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# Determinants of Dietary Diversity Score among Children Age between 6-23 Months in Bench Maji Zone, Southwest Ethiopia

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## Abstract

**Background:** Even with appropriate breastfeeding, mortality rates and levels of stunting and anemia will not be decreased unless mothers or caregivers provide appropriate complementary foods to their infants starting at six months of age. Ethiopia is a large country with diverse cultures reflected by different food habits and traditional practices. Understanding the immediate and underlying causes of low dietary diversity score in a given context is critical to delivering appropriate, effective and sustainable solutions.

**Objective:** The objective of this study was to identify determinants of dietary diversity score among children age between 6-23 months.

**Method:** Community based cross-sectional study was conducted in Benchimaji zone. Data were collected by using pre-tested structured interviewer-administered questionnaire. A multi-stage sampling technique was used to select 422 study participants. Data were entered into a computer using Epidata 3.1 and analyzed using SPSS version 20. Logistic regression was used to identify determinants of minimum dietary diversity score.

**Result:** In this study, 38% of children attain the minimum dietary diversity score ( $\geq 4$  items). Mother's education, nutritional knowledge, Residency, number of children and ANC follow up were significant determinants of children dietary diversity score.

**Conclusion:** Less than half of children aged between 6-23 months received minimum dietary. Mother's education, nutritional knowledge, Residency, number of children and ANC follow up were determinants of minimum dietary diversity score of children age between 6 to 23 months. Health intervention that focuses on a cognitive dimension of dietary diversity practice is essential to promote dietary diversity practices of mothers.

**Keywords:** Dietary diversity; Minimum Dietary diversity; Determinants; Complementary feeding

**List of abbreviations:** EDHS: Ethiopian Demographic and Health Survey; HSDP: Health Sector Development Plan; DDV: Dietary Diversity; MDDV: Minimum Dietary Diversity; IYCF: Infant and Young Child Feeding; WHO: World Health Organization; SPSS: Statistical Package for Social Science

## Introduction

Undernutrition is estimated to be associated with 2.7 million child deaths annually. Nutrition-related factors contribute to about 45% of deaths in children under 5 years of age [1]. Globally in 2016, 155 million children under 5 were estimated to be stunted, 52 million were wasted, and 41 million were overweight or obese. Undernutrition is a major health problem that prevents children from reaching their full developmental potential. In developing countries, around 32% of age less than five years children are stunted and 10% are wasted [2]

The main underlying causes of acute malnutrition are poor access to appropriate, timely and affordable health care; inadequate caring and feeding practices (e.g. exclusive breastfeeding or low quantity and quality of complementary food) [3]. Complementary feeding typically covers the period from 6 to 18-24 months of age and is a very vulnerable period. It is the time when malnutrition starts in many infants, contributing significantly to the high prevalence of malnutrition in children under five years of age [4].

Researchers have shown that inadequate complementary feeding directly affects the nutritional status of children. A study on urban primary school children from Iran and India reported that increasing weight was associated with higher dietary diversity scores for almost all food groups in India. Heights for age z-scores were positively associated with dietary diversity scores [5]. Evidence generated from 11 Demographic and Health Surveys revealed a significant association between child dietary diversity score and nutritional status [6]. Analysis of Ethiopia and Zambia DHS demonstrated that optimal IYCF practices are related to nutritional status of infant and young children [7].

World health organization recommends that babies should begin receiving adequate complementary foods at 6 months of

age. However, in many countries few children receive nutritionally adequate and safe complementary foods; less than a fourth of infants 6-23 months of age meet the criteria of dietary diversity and feeding frequency that are appropriate for their age [1,8].

Understanding the immediate and underlying causes of poor dietary diversity practice in a given context is critical to delivering appropriate, effective and sustainable solutions and adequately meeting the needs of the most vulnerable people. Therefore this study was designed to identify determinants of dietary diversity score of children age between 6-23 months in the study area

## Method and Materials

### The study area, period and design

Community-based cross-sectional study from December to January 2016 was conducted to determine magnitude and determinants of dietary diversity score among children age between 6-23 months in Bench Maji Zone, Ethiopia.

