Maternal dietary diversity (MDD-W) in Dibrugarh district, Assam

Mridushman Saikia, Tulika Goswami Mahanta, Nabanita Nirmolia, Arpita Nath, Hiranya Saikia, Gourangie Gogoi

Department of Community Medicine, Assam Medical College and Hospital, Dibrugarh Assam

ABSTRACT

Background: (Minimum Dietary Diversity for Women) MDD-W is crucial for both mothers and children, but significant disparities are present. The study was conducted to assess the factors influencing MDD-W among postnatal women of 15-49 years in Dibrugarh, Assam. **Methodology**: A cross-sectional study was carried out with 180 postnatal women using multi-stage sampling and interviewed using 24-hour recall method. Descriptive data was presented as proportions and frequencies, and analysed using Chi-square test and Fisher's exact test. **Results**: Lack of knowledge on dietary diversity was 77.8%. Only 55.6% consumed foods from ≥ 5 food groups. Women from rural residences, lower socio-economic status, and late antenatal visits were less likely, while women with higher education, family support were more likely to have MDD-W. **Conclusion**: Lack of diverse diets, particularly protein and vitamin A-rich foods, among postnatal women necessitates intervention to combat malnutrition.

INTRODUCTION

Pregnancy signifies a period of profound physiological shifts, necessitating increased energy and nutrient intake.(1) Maternal nutrition influences pregnancy outcomes and baby's long-term health.(2) MDD-W serves as a proxy measure indicating the quality of diet and micronutrient status for women aged 15 to 49 years. It assesses whether they consumed a minimum of five out of ten predetermined food groups during the previous day or night.(3) In India, 18.7% of women of reproductive age have a Body Mass Index (BMI) < 18.5 kg/m², and 57% of them are found to be anaemic. Additionally, 52.2% experience anaemia during pregnancy, with an average weight gain of only 7 kg, below the recommended range of 10-12 kg.(4,5)

Aim & objectives: To assess the factors influencing MDD-W among postnatal women aged 15-49 years in Dibrugarh, Assam.

MATERIAL & METHODS

A community-based cross-sectional design was employed, conducted in Dibrugarh district, Assam, from March 2023 to February 2024. Postnatal women (15-49 years) who provided informed written consent were included. Those who were hospitalized or locked households during three consecutive visits were excluded. Considering prevalence of anaemia (pregnant women) in Assam as 54.2%,(6) relative precision of 20%, using the formula: $n = \frac{z^2 pq}{d^2}$, initial sample size was calculated to be 81(z = 1.96 for a 95% confidence interval (CI), p = population proportion, q =1 - p, and d = relative error). Considering design effect of 2 and 10% non-response rate, final sample size was found to be 178, rounded up to 180. Postnatal women were chosen through multi-stage sampling as per the micro-plan for eligible mothers, aligning with the urban-rural ratio (1:4) in Dibrugarh district. In urban areas, 3 wards were chosen, and 12 postnatal women were interviewed per ward and in rural

areas, 4 subcentre areas per block were chosen, and 6 postnatal women were interviewed per subcentre. (Figure 1) Data collection was conducted through house-to-house visits, utilizing a pre-designed and pre-tested proforma. Dietary diversity was evaluated by 24-hour dietary recall method. Dietary diversity scores were computed based on the variety of food groups consumed.(3) Behavioural factors including knowledge, beliefs, self-efficacy, perceived social support, and social norms pertaining to dietary diversity were also evaluated. Knowledge was evaluated by asking women to identify food groups with a score of 1 awarded for reporting ≥5 food groups. Additional behavioural determinants were assessed using a validated questionnaire employing a 5-point Likert scale,(5) where responses were rated as 1 for agree or strongly agree and 0 for disagree or strongly disagree or neutral. Subsequently, the scores were aggregated, divided into tertiles, and participants were categorized as having high, medium, or low levels for each determinant. Maternal exposure to nutrition counselling during pregnancy was evaluated by inquiring about the messages received during antenatal checkups (ANC) or from frontline workers (FLWs). Approval was secured from the Institutional Ethics Committee (Human) and administrative authorization was obtained from the district health authority and block-level stakeholders.

