

Magnitude and factors associated with appropriate complementary feeding among mothers having children 6-23 months-of-age in Northern Ethiopia; a community-based cross-sectional study

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Abstract: Background- Adequate and appropriate complementary feeding during 6-23 months-of-age, is fundamental to the development of each child's full human potential. Ethiopian national survey reports showed the minimum acceptable diet was 4.2% in same region. But in most cases only timely initiation is considered as the only indicator of complementary feeding. The aim of this study was to assess the prevalence of appropriate complementary feeding practices and associated factors among mothers having 6 - 23 months of age children in Northern Ethiopia. Methods- A community-based cross-sectional study design was conducted among 428 mothers who had children with 6-23 months of age in Northern Ethiopia. Simple random sampling was used to select the required number of sample. Pretest was done among 22 respondents out of the study area. A face-to-face interview was used to collect data using structured questionnaire. Data were entered with EPI info version 3.5.1 and cleaning and analysis was done by using SPSS version 16. Frequencies distribution, binary and multiple logistic regressions were done. OR with 95% confidence interval was computed to measure the strength of association. Results – The response rate was 98.6%. In this study only 10.75% (95% CI = 8.07, 13.95) children aged 6-23 months received appropriate complementary feeding. Child's age (AOR=4.21), education level of mother (AOR=3.84), and postnatal care follow up (AOR=2.80) were found to be independent predictor of timely initiation of complementary feeding. Conclusion and recommendations – one out of ten mothers fed complementary foods appropriately to their children aged 6-23 months which was very low. Mothers who are illiterate and completed only primary school need more attention. All mothers must be encouraged to make postnatal care follow up.

Keywords: Complementary Feeding, Food Diversity, Meal Frequency, Minimum Acceptable Diet

1. Background

Adequate nutrition during infancy and early childhood is fundamental to the development of each child's full human potential. World Health Organization recommends introducing complementary foods when an infant reaches 6 months of age. After sixth month of age, breast milk alone is no longer sufficient to meet the nutritional requirements of 6-23 months of age children [1-6].

Inappropriate complementary feeding practices remain as major public health problem in many developing countries where many children are victim of the malpractice [7]. Less

than one-third of 6-23 months old children met the minimum criteria for dietary diversity, and only 50% received the minimum number of meals. When these indicators combined, called as the minimum acceptable diet, only 21% of children aged 6-23 months met the minimum criteria [7]. According to Ethiopian demographic and health survey and alive thrive Ethiopia survey in 2011, in Tigray regional state the percentage of minimum acceptable diet was 4.2%. This indicates that appropriate complementary feeding practice in this area was very low [8,9].

Inappropriate complementary feeding practices continue to make children to be vulnerable to irreversible outcomes of stunting, poor cognitive development and significantly

increased risk of infectious diseases leading to gastroenteritis, diarrhea and acute respiratory infection [10-13]. Globally, malnutrition has been responsible, directly or indirectly, for 60.0% of the 10.9 million deaths annually among children under five. Well over two-thirds of these deaths, which are often associated with inappropriate feeding practices, occur during the first year of life [5]. It is believed that appropriate CF has the potential to prevent 6% of all under-five deaths particularly in the developing world [14,15].

The study was purposely conducted in area which was considered to have higher magnitude of timely initiation of complementary feeding to enable us to see the gap that could exist between appropriate complementary feeding, considering other criteria, and timely initiation. The aim of this study was therefore: i) to determine the prevalence of timely initiation of complementary feeding practices among mothers having children 6-23 months of age in Northern Ethiopia; ii) to determine the prevalence of appropriate complementary feeding practices among mothers having children 6-23 months of age in Northern Ethiopia; iii) to identify factors affecting complementary feeding practices among mothers having children 6-23 months of age in Northern Ethiopia.

2. Methods

2.1. Study Area and Period

The study was carried out in Abyi-Adi town, which is located 95kms Northwest of Mekelle, the capital of Tigray regional state and 978 Kms North of Addis Ababa, the capital of Ethiopia. The total population is estimated to be 18,319. Among this population, 9343(51%) were females, 8976(49%) male, 2725(15%) under 5, 1496(8%) under 3 and 663(3.6%) children aged 6-23 months. The dominant religion is orthodox Christian followed by Muslim. There is one governmental hospital and one health center in the town. The study was conducted from October 2012 to May 2013. It is a town which presumably is believed to have good practice of complementary feeding considering timely initiation as the only indicator.

