Heliyon 9 (2023) e17560

Contents lists available at ScienceDirect

Heliyon

journal homepage: www.cell.com/heliyon

Determinants of meeting the minimum acceptable diet among children aged 6 to 23 months in Bangladesh: Evidence from a national representative cross-sectional study

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ARTICLE INFO

Keywords:
IYCF
Minimum acceptable diet
Children
Determinants
Infants and child feeding practices
Bangladesh

ABSTRACT

Background: Minimum acceptable diet (MAD) is a core indicator of infant and child feeding practices (IYCF). Meeting the MAD is essential to enhance the nutritional status of children aged 6–23 months.
Objective: To identify the determinants of meeting the MAD among children aged 6–23 months in Bangladesh.
Methods: The study was based on a secondary dataset of the 2017–2018 Bangladesh Demographic and Health Survey (BDHS 2017–18). Complete (weighted) data from 2,426 children aged 6–23 months were analyzed.
Results: The overall percentage of meeting the MAD was 34.70%, whereas, in terms of urban and rural, it was 39.56% and 32.96%, respectively. Age of the children 9–11 months [Adjusted odds ratio (AOR) = 3.54; 95% CI: 2.33–5.4], 12–17 months [AOR = 6.72; 95% CI: 4.63–9.77], and 18–23 months [AOR = 7.12; 95% CI: 1.72–5.98], the maternal primary [AOR = 1.75; 95% CI: 1.07–2.86], secondary [AOR = 2.3; 95% CI: 1.36–3.89], and higher education [AOR = 3.21; 95% CI: 1.72–5.98], currently working mothers [AOR = 1.45; 95% CI: 1.13–1.79], mothers' access to mass media [AOR = 1.29; 95% CI: 1–1.66], and at least four antenatal care (ANC) from medically skilled providers [AOR = 1.74; 95% CI: 1.39,2.18] were independent determinants of meeting the MAD.
Conclusions: Many children are still far behind in meeting the MAD. Nutritional interventions like improved nutrition recipes, nutrition education and homemade food supplementation, nutritional counseling by home visits, community mobilization, health forums, antenatal and postnatal sessions, and media campaigns on IYCF are needed to meet MAD practice.

1. Introduction

A minimum acceptable diet (MAD) that combines minimum meal frequency (MMF) and minimum dietary diversity (MDD) is one of the core indicators used to assess infant and young child feeding (IYCF) practices [1]. According to the World Health Organization

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https://doi.org/10.1016/j.heliyon.2023.e17560
Received 8 March 2022; Received in revised form 19 June 2023; Accepted 21 June 2023
Available online 22 June 2023

(WHO), MAD is the rate of children aged between 6 and 23months who achieved MDD and MMF in the last 24 h [1]. The MMF is an alternative indicator for energy requirements, whereas the MDD is a proxy for sufficient micronutrient density of foods [2]. Along with numerous aspects of baby feeding that consider both macro and micronutrient requirements, MAD evaluates the volume of food consumed in the most recent day or night and the adequacy of micronutrients. However, MDD and MMF only assess one aspect of a child's nutrition [3]. Complementary feeding is the process of introducing additional foods along with breastfeeding after six months of age among children, as breast milk is insufficient to meet the additional nutritional requirements of children after six months [4,5]. To meet the dietary demands of children, timely initiation of complementary feeding and an adequate amount of diversified foods are necessary as it promotes proper growth, health, and development [6].

Children and newborns are more prone to malnutrition, which commonly leads to child morbidity and death [2]. Stunted growth, limited cognitive development, and micronutrient deficiencies result from inappropriate feeding practices as well as lower MAD [7–10]. Early childhood stunting has had negative long-term implications on health, physical development, earning potential, learning, and cognitive growth [11]. Due to a lack of MAD, even though optimal breastfeeding, children could be stunted, whereas complementary feeding can prevent stunting among children 6–23 months by 20% [12,13]. According to previous studies, children with MDD have a lower risk of being stunted, and sustained breastfeeding for two years beyond six months ensures optimal growth and development as well as long-term health [7,14]. Possible positive outcomes of consuming acceptable dietary standards are promoted growth, improved cognitive development, higher school performances, decrease the risk of non-communicable disease, increased body immunity system, and productivity during adulthood [15,16]. Achieving MAD is essential to enhance growth, macronutrient, and micronutrient deficiencies [14].

