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Original Research

Minimum Acceptable Diet and Associated Factors Among Infants and Young Children Aged 6-23 Months in Jigjiga, Ethiopia: MAD and Associated Factors

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Abstract

A minimum acceptable diet (MAD) is one of the valid and reliable indicators to assess complementary feeding practices in 6–23-month-old children. The study aimed to assess the proportion of MAD and associated factors among young children aged 6-23 months in Jigjiga City, Ethiopia, 2021. A sample of 292 mothers with children aged 6–23 months were randomly selected from six kebeles. A systematic random sampling technique was used to identify study participants. Data were collected using a pre-tested structured questionnaire. A logistic regression model was applied to identify the significant factors associated with MAD. The result showed that 22.2% of the children between the ages of six and twenty-three months met the required MAD. The place of delivery [AOR=1.99, 95% CI (1.07-3.70)], aged group of 12–17 months [AOR=2.61, 95% CI (1.15-5.92)], aged group of 18-23 months [AOR=3.2 95% CI (1.25-8.17)] and receiving child feeding counseling [AOR=2.54, 95% CI (1.21-5.35)] were significantly associated with adequate MAD compared to their counterparts. The study found that the proportion of children aged 6-23 months who met the recommended MAD was low in Jigjiga City, Ethiopia.

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INTRODUCTION

The first 1000 days, or the period from conception to the end of a child's second year, have come to be known as the earliest stage of human development. Governments, the early years sector, and some commercial organizations have increased their attention on the first 1000 days as a result of the importance of this time frame for long-term health and developmental outcomes (Moore *et al*., 2017; Prado & Dewey, 2014). Consequently, proper nutrition at the early age of the child is the cornerstone for developing the maximum human potential in adult life (WHO, 2018). For this, a child should fulfill the timely introduction of complementary feeding, and meet the minimum acceptable diet *(*MAD) adequate for his age (WHO, 2010, 2018). Since MAD is a composite indicator of minimum dietary diversity (MDD) and minimum meal frequency (MMF) (WHO, 2010). MDD is utilized to assess the quality of a baby's and young child's complementary diet while MMF is used as a stand-in measure of caloric intake or quantity of food consumed other than breast milk. Furthermore, MAD assesses both micronutrient adequacy and quantity of food consumed during the previous day or night and measures appropriate complementary feeding practices (WHO, 2010). Thus, the MAD assesses several aspects of the diet of newborns and young children. Optimal nutrition during the first 1000 days is an important period to prevent undernutrition in infants and children (WHO, 2013). It is evidenced that suboptimal child-feeding practices are among the leading causes of child undernutrition (Tafese *et al*., 2020). Optimal complementary feeding has been shown to reduce mortality in infants under five by 6%, according to a prior study (Black *et al*., 2013; Oot *et al*., 2015). Generally, undernutrition is more prevalent in nations with lower feeding rates (Disha *et al*., 2012). Worldwide estimates of the proportion of MAD were (21%) (Lutter *et al*., 2011). Previous works address that just 8% of children (6–23 months) in two rural districts of Pakistan had met the MAD (Khan *et al*., 2017). Other studies from India, Nepal, and Nigeria also reported 33%, 34%, and 31.5% proportion of MDD respectively (Dhami *et al*., 2019; Joshi *et al*., 2012); showing the proportion of MAD slightly varied across regions ranging from 4% in western regions of India to 34% in Nepal. Likewise, the Ethiopian Demographic and Health Survey (EDHS) 2016 reported a 7% proportion of MAD (Shagaro *et al*., 2021).