### Study subjects

The source population of this study was all infant and young children between 6-23 months old who lived in Bench Maji Zone. The estimated proportion of children less than two years constitutes 2.1% of the total population of the study area [9]. Sampled mothers with children aged 6-23 months were study population. This range was selected because the optimum duration of breastfeeding practice is recommended to continue to the minimum of two years of age [10].

### Sample size determination and sampling technique

The sample size (n) required for the study was calculated using a single population proportion formula. Considering the absence of previous data on most of the issues to be studied; 50% estimated minimum dietary diversity, 5% marginal error and 95% confidence interval were used to obtain the maximum sample size. With the addition of 10% contingency, initial sample size inflated to 422. To obtain the participants, a two-stage cluster sampling technique was used to select kebeles (smallest unit of administration). First, from 11 districts, 3 were selected by lottery method. From 60 kebeles of selected districts, 18 kebeles were selected by lottery method. All eligible households of selected kebeles listed with the help of health extension workers. Finally, 422 study participants were selected by using a systematic random sampling technique. The sample size was allocated proportionally to the population size of selected districts. For more than one eligible mother per household, a mother was selected by lottery method.

### Measurement and data collection tools

Data was collected using a pretested structured interview administered questionnaire. The data collection tool regarding the various factors was adopted from the WHO standardized questionnaire for IYCF practices. The dietary diversity indicator

contains seven foods groups namely: grains, roots and tubers; legumes and nuts; dairy products (milk, yogurt); Flesh foods (meat, fish, poultry and liver/organ meats); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables. This was based on the mother's recall of foods given to her child in the past twenty-four hours before the survey. The questionnaire is translated into Amharic.

### Data quality control

Data collectors and supervisors were trained. Every day, the collected data was reviewed and checked for completeness and consistency by the supervisors and the principal investigators. The questionnaire was Pre-tested. Data collectors who live and work in the study area were recruited.

### Data processing and analysis

Data was entered into Epidata3.1 for cleaning and coding then exported to SPSS version 20 for analysis. Descriptive statistics (mean, standard deviation, frequency,) were used to describe the study population. For bivariate analysis, binary logistic regression was used to determine the degree of association between independent and dependent variables. Those variables  $p < 0.05$  were entered into multivariate analysis. Binary logistic regression is considered the more appropriate statistical method to apply here because dependent variables are categorical and dichotomous. CI of 95% and adjusted odds ratio was used to measure the strength of association. And those variables with a  $p < 0.05$  were considered statistically significant in multivariate analysis.

## Result

### Sociodemographic characteristics of mothers

A total of 405 mothers participated in the study, making the response rate of 95.9%. Out of the total, majority 248 (61.2%) of them were in the age category of 25-34 year age group. Mean age of the mothers was 27 ( $\pm 4$ ) years. Of the total, 220 (54.3%) were from rural settings. The majority of the participants 374 (92.3%) were married and 146 (36%) can't write and read. Concerning husband's educational and occupational status, majority 257 (63.5%) were employed, and 87 (21.5%) can't write and read (**Table 1**).

**Table 1.** Socio-demographic characteristics of respondents in Bench Maji zone, southwest Ethiopia, 2016.

Characteristics	Frequency (n)	Percent (%)
<b>Sex of the last child</b>		
Male	209	51.6
Female	196	48.4
<b>Mothers age (years)</b>		
15-24	98	24.2
25-34	248	61.2

35+	59	14.6
<b>Mother's religion</b>		
Protestant	199	49.1
Orthodox	158	39
Islam	47	11.6
Other	1	0.2
<b>Mother's education</b>		
Cannot read and write	146	36
Able to read and write	62	15.3
Primary school (1-8)	99	24.4
Secondary school (10-12)	50	12.3
Higher education	48	11.9
<b>Mothers marital status</b>		
Married	374	92.3
Single	16	4
Divorced	10	2.5
Widowed	5	1.2
<b>Father's Educational status</b>		
Cannot read and write	87	21.5