Statistical analysis plan: Data was analysed utilizing SPSS version 25. Descriptive data were presented as proportions and frequencies, and analysed using Chi-square test and Fisher's exact test. Unadjusted-odds ratio (U-OR) was calculated with 95% CI, and statistical significance was determined with $p < 0.05$.

Figure 1: Flowchart for selection of study population
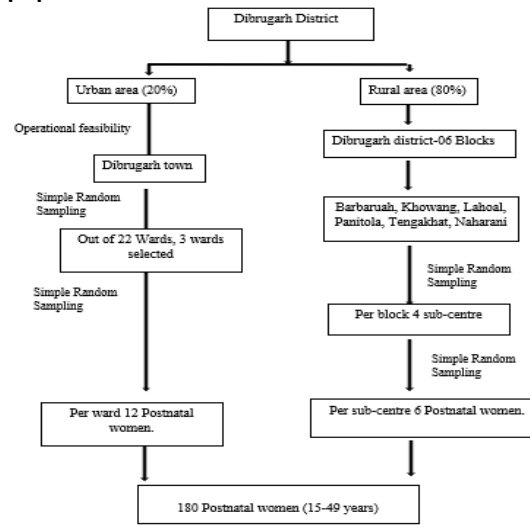
RESULTS

Our study consisted predominantly of 20–29 years age group (63.9%), Hindu (80.6%), OBC caste (51.7%) and living in nuclear families (52.2%). Most had lower middle socioeconomic status (SES) (36.7%), worked as housewives (40.6%) or cultivators/tea garden workers (26.1%), and completed secondary school or above (52.2%). Their husbands were mainly employed in business/private/government jobs (65.6%) and also had secondary or higher education (52.2%). Majority lacked knowledge of dietary diversity (77.8%), reported low belief and self-efficacy (38.9%), received low support from family members (46.7%), and perceived low social norms (37.8). Most women attended ≥4 ANCs (71.7%), starting early (72.2%), and delivered in government hospitals (62.8%) via normal delivery (70.6%). Home visits by FLWs were common (69.4%), and most received dietary diversity counselling (66.1%). (Table 1)

Table 1 Distribution of Postnatal women according to sociodemographic variables, behavioural determinants and perinatal characteristics.

Variable		Frequency (n)	Percentage (%)	Chi-square (p value)
Sociodemographic variables				
Age	<20 years	22	12.2	0.005
	20-29 years	115	63.9	
	30-39 years	30	16.7	
	≥40 years	13	7.2	
Residence	Urban	36	20	0.004
	Rural	144	80	
Religion	Hindu	145	80.6	0.002
	Muslim	20	11.1	
	Christian	15	8.3	
Caste	General	45	25	0
	SC	23	12.8	
	OBC	93	51.7	
	ST	19	10.5	

Variable		Frequency (n)	Percentage (%)	Chi-square (p value)
Type of family	Nuclear	94	52.2	0.002
	Joint	86	47.8	
Socio economic status	Upper	7	3.9	0
	Upper middle	26	14.4	
	Middle	59	32.8	
	Lower middle	66	36.7	
	Lower	22	12.2	
Occupation	House wife	73	40.6	0.001
	Cultivator/ Tea Garden worker	47	26.1	
	Business/Private / Govt Employee	60	33.3	
Education	Illiterate	45	25	0
	Primary/Upper primary school	41	22.8	
	Secondary school or above	94	52.2	
Husband's occupation	Cultivator/ Tea Garden worker	62	34.4	0.001
	Business/Private / Govt Employee	118	65.6	
Husband's education	Illiterate	29	16.1	0
	Primary/Upper primary school	57	31.7	
	Secondary school or above	94	52.2	
Behavioural determinants				
Knowledge on dietary diversity	Absent	140	77.8	0
	Present	40	22.2	
Belief and self-efficacy	Low	70	38.9	0
	Medium	69	38.3	
	High	41	22.8	
Support from family members	Low	84	46.7	0
	Medium	38	21.1	
	High	58	32.2	
Social norms	Low	68	37.8	0
	Medium	53	29.4	
	High	59	32.8	
Perinatal characteristics				
ANC Visits	< 4	51	28.3	0
	≥ 4	129	71.7	
Time of ANC	Early	130	72.2	0
	Intermediate	8	4.4	
	Late/ Never	42	23.4	
Place of delivery	Home delivery	17	9.4	0
	Govt hospital	113	62.8	
	Private hospital	50	27.8	
Type of delivery	Normal delivery	127	70.6	0.034
	Caesarean section	53	29.4	
Home visited by FLW	No	55	30.6	0
	Yes	125	69.4	
Received dietary diversity counselling	No	61	33.9	0
	Yes	119	66.1	

