

Minimum Acceptable Diet and its Predictors among Children Aged 6-23 Months in Mareka District, Southern Ethiopia: Community Based Cross-Sectional Study

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Abstract: *Background:* Optimal infant and young child feeding practices are essential for normal growth, better health, and mental and physical development. Even though there are a lot of nutrition intervention programs in Ethiopia, still suboptimal feeding practices are prevalent. This study was devised to assess a level of minimum acceptable diet (MAD) and predictors among children aged 6-23 months in Mareka District, south Ethiopia.

Method: A community-based cross-sectional study was employed on 662 study participants from August 15 to September 15/ 2015. They were selected by a multi-stage sampling technique. Data were collected by interviewer-administered semi-structured questionnaires. Statistical significance was declared at p-value <0.05 at multivariable logistic regression.

Result: The study showed that 35.5 % of the children aged 6-23 months met the recommended MAD. Maternal primary and secondary education (AOR: 1.90; 95% CI: 1.15-3.16 and AOR: 2.06, 95% CI: 1.12-3.77), Media exposure (AOR: 2.16; 95% CI: 1.46-3.29), health facility delivery (AOR:2.52; 95% CI: 1.54-4.13), child age of 9-11 and 12-23 months (AOR:2.73; 95% CI: 1.41-5.49 and AOR:2.55; 95% CI: 1.39-4.69) and GMP service utilization (AOR: 4.09; 95% CI: 2.51-6.65) were associated with MAD of children.

Conclusion: The level of MAD among children was low. Maternal educational status, media exposure, institutional delivery, child age, and GMP service utilization were associated with MAD. Increasing utilization of GMP service, health facility delivery, maternal education, and media promotion was recommended to increase the level of MAD.

Keywords: Minimum Acceptable diet, children, 6-23 months, dietary diversity, Ethiopia.

BACKGROUND

Malnutrition persists at unacceptably high levels on a global scale. Globally, among children aged under five years, 149.0 million are stunted, and 49.5 million are wasted [1]. Despite some improvements in selected nutrition indicators, progress is insufficient to meet the 2025 global nutrition targets. An undernourished child has a nine times higher risk of mortality as compared with an optimally nourished child [2]. Almost half (45%) of all child death resulted in the effect of malnutrition, and the highest figure was in Africa [3].

The immediate causes of infant and child malnutrition are inadequate dietary intake and disease, while the underlining causes are inadequate access to food and insufficient health services for the child, and an unhealthy environment [4]. Optimal infant and young child feeding practices are important for normal growth, better health, and mental and physical development, especially for children aged 6-23 months [5, 6]. Nearly one-third of child deaths could be prevented by optimal complementary feeding practices [7, 8]. Implementing optimal complementary feeding, consumption of

diversified diet, and optimal meal frequency are core indicators for monitoring feeding practices of infants and young children [4]. The MAD is a composite indicator defined as the proportion of children aged 6-23 months who met both minimum dietary diversity (MDD) and the minimum meal frequency (MMF) during the previous 24 hours [7].

Nowadays, the Ethiopian government also set targets to improve the nutritional status of children and to end child malnutrition by 2030 through implementing different programs and strategies such as the National Nutrition Program (NNP) [9], Health Sector Transformation Plan (HSTP) [10, 11], Health Extension Program (HEP) [12], Sustainable Undernutrition Reduction in Ethiopia (SURE) [13] and seqota declaration [14]. Despite the above efforts, currently, 37%, 21%, and 7% under five years children were stunted, underweight, and wasted, respectively [15]. In Ethiopia, only 7% of children aged 6-23 months have met the MAD [16].

Even though some studies were conducted on the determinants of complementary feeding in Ethiopia, inadequate information was documented about MAD separately. Notably, there were no studies that investigated MAD in South Ethiopia. The finding of this study will assist the national nutrition program (NNP) to

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monitor the changes and design interventions for reducing under-nutrition in the country. Therefore, this study was devised to assess the level of MAD and associated factors among children aged 6-23 months in Mareka District, South Ethiopia.

