	21	3.7
<b>Household monthly income</b>		
Mean and above(2,756.65)	249	43.5
Below mean	323	56.5
<b>Place of residence</b>		
Urban	374	65.4
Rural	198	34.6
<b>Access to media (TV or radio)</b>		
Yes	288	50.3
No	284	49.7
<b>Got training on child food preparation</b>		

Variable/categories	Frequency (n)	Percent (%)
Yes	85	14.9
No	487	85.1

## Housing and environmental characteristics

Of the 572 respondents, the majority 482 (84.3%) them had latrine of any type for their household members. Pit latrine with slab 239 (41.8%) was the most common type of latrine and almost all 561 (98.1%) households had got drinking water from protected sources. About 510 (89.2%) of the households had a separate kitchen for food preparation and nearly 380 (66.4%) households used cultural cook stoves for cooking. Other housing and environmental characteristics and the results of the bivariate analysis of their association with complementary feeding hygienic practice among mothers are summarized in (Table 2).

Table 2  
Housing and Environmental of household in Tegedie district, northeastern Ethiopia, March 2021

<b>Variable/categories</b>	<b>Frequency (n)</b>	<b>Percent (%)</b>
<b>Presence of latrine</b>		
Yes	482	84.3
No	90	15.7
<b>Type of latrine</b>		
Pour flush	21	3.7
VIP latrine	118	20.6
Pit latrine with slab	239	41.8
Pit latrine without a slab	105	18.4
No latrine facilities	89	15.6
<b>Presence of hand washing facility near the latrine</b>		
Yes	29	5.1
No	543	94.9
<b>Handwashing with soap after visiting toilets</b>		
Always	274	47.9
Sometimes	93	16.3
Never	205	35.8
<b>Handwashing with soap after cleaning child's bottom</b>		
Always	276	48.3
Sometimes	91	15.9
Wash only with water	186	32.5
Never	19	3.3
<b>Wash child's hands with soap after he/she defecate</b>		
Always	308	53.8
Sometimes	158	27.6
Wash only with water	106	18.5
<b>Source of drinking water</b>		

<b>Variable/categories</b>	<b>Frequency (n)</b>	<b>Percent (%)</b>
Protected water	561	98.1
Unprotected water	11	1.9
<b>Distance to the water source</b>		
<b>In the yard</b>	185	32.3
≤ 30 minutes	196	34.3
>30 minutes	191	33.4
<b>HH water treatment</b>		
Yes	62	10.8
No	510	89.2
<b>Presence of separate kitchen for food preparation</b>		
Yes	510	89.2
No	62	10.8
<b>Type of cook stove</b>		
Modern stove	192	33.6
Cultural stove	380	66.4
<b>Presence of separate area to store raw &amp; cooked foods</b>		
Yes	375	65.6
No	197	34.4
<b>Presence of a three-compartment dishwashing facility</b>		
Yes	266	46.5
No	306	53.5
<b>Knowledge</b>		
Good (Mean and above)	365	63.8
Poor (Below mean)	207	36.2
<b>Attitude</b>		
Good attitude	400	69.9
Poor attitude	172	30.1

# Knowledge, attitude, and practice of hygienic complementary feeding

Among 572 mothers/caregivers, 33.6% 95% CI: (29.7%, 37.6%) of them had good hygienic practice during complementary feeding of their children aged 6-24 months. However, 365 (63.8%) and 400(69.9%) of mothers/caregivers had desirable knowledge and attitude for hygienic complementary feeding (Figure2).

## Factors associated with hygienic practices of complementary feeding

In bivariate logistic regression urban residence, access to media, maternal educational status, having good knowledge about the hygienic practice of complementary feeding, presence of latrine, having improved latrine, presence of hand washing facilities near the latrine, accessible water source ( time taken to the source), the habit of treating water in the household, having separate kitchen from the main house, presence of separate storage area for cooked and raw food, presence of three-compartment dishwashing system was candidate variables for the multivariable logistic regression analysis.

A multivariable logistic regression analysis was carried out to evaluate the combined effect of multiple associated factors, adjusting for confounding variables. The result indicated that urban residence, presence of hand washing facility near the latrine, presence of separate area to store raw and cooked foods, and presence of three-compartment dishwashing facilities showed statistically significant association with hygienic complementary feeding practice among mothers who had children aged 6-24 months.