Cereals were universally consumed (100%), while nuts and seeds were consumed by 11.7%. Only 55.6% consumed foods from ≥ 5 food groups.

Rural residence, OBC or ST caste, belonging to joint family, lower SES, being a cultivator/tea garden worker, and having ANCs in intermediate or late/never stages were significantly less likely to have ≥5 food groups. However, Muslim religion, aged 30-39 years, with higher education, having husband in business/private/government employment with higher education, possessing knowledge on dietary diversity were significantly more likely to practice dietary diversity. Those having supportive beliefs and self-efficacy, family support, and social norms (medium and high levels) were also more likely to practice dietary diversity. Those attending ≥4 ANC visits, delivering in private hospitals, undergoing caesarean section, receiving FLW visits and dietary counselling were significantly more likely to have dietary diversity. (Table 2)

Table 2: Factors associated with dietary diversity among postnatal women

Variable		Dietary diversity				U-OR	95% CI	p-Value
		< 5 food groups		At least five food groups				
		n	%	n	%			
Sociodemographic variables								
Age	<20 years	14	63.6	8	36.4	Ref.	--	--
	20-29 years	56	48.7	59	51.3	1.84	0.71-4.72	0.203
	30-39 years	6	20	24	80	7	2.01-24.35	0.002
	≥40 years	4	30.8	9	69.2	3.93	0.91-17.01	0.066
Residence	Urban	8	22.2	28	77.8	Ref.	--	--
	Rural	72	50	72	50	0.28	0.12-0.66	0.004
Religion	Hindu	66	45.5	79	54.5	Ref.	--	--
	Muslim	3	15	17	85	4.73	1.32-16.86	0.016
	Christian	11	73.3	4	26.7	0.3	0.09-0.99	0.05
Caste	General	9	20	36	80	Ref.	--	--
	SC	7	30.4	16	69.6	0.57	0.18-1.80	0.34
	OBC	51	54.8	42	45.2	0.2	0.08-0.47	0
	ST	13	68.4	6	31.6	0.11	0.03-0.38	0
Type of family	Nuclear	31	33	63	67	Ref.	--	--
	Joint	49	57	37	43	0.37	0.20-0.68	0.001
Socio economic status	Upper	2	28.6	5	71.4	Ref.	--	--
	Upper middle	3	11.5	23	88.5	3.06	0.40-23.44	0.28
	Middle	13	22	46	78	1.41	0.24-8.15	0.697
	Lower middle	44	66.7	22	33.3	0.2	0.03-1.11	0.066
	Lower	18	81.8	4	18.2	0.08	0.01-0.63	0.016
Occupation	House wife	32	43.8	41	56.2	Ref.	--	--
	Cultivator/Tea Garden worker	31	66	16	34	0.4	0.18-0.86	0.019
	Business/Private /Govt Employee	17	28.3	43	71.7	1.97	0.95-4.08	0.067
Education	Illiterate	30	66.7	15	33.3	Ref.	--	--
	Primary/Upper primary school	32	78	9	22	0.56	0.21-1.47	0.243
	Secondary school or above	18	19.1	76	80.9	8.44	3.77-18.88	0
Husband's occupation	Cultivator/Tea Garden worker	38	61.3	24	38.7	Ref.	--	--
	Business/Private /Govt Employee	42	35.6	76	64.4	2.86	1.51-5.40	0.001
Husband's education	Illiterate	20	69	9	31	Ref.	--	--
	Primary/Upper primary school	42	73.7	15	26.3	0.79	0.29-2.12	0.645
	Secondary school or above	18	19.1	76	80.9	9.38	3.66-24.01	0
Behavioural determinants								
Knowledge on dietary diversity	Absent	76	54.3	64	45.7	Ref.	--	--
	Present	4	10	36	90	10.68	3.61-31.63	0
Belief and self-efficacy	Low	47	67.1	23	32.9	Ref.	--	--
	Medium	23	33.3	46	66.7	4.08	2.01-8.28	0
	High	10	24.4	31	75.6	6.33	2.65-15.12	0
Support from family members	Low	59	70.2	25	29.8	Ref.	--	--
	Medium	10	26.3	28	73.7	6.6	2.79-15.62	0
	High	11	19	47	81	10.08	4.50-22.57	0
Social norms	Low	50	73.5	18	26.5	Ref.	--	--
	Medium	20	37.7	33	62.3	4.58	2.11-9.93	0
	High	10	16.9	49	83.1	13.61	5.71-32.41	0
Perinatal characteristics								
ANC Visits	< 4	40	78.4	11	21.6	Ref.	--	--
	≥ 4	40	31	89	69	8.09	3.76-17.37	0
Time of ANC	Early	40	30.8	90	69.2	Ref.	--	--