METHODS

Study Setting and Period

The study was conducted in Mareka District, Dawro zone, south Ethiopia from August 15 to September 15, 2015. Mareka District was one of the 11 districts in the Dawro zone. It is 455 km far from Addis Ababa, which is the capital city of Ethiopia, and 311 km from Hawassa, which the capital city of the SNNPR regional state was.

According to the projection of the Ethiopian 2007 census, the district had a total population of 63,022, of which 32,141 were males and 30,881 females. There were 3,239 under two years old children, of which 2,212 were lie in the age range of 6–23 months (Mareka District health department report). There was one health center and 15 functional health posts in the district. The communities largely depended on agriculture for their livelihood. The staple food in the highland was locally known as *enset (kocho)*, whereas corn and sorghum were common in low-land areas. Common cash crops were wheat and teff.

Study Design

A community-based cross-sectional study design was conducted.

Source Population

All children aged 6-23 months living in Mareka District were the source population. Respondents drawn from the randomly selected kebeles were considered as the study population.

Exclusion and Inclusion Criteria

Children were excluded if they were residents for more than six months in the district.

Sample Size Determination

The minimum sample size was calculated using the single population proportion formula with EPI-info version 7.1 considering 95% CI, 5% margin of error, different proportions from different studies done in Africa, 10% non-response allowance, and a design

effect of 2. Finally, the required size was 710, since this was found the largest from all calculated sample sizes (Table 1).

Table 1: Sample Size Calculation using Different Proportions from Different Studies to Determine the Level of MAD among Children 6-23 Months in Mareka District, Southern Ethiopia, 2016

Proportion of MAD (P)	Reference	Total sample size
7	[16]	220
29.9	[17]	710
28.2	[18]	686
15.9	[19]	452

Sampling Technique and Procedure

A multi-stage sampling technique was employed. The selected district had a total of 15 kebeles, which were stratified into two urban and thirteen rural kebeles. The four kebele from rural and one from urban were selected randomly. The sample size was then allocated based on population proportional to the size of under-five children of each kebele. Then study units were selected using a systematic random sampling method (Figure 1).

Data Collection Techniques and Quality Control

Data were collected using a semi-structured questionnaire via face to face interviews with mothers of children aged 6-23 months. The questionnaire was prepared in English and translated into the local language (Dawurgna and Amharic). The study tool was pretested on 10% of the sample size in non-selected kebeles. Six diploma holder health professional data collectors and three masters' holder supervisors, who were fluent in the local language, were recruited. Two days of training was given for data collectors and supervisors. After data entry, random checks of 10% of the questionnaires were done. When households found having two or more eligible children, one of them was selected randomly via the lottery method.

The child dietary diversity, meal frequency, and minimum acceptable diet were assessed using the 24-hours dietary recall method. The dietary diversity of children was calculated by a simple count of the number of food groups eaten 24-hours before the survey, regardless of the portion size using the WHO seven food group criteria [7]. The children's age was