2.2. Study Design, Population, Sampling

A community-based cross-sectional was conducted. Mothers of infants aged from 6-23 months in Abyi-Adi were the study population. The sample size for the study was calculated using Epi Info statCalc for unmatched case control formula. The following assumption were used; Power= 80% , $Z\beta=.84$, significance level=5%, $Z\alpha=1.96$, to detect an odds ratio of 2.0 between the two groups and 69.2% mothers exposed to media [29] was take as population exposed to a factor, ratio of controls to cases 1 (equal number of cases and controls. Considering 10% none response rate, a total of 434 mothers were required for the study. Total number of children in the age group between 6-23 months in the town was taken from the Health centre and Hospital EPI registration books, where EPI coverage was

100%. Then sampling frame was prepared. Finally, the required number of mothers were selected using simple random sampling.

2.3. Data Collection Procedure and Tools

Data were collected using face-to-face interview during house-to-house visit from mothers who had 6-23 months age children using structured questionnaire. The questionnaire were originally prepared in English the translated to local language. The questionnaire comprises three parts; the first part is about background characteristics of mothers and children, the second includes maternal health related practices and the third includes feeding practices of the child. To proceed with data collection, six diploma nurses as data collector and one BSC nurse as supervisor were recruited.

Data quality control: The questionnaire was translated to local language, Tigrigna, and then back to English by two people for consistency. Pretest was made in 22 (5%) mothers, in the study area, which was not included in the study to assess the content and approach of the questionnaire. Training was given to data collectors and supervisor for two days on the objective, relevance of the study, confidentiality of information, respondent's right, about pre-test, informed consent and techniques of interview; after the investigators discuss deeply. All questioners were checked by the supervisor daily for completeness and the principal investigator had monitored the overall quality of data collection. Besides this, the investigators carefully entered and thoroughly cleaned the data before the commencement of the analysis.

2.4. Standard and Operational Definitions

Timely introduction of complementary feeding: proportion of children 6-23 months of age who started complementary foods at 6th month.

Minimum dietary diversity: proportion of children 6-23 months of age who receive foods from four or more food groups during the previous day. The seven food groups used for tabulation of this indicator were: grains, roots and tubers; legumes and nuts; dairy products (milk, yogurt, cheese); flesh foods (meat, chicken and liver/organ meats); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables.

Minimum meal frequency: proportion of breastfed and non-breastfed children 6-23 months of age who receive solid, semi-solid or soft foods the minimum number of times or more (minimum is defined as: two times for breastfed infants 6-8 months; three times for breastfed children 9-23 months; and four times for non-breastfed children 6-23 months) in the previous day.

Minimum acceptable diet: proportion of breastfed children 6-23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day, and non-breastfed children 6-23 months of age who received at least two milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day.

2.5. Complementary Feeding Practices

- Appropriate– If the mother responds correctly all the above four indicators, as recommended.
- Inappropriate – Among the four indicators if at least one indicator was not fulfilled.

2.6. Data Analysis, Presentation and Interpretation

Data were entered using EPI info version 3.5.1 statistical software and cleaning and analysis was made using SPSS version 16. Cleaning was made using frequencies. Univariate analysis was done to describe dependent and independent variables; percentages, frequency distributions and measures of central tendency and measures of dispersion were used for describing data. Then binary logistic regression was made to see the crude significant relation of each variable with dependant variables. Finally, independent variables found significant were entered to multivariate logistic regressions to control the effect of confounding. Stepwise backward LR was used for multiple logistic regressions. Odds ratio with 95% confidence interval to ascertain association between independent and dependent variable was used.

2.7. Ethical Considerations

Ethical clearance was obtained from institutional review board of Mekelle University. The offices of Tigray Region Health Bureau, Mekelle zonal health Department and the selected Health institutions were communicated with formal letters from the Mekelle University, Department of Public Health.

All the study participants were reassured that they would be anonymous. Names or any personal identifiers were not recorded. Respondents were clearly told about the study and the variety of information needed from them. They were given the chance to ask anything about the study and made free to refuse or stop the interview at any moment they want if that was their choice. After interview the importance of timely initiation of complimentary feeding was discussed with the respondents who had not had knowledge on complementary issues.

