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Prevalence and determinants of minimum acceptable diet among children between 6–23 months attending an immunization clinic in a tertiary care hospital

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Abstract

Background: The Minimum Acceptable Diet (MAD), a composite measure defined by WHO and UNICEF, assesses both Minimum Dietary Diversity (MDD) and Minimum Meal Frequency (MMF). However, only a small proportion of Indian children achieve MAD, increasing their risk of undernutrition and stunting.

Objectives: This study aimed to assess the prevalence of MAD and identify associated socio-demographic factors among children attending an immunization clinic at a tertiary care hospital.

Methods: A descriptive, cross-sectional study was conducted at the Immunization Clinic of Maharaja Jitendra Narayan Medical College and Hospital, Cooch Behar, from September 17 to October 26, 2024. Using purposive sampling, 51 children under two years of age were enrolled. Data collection involved caregiver interviews and anthropometric measurements. Socio-demographic characteristics, feeding practices, and nutritional indicators were analyzed using descriptive and analytical statistics using Microsoft Excel and IBM-SPSS.

Results: The study found that 61.5% of children met the criteria for MAD. MDD was achieved by 64.1%, while MMF was met by 89.7%. Bivariate analysis shows decreased odds of receiving minimum acceptable diet with caregiver's age between 31-40 years (OR=0.429), and 21-30 years (OR=0.364), Islam religion (OR=0.350 and male child (OR=0.788. Higher odds of receiving minimum acceptable diet was seen in mothers with >10 years (OR= 6.750) and 5-10 years (OR=5.250) of schooling; nuclear families (OR=1.964); Middle class as per BG Prasad scale (OR=3.33); age of child (OR=2.8) and children with 0-1 siblings (OR=2.0)

Conclusion: The findings emphasize the importance of maternal education and socioeconomic status in achieving optimal infant and young child feeding (IYCF) practices. Strengthening educational programs and economic support initiatives for caregivers can significantly enhance child nutrition outcomes in India. Future research should explore seasonality and broader demographic variations to refine targeted nutrition interventions.

INTRODUCTION

The nutritional well-being of children aged 6 to 23 months is a pressing concern in India, where malnutrition significantly impacts child health and development.[1] This critical period marks the transition from exclusive breastfeeding to the introduction of complementary foods, which are essential for meeting the growing nutritional needs of infants.[2] The Minimum Acceptable Diet (MAD), defined by the World Health Organization (WHO) and UNICEF, is a composite measure that includes both Minimum Dietary Diversity (MDD) and Minimum Meal Frequency (MMF), ser-

Keywords: children, diet, immunization clinic

serving as a vital indicator of infant and young child feeding (IYCF) practices.[3] Research indicates that only a small percentage of Indian children in this age group achieve MAD, with estimates suggesting that only 19.4% meet these dietary requirements in 2015-16.[4]

The implications of inadequate MAD are profound, as insufficient dietary diversity and frequency can lead to undernutrition, stunting, and increased morbidity among young children.[5] Factors influencing MAD include maternal education, socio-economic status, and access to healthcare services. For instance, studies have shown that children whose mothers have higher education levels or who receive adequate antenatal care are more likely to achieve MAD.[6,7] Furthermore, participation in programs such as the Integrated Child Development Services (ICDS) has been associated with improved dietary practices among young children.[6]

This study aims to assess the prevalence of MAD and identify associated socio-demographic factors among children attending an immunization clinic at a tertiary care hospital in India. By focusing on this demographic, this research seeks to provide insights that can inform public health strategies aimed at improving child nutrition and addressing the multifaceted issue of undernutrition in India. Understanding these dynamics is crucial for developing effective interventions that promote better IYCF practices and enhance the overall health outcomes for infants and young children in this vulnerable age group.

MATERIALS AND METHODS

Study type and design: The study was a descriptive observational study with cross sectional design.

Study Setting: The study was conducted at the Immunization Clinic of Maharaja Jitendra Narayan Medical College and Hospital, Cooch Behar.

Study Period: The study was conducted over the course of 1 month from 17th September to 26th October, 2024.

Study Population: All the children between 6 months to 2 years visiting the immunization centre.

Exclusion Criteria: Caregiver unwilling to participate in study.

Study Procedure

Sample Size and Sampling Technique: All the children under 2 years visiting the immunization centre during data collection period were approached consecutively to be included in the study. After applying exclusion criteria, 51 children were included in the final study.