Able to read and write	60	14.8
Primary school (1-8)	76	18.8
Secondary school (10-12)	78	19.3
Higher education	73	18
<b>Father's employment status</b>		
Employed	257	63.5
employed	117	28.9
<b>Residency</b>		
Rural	220	54.3
Urban	185	45.7
<b>Media exposure</b>		
Yes	233	57.5
No	172	42.5

### Practices of dietary diversity

**Table 2** indicates the types of food groups practiced by study participants. Grains, roots, and tubers were eaten by 99.8% of children. The present study found that only 38% of children received the recommended dietary diversity (**Table 2**).

**Table 2.** Types of food groups practiced among 6-23 months children in Bench Maji zone, southwest Ethiopia, 2016.

7 Food groups	Category	Frequency (n)	Percent (%)
Grains, roots, and tubers	No	1	0.2
	Yes	404	99.8
Legumes and nuts	No	332	82
	Yes	73	18
Dairy products	No	214	52.8
	Yes	191	47.2
Flesh foods	No	335	82.7
	Yes	70	17.3
Eggs	No	199	49.1
	Yes	206	50.9
Vitamin-A rich fruits and vegetables	No	172	42.5
	Yes	233	57.5
Other fruits and vegetables	No	310	76.5
	Yes	95	23.5
Over all dietary diversity score	>=4	154	38
	<4	251	62

### Predictors of minimum dietary diversity

In this study maternal education level, Residency, knowledge toward child feeding practice, ANC follow up and Number of

children were significantly associated with dietary diversity practice after controlling for other predictors in the model (**Table 3**).

**Table 3.** Bivariate and multivariate logistic regression output showing factors associated with minimum dietary diversity practice among 6 to 23 months children in Bench Maji zone, south west Ethiopia, 2016.

	Dietary diversity		COR (95% C.I)	AOR (95% C.I)
	Adequate	Inadequate		
<b>Mother's education</b>				
Can't write and read	52 (35.6%)	94 (64.4%)	1	1
Can write and read	16 (25.8%)	46 (74.2%)	0.629 (0.324,1.219)	0.689 (0.234,2.033)
Primary school(1-8)	46 (46.5%)	53 (53.5%)	1.569 (0.932, 2.640)	2.964 (1.212,7.247)*
Secondary school (9-12)	20 (40.0%)	30 (60.0%)	1.205 (0.623,2.330)	4.918 (1.432,16.884)*
Higher education	20 (41.7%)	28 (58.3%)	1.291 (0.663,2.514)	14.907 (3.330,66.724)*
<b>Residency</b>				
Rural	70 (31.8%)	150 (68.2%)	1	1
Urban	84 (45.4%)	101(54.6%)	1.782 (1.188,2.673)	2.555 (1.163,5.612)*
<b>Number of children</b>				
1	43 (40.6%)	63 (59.4%)	1	1
2	43 (33.9%)	84 (66.1%)	0.750 (0.440,1.280)	1.048 (0.474,2.314)
3	43 (46.7%)	49 (53.3%)	1.286 (0.732,2.260)	1.529 (0.670,3.489)
4	15 (33.3%)	30 (66.7%)	0.733 (0.353,1.522)	0.699 (0.248,1.970)
≥ 5	10 (28.6%)	25 (71.4%)	0.586 (0.256,1.343)	0.278 (0.085,0.912)*
<b>ANC follow up</b>				
Yes	148 (40.4%)	218 (59.6%)	1	1
No	6 (15.4%)	33 (84.6%)	0.268 (0.109,0.655)	0.157 (0.045,0.546)*
<b>Mother's Knowledge</b>				
Inadequate	78 (33.9%)	152 (66.1%)	1	1
Adequate	76 (43.4%)	99 (56.6%)	1.496 (0.998,2.243)	2.099 (1.166,3.781)*

**Note:** \* refers to p-value less than 0.05; COR=Crude odds ratio, AOR=Adjusted odds ratio, CI=Confidence interval

## Discussion

Dietary diversity is a proxy for adequate micronutrient density of foods. Minimum dietary diversity assesses food intake among children age 6-23 months from at least four food groups. According to this study, 38% of the children received acceptable diversified diets. This finding is comparable with a study done in another part of Ethiopia (Wolyta) that reported 43.2% of children aged 6-23 months received minimum diversified foods [11]. The magnitude of minimum DDV in our study is also comparable with the studies done in other countries like in India East Delhi 32.6% [12], Bangladesh 42% [13] and China 45% of children 6-23 months of age met the minimum dietary diversity score [14].