In Bangladesh, a developing nation, malnutrition is a severe public health problem. According to the Bangladesh Demographic and Health Survey (BDHS) 2017–18, just 35% of children aged six to 23 months met the MAD, while the percentages of stunting, wasting, and underweight among children under the age of five are 31%, 8%, and 22%, respectively [17]. However, MAD depends on numerous factors, including individual and community levels [6]. Furthermore, indicators of MAD are quite critical. Previous studies found that children's age, wealth index of the family, maternal education, working status of the mother, number of living children in the family, total family members of the family, mass media access of the mother, antenatal care (ANC) visits of the mother, and delivery place and type were independent predictors of MAD [2,6,7,18–20]. The MAD has become a significant challenge in Bangladesh, as it is in other developing nations. Several studies were conducted to determine the factors associated with IYCF practices collectively, with limited evidence of predictors of MAD in Bangladesh [21,22]. Nevertheless, all previous research, with the exception of MAD, uncovered stagnant trends in complementary feeding practices. Meanwhile, a recent study based on National Food Security and Nutrition Surveillance 2018-19 data suggested an increased trend in MAD, albeit not investigating the causes linked with MAD [23]. As a result, it has become crucial to identify possible MAD predictors to better understand this increasing pattern. Therefore, this particular study aimed to determine the factors associated with MAD among children aged 6–23 months using a recent nationally representative cross-sectional study.

2. Methods

2.1. Source of data and sample size

Our study was based on a nationwide cross-sectional study of the BDHS 2017-18 dataset, and data were collected from October 2017 to March 2018 [24]. The BDHS 2017-18 survey used two-stage stratified household sampling in which six types of questionnaires were used: (1) the Household Questionnaire, (2) the Woman's Questionnaire (completed by ever-married women aged 15–49), (3) the Biomarker Questionnaire, (4) two verbal autopsy questionnaires to collect data on causes of death among children under age 5, (5) the Community Questionnaire, and (6) the Field worker Questionnaire of data collection. For this study, we used the children's data file, which had a total sample size of 8,759 under-five children. However, after cleaning the missing data, our study's final (weighted) sample size was 2426. We only considered the youngest children, aged 6–23 months, who were living with their mothers in this study for our analysis.

2.2. Outcome variable

The MAD was the outcome variable in this study. The MAD was calculated by the proportion of children aged 6–23 months who met both MDD and MMF [25]. The MAD indicator was expressed as a dichotomous variable categorized as "meeting the MAD" and "not meeting the MAD".

MDD is met when the children aged 6–23 months consumed at least four food groups among the seven food groups on the previous day. The seven food groups are (1) grains, roots, and tubers, (2) legumes and nuts, (3) dairy products (milk, yogurt, cheese), (4) flesh foods (meat, fish, poultry, and liver/organ meats), (5) eggs, (6) vitamin-A rich fruits and vegetables, and (7) other fruits and vegetables [26].

MMF is met when the breastfed and non-breastfed children consume solid, semi-solid, or soft foods (but also include milk feeds for non-breastfed children) a minimum number of times. The minimum times vary depending on the children's age. For children who are breastfed, MMF is two times for children aged 6–8 months and three times for children aged 9–23 months in a day, and for non-breastfed children aged 6–23 months, MMF is four times a day [25].

2.3. Independent variables

Several background characteristics and socio-demographic variables of the respondents studied elsewhere were considered independent variables [2,6,7,18–20]. Those were the type of resident, wealth index of family, number of living under-five children in the family, gender of the children, age of children, birth order, mothers and fathers' educational qualifications, working status of the mother, mass media access by mother, number of ANC visits, and delivery type.

2.4. Statistical analysis

Statistical analyses were conducted as per the guidelines of the *Guide to DHS statistics* for conducting data analysis [27]. A sampling weight was applied to assure data representation at the national level. To calculate the percentages of independent variables, descriptive analysis was used. Furthermore, a chi-square (χ^2) test was performed to identify the association between the independent variables and the dependent variable. A logistic regression model was run containing the variables found to be significantly associated with the chi-square (χ^2) test. Both unadjusted and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. The Hosmer-Lemeshow test was conducted to test the goodness of fit of the final model. The test result was insignificant ($p = 0.54$), which indicates the final model is a good fit [28]. The multicollinearity of the predictors was assessed by the correlation matrix and showed that the correlation coefficient among the predictors was less than 0.90, which showed that there is no multicollinearity among the predictors [29]. All sorts of statistical analyses were performed by Stata 14.0 (Stata Corp, College Station, TX, USA) software. The significance level was set at $p < 0.05$.