Accordingly, those mothers/caregivers who lived in urban areas had 7 times [AOR= 7.02, 95% CI: (4.14, 11.88)] higher odds of practicing good hygienic complementary feeding than those mothers/caregivers who lived in rural areas.

The odds of good hygienic complementary feeding practice among mothers/caregivers who had a hand washing facility near the latrine were 3 times [AOR= 3.02, 95% CI: (1.18, 7.70)] higher compared to mothers/caregivers who had no hand washing facility near the latrine.

Those mothers/caregivers who had a separate area to store raw and cooked foods had almost 6 times higher odds of good hygienic complementary feeding practice than their counterparts [AOR= 5.87, 95% CI: (2.84, 12.13)]. The odds of practicing good hygienic complementary feeding among mothers/caregivers who had three-compartment dishwashing facility had 5.7 times [AOR= 5.70, 95% CI: (3.41, 9.54)] higher compared to those mothers who did not have (Table 3).

Table 3

Bivariate and multivariable logistic regression analysis of complementary feeding hygienic practice among mothers who had 6 to 24 months children in Tegegie district, northeastern Ethiopia, March 2021 (N=572)

Variable/categories	Complementary feeding hygienic practices		COR(95% CI)	AOR (95% CI)
	Good	Poor		
Maternal education				
Diploma and above	53	35	1	
Secondary level	20	38	2.88 (1.44, 5.73)**	
Primary level	24	57	3.60 (1.90, 6.82)***	
No formal education	95	250	4.00(2.45, 6.49)***	
Place of residence				
Urban	165	209	5.00 (3.17, 7.88)***	7.02 (4.14, 11.88)***
Rural	27	171	1	1
Access to media (TV or radio)				
Yes	132	156	3.16 (2.19, 4.56)***	
No	60	224	1	
Presence of latrine				
Yes	175	307	2.45 (1.40, 4.28)**	
No	17	73	1	
Type of latrine				
Improved	151	227	2.48(1.66, 3.71)***	
Unimproved	41	153	1	
Time is taken to the water source				
≤ 30 minutes	147	234	2.04(1.38, 3.02)***	

Note: The Hosmer and Lemeshow model fitness test p-value was 0.96.

Variable/categories	Complementary feeding hygienic practices		COR(95% CI)	AOR (95% CI)
	Good	Poor		
> 30 minutes	45	146	1	
HH water treatment				
Yes	27	35	1.61 (0.94, 2.76)	
No	165	345	1	
Presence of hand washing facility near the latrine				
Yes	20	9	4.79 (2.14, 10.75)***	3.02 (1.18, 7.70)*
No	172	371	1	1
Separated kitchen for food preparation				
Yes	187	323	6.60 (2.60, 16.76)***	
No	5	57	1	
Presence of separate area to store raw and cooked foods				
Yes	181	194	15.78(8.31, 29.95)***	5.87 (2.84, 12.13)***
No	11	186	1	1
Presence of three compartments dishwashing facility				
Yes	149	117	7.79 (5.21, 11.66)***	5.70 (3.41, 9.54)***
No	43	263	1	1
Knowledge				
Good	142	223	2.00 (1.37, 2.93)***	
Poor	50	157	1	
Note: The Hosmer and Lemeshow model fitness test p-value was 0.96.				

1 = Reference category,

\* = Statistically significant at  $p < 0.05$ ,

\*\* = Statistically significant at  $p < 0.01$  and

\*\*\* = Statistically significant at  $p < 0.001$

## Discussion

In this community-based cross-sectional study, the overall prevalence of hygienic complementary feeding practice among mothers who had children aged 6-24 months was found to be 33.6%, 95% CI: (29.7, 37.6) and factors such as, living in urban areas, presence of hand washing facility near the latrine, presence of separate area to store raw and cooked foods and presence of three-compartment dishwashing system were significant predictors of hygienic complementary feeding practice.

The prevalence of hygienic complementary feeding practice in this study was lower than the prevalence (38.9%) reported by a study conducted in Bahir Dar Zuria District, Northwest Ethiopia [26]. This might be due to the differences in the study setting as Bahir Dar Zuria district is located near the capital city of Amhara National Regional State, Bahir Dar city; mothers/ caregivers might have better information and water and sanitation access compared to the current study area. Access to better information and water and sanitation services helps mothers/caregivers to improve the habit of good hygienic complementary practice.