Study Tools and Techniques

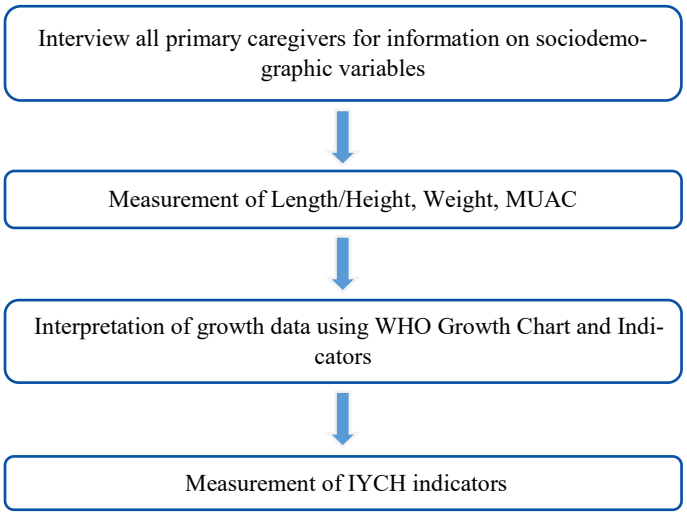
Study Tools

1. Pre-designed and pre-tested schedule based on the IYCF guidelines
2. Infantometer
3. Shakir's Tape
4. Weighing machine
5. Measuring tape

Study Techniques:

All primary caregivers were interviewed. Measurement of length/height were performed using a measuring tape. Measurement of weight was performed using a weighing scale, measurement of MUAC (Mid upper arm circumference) of the child was done using measuring tape. Circumference of the upper arm measured at the mid-point between the tips of the shoulder and elbow. The height and weight of the child was plotted in the WHO growth charts to assess the nutritional status.

Measurement of IYCF indicators: In total, there are 17 recommended IYCF indicators in the 2021 edition. Seven are new, and four of the 2008 indicators have been excluded from the 2021 list of IYCF indicators. In addition, three indicators of unhealthy food and beverage consumption are included. Unlike in 2008, no distinction is made between core and optional indicators in this set of recommendations. It is important to assess data using the full set of indicators for any given population and to report all findings. The World Health Assembly (WHA) included the minimum acceptable diet (MAD) indicator in the Global Nutrition Monitoring Framework (GNMF) for monitoring of the Global Nutrition Targets. But the WHO Member States requested additional operational guidance on this indicator. Based on an inter-agency technical consultation convened in 2017, WHO-UNICEF Technical Expert Advisory group on Nutrition Monitoring (TEAM) provisionally recommended *"minimum dietary diversity"* (MDD). They also recommended review of the guidance on IYCF indicators developed in 2008.



Flow chart: Steps of the study

Study Variables:

Dependent variables: receiving minimum acceptable diet (MAD)

Independent variables:

1. Socio-demographic Information of Primary Caregiver (Age of primary care giver, religion, residence, socio economic status based on Modified BG Prasad classification (January 2024) and education;
2. General Information of Baby (baby's age, baby's sex, mode of delivery, birth weight, current weight, MUAC, length and number of siblings)

Data Collection Procedure:

Before conduction of study, permission was obtained from the Principal, MSVP, and Institutional Ethics Committee of MJNMCH. The study was conducted in the immunization centre and was visited 2 days a week (Wednesday and Friday) from 10:30 A.M. to 1:30 P.M. All the necessary data were obtained by interviewing the primary care giver of the child, by properly measuring the child's length, weight and mid upper arm circumference. Collected data also comprised of the care-givers socio-demographic characteristics, site of residence, educational qualification, occupational status and socio-economic status. A fixed set of questions were prepared so that the care-givers could be asked for the information methodically. The data were entered simultaneously into the forms prepared beforehand. Collected data were analyzed and conclusions were drawn.

Data Analysis Plan:

Collected data was checked for consistency and completeness and was entered into Microsoft Excel Data Sheet 2024. Data were analyzed by using the principle of descriptive and analytical statistics.

Operational definitions used in the study (all definitions based on WHO)

1. **Early initiation of breast feeding** is defined as provision of mother's breast milk to infants within one hour of birth.
2. **Exclusive breast feeding:** Exclusive breastfeeding was defined as giving no other food or drink except breast milk.
3. **Minimum acceptable diet (MAD):** The minimum acceptable diet is defined as for breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day, and for non-breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day as well as at least two milk feeds.
4. **Minimum Meal Frequency (MMF)** is defined as percentage of children 6–23 months of age who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) at least the minimum number of times during the previous day.
5. **Minimum Diet Diversity (MDD)** is defined as the percentage of children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day.