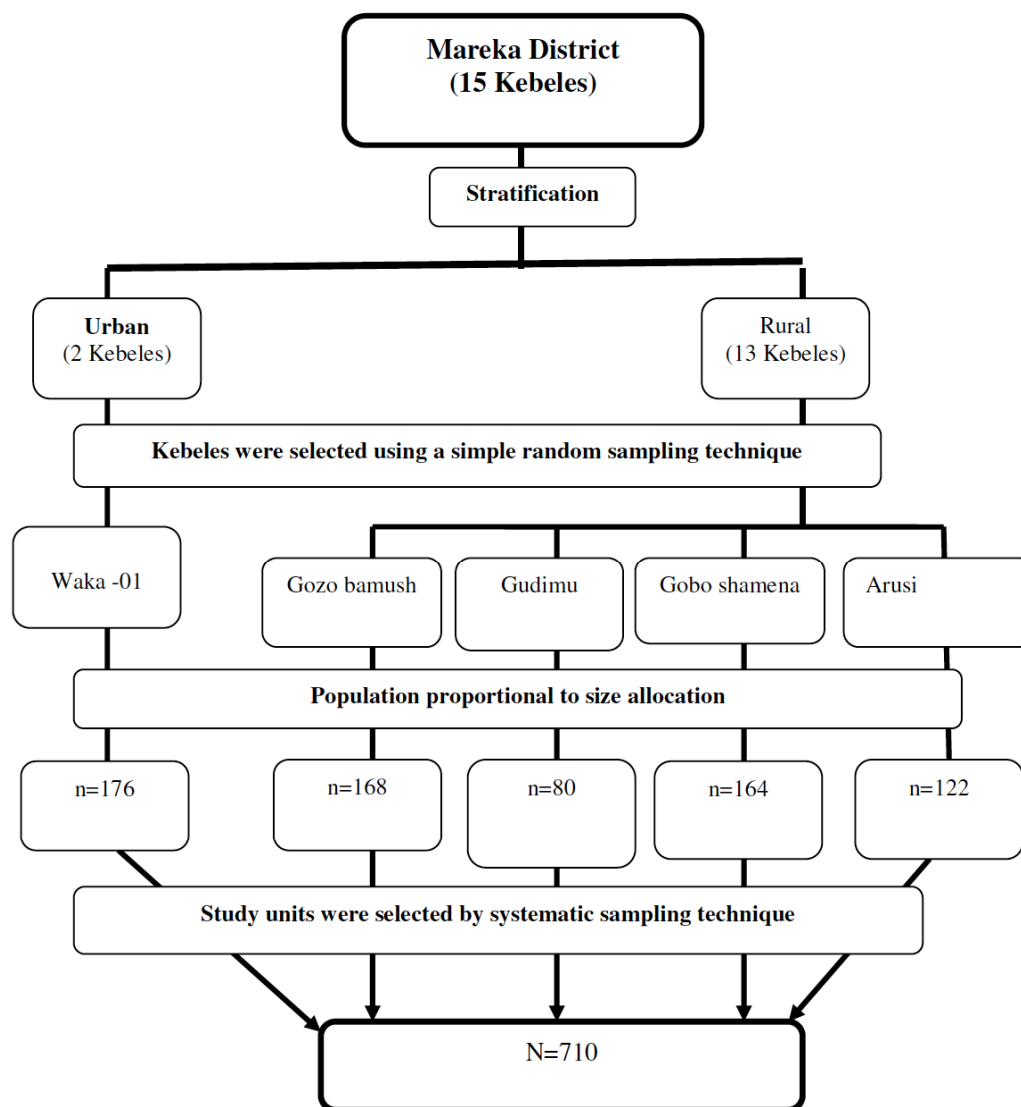


Figure 1: Schematic representations of the sampling procedure and sampling technique for selecting study participants to assess the level of MAD and predictors among children aged 6-23 months Mareka district, South Ethiopia, 2016.

assessed by local health extension roaster, vaccination status card, BCG scar, and mother recalled.

Data Processing and Analysis

After cleaning and editing, the data was entered into Epi-data version 3.1 and exported to the statistical package for social sciences (SPSS) software version 22 for further analysis. The result was presented using descriptive statistics such as frequency, percentage, bar graphs, and mean (\pm SD).

The bivariable and multivariable logistic regression analyses were used to identify the potential predictors of the outcome variable. Independent variables that remain statistically significant in the bivariable analysis at $P < 0.25$ were entered into a multivariable logistic regression model. The wealth index was assessed

using household assets via principal component analysis. The multicollinearity diagnosis was ruled-out with all standard errors being less than 2. The overall percentage of the model accurately classified was 73.4%, with Hosmer and Lemeshow's goodness-of-fit test p-value of 0.443, indicating the model fits well [23]. Finally, the statistical association was declared at a 95% confidence interval with an adjusted odds ratio at the multivariable logistic regression model.

Definition of Terms

Minimum Acceptable Diet (MAD)

The percentage 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 [7, 20].

Minimum Dietary Diversity (MDD)

Means when a child consumes at least four types of food groups from seven WHO recommended food groups, taken 24-hours before the survey, regardless of the portion size and meal frequency [7, 20].