Similarly, this prevalence was lower than the prevalence (39.6%) reported by a cross-sectional study conducted in rural Kebeles of Harari Region, Ethiopia[31]. This might be due to the differences in the measurement of the outcome variable. In the study conducted in the Harari region, the sum of the three-point score scale (always, sometimes, and never) was used to measure the status of hygienic complementary feeding practice. However, in this study, this three-point scale was dichotomized into "Yes" or "No" responses coded as 1 and 0 respectively and added to measure the outcome variable.

Similarly, the result in this study was much lower than the prevalence (51%) reported by a study done in Abobo district, Southwestern Ethiopia on the model and non-model household mothers[32]. This discrepancy might be due to differences in the measurement of good hygienic practice and the comparative nature of the previous study includes the model households which have a higher tendency to adopt good food hygiene behaviors.

The study also revealed that urban residence, presence of hand washing facility near the latrine, presence of separate area to store raw and cooked foods, and presence of three-compartment dishwashing facilities showed statistically significant association with hygienic complementary feeding practice among mothers who had children aged 6-24 months.

In this study, living in urban areas was a significant predictor of good hygienic complementary feeding practice among mothers with children aged 6-24 months. The odds of good hygienic complementary feeding practice were higher in mothers/caregivers who lived in urban areas compared to mothers/caregivers living in a rural area. A similar finding was reported by a cross-sectional study conducted in Bahir Dar Zuria District, Northwest Ethiopia[26]. This might be due to mothers in urban

areas might have access to information and an adequate supply of water which helps them in improving the habit of good hygienic practices.

In this study, the presence of a hand washing facility near the latrine was associated with good hygienic complementary feeding practice. This finding is supported by a study conducted in Bahir Dar Zuria District, Northwest and Abobo district Southwestern, Ethiopia[26, 32]. The reason for this association is the presence of a hand washing facility near the latrine inevitably promotes hand washing after visiting the toilet which helps to adopt hygienic practices in day-to-day activities especially during food preparation.

Similarly, mothers/caregivers who had a separate area to store raw and cooked foods had higher odds of good hygienic practices during complementary feeding. This is because the presence of a separate storage area for ready-to-eat and raw foods might have an important role in avoiding unintentional cross-contamination from raw food staff to cooked ones.

The odds of hygienic complementary feeding practice were higher among mothers/caregivers who had three-compartment dishwashing facility compared to their counterparts. This might be due to the presence of a three-compartment dishwashing facility promotes the proper way of washing food utensils which in turn play important role in improving hygienic food preparation.

Strength and limitations: The community-based nature of the study could be taken as the strength of this study. However, the possibility of social desirability bias could be taken as the limitation of this study. Moreover, this study share drawbacks of the cross-sectional study design as this can't determine the temporal relationship between the predictor variable and the outcome variable.

## **Conclusions and recommendations**

The prevalence of good hygienic practice during complementary feeding among mothers who had children aged 6-24 months was still low in the study area. This study also revealed that the observed prevalence of hygienic practice during complementary feeding was very low compared to previous studies in Ethiopia. The study also revealed urban residence, presence of hand washing facility near the latrine, presence of separate area to store raw and cooked foods, and presence of three-compartment dishwashing facilities showed statistically significant association with hygienic complementary feeding practice among mothers who had children aged 6-24 months.

District health office should design a health education program for both urban and rural mothers with 6-24 months children about the importance of hand washing facilities near the latrine, separate area to store raw and cooked foods, and three-compartment dishwashing system in developing the habit of safe and hygienic preparation of foods.

The low prevalence of hygienic complementary feeding practices can be improved by providing training for mothers and the women's health development armies' weekly discussion agendas should include the plan to raise issues related to hygienic complementary feeding to make possible sharing of information

and increase the awareness of mothers. Therefore, the health extension workers should design training programs on hygienic food preparation especially during complementary feeding.

## **Abbreviations**

AOR: Adjusted Odds Ratio, CF: Complementary Feeding, COR: Crude Odds Ratio, ETB: Ethiopian Birr, HEW: Health Extension Worker, and HHs: Households

## **Declarations**

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### **Availability of data and materials**

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

### **Author Contributions**

#### **Conceptualization**

HA: Methods: HA,WW, JA, GT and AM; Data curation: AS; Formal analysis: AS, HA and WT; Report writing: AS, HA and WT; Manuscript preparation: HA. All authors read and approved the final version of the manuscript.