   These eight defined food groups, as revised by the WHO-UNICEF Technical Expert Advisory Group on Nutrition in 2017, are:

   i. **Breast milk**

   ii. **Grains, roots, and tubers** (e.g., rice, wheat, potatoes)

   iii. **Legumes and nuts** (e.g., beans, lentils, nuts)

   iv. **Dairy products** (e.g., milk, yogurt, cheese)

   v. **Flesh foods** (e.g., meat, fish, poultry, liver or other organs)

   vi. **Eggs**

   vii. **Vitamin A-rich fruits and vegetables** (e.g., carrots, sweet potatoes, mangoes)

   viii. **Other fruits and vegetables** (e.g., apples, bananas, leafy greens)
6. **Zero vegetable or fruit consumption** is defined as percentage of children 6–23 months of age who did not consume any vegetables or fruits during the previous day.

RESULTS

The commonest respondent were mothers (94.9%), most commonly between the ages of 21-30 years (64.1%), Muslim by religion (66.7%), from rural areas (66.7%) and in the class IV as per the BG Prasad scale. Most (56.4%) were educated beyond middle school. Commonest occupation of the caregivers were homemakers (92.3%) from joint families (64.1%). Children included in the study were between 6-12 months of age (51.3%), mostly female (53.6%)and had 0-1 siblings (89.7%). (Table 1)

In children between 0-23 months, hundred percent (100%) were ever breastfed, 94.9% received colostrum, 17.9% were given pre-lacteal feed, 76.9% had initiation of breastfeeding within 1 hour of birth. In children less than 6 months, 46.2% were bottle fed while 35.9% had mixed milk feeding. In children between 6-8 months of age 94.9% had had introduction of solid/semisolid/soft food. In children between 6-23 months, 82.1% had exclusive breast-feeding for first six months, 61.5% were having bottle feeding. Minimum dietary diversity was seen in 64.1%, minimum meal frequency was seen in 89.7% and minimum accetabe diet was seen in 61.5% in children 6-23 months of age. Egg or fish consumption was reported in 69.2% of children. Sweet beverage consumption, Unhealthy food consumption and zero fruit or vegetable consumption was seen in 46.2% among children 6-23 months of age. In children between 12-23 months continued breastfeeding was seen in 66.7%. (Table 2)

Bivariate analysis shows decreased odds of receiving minimum acceptable diet with caregiver's age between 31-40 years (OR=0.429,

95%CI= 0.040-4.637) and 21-30 years (OR=0.364, 95% CI=0.063-2.111) compared to caregivers age ≤ 20, Islam religion (OR=0.350, 95%CI= 0.078-1.573) compared to Hindu religion and male child (OR=0.788, 95% CI= 0.213-2.915) compared to female child. Higher odds of revieving minimum acceptable diet are higher in mothers with >10 years (OR= 6.750, 95% CI=0.526-86.561) and 5-10 years (OR=5.250, 95% CI=0.465-59.286) of schooling compared to <5 years of schooling; numclear families (OR=1.964, 95% CI= 0.483-7.989) compared to joint families; Middle class as per BG Prasad scale (OR=3.333, 95% CI= 0.751-14.787); age of child (OR=2.8, 95% CI=0.213-2.915) and children with 0-1 siblings compared to 2-3 siblings (OR=2.0, 95% CI=0.188-21.225).(table 3)

DISCUSSION

Inadequate infant and young child-feeding practices are the most important causes of undernutrition. Young children require proper nutrition in order to achieve optimal growth and development, especially during the first two years of life. Improving children's general health and wellbeing requires identifying and minimising the barriers to proper nutrition during this vital window of opportunity.[8] The objective of this study was to determine the IYCF practices, find the prevalence of MAD and its predictors among children 6–23 months of age attending the immunisation clinic of a government tertiary care hospital. However, the results of the study need to be interpreted with caution because the sample size was small and data was cross-sectional in nature.