Minimum Meal Frequency (MMF)

Calculated by grouping child age into two (6-8 months and 9-23 months). The acceptable MMF of children aged 6-8 months is considered as two or more

times per 24 hours, while for children aged 9-23 months, it is three or more times per 24-hours [7, 20].

GMP Service Utilization

Child weighed to growth monitoring and promotion service at least 5 and 4 times for 6-11 and 12-23 months of age per year, respectively [21, 22].

RESULTS

Socio-Demographic Characteristics

This study included 662 mother-child pairs with a response rate of 93.2%. The majority, 629(95%) of them, were Dawro ethnic group. Around half,

Table 2: Socio-Demographic Characteristics of Study Participants in Mareka District, South Ethiopia, 2016 (n=662)

Variables		Frequency (n)	Percentage (%)
Maternal age (years)	15-24	125	18.9
	25-34	404	61.0
	35-49	133	20.1
Maternal ethnicity	Dawro	629	95.0
	Others*	33	5.0
Maternal religion	Protestant	612	92.2
	Others**	50	7.8
Marital status	Married	655	98.9
	Others***	7	1.1
Maternal education	No formal education	333	50.3
	Primary	210	31.7
	Secondary and above	119	18.0
Paternal education	No formal education	295	44.6
	Primary	240	36.3
	Secondary and above	127	19.1
Household wealth index	Low	190	28.7
	Medium	237	35.8
	High	235	35.5
Household family size	Mean \pm SD	(5.04 \pm 1.33)	
	\leq 5	443	66.9
	>5	219	33.1
Index child age in completed months	Mean \pm SD	(14.35 \pm 5.24)	
	6-8	114	17.2
	9-11	128	19.3
	12-23	420	63.4
Child sex	Female	340	51.4
	Male	322	48.6

*Wolaita, Amhara and Kefa; ** Orthodox, Catholic; ***Divorced, widowed; ****Merchant, a government employee.

333(50.3%) of mothers of index children were not educated. Regarding maternal occupation, 632 (95.5%) were housewives. The mean (\pm SD) age of children was 14.35 (\pm 5.24) months (Table 2).

Maternal and Child Healthcare-Related Characteristics

Two-hundred ninety-two (44.1%) of mothers did not attend antenatal care follow-up for the index child. Institutional delivery was 190(28.7%). About one-third of (31.1%) mothers had a workload, and 28.7% of them had the birth order of the first child. The majority, 530(80.1%) of children, did not utilize GMP services (Table 3).

Infant and Young Child Feeding (IYCF) Practices

The study revealed that about 35.5% (95% CI: 32-39) of children aged 6-23 months met the recommended level of MAD. The study also revealed that 577(87.2%) and 258 (39%) of children had met the recommended MMF and MDD, respectively. But the level of MAD varies with age; it is lower among children aged 6-8 months (14.9%) than children aged 12-23

months (39.0%). The extent of consuming diverse food groups and meal frequency, 24-hours before the survey, also showed variation with child age. As the age of children increases, the uptake of MAD increases, but the meal frequency is reverse with the age of the child feeding practices (Figure 2).

Grains, roots, tubers (92%), legumes, and nuts (86%) were the most common food items consumed by the children 24-hours before the survey. But only 25% and 8% of children consumed vitamin-A rich fruit and vegetables, and flesh foods, respectively (Figure 3).

Factors Associated with MAD

Predictor variables that were statistically significant at p -value < 0.25 at bi-variable analysis and were incorporated at the final multivariable logistic regression model were maternal education, paternal education, wealth index, media exposure, age of the index child, ANC follow-up, institutional delivery, postnatal care utilization, birth order, and GMP service utilization. But the variables that were declared as statistically significant predictors at the final model at p -value <0.05 were maternal education, child age, media

Table 3: Maternal and Child Healthcare-Related Characteristics on the MAD in Mareka District, South Ethiopia, 2016 (n=662)