2.5. Ethical approval

No ethical consideration was needed for this study as the data were based on publicly available secondary data obtained from the BDHS 2017–18. The data files are freely available from the Demographic and Health Surveys (DHS) website (https://dhsprogram.com/data/available-datasets.cfm). Access to the dataset was given for analysis. Ethics approval for the original Bangladesh DHS was obtained from the ICF International institutional review board. All participants had given their informed consent.

3. Results

3.1. Demographic information of the studied population

Demographic data for the study population are shown in Table 1 below. The children who were examined were 14.43 months old on average (standard deviation, SD: 5.08). Additionally, the mean age of mothers was 24.71 years, with a SD of 5.59. The maximum number of children was 9, but the average number of people per family ranged between 2 and 30. The average number of ANC visits was 3.84 (SD 2.89), with zero and twenty being the minimum and greatest numbers.

3.2. Background characteristics of the study population

Overall, 34.70% of children met the MAD. Below Table 2 represents the background characteristics of children based on MAD. Most children were from rural areas (73.53%), whereas only about one-fourth (26.47%) were from urban areas. Among urban children, the percentage of MAD was slightly higher than rural children. Four in every ten children belong to a poor family. However, the MAD was more than 40% among rich families' children, whereas it was lowest among poor (28.36%) children. About three-fourths (74.42%) of the total children residing in the family have up to two living under-five children. The rates for having MAD were lower among the children who live in a family consisting of three or more living children. In this study, the percentage of boy and girl children was 52.24% and 47.76%, respectively. However, the rates of children of both sexes meeting MAD were essentially equal. The prevalence of MAD rose along with the average age.

Table 2 also showed that below ten percent of mothers were illiterate (6.21%), whereas nearly half of the mothers had up to secondary level (49.05%) of schooling. As maternal educational qualifications increased, the rates of having MAD significantly rose. Half of the children (50.91%) whose mothers had an academic background of a higher level met the MAD. However, the percentages

Table 1
Demographic information of the study population.

Variable	Mean	SD	Minimum	Maximum
Age of children (months)	14.43	±5.08	6	23
Maternal age (years)	24.71	±5.59	15	49
Number of living children	2	±1.08	1	9
Total family member	6.06	±2.66	2	30
Number of ANC	3.84	±2.89	0	20

SD= Standard Deviation.
ANC = Antenatal Care.

Table 2
Background characteristics of the study population (n = 2426) based on MAD.

Variables	Minimum Acceptable Diet			
	Overall n = 2426	No (%) n = 1584 (65.30)	Yes (%) n = 842 (34.70)	*p*-value
Type of residence				
Urban	642 (26.47)	388 (60.44)	254 (39.56)	***0.005****
Rural	1784 (73.53)	1196 (67.04)	588 (32.96)	
Wealth Index of Family				
Poor	1016 (41.86)	728 (71.64)	288 (28.36)	***<0.001****
Middle	447 (18.42)	300 (67.21)	147 (32.79)	
Rich	963 (39.72)	556 (57.73)	407 (42.27)	
Number of living children				
Less than 3 children	1805 (74.42)	1151 (63.76)	654 (36.24)	***0.029****
3 or more children	621 (25.58)	433 (69.77)	188 (30.23)	
Gender of Children				
Male	1267 (52.24)	831 (65.61)	436 (34.39)	*0.761*
Female	1159 (47.76)	753 (64.95)	406 (35.05)	
Age of Children				
6–8 months	383 (15.79)	343 (89.50)	40 (10.50)	***<0.001****
9–11 months	422 (17.40)	308 (73.00)	114 (27.00)	
12–17 months	851 (35.09)	491 (57.64)	360 (42.36)	
18–23 months	769 (31.72)	442 (57.49)	327 (42.51)	
Mothers Educational Level				
No education	151 (6.21)	127 (84.14)	24 (15.86)	***<0.001****
Primary	652 (26.86)	471 (72.22)	181 (27.78)	
Secondary	1190 (49.05)	774 (65.03)	416 (34.97)	
Higher	434 (17.87)	213 (49.09)	221 (50.91)	
Fathers' Educational Level[a]				
No education	321 (13.44)	242 (75.37)	79 (24.63)	***<0.001****
Primary	835 (34.88)	574 (68.74)	261 (31.26)	
Secondary	783 (32.72)	519 (66.31)	264 (33.69)	
Higher	454 (18.97)	226 (49.91)	228 (50.09)	
Respondents Currently Working				
No	1530 (63.05)	1020 (66.67)	530 (33.33)	*0.11*
Yes	896 (36.95)	564 (62.96)	332 (37.04)	

