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Research Article

Dietary Diversity Score of Women of Reproductive Age and Infant and Young Children and Associated Factors among Rural Dwellers in Shalla Bura District, Oromia, Ethiopia

Demelash Wachamo[1]* and Yadessa Tegene[2]

[1]*Department of Public Health, Research and Community Service Director, Paradise Valley College, West Arsi Zone, Oromia, Ethiopia*

[2]*Department of Public Health, Research and Community Service President, Paradise Valley College, West Arsi Zone, Oromia, Ethiopia*

***Address for Correspondence:** Demelash Wachamo, Department of Public Health, Research and Community Service Director, Paradise Valley College, West Arsi Zone, Oromia, Ethiopia, Tel: +251- 916 -866-654; E-mail: demmenew1@gmail.com

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ABSTRACT

Background: Dietary diversity is related to the infant evolution, maternal and child health, lower risk of chronic diseases and better academic achievement. Undernutrition is one of the leading causes of morbidity and mortality in most developing countries like Ethiopia. Hence, this study aimed to assess the Minimum Dietary Diversity Score of Women (MDDS-W) of reproductive age (15-49) and Infant and Young Child Feeding Practice (IYCF) (6-23 month) and associated factors among rural dwellers in Shalla Bura District, West Arsi Zone, Oromia, Ethiopia.

Methods: A community-based cross-sectional study was conducted among 422 mothers/care givers who had 6-23 months old child from June 01, 2019 - January, 2020. Study participants were selected by simple random sampling. Data were collected by face-to-face interview by using structured Pre-tested questionnaire. Data entry and analysis for descriptive and logistic regression models by SPSS v.23. The result declared as statistically significant at $p < 0.05$.

Results: The MDDS was 233 (56.0%), and 284 (68.3%) can't receive by mothers/ caregivers and their IYC, respectively. Mothers who were not working currently [AOR 4.55, 95% CI: 2.16, 9.61], no formal education [AOR 2.69, 95% CI: 1.49, 4.90] and involved in decision making [AOR 2.49, 95% CI: 1.15, 5.41] were associated with not having MDDS-W. The Infants and children born from mothers who had two or more under five children, illness in the last week, and whose mother had no formal education were significantly associated with not having MDDS as compared with their counter parts.

Conclusions: There was a low consumption of the MDDS among mothers/caregivers and their IYC. Which needs improvement and action to promote health and to reduce the risk of the malnutrition. Health officials and clinicians needs to emphasis on pertinent health education on feeding sick child, family planning and mother's participation on decision making at household.

Keywords: Minimum dietary diversity Score; Mothers/ Caregivers; IYC; Shalla bura district; Ethiopia

ABBREVIATIONS

AOR: Adjusted Odds Ratio; COR: Crudes Odds Ratio; DDS: Dietary Diversity Score; ETB: Ethiopian Birr; IYCF: Infant and Young Child Feeding; MDD-W: Minimum Dietary Diversity for Women of Reproductive Age; SPSS: Statistical Package for Social Science; UNICEF: United Nations International Children's Emergency Fund; WHO: World Health Organization

BACKGROUND

Adequate nutrient intakes among women of reproductive age are important determinants of maternal and child health outcomes [1]. The world faces challenges from malnutrition of all forms, with one in three people being directly affected by underweight, vitamin and mineral deficiency [2]. Lactating women who do not get enough energy and nutrients in their diets risk maternal depletion [3]. Undernutrition is a situation in which the body's requirements are not met, due to under consumption, or to impaired absorption and use of nutrients [4]. Globally, only a few children are receiving nutritionally adequate and diversified foods. In many countries, less than one fourth of infants aged 6-23 months meet the criteria for dietary diversity and feeding frequency [5].

Globally in 2017, WHO estimated 5.4 million children aged under 5 years died, out of this 1.6 million at age 1-11 months, among this 45% of deaths contributed by nutrition-related factors [6]. In addition, undernutrition causes irreversible damage to physical, mental, and social development of the child transcending into reduced intellectual potential at adulthood [7,8].

However, Ethiopia working towards the 'Seqota' Declaration aims to end hunger and undernutrition by 2030 [9]. More than 90% of countries in almost all regions were implementing nutrition programs targeting "the first 1000 days" and beyond; (i.e. pregnant and lactating women, infants and young children, preschool-age children and school-age children) [2]. In developing countries like Ethiopia, low socio-economic status, poor water supply and sanitation, and high infectious diseases burden were major contributing factors under nutrition [10,11].