3. Results

3.1. Socio-Demographic Characteristics of Mothers

Of the 434 sampled mothers, 428 were successfully included in the study making the response rate of 98.6%. Biological mothers accounted for 422 (98.6%) of caregivers, while 6 (1.4%) were other caregivers such as grand-mothers and sisters. The median age of mothers was 26 years with inter quartile range (IQR) being 8. Three hundred ninety one (91.4%) were orthodox by religion and all of them (100%) belong to the Tigray ethnic group (from the same region). Concerning the educational status of mothers, 310 (72.4%) had attended formal school. The majority of mothers, 363 (84.4%), were married and 264

(61.7%) were house wives by occupation. More than a third, 161 (37.6%), of mothers earned an average monthly income of less than or equal to 999 Ethiopian Birr (<55 USD). Husbands of 317 (85.9%) mothers had attended formal education. The median age of children was 13 months with IQR being 8 (Table 1).

3.2. Obstetrics and Health Service Related Variables

Almost all, 424 (99.1%), mothers had antenatal care follow up at least once during the last pregnancy. About 66% (279/428) of mother had at least 4 visits as recommended. About 86.0% of mothers gave birth their last child at health institution. Approximately 70.0% had received postnatal care (PNC) at least once (Table 1).

3.3. Complementary Feeding Knowledge and Practices

In this study, it was found that majority (99.1%) of mothers had ever practiced breastfeeding. Approximately 87% (371/428) of mothers had satisfactory knowledge and the rest 13% had poor knowledge about complementary feeding. About 76% (324/428) of mothers had supportive attitude while the rest 24% had no supportive attitude towards complementary feeding.

Grain, roots and tubers were the most commonly taken food items by the children in 24 hours preceding the survey. Legumes and nuts (28.9%), vitamin-A rich foods (26.3%), other fruits and vegetables (60.9%), flesh foods (16.4%) and egg (25.8%) was higher in the 18-23 months group compared to the other groups. Generally, the rates of different food groups offered during the past 24 hours were uniformly lower in the 6–11 months age group, with the lowest rates reported for flesh foods (3.4%) (Table 2).

Approximately 79.7% (95% CI: 75.66%-83.28, 341/428) of mothers introduced complementary feeding at 6 months age of the children as per recommended. Only 9 (2.1%) mothers introduced complementary feeding early before 6 month, 68 (15.9%) mothers initiated late after 6 month and 10 (2.3%) mothers did not start complementary feeding at all.

Only seventy six (17.8%) mothers offered four or more food groups to their child meeting the minimum dietary diversity criteria on the day preceding the study. One hundred seventy one (40.0%) mothers fed their children more than two times the day preceding the study. Only 51(11.9%) of mothers had practice the minimum acceptable diet.

The overall prevalence of appropriate complementary feeding practices, combining the four mentioned indicators was 10.75% (95% CI = 8.07, 13.95, 46/428).

3.4. Factors Found Associated with Appropriate Complementary Feeding Practice

After applying bivariate and multiple logistic regressions, three variables were found to be significantly associated with appropriate complementary feeding practice. These were child's age 18-23 months (AOR=4.21), mothers who had postnatal care (AOR=2.80) and secondary school or above educated mothers (AOR=3.84) were more likely to give

appropriate complementary feeding to their children (Table 3).

Table 1. Socio-demographic and obstetrics and health related variables of mothers who had children 6-23 months of age (n=428) in Abyi-Adi town, Tigray, Northern Ethiopia, October 2012 to May 2013.

Variable	Categories	Frequency	Percentage
Mothers' age	< 20	35	8.2
	20-24	112	26.2
	25-29	146	34.1
	30-34	77	18.0
	≥ 35	58	13.6
Marital status	Married	363	84.8
	Divorced/Widowed/Separated	65	15.2
Religion	Orthodox	391	91.4
	Muslim	37	8.6
Mothers' educational status	No education	118	27.6
	Primary education (1-8)	126	29.4
	Secondary education (9+)	184	43.0
Mothers' occupation	Unemployed	264	61.7
	Employed	164	38.3
Monthly income (ETB)	≤ 999	161	37.6
	1000-1999	143	33.4
	2000-2999	65	15.2
	3000-3999	41	9.6
	≥ 4000	18	4.2
Child's age (months)	6-11	148	34.6
	12-17	152	35.5
	18-23	128	29.9
Number of children	1	173	40.4
	2-4	233	54.4
	5 and above	22	5.1
Number of ANC follow up	<4	145	34.2
	≥4	279	65.8
Place of delivery	Home	60	14.0
	Health institution	368	86.0
Postnatal care	Yes	299	69.9
	No	129	30.1

*private employee, student, farmer

Table 2. Types of food given to children aged 6-23 months by age group (n=428), Abyi-Adi town, Tigray, Northern Ethiopia, October 2012 to May 2013.