Variable		Dietary diversity				U-OR	95% CI	p-Value
		< 5 food groups		At least five food groups				
		n	%	n	%			
	Intermediate	6	75	2	25	0.14	0.02-0.76	0.023
	Late/ Never	34	81	8	19	0.1	0.04-0.24	0
Place of delivery	Home delivery	9	52.9	8	47.1	Ref.	--	--
	Govt hospital	63	55.8	50	44.2	0.89	0.32-2.48	0.828
	Private hospital	8	16	42	84	5.9	1.75-19.92	0.004
Type of delivery	Normal delivery	63	49.6	64	50.4	Ref.	--	--
	Caesarean section	17	32.1	36	67.9	2.08	1.06-4.08	0.033
Home visited by FLW	No	38	69.1	17	30.9	Ref.	--	--
	Yes	42	33.6	83	66.4	4.41	2.23-8.73	0
Received dietary diversity counselling	No	43	70.5	18	29.5	Ref.	--	--
	Yes	37	31.1	82	68.9	5.29	2.70-10.38	0

DISCUSSION

In our study, universal consumption of cereals suggests a carbohydrate-heavy diet, which could contribute to meeting energy requirements, but might not sufficiently address the need for diverse nutrients. While all women consumed other vegetables (mostly potatoes), dark green leafy vegetables were consumed by only half of the participants, potentially due to cultural factors, seasonal variations, or a preference for potato-based diets. Combining cereals and pulses in a 3:1 ratio with animal-based proteins like milk, fish, and meat provides a high-quality protein source.[7] However in our study, a decreased consumption of protein-rich foods such as eggs, pulses, and dairy products was observed. As per a review article, most Indian states exhibited limited intake of fruits and animal-source foods (<30%); with significant variations in dairy, pulses, and green vegetables (3% to 80%).[8] Moreover, our study revealed low consumption of vitamin A-rich fruits, nuts and seeds. Lack of dietary diversity leads to micronutrient deficiencies,[9] however, only half of the participants consumed ≥ 5 food groups.

Multiple demand-supply issues influence maternal diets, including food availability, financial constraints, access to nutrition services, cultural taboos, family influence, and lack of knowledge.[8] In our study, a noticeable gap between rural and urban areas, religious affiliation and caste-based inequities are evident, which may stem from socioeconomic inequalities, cultural influences, and access to resources. Participants from joint families being less likely to consume ≥5 food groups. Strong cultural traditions in large multigenerational families can prevent pregnant women from getting enough food.[10] Participants from lower SES had a negative association underscoring the intersectionality of social and economic factors. Women with higher age had greater dietary diversity, which may be due to greater decision-making power and potentially higher nutritional knowledge. Occupation of the postnatal women and their husbands also played an important role. Addressing food unavailability requires a multi-faceted approach, including promoting kitchen gardens, home-based production, and nutritionally important agriculture interventions.[8] Postnatal women and their husbands with higher education were more inclined to practice dietary diversity. Postnatal women with knowledge of dietary diversity had better food choices, highlighting the need for continuous nutrition-focused education programs. Positive social norms around dietary diversity were influential in shaping women's dietary choices. Healthcare workers need to boost women's knowledge and confidence, engage their families, and address all factors influencing their behaviour throughout pregnancy.[5] Having ≥4 ANC visits correlated with increased dietary diversity, highlighting the potential of ANC visits in delivering effective nutrition counselling. Mode and place of delivery played an important role. Home visits by FLWs and dietary counselling were associated with improved dietary diversity, highlighting the need to increase prenatal care access, improve the quality of counselling, and leverage interactions with healthcare providers. Behaviour change communication considering the socio-ecological model, community engagement, and addressing gender disparities are crucial.[8] A multi-faceted approach encompassing education, awareness, and access to diverse, affordable, and culturally appropriate foods, tailored to address socioeconomic, cultural, and educational disparities, while empowering women through knowledge and support can be implemented as community-based implementation research.