Regional variations in the proportion of MAD were also reported in Ethiopia. Accordingly, study reports from Oromia, Afar, and southern Ethiopia reported 29%, 19.4%, and 12.3% respectively (Fentaw *et al*., 2020; Kassa *et al*., 2016; Wondu & Yang, 2017). Studies from various

databases published until July 2018 revealed that in Ethiopia the pooled proportion estimate of MDD, MMF, and MAD was 18.0%, (Udoh & Amodu, 2016) 56.0%, and 10.0% respectively (Abdurahman *et al*., 2019). Studies on child feeding practices have shown that a number of factors are associated with appropriate complementary feeding practices. These include the mother's and father's educational and occupational status (Birie *et al*., 2021; Debela *et al*., 2021; Fentaw *et al*., 2020; Manzione *et al*., 2019; Mya *et al*., 2019; Nankinga *et al*., 2019), the family's socioeconomic status (Solomon *et al*., 2017; Zebadia *et al*., 2021), maternal decision-making at the household level (Beyene *et al*., 2015; Victor *et al*., 2014), institutional delivery (Birie *et al*., 2021; Issaka *et al*., 2015; Mulat *et al*., 2019; Temesgen *et al*., 2018), the child's age (Guirindola et al., 2018; Issaka *et al*., 2015; Mokori *et al*., 2017; Na *et al*., 2017), receiving IYCF counseling (Liben *et al*., 2017; Molla *et al*., 2021; Pokhrel *et al*., 2016), and a history of illness two weeks prior to the survey (Molla *et al*., 2021).

Therefore, in addition to providing a better understanding of the status of child-feeding practices, the current study may produce up-to-date information on these practices and related factors that will help in the development of suitable interventions for improved infant and young child feeding (IYCF) in the study area.

METHODOLOGY

Study area

The study was carried out in Jigjiga City which is the capital city of the Somali regional state, located in south-eastern Ethiopia, 632 km away from Addis Ababa (Figure 1). Jigjiga experiences variation in temperature throughout the year, with highs and lows between 25.6°C and 28.2°C and 7.1°C and 15.5°C, respectively, due to its diverse weather patterns. According to the Central Statistics Agency of Ethiopia, Jigjiga has an estimated total population of 184,660 (the annual growth rate is 2.6%) of whom 46.7% are females and 53.3% are males. Among the total population, 47% are under the age of 15 years whereas 3.2 are under the age of 1 year. The reproductive age group is 22.8% and the total fertility rate (TFR) is 6.6. Life expectancy at birth is estimated to be 55.4 years for females and 58.7 years for males (Macro, 2006).

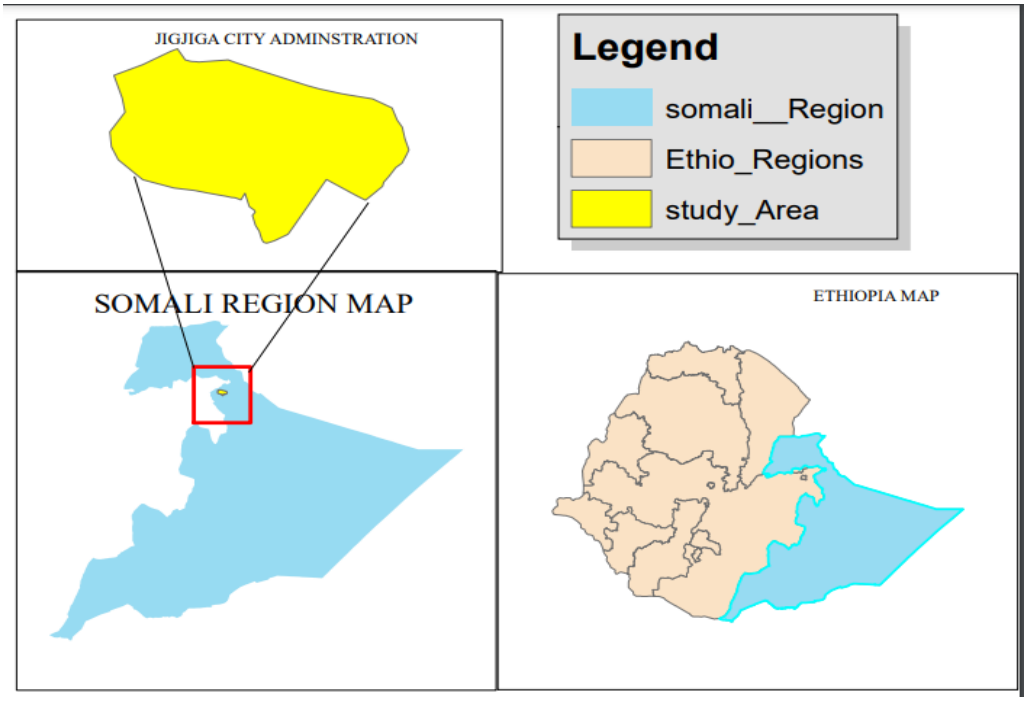


Figure 1: Map of the study area in Jigjiga City Somali Region, 2021, Taken from Central Statistics Agency, 2008 with slight modification.