### **Ethics approval and consent to participate**

Before data collection ethical approval was obtained with Ref No /IPH/ 1499 /2013 on date 16 /07/ 2013 from the institutional review committee institute of Public Health, College of Medicine and Health Sciences, University of Gondar. Permission letter was also obtained from Zonal Health Department and District Health Offices. Verbal informed consent was obtained from each study participant. The respondents were also informed that they have full right to withdraw or refuse at any time from the interview. Confidentiality of information given by each respondent was kept properly.

### **Consent for publication**

Not applicable.

## Competing interests

The authors declare that they don't have any conflict of interest in any aspect of the article.

## References

1. Organization, W.H., *Complementary feeding: report of the global consultation, and summary of guiding principles for complementary feeding of the breastfed child*. report of the global consultation, 2003.
2. Gautam, O., *Food hygiene intervention to improve food hygiene behaviours, and reduce food contamination in Nepal: an exploratory trial*. 2015, London School of Hygiene & Tropical Medicine.
3. Jones AD, I.S., Smith LE, et al, *World Health Organization infant and young child feeding indicators and their associations with child anthropometry: a synthesis of recent findings* *Matern Child Nutr* doi:10.1111/mcn.12070, 2014. **10(1):1-17**.
4. Das, S., et al., *Not water, sanitation and hygiene practice, but timing of stunting is associated with recovery from stunting at 24 months: results from a multi-country birth cohort study*. *Public health nutrition*, 2020: p. 1–10.
5. Gizaw, Z., W. Woldu, and B.D. Bitew, *Child feeding practices and diarrheal disease among children less than two years of age of the nomadic people in Hadaleala District, Afar Region, Northeast Ethiopia*. *International breastfeeding journal*, 2017. **12(1)**: p. 1–10.
6. Shati, A.A., et al., *Occurrence of Diarrhea and Feeding Practices among Children below Two Years of Age in Southwestern Saudi Arabia*. *International journal of environmental research and public health*, 2020. **17(3)**: p. 722.
7. Ehiri, J.E., et al., *Critical control points of complementary food preparation and handling in eastern Nigeria*. *Bulletin of the World Health Organization*, 2001. **79**: p. 423–433.
8. Mattioli, M.C., et al., *Hands and water as vectors of diarrheal pathogens in Bagamoyo, Tanzania*. *Environmental science & technology*, 2013. **47(1)**: p. 355–363.
9. Oluwafemi, F. and I.N. Ibeh, *Microbial contamination of seven major weaning foods in Nigeria*. *Journal of health, population, and nutrition*, 2011. **29(4)**: p. 415.
10. Gorospe, E.C. and A.S. Oxentenko, *Nutritional consequences of chronic diarrhoea*. *Best practice & research clinical gastroenterology*, 2012. **26(5)**: p. 663–675.
11. Derso, T., et al., *Stunting, wasting and associated factors among children aged 6–24 months in Dabat health and demographic surveillance system site: A community based cross-sectional study in Ethiopia*. *BMC pediatrics*, 2017. **17(1)**: p. 1–9.
12. Curtis, V., et al., *Hygiene: new hopes, new horizons*. *The Lancet infectious diseases*, 2011. **11(4)**: p. 312–321.
13. Cami Moss, T.H.B., Mihretab Melesse Salasibew, Joanna Sturgess, Girmay Ayana, Desalegn Kuche, *Sustainable Undernutrition Reduction in Ethiopia (SURE) evaluation study: a protocol to evaluate*