Variables	Category	Frequency (n)	Percentage (%)
Antenatal care	No	292	44.1
	1-3	139	21.0
	≥ 4	231	34.9
Place of delivery	Health institution	190	28.7
	Home	472	71.3
Postnatal care	Yes	310	46.8
Media exposure	Yes	211	31.9
Birth order	Mean \pm SD	(2.06 \pm 0.97)	
	First child	190	28.7
	2-3	400	60.4
	>3	72	10.9
Under-five children	One	383	57.9
	Two	235	35.5
	Three and above	44	6.6
GMP service utilization	No	530	80.1
	Yes	132	19.9
Time to initiate complementary feeding	Before six months	297	44.7
	Exactly at six months	283	42.7
	After six months	82	12.6

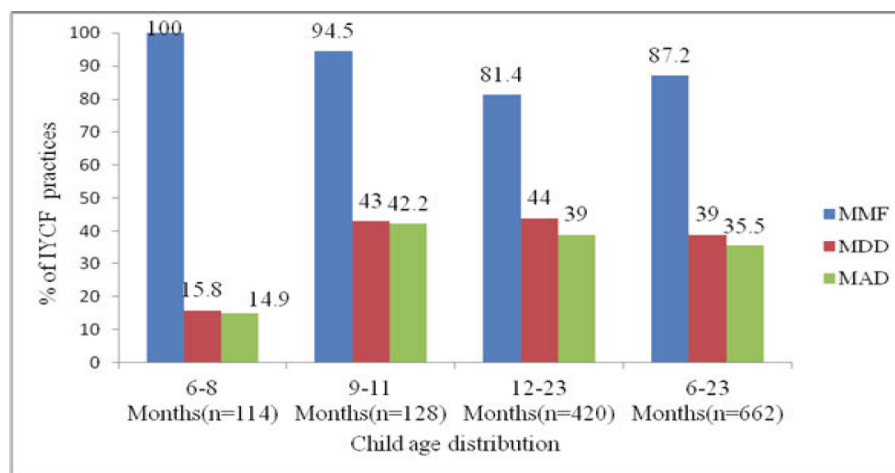


Figure 2: YCF practices disaggregated by age in Mareka District, South Ethiopia, 2016 (n=662).

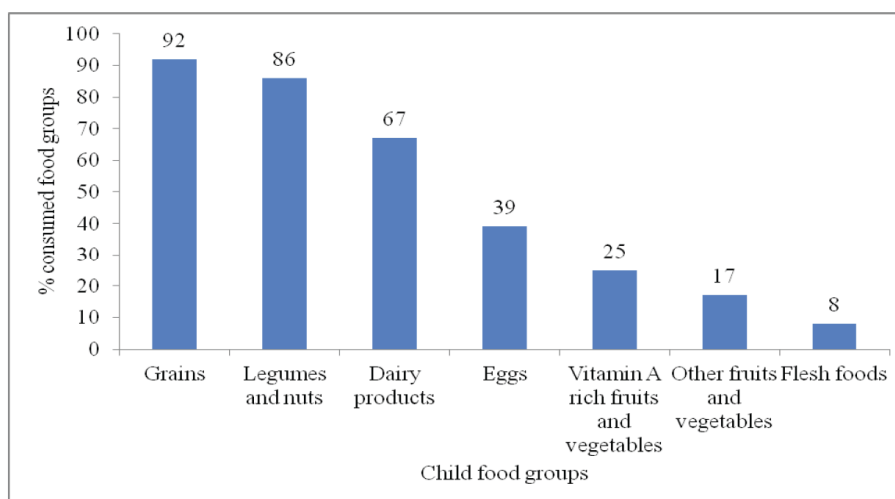


Figure 3: Percentage of each food group consumption by children aged 6-23 months 24-hours before the survey in Mareka District, south Ethiopia, 2016 (n = 662)

exposure, institutional delivery, and GMP service utilization (Table 4).

DISCUSSION

To reduce malnutrition in a developing country like Ethiopia, adequate and safe infant, and young child feeding practice is crucial [7, 20]. Optimal infant and young child feeding practices are defined within narrow age ranges, and these key feeding practices, within a continuum of child feeding, are used as an indicator of nutritional care practices [23]. Optimal complementary feeding is most effective in improving child growth and in reducing stunting among children 6-23 months of age [24].