Study period and design

A community-based cross-sectional study design was conducted from June 15 to July 20, 2021.

Study Population

The study populations were children aged 6 to 23 months and their mothers /caregivers (mother-child pair) who were inhabitants of the Jigjiga City administration. Respondents who were mentally or physically disabled such as mothers who are unable to speak and/or listen, mothers with serious illness at the time of data were excluded from the study.

Sampling Size Determination

The single population proportion formula was used to calculate the sample size with the assumption of a 22.2% proportion of MAD in Ethiopia (Roba, O'Connor, Belachew, & O'Brien, 2016), 95% confidence level, and 5% margin of error. Adding a 10% non-response rate, the final sample size of 292 child-mother pairs was determined. Because this is a sample proportion we expect the results to be. So we have used a result from a previous survey done in most similar socioeconomic areas compared with our study area. we also considered that the sample size calculation uses the Normal approximation to the Binomial distribution. And if the sample proportion is close to 1 as reported by EDHS 2011, 2016, and 2019 we believe the approximation cannot be valid and the sample size we get will be too small. Hence, we consider an alternative proportion to get adequate power for the present study.

Sampling Procedure

Jigjiga City Administration has 20 kebeles, 6 kebeles were selected randomly and the total number of mothers with children aged 6-23 months was obtained from the kebele office of the selected 6 kebeles. And lastly, the study participants were selected using systematic random sampling.

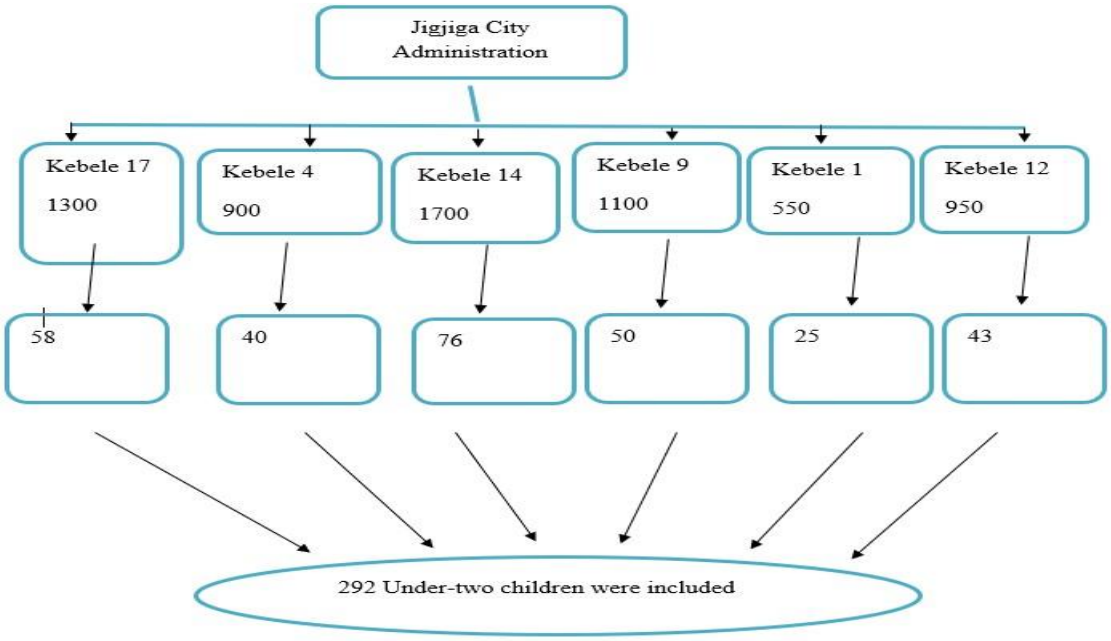


Figure 2: Schematic presentation of sampling technique of a study on minimum acceptable and associated factors in Jigjiga City Administration, Ethiopia, 2021