- impact, process and context of a large-scale integrated health and agriculture programme to improve complementary feeding in Ethiopia*. BMJ Open. doi:10.1136/ bmjopen-2018-022028, 2018.
14. Arikpo, D., et al., *Educational interventions for improving primary caregiver complementary feeding practices for children aged 24 months and under*. Cochrane database of systematic reviews, 2018(5).
  15. R. Agustina, T.P.S., S. Satroamidjojo, I. M. J. Boveeoudenhoven, and a.F.J.K. E. J. M. Feskens, *Association of food-hygiene practices and diarrhea prevalence among Indonesian young children from low socioeconomic urban areas*. BMC Public Health 2013. **vol. 13, no. 1**
  16. Mshida, H.A., et al., *Water, sanitation, and hygiene practices associated with nutritional status of under-five children in semi-pastoral communities Tanzania*. The American journal of tropical medicine and hygiene, 2018. **98(5)**: p. 1242–1249.
  17. Byrd, K., et al., *Differences in complementary feeding practices within the context of the wash benefits randomized, controlled trial of nutrition, water, sanitation, and hygiene interventions in rural Kenya*. The FASEB Journal, 2017. **31**: p. 165.1-165.1.
  18. Abdurahman, A.A., et al., *Magnitude and determinants of complementary feeding practices in Ethiopia: A systematic review and meta-analysis*. Heliyon, 2019. **5(7)**: p. e01865.
  19. Ntaji, M., P. Oyibo, and J. Bamidele, *Food hygiene practices of mothers of under-fives and prevalence of diarrhoea in their children in Malawi*. Journal of Medicine and Biomedical Research, 2014. **13(2)**: p. 134–145.
  20. Jee Hyun Rah, A.A.C., Bhupendra Badgaiyan, Victor M Aguayo, and S.A. Suzanne Coates, *Household sanitation and personal hygiene practices are associated with child stunting in rural India: a cross-sectional analysis of surveys*. BMJ Open:e005180. doi:10.1136/ bmjopen-2014-005180, 2015. **5**.
  21. Barker J, S.D., Bloomfield SF, *Spread and prevention of some common viral infections in community facilities and domestic homes* J Appl Microbiol. PMID <https://doi.org/10.1046/j.1365-2672.2001.01364.x> 2001. **91(1)(11442709)**: p. 7-21.
  22. Rockville, M., USA: EPHI *Ethiopia Mini Demographic and Health Survey* Ethiopian Public Health Institute (EPHI) [Ethiopia] 2019.
  23. Zongrone A, W.K., Menon P, *Infant and young child feeding practices and child undernutrition in Bangladesh: insights from nationally representative data* Public Health Nutr [Internet]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22564370>, 2012. **15:4**: p. 1697-70.
  24. Mitchodigni, I.M., et al., *Complementary feeding practices: determinants of dietary diversity and meal frequency among children aged 6–23 months in Southern Benin*. Food Security, 2017. **9(5)**: p. 1117–1130.
  25. Mohammed, S. and D. Tamiru, *The burden of diarrheal diseases among children under five years of age in Arba Minch District, southern Ethiopia, and associated risk factors: a cross-sectional study*. International scholarly research notices, 2014. **2014**.
  26. Demmelash, A.A., et al., *Hygienic Practice during Complementary Feeding and Associated Factors among Mothers of Children Aged 6–24 Months in Bahir Dar Zuria District, Northwest Ethiopia, 2019*.

- Journal of Environmental and Public Health, 2020. **2020**.
27. Bedada, S., M. Tegegne, and T. Benti, *Complementary Food Hygiene Practice among Mothers or Caregivers in Bale Zone, Southeast Ethiopia: A Community Based Cross-Sectional Study*. 2021.
  28. Organization, W.H., *Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines*. 2017.
  29. Gebre Yitayih Abyu, Kiros Belay, and M. Tsegaye, *Assessment of Hygienic Practice on Complementary Food among Mothers with 6–24 Months Age Living Young Children in Mohoni Town, North Eastern Ethiopia*. <https://www.researchgate.net/publication/308986405>, 2016. **6**(2277-6206).
  30. Henok Dagne, L.B., Muluneh Borchia, Anley Tesfayeand Baye Dagne, *Hand washing practice at critical times and its associated factors among mothers of under five children in Debark town, northwest Ethiopia, 2018*. *Italian Journal of Pediatrics* 2019. **45:120**.
  31. Desta Dugassa Fufa, A.A., Awgichew Teshome, Kedir Teji, Fistum Abera, MaledaTefera,etail, *Hygienic Practice of Complementary Food Preparation and Associated Factors among Mothers with Children Aged from 6 to 24 Months in Rural Kebeles of Harari Region, Ethiopia*. *Food Science and Technology* 2020. **8(2)** p. 34–42.
  32. Akoma Okugn, D.W., *Food hygiene practices and its associated factors among model and non model households in Abobo district, southwestern Ethiopia: Comparative cross-sectional study*. *PLOS ONE* | <https://doi.org/10.1371/journal.pone.0194391>, 2018.