Food groups	Age of child in month					
	6-11		12-17		18-23	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Grain, root and tubers	86.5	13.5	95.4	4.6	96.1	3.9
Legumes and nuts	22.3	77.7	27.0	73.0	28.9	71.1
Dairy products	16.9	83.1	27.6	72.4	23.4	76.6
Vit A rich foods	8.8	91.2	16.4	83.6	26.3	73.7
Other fruits and vegetables	41.2	58.8	52.0	48.0	60.9	39.1
Flesh foods	3.4	96.6	8.6	91.4	16.4	83.6
Egg	18.2	81.8	24.3	75.7	25.8	74.2

Table 3. Factors associated with appropriate complementary feeding practice among mothers who had 6-23 months children in Abyi-Adi town, Tigray, Northern Ethiopia, October 2012 to May 2013.

Variables	Complementary feeding practice		COR [95% C.I.]	AOR [95% C.I.]
	Appropriate N (%)	Inappropriate N (%)		
Mothers' education				
No education	5(4.2)	113(95.8)	1.00	1.00
Primary education	10(7.9)	116(92.1)	1.94[0.64,5.87]	1.81[0.57,5.70]
Secondary and above	31(16.8)	153(83.2)	4.57[1.72,12.14]**	3.84[1.33,11.09]*
Mothers' occupation				
Unemployed	22(8.3)	242(91.7)	1.00	1.00
Employed	24(14.6)	140(85.4)	1.88[1.02,3.48]*	1.38[0.67,2.83]
Age of child (months)				
6 – 11	8(5.4)	140(94.6)	1.00	1.00
12 - 17	15(9.9)	137(90.1)	1.91[0.78,4.66]	1.94[0.76,4.94]
18 - 23	23(18.0)	105(82.0)	3.83[1.64,8.90]**	4.21[1.70,10.39]**
Monthly income (ETB)				
≤ 999	15(9.3)	146(90.7)	1.00	1.00
1000 – 1999	7(4.9)	136(95.1)	0.50[0.19,1.26]	0.45[0.16,1.20]
2000 – 2999	9(13.8)	56(86.2)	1.56[0.64,3.77]	1.04[0.40,2.72]
3000 – 3999	10(24.4)	31(75.6)	3.14[1.29,7.63]*	2.26[0.86,5.98]
≥ 4000	5(27.8)	13(72.2)	3.74[1.17,11.94]*	2.54[0.70,9.19]
Owns television				
No	8(5.4)	141(94.6)	1.00	1.00
Yes	38(13.6)	241(86.4)	2.79[1.26,6.12]*	2.09[0.84,5.21]
No. ANC visit				
< 4	15(10.3)	130(89.7)	1.00	
≥ 4	31(11.1)	248(88.9)	1.08[0.56,2.07]	
Place of delivery				
Home	3(5.4)	53(94.6)	1.00	
Health care facility	43(11.6)	329(88.4)	2.30[0.69,7.71]	
PNC follow up				
No	6(4.7)	123(95.3)	1.00	1.00
Yes	40(13.4)	259(86.6)	3.16[1.30,7.66]*	2.80[1.11,7.03]*
Attitude towards complementary feeding				
unsupportive attitude	5(4.8)	99(95.2)	1.00	1.00
supportive attitude	41(12.7)	283(87.3)	2.86[1.10,7.46]*	1.74[0.62,4.88]

*P<0.05, **P<0.01, COR (Crude odds ratio), AOR (Adjusted odds ratio), CI (Confidence interval)

4. Discussion

The result of our study revealed that the prevalence of appropriate complementary feeding was 10.75%. Educated mothers, children age 18-23 months and mothers who had postnatal care were factors that can increase appropriate complementary feeding practice.

About 80% of mothers had started complementary feeding at sixth month of the child's age, as recommended. It was higher than the findings from United Arab Emirates (<17%), Delhi India (17.5%), Mekelle (62.8%), Ethiopia with national level (51 %) and Harar (54.4%) [16-20]. This relatively higher prevalence might be due to practices change with time, better postnatal care follow up and the effort of health extension worker in the area.