Variables (dependent and independent)

The dependent variable was minimum acceptable diet (MAD) with the possibility of adequate or inadequate intakes whereas the independent Variables were Socio-demographic and socio-economic factors like age, marital status, family size, level of education, occupation, and income level, maternal knowledge on recommended child feeding, maternal and child-related factors (maternal and childhood illness, maternal workload), cultural norms and beliefs (presence of prohibited foods for infants, familial and cultural acceptance), and obstetric factors (Antenatal care (ANC), postnatal care (PNC), birth order, parity, place of delivery).

Operational definitions

Minimum Acceptable Diet (MAD): Proportion of children 6–23 months of age who receive a minimum acceptable diet (including breast milk). This composite indicator was calculated from children 6–23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day (WHO, 2010).

Minimum Dietary Diversity (MDD): at least 5 food groups out of 8 food groups within 24 h and the cut of was <5 food is inadequate and >5 to 8 food groups consumed are adequate (Breast milk, grain, legumes, dairy products, egg, meat, fruits, and vegetables) recommended by world health organization (WHO, 2017).

Minimum Meal Frequency (MMF): cut of point of a child who receives solid, semi-solid, or soft foods (but also includes milk for non-breastfed children) the minimum number of times or more over the previous day for more the minimum number of times is 2 times for breastfed infants 6-8 months 3 times for breastfed children 9-23 months 4 times for non-breastfed children 6-23 month (WHO, 2010).

Feeding Practices (FP): these were the actions carried out by a caregiver relating to breastfeeding and complementary feeding, solid and semi-solid foods, given to a child (WHO, 2010).

Data collection instrument

A pre-tested structured questionnaire was used which was developed from consistent pieces of literature. The English version questionnaire was translated into the Somali language and translated back to English by an expert fluent in English and the local languages to check the consistency. The MAD was collected as a simple count of 8 food groups (breast milk, grains, roots, and tubers; legumes and nuts; dairy products; flesh foods (meats/fish/poultry); eggs; vitamin A-rich fruits and vegetables, and other fruits and vegetables) consumed by the child in 6-23 months to calculate MDD and MMF over the past 24 hours of the survey (WHO, 2017).

Data Processing and Analysis

The completeness and consistency of the data were checked the data was coded and double-entered into EPI Data 3.1. The data was exported into SPSS version 25 statistical software for analysis. Bivariate logistic regression was used (p-value less than 0.25) as the candidate to see the association between each independent variable and the outcome variable. Multivariable logistic regression analysis was used to control for all possible confounders and to identify independent predictors of minimum acceptable diet. The odds ratio along with a 95% confidence interval was estimated to measure the strength of the association. The level of statistical significance was declared at a P-value less than 0.05. The model was checked for their fitness using the Hosmer and Leme show goodness of Fitness test.

To assure the quality of the data, the structured and pre-tested questionnaire was used. A pre-test of the questionnaire was employed before the actual data collection time among 5% of the study sample on one kebele not included in this study. During the pre-test, the

questionnaire was assessed for its clarity/understandability, reliability, sensitivity of the subject matter, and cultural acceptability in the area. It was also a good opportunity to learn different techniques related to our study and, to estimate resources and time. A two-day intensive training was given on the instruments, method of data collection, and ethical issues to the data collectors.

Ethical consideration

Ethical clearance was obtained from Jigjiga University Research and Ethical Committee. An official letter was written from the school of Graduate Studies to the Jigjiga city administration to get permission and a support letter to each respected kebeles. Informed voluntary consent was sought from each participant. For illiterate women, a right thumbprint was taken as a signature. The purpose of the study was explained to the study participants. Confidentiality of responses was also ensured throughout the research process.