This study revealed that around 35.5% (95% CI: 32-39) of children met the MAD. This finding is higher than studies conducted in Dembech district, Amhara region

8.6% [25], Golina district, Afar region 19.4 [26], and Babile, Enderta, and Hintalo Wajirat districts of Ethiopia [27]. It is also higher than the national findings [16, 28]. It might be due to sampling size, study area, and period. This finding is also higher than the study conducted in Tanzania 9%, Pakistan 7.9%, India 9.2%, and Cambodia 28.3%, in which only children met the MAD [18, 29-31] while less than studies conducted in Asian countries such Indonesia 44.9 % [32], Sri Lanka 67.9% [30], Bangladesh 39.59 % [33] and Mongolia 43.8% [34], whereas it is nearly consistent with Nepal 31.8% [30].

In this study, maternal education, age of the index child, media exposure, place of delivery, and GMP utilization showed a statistically significant association with child MAD. Children from mothers who attended secondary and above level of education were more than two times to meet the MAD than children from

Table 4: MAD Predictors among Children Aged 6 - 23 Months in Mareka District, South Ethiopia, 2016

Variables	Category	MAD		COR (95% CI)	AOR (95% CI)
		Met	Not met		
Maternal education	Not educated	82	251	1	1
	Primary	93	117	2.43(1.68-3.52)	1.90(1.15-3.16) *
	Secondary and above	60	59	3.11(2.01-4.82)	2.06 (1.12-3.77) *
Paternal education	Not educated	80	215	1	1
	Primary	99	141	1.89(1.31-2.71)	0.86(0.51-1.43)
	Secondary and above	56	71	2.12(1.37-3.27)	1.17(0.63-2.17)
Wealth index	Low	82	147	1	1
	Medium	61	144	0.76(0.51 -1.14)	0.90(0.56-1.46)
	High	92	136	1.21(0.83-1.77)	0.82(0.53-1.29)
Media exposure	Satisfactory	98	113	1.99(1.42-2.78)	2.16(1.42-3.29) **
	Unsatisfactory	137	314	1	1
ANC utilization	Yes	160	210	2.20(1.58-3.08)	1.48(0.99-2.22)
	No	75	217	1	1
Delivery place	Health facility	115	75	4.50(3.15-6.23)	2.52(1.54-4.13) **
	Home	120	352	1	1
PNC utilization	Yes	150	160	2.93(2.11-4.07)	1.24(0.77-1.99)
	No	85	260	1	1
Age of the index child	6 - 8 months	17	97	1	1
	9-11 months	54	74	4.16(2.23-7.77)	2.73(1.41-5.49) *
	12-23months	164	256	3.49(2.11-6.34)	2.55(1.39-4.69) *
Birth order	First child	60	130	1	1
	2-3	152	248	1.33(0.92-1.92)	1.83(0.76-1.83)
	>3	23	49	1.02(0.57-1.82)	0.55(0.27-1.23)
GMP utilization	No	144	386	1	1
	Yes	91	41	5.95(3.93-9.01)	4.09(2.51-6.65) **

*P-Value<0.005, and ** P-Value<0.0001.

non-educated mothers. This finding is in line with studies done in Ethiopia [25, 35, 36], Tanzania [31], Kenya, Uganda, and Nigeria [30, 37], and Asian countries [30]. This might be explained by; as the maternal education level becomes higher, her knowledge, attitude, and practice towards child feeding practice might be improved [26].

The age of the child was positively associated with MAD among children aged 6-23 months. Children in the age range of 9-11 and 12-23 months were more than two times more likely to meet the MAD than children aged 6-11 months. This finding is consistent with the evidence from Asia, Indonesia, Pakistan, Ghana, and Uganda [17, 32, 34, 38-40]. This might be due to the late introduction of complementary feeding, and even when they start complementary feeding on

time; they included either only milk or cereal products. Another possibility could be mothers may perceive that the intestine of young children may not digest certain foods like banana, egg, pumpkin, carrot, green vegetables, and meat; as a result, they might not add such foods while they prepare complementary foods [20]. This could be further justified by mothers predisposing factors such as traditional beliefs and practices, during introducing optimal complementary food to infants in the rural community, infants may develop diarrhea due to poor hygienic condition, but mothers could associate this problem with taking different food items and eventually they might not permit the child to take such foods. It can be attributed to the feeding interest of the child too. This was supported by studies carried out in Indonesia, Nepal, Sri Lanka, and Ethiopia [18, 25, 28, 30, 40].