CONCLUSION

Inadequate dietary variety among postnatal women, coupled with a scarcity of protein-rich foods such as eggs, pulses, milk, and dairy products, as well as foods abundant in vitamin A, nuts, and seeds, underscores the urgency for early intervention to address the prevalent maternal malnutrition in the district.

RECOMMENDATION

To improve MDD-W, interventions should focus on targeted nutrition education, community engagement, enhanced antenatal care, supportive policies, addressing food access and affordability, and culturally sensitive communication program design.

LIMITATION OF THE STUDY

The 24-hour dietary recall used to assess MDD-W may be subject to recall bias. The focus is on the number of consumed food groups, not meal composition. Cross-sectional design restricts our capacity to establish causal relationships.

RELEVANCE OF THE STUDY

Our research found various socioeconomic, cultural, and demographic factors contribute to poor dietary diversity among postnatal women, especially in their consumption of protein and vitamin A-rich foods underscoring the urgency for targeted interventions in the region.

AUTHORS CONTRIBUTION

MS and TGM made contributions to the conception, design, data acquisition, analysis, and interpretation, as well as drafting or critically revising the article and granting final approval for publication. NN, AN, HS, and GG contributed by critically revising the article for important intellectual content.

DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors haven't used any generative AI/ AI assisted technologies in the writing process.

REFERENCES

1. Mousa A, Naqash A, Lim S. Macronutrient and Micronutrient Intake during Pregnancy: An Overview of Recent Evidence. Nutrients. 2019;11(2):443.
2. Ahmed T, Hossain M, Sanin KI. Global Burden of Maternal and Child Undernutrition and Micronutrient Deficiencies. Ann Nutr Metab. 2012;61(Suppl. 1):8–17.
3. FAO and FHI 360. 2016. Minimum Dietary Diversity for Women: A Guide for Measurement. Rome: FAO [Internet]. [cited 13/05/2024]. Available from: https://openknowledge.fao.org/.
4. India factsheet.pdf [Internet]. [cited 13/12/2024]. Available from: http://rchiips.org/nfhs/NFHS-5 FCTS/India.pdf .
5. Nguyen PH, Kachwaha S, Avula R, Young M, Tran LM, Ghosh S, et al. Maternal nutrition practices in Uttar Pradesh, India: Role of key influential demand and supply factors. Matern Child Nutr. 2019;15(4): e12839.
6. Assam factsheet.pdf [Internet]. [cited 13/12/2024]. Available from: http://rchiips.org/nfhs/NFHS-5Reports/Assam.pdf .
7. Dietary Guidelines for Indians 07th May 2024 fin.pdf [Internet]. [cited 13/12/2024]. Available from: https://main.icmr.nic.in/.
8. Nguyen PH, Kachwaha S, Tran LM, Sanghvi T, Ghosh S, Kulkarni B, et al. Maternal Diets in India: Gaps, Barriers, and Opportunities. Nutrients. 2021;13(10):3534.
9. Dietary diversity as a measure of micronutrient adequacy of women's diets in resource-poor areas. [cited 13/12/2024]. Available from: https://www.fantaproject.org/research/womens-dietary-diversity-project .
10. Chakrabarti S & Chakrabarti A. Food taboos in pregnancy and early lactation among women living in a rural area of West Bengal. Journal of Family Medicine and Primary Care, 2019;8(1):86–90.