RESULTS

Socio-demographic and health-related characteristics of mothers

A total of 292 mothers were participated in the study with a response rate of 100%. The majority of participant mothers (48%) were in the age range of 26-35 years. Most of them (95.2%) were biological mothers while the rest were caregivers and family members. Nearly half of the mothers (49%) were unable to read or write, 87% were married, 95% were Muslims, and 71.2% were housewives (Table 1).

Table 1. Socio-demographic and health care related characteristics of respondent mothers among children 6- to 23-mo-old from Jigjiga City Administration, Ethiopia 2021 (n=292)

Participant characteristic (s)	Frequency (n)	Percentage (%)
Relationship to child		
Biological mother	278	95.2
Caregiver (family member)	14	4.8
Age of the mother(year)		
15-25	84	28.8
26-35	141	48.3
36-45	62	21.2
≥45	5	1.7
Marital Status		
Married	254	87.0
Widowed	13	4.5
Divorced	23	7.9
Single	2	.7
Family size		
1-4	133	45.6
4-6	90	30.8
≥6	69	23.6
Religion		
Muslim	277	94.9
Christian	15	5.1
Educational Status of the mothers		
No formal Education	143	49.0
Primary Education (1-8th grade)	66	22.6
High school and above	83	28.4
Educational Status of the Father		
No formal Education	81	27.7
Primary School (1-8th grade)	39	13.4
High school and above	172	58.9
Occupation of the mother		
House wife	208	71.2
Government employed	41	14.0
Merchant	37	12.7
Others	6	2.1
Occupation of the father		
Unemployed	47	16.1
Government employed	101	34.6
Merchant	94	32.2
Farmer	22	7.5
Other employment	28	9.6
Total number of births		
1-5	182	62.3
5-10	104	35.6
≥10	6	2.1
Mother delivered at health institution	174	59.6
Sources of information for IYCF		
Health care workers	169	57.9
Mass media	100	34.2
Neighbors/friends	19	6.5
Other sources	4	1.4
Mother had an ANC visit	251	86.0
Mother had a PNC visit	106	36.3
Mother ever used contraceptive methods	269	92.12

n = 292, Child, child 6–23 months old enrolled for the study; ANC: antenatal care; PNC: Post-natal care.

More than half (62.3%) of mothers gave birth to 1-5 children and 59.6% delivered at the health facility. In this study, nearly half of the mothers (57%) got IYCF information from health professionals and 50% got an extra meal during pregnancy. The majority of them (86%) had ANC and one-third (36%) of them got postnatal Care (Table 1).

Child feeding and health-related characteristics

About 42% of the children were in the age category of 6-8 months, 56.6% were female and all children were breastfeeding. From the reported illness nearly one-third (31.5%) had diarrhea and 37% fever in the last two weeks of the survey. One hundred thirty-two children (45.2%) were fed with a cup and spoon (Table 2) and 22% of participant children met the MAD (Figure 3).

Table 2. Child feeding and health care characteristics among children 6- to 23-mo-old from Jigjiga City Administration, Ethiopia 2021(n=292)

Participant characteristic (s)	N	Percentage (%)
The child`s age in months		
6-8	123	42.1
9-11	78	26.7
12-17	58	19.9
18-23	33	11.3
Gender of the child		
Female	174	59.6
Male	118	40.4
Currently Breast Feeding	292	100
Breastfeed initiation		
Within 1 hour	108	55.4
>1 hour	87	44.6
Complementary feeding initiation time		
Before 6 months of age	81	27.7
At 6 months	137	46.9
After 6 months	69	23.6
Don`t know	5	1.7
Child had separate plate for feeding	103	35.3
Child met minimum acceptable diet	64	22
Mother received IYCF counseling	171	58.6
Updated vaccination Status	248	84.9
Child had diarrhea in the last 2 wks	92	31.5
Child had fever in the last 2 wks	108	37.0

Minimum acceptable diet practice Proportion

From total (292) children aged 6-23 months, about 64(22%) of children meet the recommended minimum acceptable diet.