Children from mothers who were exposed to media (watched television, listened to the radio, and read newspapers or magazines) every day or at least once a week were more than two times more likely to meet MAD than those children from mothers who didn't. This study is similar to other studies conducted in Ethiopia and Asian countries [21, 25, 28, 35-37, 41]. The reason behind this could be that currently, most of the time, child feeding practices are promoted using different Media, which has the power to change the attitude and practices of individuals.

Other most important variables found to be associated with child MAD were institutional delivery. Children who were delivered at health institutions were also more than two and half times more likely to meet the MAD. Maternal counseling on infant and young child feeding practices after delivery in the health facility increases maternal knowledge, attitude, and practice on MAD. This finding is supported by studies in the northern part of Ethiopia [25].

Those children who utilized GMP service were more than three and half times more likely to meet MAD than children who didn't get GMP service. The GMP service utilization is conducted in every health facility using the WHO GMP chart monthly [42, 43]. This might be as the HEWs monitor the weight of children using the standard GMP charts, and they will provide nutrition counseling to mothers or caregivers of children; as a result, there might be an improvement in child feeding practices [21]. This finding is also supported by studies conducted in northern parts of Ethiopia, which indicated that there is more likely for meeting MAD on those children attending regular GMP services utilization at each health post level [21, 25, 43].

The possible limitations of this study could be the 24-hours dietary recall method might not show the usual intake and feeding pattern of the child. Recall-bias might also be encountered. This indicator was designed to capture optimal complementary feeding patterns (based on WHO recommendations), but it was not designed to capture excessive intake of energy, sugar, or fat that would yield information about risks for overweight and obesity. It does not also provide quantitative information about children's food and nutrient intake. Some explanatory variables such as food security that might have a residual confounding on MAD were not assessed.

CONCLUSION

The study revealed that the level of MAD among children aged 6-23 months is low. Socio-demographic

characteristics (such as maternal education, age of the index child, and media exposure), and maternal and child health-related characteristics (such as institutional delivery and GMP service utilization) were factors associated with MAD.

Therefore, strengthening emphasis on the importance of the education of girls (future mothers) is needed. It is also recommended that promoting and strengthening institutional delivery and GMP service utilization should be given emphasis.

ABBREVIATIONS AND ACRONYMS

AOR	=	Adjusted Odds Ratio
ANC	=	Antenatal Care
BCG	=	Bacillus Calumet Guerin
GMP	=	Growth Monitoring and Promotion
HEP	=	Health Extension Program
HEWs	=	Health Extension Workers
HSTP	=	Health Sector Transformation Plan
ITNs	=	Insecticide Treated bed Nets
MAD	=	Minimum Acceptable Diet
MDD	=	Minimum Dietary Diversity
MMF	=	Minimum Meal Frequency
NNP	=	National Nutrition Program
PNC	=	Postnatal Care
SD	=	Standard Deviation
SPSS	=	Statistical Package for Social Sciences
SURE	=	Sustainable Undernutrition Reduction in Ethiopia
UNICEF	=	United Nations International Child Emergency Fund
WHO	=	World Health Organization

ETHICAL CONSIDERATIONS

An ethical clearance was obtained from Hawassa University Institutional review board ethical committee. A cooperation letter was taken to each Kebele after

permission. Informed written consent was obtained from the participants. The confidentiality of participants was secured.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

AUTHORS CONTRIBUTION

FWF conceived and designed the study, performed analysis, interpreted the data. GFM is involved in the analysis, interpretation of the data. FWF and GFM prepare the manuscript. Both authors critically reviewed and approved the final manuscript.

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AVAILABILITY OF DATA AND MATERIALS

The data sets analyzed during the current study are available from the corresponding author upon reasonable request.

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