However the finding of this study showed slight increment in compare to findings of previous studies done in other parts of Ethiopia including the latest EDHS report such as in a study in Afar found 30.8% [15], In Oromia 28.5% [16], in Wolyta southern region 27.3% [17] and in the latest EDHS report 14% of children age between 6-23 had an adequately diverse diet [18]. Ethiopia is a multicultural country and has diverse geographic and climate conditions may affect the availability of food and feeding habits of inhabitants.

In this study maternal educational status, Number of children, residency, ANC follow up and mother's nutritional knowledge was found to be associated with feeding diversified food to children. Mothers who had primary [AOR 2.964; 95% CI (1.212, 7.247)], secondary [AOR 4.918; 95% CI (1.432, 16.884)] and above educational status [AOR 14.907 95% CI (3.330, 66.724)]

were more likely feed recommended diversified food to their children than the mothers who can't write and read. Studies done in Norwest Ethiopia [19], Wolyta [11] and Chepang communities [20] found a similar association between maternal education and minimum dietary diversity practice.

Maternal knowledge showed a positive association with the dietary diversity of children. Mothers who had adequate knowledge more likely practices minimum DDV [AOR 2.099; 95% CI (1.166, 3.781)] than the mothers who had inadequate knowledge. The similar positive impact of knowledge reported in the previous study done Addis Abeba (Ethiopia) [21].

Residency of the child also showed association with DDV of the children. Children residing in an urban area more likely [AOR 2.555; 95% CI (1.163, 5.612)] receive  $\geq 4$  food groups than rural residents. Similar association showed a study done in northwest Ethiopia [19].

Mothers who don't follow ANC during their last pregnancy were less likely in comparison with those who have followed ANC [AOR 0.157; 95% CI (0.045, 0.546)], this may be related to different access to ANC nutritional counseling. In Ethiopia ANC utilization in a rural area is low. Other reason may be urban residents easily purchase factory prepared enriched food items.

In this study, the numbers of children negatively impact the minimum dietary diversity practice. Mothers who had five or more children were less likely feed  $\geq 4$  food group to their children than the mother who had a child [AOR 0.278 95% CI (0.085,0.912)]. Such associations were observed in a secondary analysis of EDHS in which having two children had 31% less chance of practicing adequate dietary diversity compared with having three children (OR=0.690, 95% CI: 0.481, 0.992) [22].

The following limitation should be considered while interpreting the findings of this study. The dietary diversity was assessed on the basis of 24-hour recall hence it may not accurately show the usual dietary practice of the community. Maternal knowledge was measured via non-standard scales hence misclassification errors cannot be excluded. Further, the study is cross-sectional causal inference may not be strong.

## Conclusion

Less than half of children aged between 6-13 months received minimum dietary. Mother's attendance of primary and above education, mother's adequate nutritional knowledge, residing in the urban area, having a limited number of children and ANC follow up were determinants of feeding adequate diversified foods to their children. Health intervention that focuses on a cognitive dimension of dietary diversity practice is essential to promote dietary diversity practices of mothers.

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## Availability of Data and Materials

Data sets used and analyzed during the current study are available from the corresponding author on reasonable requests.

## Competing Interests

Authors declare that they have no competing interest.

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## Authors' Contributions

MM and NT developed the protocol, supervised the data collection, analyzed the data and prepared the draft manuscript; TL participated in the development of the protocol, analysis, interprets and finalized the manuscript. All authors read and approved the final manuscript to submit it for publication.

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