## Figures

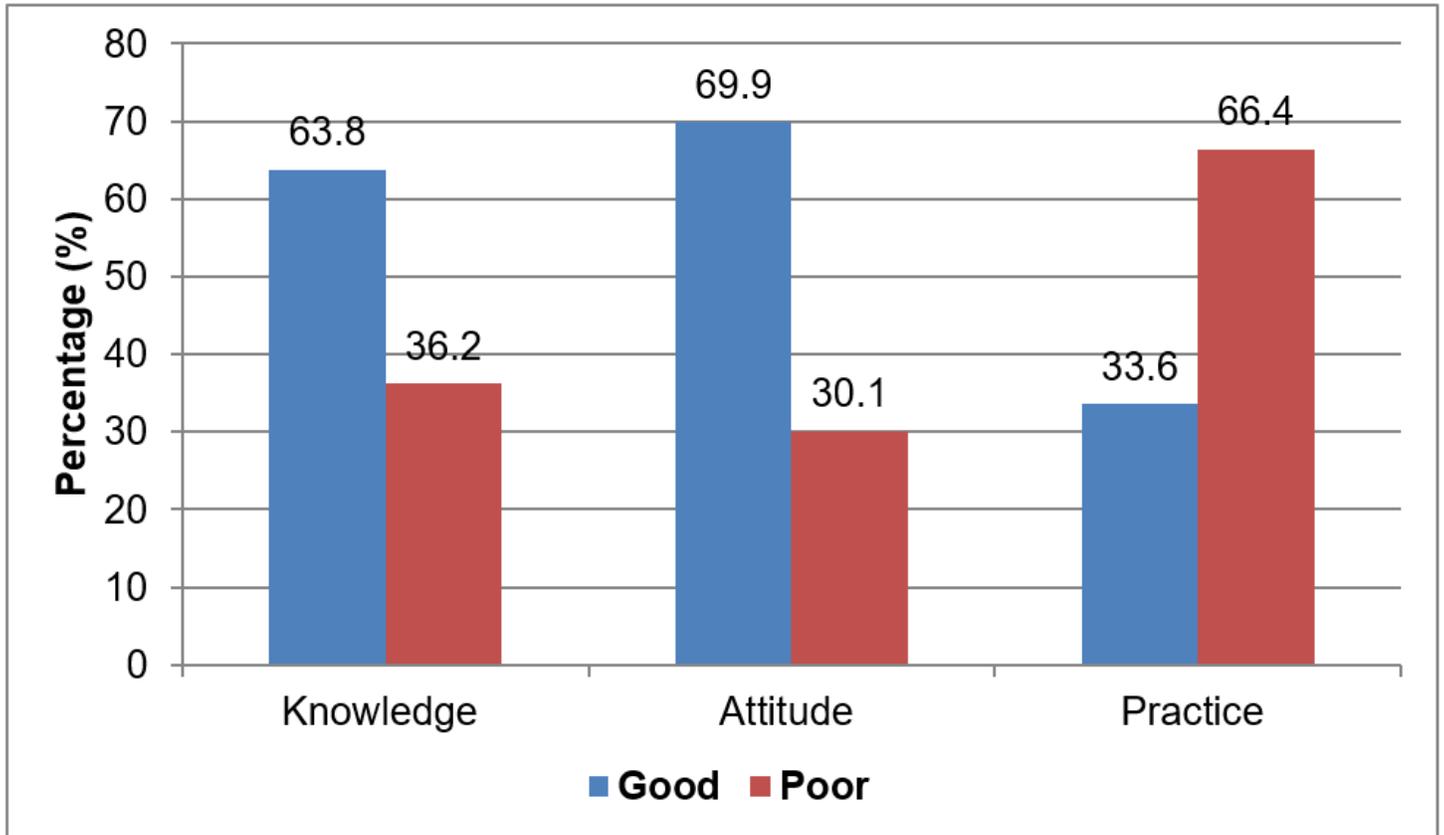


Figure 1

Knowledge, attitude, and practice of mothers/caregivers about complementary feeding their children aged 6-24 months

## Supplementary Files

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