A study report in Ethiopia indicates, undernutrition is still major public health problem [12,13]. A study findings indicates 52% in Angecha District [14], and 56.4% lactating mothers had low dietary diversity in Aksum town, Tigray, Northern Ethiopia [15]. On other hand Mother who had children age 6-23 months only 27.3% Wolaita Sodo [16] and 28.5% bale zone south east Ethiopia had a minimum Dietary Diversity Score (DDS) [17]. Women in the reproductive age group and children are most vulnerable to malnutrition due to low dietary intakes, inequitable distribution of food within the household, improper food storage and preparation, dietary taboos, infectious diseases, and care [18]. Also, Mothers are not still relieved of their customary domestic duties but rather are double burdened with the job and their domestic responsibilities as primary parent, caregiver and housekeeper [10].

According to the Ethiopia demographic health survey in 2019, the children who are currently breastfed decreases from 85% among children age 12-17 months to 76% among children age 18-23 months [19]. There is regional variation and not studied in the study area. Hence, this study was designed to assess the dietary diversity score and its associated factors among mothers and their infants and young children (6-23 month) in rural communities. These study findings can be helpful evidence in planning sound interventions to reduce the malnutrition among infant and young child and its determinant factors which can be used for public health officials, clinicians, and health planners to reduce the impacts of malnutrition.

MATERIALS AND METHODS

Study setting and design

This study was conducted in Shalla district of West Arsi Zone of Oromia Region. It is 30 km from Shashemene and 279 km from capital Addis Ababa. The district is composed of 38 rural Kebeles and the capital, Ajje. The elevation of the district is estimated to be in the range between 1000 and 2300 m above sea level. The study design was community-based cross-sectional study and conducted from June 01, 2019 - January, 2020.

Study population and eligibility criteria

The source population of the study was all reproductive age women and Infant and Young children (6-23month) among rural dwellers in Shalla Bura District. While, all randomly selected mothers/care givers who had 6-23months of child, and available on the study period was considered as the study population.

All randomly selected mothers/care givers who had 6-23 months old child, can gave informed consent, and who lived in the area for six or more months and were available on the study period were included in the study. Those mothers who were unable to respond due seriously ill, and care givers older than 49 years old were excluded from the study.

Sample size and sampling procedures

The sample size (n) was calculated using the following single population proportion formula based on the assumption of (p) 28.5% of IYCF in bale zone [17], and 52% of DDSW and Angecha District Ethiopia of Southern Ethiopia [14], 95% Confidence Interval (CI) (1.96), 5% margin of error (d), and adding 10% contingency.

$$n = \frac{(1.96)2(0.52)}{(0.48)} \quad 0.052$$

$$n = (Z_{1-\alpha/2})^2 \frac{P[1-P]}{d^2}$$

$n = 383 + 10\% (38.3) = 421.3 \approx 422$

Therefore, the required sample size was $n = 422$ were calculated for the study.

A simple random sampling technique was employed to select study participants. The sampling frame was prepared by reviewing health post family folder and records from all 38 kebeles of the district. A total of 4282 mothers/care givers who had 6-23 months of child were identified through reviewing health post family folder and record form. Finally, 422 lactating mothers were selected by using computer-generated random number method selected mothers/care givers who had 6-23 months aged child were interviewed.

Data collection tools, and procedures

The data were collected through an interview by pre-tested, and structured questionnaires. Socio-demographic and other determinants were assessed. The questionnaires were translated into the local language and validated before the study time was done outside of the study area and necessary modifications were done based on the findings. Anthropometric measurements like (HFA Z score, LFA Z score, BMIZ sore) were collected from the selected children using well-calibrated weighing scale and height measuring board. A survey was carried out by trained data collectors, nurses. Principal investigators and supervisors follow the data collection process and check them for consistency and completeness.