The present study shows that the prevalence of achieving MAD among children in this age group was 61.5%. This prevalence is much higher than that reported from Nepal (33%), or Indonesia (44.9%).[9,10] Studies from India have reported prevalence of MDD in the range of 24.4% to 46%.[11,12] In contrast, Singhal et al,[13] noted a higher prevalence of MDD (79.6%) in their study from North east India. The possible reasons for the variation between countries and among the states in India, could be attributed to differences in a study setting, period, population and sample size. The discrepancy might be due to geographic variation, population growth and density, and socio-economic status. Additionally, food preparation, dietary restrictions, food item selection, meal scheduling, cultural beliefs, availability and accessibility of food, and childcare practices may differ across countries.[14] Differences in proportion of children attaining MDD has even been reported between summer and winter seasons.[15]

The present study also identified different sociodemographic predictors of MAD; including mother's age, years of schooling, occupation, type of family, socio-economic status based on the BG Prasad SES scale, sex of the child and number of siblings of the child. Mothers in the age group of 21-30 and 31-40 years had lower odds of achieving MAD. These findings were similar to that found in the study by Farah et al,[16] from Ethiopia who reported that mothers in the 15–24 years and 25–34 years were seven and five times more likely to receive the recommended minimum acceptable diet than children born to mothers aged 35–44 years and > 45 years, respectively. The authors proposed that mothers in the younger age group are more productive and have better information about child-feeding practices.

While the present study fails to find any difference in the consumption of MDD among rural and urban children, significant associations of MDD with residence has been reported by Prashar et al,[13] and Khanal et al.[17] Since, the study was undertaken in a tertiary care government hospital where most attendees are from a middle or lower socioeconomic background despite their area of residence, the results could be a reflection of the SES rather than the residence. A community-based survey or an analysis of larger health surveys would be helpful.

Children whose parents had higher years of schooling were positively associated with increasing MAD. Children whose mother received 5-10 years of schooling had an odds of 5.250 while mothers with >10 years of schooling had an odds of 6.750 of MAD compared to mothers with < 5 years of schooling. Children born from parents with higher education had a higher chance of attaining the minimum acceptable use as compared to children born from uneducated parents as reported in studies from Indonesia, Bangladesh, and Nepal.[9,10,18] This is due to the fact that as the mother's education level grows, her knowledge, attitude, and practice may improve. Furthermore, higher education will provide nutritional counseling and enhance child-feeding practices.[19,20] Thus, educating parents is one key strategy to improve the nutritional status of young children. In addition, higher education translated into improved household income and household food security because educated parents may be employed in a better-paid job, thereby increasing the purchasing power of diversified and high-quality diet to their children.[21] A recent comparison of five Asian countries on infant feeding reported that mother's education was a significant determinant of appropriate infant feeding.[22]

In the study, children belonging to middle socioeconomic class had 3.333 times odds of MAD compared to children in the lower socioeconomic class. All children of employed mothers received MAD. Similar results were reported in by Tebeka et al,[23] from a demographic and health survey in Ghana. With increasing wealth status, the nutritional status of the children improves.[24,25] Mothers from the richer households could provide their children with highly nutritious food as compared to mothers from poorer households, who were more likely to focus on the quantity rather than the quality of the diet.[26]

According to the present study, children from nuclear households with 0–1 siblings were twice as likely to have MAD as children from joint families with more than one sibling. Families with more siblings, particularly those in lower socioeconomic class, struggle to allocate resources, which restricts the range and availability of food.[16] Larger families may spend less time and care on each child, which could affect the child's feeding habits. Mothers who have more than one kid, for instance, may prioritise feeding according to the child's age or health requirements, which may result in irregular compliance with baby feeding recommendations. The mother's access to support networks and nutritional information may be impacted by having more siblings. According to studies, mothers who have fewer children may have more time to attend to the dietary needs of each kid, which increases the possibility that the children will reach MAD standards. Because of shared resources, higher family sizes may normalize less food variation. In some cultures, perceptions of what makes for a suit-

-able diet for young infants may be influenced by the cultural background.[27]

The present study shows a higher proportion of older children (13-23 months) consuming MAD compared to younger children (6-12 months) with an odds of 2.800. Similar observations have been reported from other studies.[5,28] Molla et al, from Ethiopia,[21] and Tekeba et al,[23] from Ghana reasoned that mother's perception of young children's stomach incompetent to digest solid or semisolid diets, led them to introduce only a milk-based diet and start the introduction of diversified solid and semisolid diet after the child age reaches 12 months. Restrictions of certain foods and animal sources of food are seen in many societies for children before 12 months of age and before the eruption of teeth.

The present study failed to substantiate the common observation of male children having higher odds of achieving MAD, a fact contributed to gender based disparities in diet in children. However, one of the studies reporting on the issue was conducted in 2014, while the other ones, though recent were from different study setting. The exact reason for this apparent deviation from conventional findings needs to be looked into with further research.

The study had some limitations, Firstly, the sample size was small and recruited from a single centre, so the generalisability of the reuslts is somewhat limited. Secondly, due to the retrospective nature of the study, there might be some recall bias, especially for breast-feeding related questions. Finally, given the nature of questions there is a chance of a social desirability bias on the part of the caregivers.