[a] Variable have missing values; ***$p < 0.001$; **$p < 0.05$.

were lowest for children whose mothers had no formal education, than for those whose mothers had only elementary and secondary education. Similarly to that, children whose fathers had the lowest category of educational credentials had the lowest rate of MAD. In contrast, it was highest among those children who had fathers of higher educated. Though only 36.95% of mothers had a job, the rates of meeting MAD were higher among their children (37.04%) than the housewives (33.33%).

3.3. Maternal characteristics of the study population

The maternal characteristics of the group under study are shown in Table 3. Most of the children in this study were firstborn (37.16%) followed by second birth (34.01%) and three or more (28.83%). However, the rates of having MAD were highest among

Table 3
Maternal characteristics of the study population (n = 2426) based on MAD.

Variables	Minimum Acceptable Diet			
	Overall n = 2426	No (%) n = 1584 (65.30)	Yes (%) n = 842 (34.70)	*p*-value
Birth Order				
First birth	901 (37.16)	552 (61.27)	349 (38.73)	***0.013****
Second birth	825 (34.01)	547 (66.32)	278 (33.68)	
3 or more	699 (28.83)	485 (69.28)	214 (30.72)	
Mothers' Access to Mass Media				
No	815 (33.60)	601 (73.73)	214 (26.27)	***<0.001****
Yes	1611 (66.40)	983 (61.03)	628 (38.97)	
At least 4 ANC by Medically Skilled providers[a]				
No	1369 (56.44)	997 (72.85)	372 (27.15)	***<0.001****
Yes	1056 (43.56)	587 (55.55)	469 (44.45)	
Delivery by Caesarian Section[a]				
No	1593 (65.75)	1092 (68.57)	501 (31.43)	***<0.001****
Yes	830 (34.25)	490 (59.08)	340 (40.92)	

ANC = Antenatal Care.
[a] Variable have missing values; ***$p < 0.001$; **$p < 0.05$.

firstborn children (38.73%). About one-third (33.6%) of the surveyed mothers did not get access to mass media, whereas those children have the highest rates of MAD whose mothers have had exposure to mass media (38.97%) in the past week. Less than half of the women (43.56%) had at least four ANC visits from qualified medical professionals. However, the percentages of having MAD were significantly lower among the children whose mothers did not get a minimum of four ANC from skilled providers. Only about one-fourth of the children met MAD whose mothers did not visit medically skilled persons (27.15%) during pregnancy, whereas just nearly half of the total children (44.45%) met MAD whose mothers got four visits. A caesarian section was used to deliver about one-third (34.25%) of the children. However, for those born via regular delivery, 3 out of every 10 children had MAD.

3.4. Complementary feeding practices

Below, Fig. 1 depicts the complementary feeding practices among the last birth children aged 6–23 months. Overall, 37.15% of children had experienced MDD in the previous 24 h, compared to 43.44% of children in cities. However, compared to urban people, rates of children consuming the minimum variety of foods were approximately 10% lower in rural areas. Additionally, just under 80% of the children achieved MMF, which was a little higher than the overall statistics. Like the MDD, MMF was also lower than the overall rates. About one-third (34.7%) of the children met MAD. Though the proportion of meeting MAD among city areas (39.56%) children was higher, the rates were slightly lower among village children than the national percentages. Overall, the rates of consuming vitamin A-rich and iron-rich foods were very poor in terms of total, urban, and rural areas. Only around one in every ten (10.82%) children consumed vitamin-A and iron-rich foods. However, the rates were 16.36% among the urban people, whereas they fall to 8.82% among the rural children.