The Minimum Dietary Diversity Score (MDDS) assessment were done by using a 24 hours recall method, and the score is used to indicate a micronutrient adequacy of the diet of the infant and young child [20]. DDS were validated for several age/sex groups as proxy measures for both macro and micronutrient sufficiency [21]. The tool uses an open recall method to gather information for all food groups and drinks consumed in last 24 hours. Mothers of infants and young children were asked to list out food groups and drinks consumed by their children in the previous 24 hours. Prior to the survey. The MDDS was computed based on 10 food groups which contains grains, roots and tubers; grains, white roots and tubers, and plantains, pulses (beans, peas and lentils), nuts and seeds, dairy, meat, poultry and fish, eggs, dark green leafy vegetables, other vitamin a-rich fruits and vegetables & other vegetables. Likewise, the minimum meal frequency practice of infants and young children was estimated by using a 24 hours recall technique. Mothers of children were asked to count their children's meal frequency in the past 24 hours [21].

Data analysis

Data entry, cleaning, and analysis were done by SPSS V. 23. Descriptive analysis including frequency distribution and the percentage was made to determine the level of Women DDS and Infant and Young children DDS, to describe socio-economic and demographic and other determinants. Bivariate logistic regression analysis was conducted for Crude Odds Ratio (COR) and all factors with $p < 0.25$ were candidate to a multivariable logistic regression to control confounding effects. The hosmer -lemeshow goodness-of-fit statistic was used to assess whether the necessary assumptions for the application of multiple logistic regression are fulfilled. Adjusted Odds Ratios (AOR) with 95% Confidence Intervals (CI) were used to measure strength of the association between outcome variables and its determinant factors. Finally, $p < 0.05$ declared a significant association.

Operational definitions

Minimum dietary diversity for women of reproductive age (MDD-W): Diet diversity and meal frequency of the household were assessed using 24 hours recall method. The food groups of the household were assessed based on cereals, roots/tubers, vegetables, fruit, meat and meat product, fish and fish shells, egg, legumes/pulses, milk and milk products, fats and oils, sugar and honey and condiments intake. The proportion of women 15-49 years of age who consumed food items from at least five out of ten defined food groups the previous day or night.

Minimum meal frequency: Minimum is defined as proportion of children aged 6- 23 months, who receive solid, semi-solid, or soft foods at the minimum numbers of two and three times for children aged 6-8 months, and 9-23 months respectively [21].

Minimum dietary diversity score: Is proportion of infants and young children aged 6-23 months who received foods and drinks from 4 and more food groups in the previous 24 hours, Consumption of any amount and quality of food from each food group was sufficient to 'count' [21].

RESULTS

Socio-demographic characteristics

A total of 416 participants were interviewed yielding a response rate of 98.6%. The mean of participant's mother in completed year's age was 30 with standard deviation of (± 6.4) years and dominate age group were 25-29 it accounts about 157 (37.7%). About 170 (40.9%) participants were in the age range of 25-29 years. Regarding to the educational status of the mother 169 (40.6%) were had elementary school, while 85 (20.4%) were had no formal education. Out of the study participants 172 (41.3%) housewife and 127 (30.5 %) merchant by occupation. More than half 239 (57.5%) had more than four family size, while 202 (48.6%) two and 142 (34.1%) three and more under five years aged children, respectively (Table 1).

Dietary diversity score of mothers

Out of 416 study participants, the mean dietary diversity score of food groups was 4.3 with standard deviation (± SD) of (± 1.36). The mothers/ caregivers were consumed, grains white roots tubers (95.4%), pulses beans peas and lentils (59.4%), and other vegetables (61.8%) were consumed frequently. Mothers/ caregivers who cannot received MDDS-W was 233 (56.0%), 95% CI: (51.2-60.7) (Table 2).

Infant and young child MDDS

The mean DDS of food groups consumed by Infant and Young Child (IYC) was 3.2 with (± SD) (± 1.11). The IYC were consumed, grains white roots tubers (93.0%), milk and milk product (94.0%), another fruit and vegetable (42.8%) were consumed frequently. Out of this, 284 (68.3%), 95% CI: (63.7-72.6) IYC were cannot received MDDS (Table 3).

Out of 416 participants. The meal frequency of IYC consumed, (28.1%) only once, (19.2%) twice, (44.0%) three times, and (8.7%) were consumed four and more times per a day. The proportion of children who cannot received minimum meal frequency found to be 38.5%. Among this, 16 (25.0%) were 6-8 months and 144 (40.9%) were 9-23 months aged IYC were did not received minimum meal frequency (Figure 1).