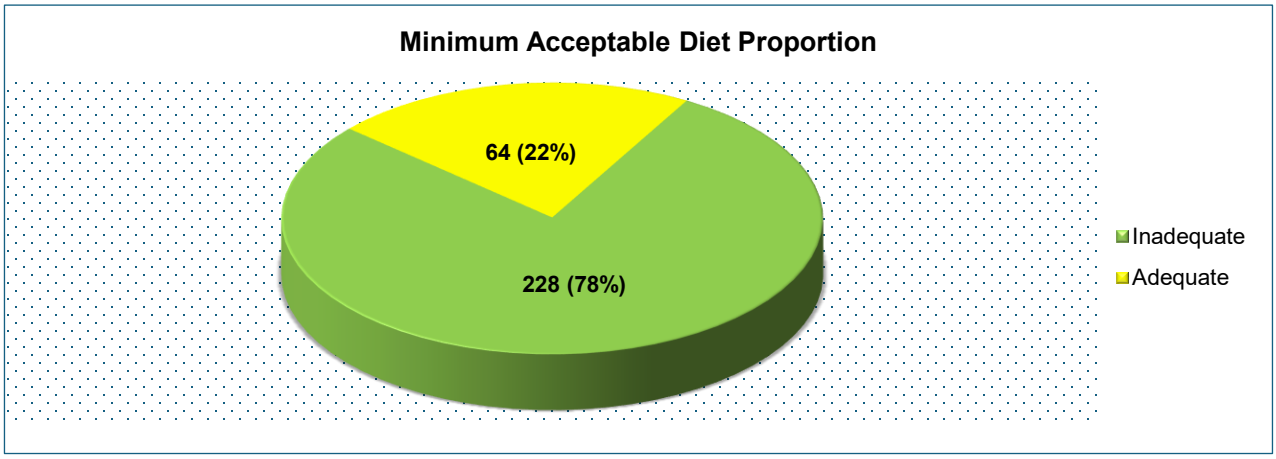


Figure 3. Proportion of minimum acceptable diet of children aged 6-23 months in Jigjiga city administration, Ethiopia 2021(n=292)

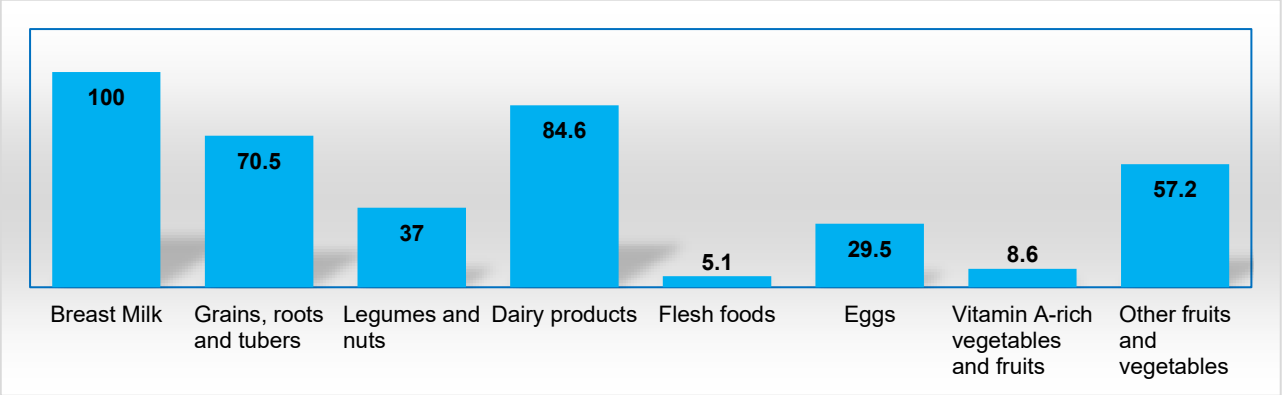


Figure 4. Food groups consumed among children aged 6-23 months in Jigjiga city administration, Ethiopia