3.5. Socio-demographic factors associated with MAD

Below Table 4 describes the association between independent variables and MAD among children 6–23 months of age. The odds for having MAD were 3.54, 6.72, and 7.12 times higher among the children aged 9–11 months [Adjusted odds ratio (AOR) = 3.54; 95% CI: 2.33–5.4], 12–17 months [AOR = 6.72; 95% CI: 4.63–9.77], and 18–23 months [AOR = 7.12; 95% CI: 1.72–5.98] respectively than their counterparts. The children were also 1.75, 2.3, and 3.21 times more likely to meet MAD whose mothers had an education background of primary [AOR = 1.75; 95% CI: 1.07–2.86], secondary [AOR = 2.3; 95% CI: 1.36–3.89], and higher education [AOR = 3.21; 95% CI: 1.72–5.98] consecutively in comparison to uneducated mothers. Table 4 also shows that children of working mothers [AOR = 1.45; 95% CI: 1.13–1.79] have the odds 1.45 times greater of having MAD than not working mothers.

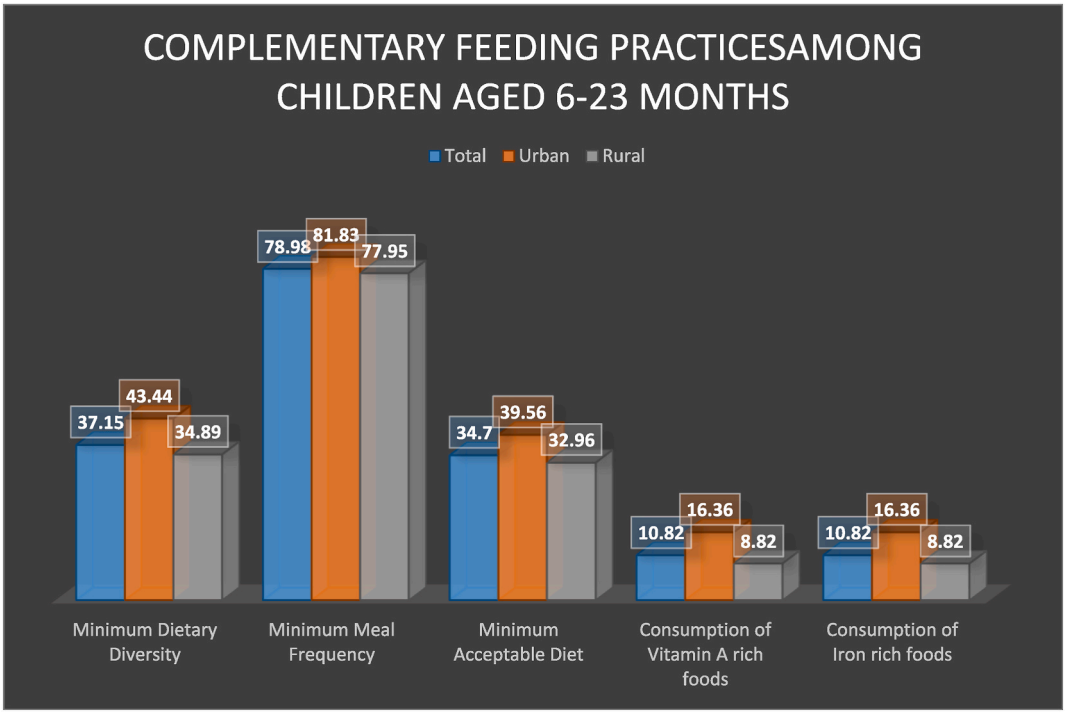

Fig. 1. Complementary feeding practices among children aged 6–23 months.

Table 4
Socio-demographic factors associated with MAD.