Factors affecting MDDS-W

In the multivariate analysis mothers who were not working currently [AOR 4.55, 95% CI: 2.16, 9.61], no formal education [AOR 2.69, 95% CI: 1.49, 4.90] and involved in decision making [AOR 2.49, 95% CI: 1.15, 5.41] were remained associated with MDDS-W after controlling for other predictors in the model (Table 4).

Factors affecting MDDS of 6 to 23 months IYC

The Infants and children born from mothers who had two or more under five children were more frequently did not received MDDS, had two [AOR 2.03, 95% CI: 1.08, 3.80] and three and more

Table 1: Socio-demographic characteristics of respondents, Shalla Bura District, Oromia, Ethiopia, 2020.

Variable	Category	No.	(%)
Age of the respondent			
	18-24 years	103	(24.8)
	25-34 years	157	(37.7)
	35 or above years	156	(37.5)
Marital status of respondents			
	Married	372	(89.4)
	Single	14	(3.4)
	Divorced	10	(2.4)
	Separated	20	(4.8)
Educational status of the Mother			
	No formal education	85	(20.4)
	Elementary School	169	(40.6)
	High School or Above	162	(38.9)
Occupation of mothers			
	Student	28	(6.7)
	House wife	172	(41.3)
	Merchant	127	(30.5)
	Gov't employed	40	(9.6)
	Privat employee	39	(9.4)
	Farmer	10	(2.4)
Family size			
	≤ 4	177	(42.5)
	> 4	239	(57.5)
No of < 5 children			
	One	72	(17.3)
	Two	202	(48.6)
	Three and above	142	(34.1)
Age if Infant/Child			
	≤ 12 months	169	(40.6)
	> 12 months	247	(59.4)

Table 2: Dietary diversity score of mothers/ caregivers in Shalla Bura District, Oromia, Ethiopia, 2020.

Food groups (*n* = 416)		Freq.	(%)
Grains white roots tubers		397	(95.4)
Pulses beans peas and lentils		247	(59.4)
Nuts and seeds		67	(16.1)
Milk and milk product		176	(42.3)
Meat poultry fish		152	(36.5)
Eggs		81	(19.5)
Dark green leafy vegetables		184	(44.2)
Vit A rich fruit and vegetable		107	(25.7)
Other vegetables		257	(61.8)
other fruits		138	(33.2)
MDDS	*Meet*	*183*	*(44.0)*
	Unmeet	*233*	*(56.0)*
Mean (± SD)		*4.27(± 1.321)*	

Table 3: Dietary diversity score of infants and young children in Shalla Bura District, Oromia, Ethiopia, 2020.

Food groups (*n* = 416)		Freq.	(%)
Grains roots tubers		387	(93.0)
Legumes and nuts		133	(32.0)
Milk and milk product		391	(94.0)
Flesh foods		30	(7.2)
Egg		141	(33.9)
Vitamin A fruit & vegetable		84	(20.2)
Another fruit and vegetable		178	(42.8)
MDDS-IYC	Meet	132	(31.7)
	Unmeet	284	(68.3)
Mean (± SD)		3.2 (± 1.11)	

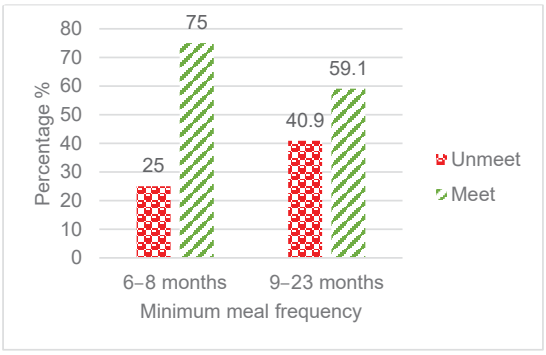

Figure 1: Minimum meal frequency of infants and young children in Shalla Bura District, West Arsi Zone, Oromia, Ethiopia, 2020.

Table 4: Bivariable and multivariable logistic regression analysis of MDDS-W factors in Shalla Bura District, Oromia, Ethiopia, 2020. (*n*= 416).