Factors associated with the minimum acceptable diet

The binary logistic regression analysis revealed that an employed mother, a father with a higher level of education, decreased family size, less than five total number of births, institutional delivery, increased child`s age, being male gender, and a mother who received IYCF counseling were found to be positively associated with MAD and significant candidates for the multivariable model (P<0.25). However, in the multivariate logistic regression analysis, only three variables were found to be significant with minimum acceptable diet: the place of delivery, the child`s age (months), and receiving IYCF counseling. Children delivered at health facilities showed a nearly two-fold higher likelihood of meeting MAD than their counterparts [AOR=1.99, 95% CI (1.07-3.70)]. Children whose age is between 12–17, and 18-23 months were 2.6 and 3.2 times more likely to meet MAD than 6-8 month children [AOR: 2.61(1.15-5.90)] and [AOR: 3.2(1.25-8.17)], respectively. The odds of MAD among mothers with children aged 6-23 months who received IYCF counseling were 2.54 times more likely than those who did not [AOR=2.54, 95% CI (1.21-5.35)] (Table 3).

Table 3. Factors associated with minimum acceptable diet among children 6 to 23 months old from Jigjiga City Administration, Ethiopia 2021 (n=292)

Variable (s)	MAD		COR (CI95%)	AOR (CI95%)
Occupation of mother	Meet MAD, N	Not meet MAD, N		
Housewife	158(76.0)	50(24.0)	1.58(0.821-3.049)*	0.78(0.371-1.621)
Employed	70(83.3)	14(16.7)	1	1
Educational status of Father				
Formal	68(84.0)	13(16.0)	1.67(0.852-3.264)*	1.07(0.490-2.324
Informal	160(75.8)	51(24.2)	1	1
Family Size, n				
<=5	96(72.2)	37(27.8)	0.53(0.303-0.930)*	0.55(0.284-1.046)
>5	132(83.0)	27(17.0)	1	1
Total births, n				
1-5	138(75.8)	44(24.2)	1	1
>5	90(81.8)	20(18.2)	0.77(0.386-1.259)*	0.74(0.379-1.433)
Institutional delivery				
Yes	86(72.9)	32(27.1)	1.65 (0.945-2.886)**	1.99(1.069-3.704)**
No	142(81.6)	32(18.4)	1	1
Age of the child, mo				
9–11	63(80.8)	15(19.2)	1.23 (0.585-2.568)*	1.39(0.625-3.081)
12–17	41(70.7)	17(29.3)	2.14 (1.018-4.480)**	2.61(1.152-5.92)**
18–23	21(63.6)	12(36.4)	2.94 (1.251-6.925)**	3.2(1.246-8.168)**
6–8	103(83.7)	20(16.3)	1	1
Gender of the child				
Male	114(96.6%)	4(3.4%)	0.07 (0.77-0.19)*	1.99(1.069-3.704)
Female	114(65.5%)	60(34.5%)	1	1
Mother ever had IYCF counseling				
Yes	121(70.3)	51(29.7)	3.5(1.789-6.727)**	2.54(1.210-5.348)**
No	107(89.2)	13(10.8)	1	1

Notice * p-value < 0.25(COR- crude odds ratio), **p-value < 0.05, (AOR- adjusted odds ratio).

DISCUSSION

This study has assessed the proportion of MAD and associated factors among children aged 6–23 months in Jigjiga City, Somali region of Ethiopia. The proportion of children who met the MAD in the present study was 22% (n=64). These findings are consistent with studies conducted in Ethiopia and elsewhere which was 21% from the estimates of surveys of 147 countries (Lutter *et al*., 2011). The percentage of children met MAD in Nepal were 26.5% (Joshi *et al*., 2012) and 19.4% in Afar Region of Ethiopia (Fentaw *et al*., 2020). This result is lower compared with the result reported from studies conducted in Congo 33% (Kambale *et al*., 2021), Addis Ababa, Ethiopia 74.6% (Abebe *et al*., 2021), Mareka District, Southern Ethiopia 35.5% (Feleke & Mulaw, 2020), and Slums of Oromia Zones 29% (Wondu & Yang, 2017). But this result is higher compared to the report of the Ethiopian demographic and health survey 11% (Shagaro *et al*., 2021), Pakistan 8% (Khan *et al*., 2017), India 7.3% (Dhami *et al*., 2019), Nigeria 7.3% (Udoh & Amodu, 2016). This difference may be due to differences in study settings, and socio-demographic and economic characteristics of the study participants and might also be due to sampling size, study area, and period.