Variables	Unadjusted Model		Adjusted Model	
Type of residence	COR (95% CI)	p-value	AOR (95% CI)	p-value
Urban	**Ref**		**Ref**	
Rural	0.75 (0.61, 0.92)	*0.006*	0.92 (0.72, 1.18)	*0.500*
Wealth Index of Family				
Poor	**Ref**		**Ref**	
Middle	1.23 (0.92, 1.65)	*0.160*	0.93 (0.68, 1.28)	*0.667*
Rich	1.85 (1.48, 2.30)	*<0.001*	1.11 (0.82, 1.49)	*0.507*
Number of living children				
Less than 3 children	**Ref**		**Ref**	
3 or more children	0.76 (0.60, 0.97)	*0.029*	1.01 (0.53, 1.91)	*0.979*
Age of Children				
6–8 months	**Ref**		**Ref**	
9–11 months	3.15 (2.08, 4.78)	*<0.001*	3.54 (2.33, 5.40)	***<0.001***
12–17 months	6.27 (4.34, 9.05)	*<0.001*	6.72 (4.63, 9.77)	***<0.001***
18–23 months	6.3 (4.37, 9.09)	*<0.001*	7.12 (4.88, 10.4)	***<0.001***
Mothers Educational Level				
No education	**Ref**		**Ref**	
Primary	2.04 (1.27, 3.28)	*0.003*	1.75 (1.07, 2.86)	***0.025***
Secondary	2.85 (1.76, 4.61)	*<0.001*	2.3 (1.36, 3.89)	***0.002***
Higher	5.5 (3.28, 9.23)	*<0.001*	3.21 (1.72, 5.98)	***<0.001***
Fathers' Educational Level[a]				
No education	**Ref**		**Ref**	
Primary	1.39 (0.99, 1.95)	*0.054*	1.11 (0.77, 1.60)	*0.577*
Secondary	1.55 (1.10, 2.20)	*0.013*	1.01 (0.67, 1.51)	*0.970*
Higher	3.07 (2.14, 4.40)	*<0.001*	1.37 (0.85, 2.22)	*0.194*
Respondents Currently Working				
No	**Ref**		**Ref**	
Yes	1.18 (0.96, 1.44)	*0.110*	1.42 (1.13, 1.79)	***0.003***

COR= Crude Odds Ratio.
AOR = Adjusted Odds Ratio.
CI= Confidence Interval.
[a] Variables have missing values.

3.6. Association between maternal characteristics and MAD

Below Table 5 showed the association between maternal factors and MAD. The odds were 1.29 times higher for having MAD among the children whose mothers got access to mass media [AOR = 1.29; 95% CI: 1–1.66] than in their reference group. Moreover, the odds of having MAD were 1.74 times greater among those children whose mothers received at least four ANC from medically skilled providers [AOR = 1.74; 95% CI: 1.39,2.18] than those who did not.

Table 5
Association between maternal characteristics and MAD.

Variables	Unadjusted Model		Adjusted Model	
Birth Order	COR (95% CI)	p-value	AOR (95% CI)	p-value
First birth	**Ref**		**Ref**	
Second birth	0.8 (0.64, 1.00)	*0.053*	0.94 (0.74, 1.20)	*0.631*
3 or more	0.7 (0.55, 0.90)	*0.005*	0.96 (0.52, 1.77)	*0.895*
Mothers' Access to Mass Media				
No	Ref		**Ref**	
Yes	1.79 (1.43, 2.24)	*<0.001*	1.29 (1, 1.66)	***0.046***
At least 4 ANC by Medically Skilled providers[a]				
No	**Ref**		**Ref**	
Yes	2.15 (1.77, 2.61)	*<0.001*	1.74 (1.39, 2.18)	***<0.001***
Delivery by Caesarian Section[a]				
No	**Ref**		**Ref**	
Yes	1.51 (1.22, 1.87)	*<0.001*	1.07 (0.83, 1.37)	*0.601*

COR= Crude Odds Ratio.
AOR = Adjusted Odds Ratio.
CI= Confidence Interval.
ANC = Antenatal Care.
[a] Variables have missing values.

4. Discussion

To the best of our knowledge, this study is one of the first to use nationally representative data from a cross-sectional study in Bangladesh to identify the independent predictors of MAD among children aged 6–23 months. One of the main strategies for preventing the intergenerational malnutrition processes in children of this age is to administer a MAD [20].

Nearly one-third of the studied children met MAD. This finding is in line with other studies conducted in Nepal (33%) [30], Ghana (29.9%) [12], India (37.7%) [31], and Ethiopia (31.6%) [7]. However, this rate was higher than in studies done in Pakistan (8%) [32], Ethiopia (6.1%–7%) [6], and the Philippines (6.7%) [18], whereas it was lower than in studies conducted in China (41.6%) [33] and Indonesia (44.9%) [34]. However, a study conducted in Sub-Saharan African countries showed that the MAD is only 10.1% [35]. Thailand (55.5%) [36] and Indonesia (48%) [37] showed higher MAD compared to our study. The overall wealth index [37,38], using growth monitoring of children [7], and implementation of the nutritional intervention [7] may be the reason behind MAD percentage variation.