CONFLICT OF INTEREST

None Declared

FUNDING

None Declared

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Original Article

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Table 1: Socio-demographic characteristics of the study population (n=51)

Variable	Categories	Frequency	Percentage
Relation with Baby	Mother	37	94.9
	Grandmother	2	5.1
Care giver's age	<= 20	9	23.1
	21-30	25	64.1
	31-40	5	12.8
Religion	Islam	26	11
	Hinduism	13	33.3
Residence	Rural	26	66.7
	Urban	13	33.7
Socioeconomic status (BG Prasad Scale 2024)	I	1	2.6
	II	6	15.4
	III	7	17.9
	IV	15	38.5
	V	10	25.6
Education	Illiterate	2	5.1
	Primary	2	5.1
	Middle	13	33.3
	Secondary	9	23.1
	Higher Secondary and above	13	33.3
Occupation of mother	Homemaker	36	92.3
	Employed	3	7.7
Type of family	Joint	25	64.1
	Nuclear	14	35.9
Age (in completed months)	6-12	20	51.3
	13-23	19	49.7
Gender	Male	17	43.6
	Female	22	56.3
Number of siblings	0-1	35	89.7
	2-3	4	10.3
Total		**39**	**100.0**

Table 2: Proportion of children fulfilling IYCF criteria (n=39)

Sl no	IYCF Criteria	Frequency	Percent
1	Ever breastfed (0-23 months)	39	100.0
2	Received colostrum (0-23 months)	37	94.9
3	Given prelacteal feed (0-23 months)	7	17.9
4	Initiation of breast feeding (within 1 hour of birth)	30	76.9
5	Bottle feeding (below 6 months)	18	46.2
6	Mixed milk feeding (below 6 months)	14	35.9
7	Introduction of solid/semisolid/soft food (6-8 months)	37	94.9
8	Exclusive breastfeeding for first six months (6-23 months)	32	82.1
9	Bottle feeding (6-23 months)	24	61.5
10	Minimum dietary diversity (6-23 months)	25	64.1
11	Minimum meal frequency (6-23 months)	35	89.7
12	Minimum acceptable diet (6-23 months)	24	61.5
13	Egg and/or flesh food consumption	27	69.2
14	Sweet beverage consumption (6-23 months)	18	46.2
15	Unhealthy food consumption (6-23 months)	18	46.2
16	Zero fruit or vegetable consumption (6-23 months)	18	46.2
17	Continued breastfeeding (12-23 months)[#]	18	66.7
	Total	39	100.0

#n=27

Table 3: Association of minimum acceptable diet with sociodemographic variables (n=39)

Variable	Category	No (n=15)	Yes (n=24)	Unadjusted Odds ratio	p value
Care giver's age (years)	31-40	2 (40)	3 (60)	0.429	0.040 - 4.637
	21-30	11 (44)	14 (56)	0.364	0.063 - 2.111
	≤ 20	2 (22.2)	7 (77.8)	1	
Religion	Islam	12 (46.2)	14 (53.8)	0.350	0.078 - 1.573
	Hinduism	3 (35.3)	10 (64.7)	1	
Address	Rural	10 (38.5)	16 (61.5)	-	-
	Urban	5 (38.5)	8 (61.5)		
Years of schooling of mother	>10 years	4 (30.8)	9 (69.2)	6.750	0.526 - 86.561
	5-10 years	8 (36.4)	14 (63.6)	5.250	0.465 - 59.286
	<5 years	3 (75)	1 (25)	1	
Occupation	Employed	0	3 (100)	-	-
	Homemaker	15 (41.7)	21 (58.3)		
Type of family	Nuclear	4 (28.6)	10 (71.4)	1.964	0.483 - 7.989
	Joint	11 (44)	14 (56)	1	
BG Prasad scale	Middle	9 (31)	20 (69)	3.333	0.751 - 14.787
	Lower	6 (60)	4 (40)	1	
Age of the child (months)	13-23	5 (26.3)	14 (73.7)	2.800	0.729-10.755
	6-12	10 (50)	10 (50)	1	
Sex of the child	Male	9 (40.9)	13 (59.1)	0.788	0.213 - 2.915
	Female	6 (35.3)	11 (64.7)	1	
Number of siblings	0-1	14 (93.3)	21 (87.5)	2.000	0.188 - 21.225
	2-3	1 (6.7)	3 (12.5)	1	

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