The present study identified factors associated with MAD that are consistent with similar studies done across Ethiopia and elsewhere. Place of delivery is one of the identified factors significantly associated with MAD showing that children born at the health facility are positively associated with meeting the MAD than their counterparts. A similar finding was reported by prior studies conducted in Ghana (Issaka *et al*., 2015), and North West Ethiopia (Birie *et al*., 2021; Mulat *et al*., 2019; Temesgen *et al*., 2018). This may be related to the fact that those mothers delivered in the health facility may get nutritional counseling by the health professionals and this can persuade them to a favorable attitude toward appropriate complementary feeding practice.

The other significant factor associated with the child feeding practice was the child's age. Those children aged one year and above showed more than double-fold likelihood to meet MAD as compared to those under one year of age. This finding is similar to the studies conducted in central Ethiopia (Molla *et al*., 2021), the Philippines (Guirindola *et al*., 2018), Uganda (Mokori *et al*., 2017), Ghana (Issaka *et al*., 2015), and Pakistan (Khan *et al*., 2017). Mothers (caregivers) in Ethiopia often complain about the lack of sufficient options for local complementary foods for a child to feed during the early age (under 1 year) of the complementary period. Commercially produced complementary foods are beyond the reach of most households (Ayele *et al*., 2022). The odds of MAD among children whose mothers received IYCF counseling were more than twofold more likely to meet MAD than those who did not. This study is in line with studies conducted in Ethiopia (Liben *et al*., 2017; Molla *et al*., 2021) and Nepal (Karn *et al*., 2019; Pokhrel *et al*., 2016). The positive association of maternal exposure to IYCF counseling could be explained in terms of the role of child-feeding counseling for the mother in increasing her knowledge and changing her attitude favorably towards appropriate child-feeding practice and this may play an important role in meeting the standard of MAD for her child.

CONCLUSION

The study revealed that the children delivered in healthcare facilities are more likely to meet the recommended MAD compared to those delivered at home. This could be due to the availability of trained healthcare professionals and access to proper nutrition support using healthcare facilities. Children who received counseling on infant and young child feeding (IYCF) were more likely to meet the recommended MAD. This highlights the importance of educating caregivers on appropriate feeding practices, which can positively impact children's nutrition. The specific age group within the 6-23 month range also influences the likelihood of meeting the recommended MAD. Further analysis is needed to understand the specific factors that affect different age groups within this range. Efforts should be made to improve access to healthcare facilities for deliveries, especially in areas with limited healthcare infrastructure. This can ensure that the children would have access to trained professionals and proper nutrition support from birth. Investing in IYCF counseling programs is crucial to improve caregivers' knowledge and practices related to infant and young child feeding. These programs should be implemented at various levels, including antenatal care, postnatal care, and community-based settings. As different age groups (within the 6-23-month range) have varying factors influencing their dietary practices, interventions should be tailored accordingly. Farther research should be conducted to identify specific barriers and facilitators for each age group, and targeted interventions should be developed to address these factors. Overall, addressing these factors can contribute to improving the proportion of children meeting the recommended MAD and ultimately enhance the nutritional status and well-being of children aged 6-23 months.

Strength

The fact that this study was carried out at the community level raises the likelihood that its findings will be applicable to the complete population from which the sample was taken. To account for all potential confounders, a multivariate logistic regression analysis was utilized in this investigation.

Limitations

The study only used a 24-hour recall method for food intake, so it's possible that the results might not correctly reflect participants' past feeding dietary habits. Additionally, there could be recall bias, and since this was a self-reported study, the minimum amount of dietary variety practice might not have been accurately recorded (social desirability bias).

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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CONTRIBUTIONS

All authors made a significant contribution to the present study. AAI conceptualized the study, developed the study design, and was involved in the analysis and write-up. ZT and AMA were involved in the analysis, writing up, and interpretation of the data. AA wrote the first draft. SMH and ZA edited the draft manuscript. All authors have reviewed the final manuscript and approved it before submission.

DATA AVAILABILITY

The data for this study are available from the first author upon reasonable request.

CONSENT FOR PUBLICATION

Not applicable.

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