According to our research, mothers who receive at least four ANC visits from medically trained physicians are more likely to achieve their children's MAD objectives. Several studies conducted in Nepal [30], the Philippines [18], and Ethiopia [39] also found similar results. A study conducted across five different South Asian countries also reported that inadequate antenatal care practices cause a lack of complementary feeding [40]. However, a similar study was conducted in 12 East African countries [41], India [2], Tanzania [42], and Nigeria (2008) [43], where there was no correlation between MAD and ANC. The ANC was shown to be related to MAD in Pakistan, but only 15% of the studied 6–23 months children had MAD [44]. Frequent antenatal visits during pregnancy boost nutritional knowledge on both mother and child nutrition through adequate counseling by health professionals, hence enabling healthy baby and young child feeding habits.

This particular study also reported that mothers' exposure to mass media has an affirmative association with the MAD. Numerous studies also support this finding [2,19,45]. A study conducted among Indonesian children also revealed that having a television in the family increases the chance of meeting MAD [46]. Alternatively, a study based on five South Asian countries showed inappropriate infant and child feeding practices due to non-exposure to mass media by mothers [40]. Several advertisements on IYCF practices are broadcast on Bangladeshi mass media [47,48]. This may have a direct impact on mothers who has access to mass media on improving IYCF practices.

Our results also demonstrated a correlation between mothers' employment status and the MAD. We found that children whose mothers engaged in any type of income-generating activity were more likely to acquire MAD than those whose mothers did not. This result was consistent with prior research [39,45,46]. Another study also revealed lower odds for MAD among children having a mother who is a housewife [20]. The most likely explanation for our findings is that working mothers can contribute to raising family income, which enables them to buy necessary food and properly feeds their children. However, we might advise performing advanced research to determine the relationship between them that is supported by data.

Maternal educational qualification is an independent determinant in our study. As the academic background increased, the chance of MAD also increased in our study. Several studies also found a positive association between maternal higher education and MAD like us [7,19,40]. Mothers with higher academic qualifications may have improved knowledge of child nutrition as well as the harmful impacts of poor feeding. Therefore, they are more conscious of appropriate feeding practices for their children.

Moreover, the age of children was also a predictor of MAD. Our analysis reported that children aged between 9 and 11 months, 12–17 months, and 18–23 months were more likely to have greater odds of MAD. This outcome is supported by other studies [2,13,19,20,39,45].

5. Strengths, limitations, and further scopes

The major strength of this study is that we have analyzed a large, nationally representative dataset, thus, we may say findings from this analysis represent the MAD trends in Bangladeshi children aged 6–23 months. However, researches based on secondary data suffer from incompleteness and unreliable information. The fact that this study is cross-sectional and community-based makes it impossible to draw any conclusions about the causes of the components examined. We also did not take into account other factors like the mother's age, postnatal checkup, gender of children, and mother's access to drinking water; those were found influential elsewhere [6,12,20]. Another issue that might be which we did only count one children's MAD status of a family even after having more than one children aged below two years which affects the dietary patterns. Also our analyzed children were living with only their mother, we did not take into account who live with else. These factors could change the results of this study. Therefore, the use of this information for comparison and decision-making should consider the inherent limitation of the study. Furthermore, we recommend future studies may design take into account the limitations of this study to better understand of affecting factors of MAD of all children (6–23 months) using primary data, whether they live with their mother or not, have siblings or not. However, this study would help design and implement interventions to promote MAD and complementary feeding practices.

6. Conclusions

The overall proportion of MAD is low in Bangladeshi children. In contrast, the age of children, maternal education, working status, access to mass media, and frequency of ANC visits are independent determinants of MAD. Appropriate interventions that promote and encourage child-feeding practices that meet the MAD are recommended. Nutrition education and social and behavior change interventions for the target groups should emphasize the importance of feeding the child nutritious family foods to meet both the MDD

and MMF, which could lead to meeting the MAD. Furthermore, implementing effective policies by government and national and international agencies focusing on nutritional interventions like improved nutrition recipes [49], nutrition education and homemade food supplementation [50,51], nutritional counseling by home visits, community mobilization, health forums, antenatal and postnatal sessions, and media campaign [52] are needed to increase MAD practice.

Author contribution statement

Md Mahbubul Alam Shaun: Shahnaz Munny: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Md Wahidur Rahman Nizum: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Data availability statement

Data will be made available on request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

The authors wish to acknowledge the authority of the National Institute of Population Research and Training, Bangladesh, for providing the dataset used in the study.

Declaration of generative AI and AI-assisted technologies in the writing process: During the preparation of this work the authors used Grammarly and QuillBot in order to improve language quality and remove grammatical errors. After using these tools, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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