Minimum acceptable diet, a combination of minimum meal frequency and minimum dietary diversity, in this study was 11.9%, which was higher than in Ethiopian national level result (5.2%) and Tigray (4.2%) [8] but was lower than the findings from Srilanka (68%), Bangladesh (40%), Nepal (32%), Zambia (25.1%), and Tanzania (15.9%) [21-25]. This low level of frequency might be

attributed by low maternal literacy, different culture and lower economy.

Only 10.75% of mothers were practicing appropriate complementary feeding which was lower than other studies in Sirlanka, Bangladesh, Nepal, Zambia, and Tanzania where it was above 20 [21-25]. This might be due to poor socioeconomic status, lower maternal literacy and shortage of nutrition professional. Health extension workers were usually concerned on timely initiation of complementary feeding than dietary diversity and frequency of meal.

There was a huge difference between the timely initiation alone and appropriate complementary feeding considering other criteria. However, in most of the cases the time of initiation of complementary feeding is reported as the only important indicator of complementary feeding, though the fact showed the presence of quite significant difference.

There was also a big gap between the knowledge of mothers about appropriate complementary feeding (86.7%) and their practices (10.75%). This might indicate the presence of some cultural practice that could affect complementary feeding and poor socioeconomic status or pressure by other part of the family on the mothers.

Children within the age group 18-23 months were 4.2 times more likely to be appropriately fed as compared to infants in the age group 6-11 months. This result was in congruent with the findings in Nepal, Indonesia and Tanzania [24,26]. This might be due to the misunderstanding of mothers that young children could not be able to digest food like meat and egg. In addition to this some of the mothers couldn't introduce complementary feeding at six month.

Mothers who had educational status of secondary and above were 3.8 times more likely to practice appropriate complementary feeding than those mothers who had no education. This result was consistent with the findings Bangladesh, India, Indonesia, Sirlanka, Nepal, Tanzania and Nairobi Kenya [21-27] where mothers with little or no education were a significant predictor of inappropriate complementary feeding practice. This might be because of educated mothers would have knowledge about the importance of appropriate complementary feeding practice, better understanding of information. Furthermore, education might enhance the status of mother and enable them to develop greater confidence and capacity to make decisions about their child feeding practice. At the same time, educated mother may be influenced by media advertising of complementary feeding.

Mothers who followed postnatal care service were 2.8 times more likely to practice appropriate complementary feeding than those who did not follow the service. This result is similar with the findings in Sirlanka, India and Tanzania [17,21,25] where lack of post-natal contacts was a significant predictor of inappropriate complementary feeding practice. This might be due to the result of information and counseling that the mothers received from health workers during their postnatal visits.

On the other hand, this study revealed that there was no association between number of antenatal care visit and appropriate complementary feeding practice and it disagrees with the study in Sirlanka, Nepal, India and Harar [17,19,21,23] where inadequate antenatal care was associated with inappropriate complementary feeding. This could show health professionals providing antenatal care were more focused on the pregnancy related information than child health care practices.

In this study there was no association between television ownership and appropriate complementary feeding practice. This result disagreed with the study in Nepal and India [17,23]. This was because nutrition related information was rarely broadcasted via Ethiopian television. .

5. Conclusion

One out of ten mothers fed complementary foods appropriately to their children aged 6-23 months which was very low. About 90% mothers were not feeding complementary foods appropriately considering, timely introduction, minimum dietary diversity, minimum meal frequency and minimum acceptable diet, which would have

negative implication on the health of infants and young children. This study indicated the importance of immediate action to promote appropriate complementary feeding. Educated mothers, children age 18-23 months and mothers who had postnatal care were factors that can increase appropriate complementary feeding practice.

We Recommend

It is important to evaluate the effectiveness, approaches and coverage of nutrition interventions being implemented to promote complementary feeding practice.

- Expanding education opportunities for women and incorporating related information in primary school is worthy.
- Infant and young child feeding practice should not be measured by considering only timely introduction of complementary feeding but also minimum dietary diversity, minimum meal frequency and minimum acceptable diet.
- Maternal health service outlets should be used to transmit child feeding information and hence, training should be given for all health workers to focus on minimum dietary diversity and minimum meal frequency as well.
- Strengthening inter-sectoral collaboration may be urgent and needed to think of the possibilities to increase and supply the minimum variety of food staples.

Competing Interests

The authors declare that they have no competing interests.

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