	MDDS-W						
	Unmeet		Meet				
	No. (%)		No. (%)		COR (95% CI)	AOR (95% CI)	*P* - Value
Family size							
≤ 4	83	(46.9)	94	(53.1)	1	1	
> 4	150	(62.8)	89	(37.2)	1.91 (1.29, 2.83)	1.52 (0.93, 2.48)	0.096
No of < 5 children							
One	102	(50.5)	100	(49.5)	1	1	
Two	37	(51.4)	35	(48.6)	1.92 (1.23, 2.99)	1.46 (0.85, 2.50)	0.172
Three and above	94	(66.2)	48	(33.8)	1.85 (1.04, 3.30)	1.45 (0.75, 2.82)	0.273
Age if Infant/Child							
≤ 12 months	110	(65.1)	59	(34.9)	1.88 (1.26, 2.81)	1.32 (0.85, 2.05)	0.211
> 12 months	123	(49.8)	124	(50.2)	1	1	
Mother's work							
Currently not working	114	(69.1)	51	(30.9)	2.48 (1.64, 3.75)	4.55 (2.16, 9.61)	< 0.001*
Currently working	119	(47.4)	132	(52.6)	1	1	
Educational status of the Mother							
No formal education	59	(69.4)	26	(30.6)	2.33 (1.34, 4.05)	2.69 (1.49, 4.90)	0.001*
Elementary School	94	(55.6)	75	(44.4)	1.81 (1.04, 3.15)	1.59 (0.89, 2.83)	0.119
High School or Above	80	(49.4)	82	(50.6)	1	1	
Decision making at household							
Mothers involved	79	(63.7)	45	(36.3)	1.57(1.02, 2.42)	2.49(1.15, 5.41)	0.021*
Mothers not involved	154	(52.7)	138	(47.3)	1	1	

NB: *statistically significant on multivariate analysis *p*- 0.05, **COR:** Crude Odds Ratio, **AOR:** Adjusted Odds Ratio, **CI:** Confidence Interval, **1:** reference.

Table 5: Bivariable and multivariable logistic regression analysis of MDDS-IYC in Shalla Bura District, Oromia, Ethiopia, 2020. (*n* = 416).

	MDDS-IYC						
	Unmeet		Meet				
	No. (%)		No. (%)		COR (95% CI)	AOR (95% CI)	*P* - Value
Family size							
≤ 4	105	(59.3)	72	(40.7)	1	1	
> 4	179	(74.9)	60	(25.1)	2.05 (1.35, 3.11)	1.58 (0.92, 2.72)	0.095
No of < 5 children							
One	40	(55.6)	32	(44.4)	1	1	
Two	130	(64.4)	72	(35.6)	2.26 (1.36, 3.73)	2.03 (1.08, 3.80)	0.028*
Three and above	114	(80.3)	28	(19.7)	3.26 (1.75, 6.07)	2.70 (1.29, 5.67)	0.009*
Age if Infant/Child							
≤ 12 months	145	(58.7)	102	(41.3)	1	1	
> 12 months	139	(82.2)	30	(17.8)	3.26 (2.04, 5.21)	2.62(1.57, 4.35)	<0.001*
Child illness in the past 1 week							
No	231	(64.9)	125	(35.1)	1	1	
Yes	53	(88.3)	7	(11.7)	4.10 (1.81, 9.28)	4.04(1.68, 9.73)	0.002*
Education status of respondents							
No formal education	71	(83.5)	14	(16.5)	2.98 (1.55, 5.75)	2.99 (1.44, 6.22)	0.003*
Elementary School	111	(65.7)	58	(34.3)	2.65 (1.38, 5.10)	2.44 (1.18, 5.08)	0.017*
High School or Above	102	(63.0)	60	(37.0)	1	1	
Mother's work							
Currently not working	172	(71.1)	70	(28.9)	1.36 (0.90,2.06)	1.53 (0.94, 2.49)	0.086
Currently working	112	(64.4)	62	(35.6)	1	1	
Decision making at household							
Mothers involved	106	(85.5)	18	(14.5)	3.77 (2.17, 6.55)	2.65 (1.45, 4.84)	0.002*
Mothers not involved	178	(61.0)	114	(39.0)	1	1	

[AOR 2.70, 95% CI: 1.29, 5.67] as compared with only one under five child. Infants and children who had illness in the last week, [AOR 4.04, 95% CI: 1.68, 9.73] and whose mother had no formal education mothers [AOR 2.99, 95% CI: 1.44, 6.22] were significantly associated with not having MDDS as compared with their counter parts after controlling for other predictors in the model (Table 5).

DISCUSSION

This community-based cross-sectional study revealed that the Minimum Dietary Diversity Score (MDDS) was 56.0% and 68.3% were cannot received by mothers/caregivers and their IYC, respectively. This means majority of the mothers/caregivers and their IYC cannot received MDDS. The mean DDS among the lactating women was 4.3 and 44%, 95% CI: (39.3-48.8) were had MDDS-W. While, mothers/caregivers who cannot received MDDS-W was 56.0%, 95% CI: (51.2-60.7). This result consistent with Angecha District, southern Ethiopia [14], and Tigray, Northern Ethiopia [15]. This result are lower than Vietnamese mothers and Bangladesh [22,23].

This study result indicates that, the Mean DDS of food groups consumed by infants and young children (6-23month) was 3.2 and 31.7% were received MDDS. While, 68.3% IYC were cannot received MDDS. In addition to this, the proportion of children who cannot received minimum meal frequency found to be 38.5%. This can explain that only one fourth of infants aged 6-23 months meet the criteria for dietary diversity and feeding frequency. This result consistent with 32.6% Delhi, India [24], 27.3% Wolaita Sodo [16] and 28.5% south east Ethiopia [17]. This result lower than 56% Gorche district, Southern Ethiopia [25] and West Bengal 43.4% [26]. This difference might be which include socio-demographic factors, low awareness and other seasonal and cultural difference in ways of traditional food preparations among study population. In addition to this may due to lack nearby market access, lack media access to get different advice about dietary diversity.

The study finding revealed that, mothers who were not working currently, had no formal education and involved in decision making were not having MDDS-W and feeding their children. This can be explained mothers and children are the most vulnerable to MDDS due to, low family income, low educational level and low occupational status, frequent round delivery and culture and work over load in the house hold, and low family encouragement [27-20]. Similarly, reported from Punjab, India [30]. This may be due to education status, occupational status and involved in decision making of participants may affect dietary diversity because of lack information about how they prepare their daily dishes as they know in traditional way of food preparations. In addition to this they had no right to access their resource and money to buy what they need, due to male or husband dominant at household culturally.

The Infants and children born from mothers who had two or more under five children, illness in the last week were significantly associated with not having MDDS. This can be explained children who were born in two or more under five children were face a challenge to get MDDS due to number of the priorities to feed all under five children and computation with elder children, and many numbers of children have high demand of foods that the low-income households that may lead to low access to adequate dietary intake in kinds and the amounts. The finding was in line with the studies conducted in Kenya [31] and in Ethiopia [32]. This may be due to increment of food prices, decreased purchasing power of the family and also shortage of other important food groups on the study area like fruits, Legumes, nuts, flesh foods, eggs, vitamin A fruit and vegetable.

In general, this study result shows, there was a low consumption of the minimum dietary diversity among mothers/caregivers and their IYC. Which needs improvement and action to promote health and to reduce the risk of the malnutrition. This implies that a lot has to be done on awareness creation about the proper consumption of the MDDS on different strategies to a rural community with an affordable cost. Poor family planning, maternal education, employment or involving mother on decision making needs attention to improve rural community health. To improve the consumption of the MDDS also needs some strategies like providing nearby market for unavailable food groups (fruits, nuts, and flesh foods) around study area. Health officials and clinicians needs to emphasis on pertinent health education on feeding sick child, family planning and mother's participation on decision making at household. It also needs better strategies to strength women education and employment in study area. Therefore, additional programs and interventions should be designed and implemented conjointly to address low dietary diversity.

LIMITATION

There might be a potential BIAS for recall and social desirability in the infant and young child feeding practice and socioeconomic. In addition to this, the odds ratios of the cross-sectional study did not show the strength of an association. We did no attempt to address seasonal variation which can affect food availability that can in influence MDDS.

CONCLUSION

This study result shows that the consumption of the minimum dietary diversity among mothers/caregivers and their IYC was low. Mothers who were not working currently, had no formal education and involved in decision making were not having MDDS-W and feeding their children. Also, the Infants and children born from mothers who had two or more under five children, illness in the last week were significantly associated with not having MDDS. It needs improvement and action to promote health and to reduce the risk of the malnutrition.

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