ORIGINAL ARTICLE

Determinants of Severe Acute Malnutrition in under-five children in Dibrugarh District, Assam

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ABSTRACT

Background: Malnutrition is a major public health problem and leading determinant of morbidity and mortality in under-five children in India. **Aim & Objective**: To assess determinants of Severe Acute Malnutrition (SAM) in under-five children of Dibrugarh district, to assess knowledge and practice of Infant, Young Child Feeding Practices (IYCF) and to assess the knowledge and practice of identification of SAM of Anganwadi workers. **Settings and Design**: Dibrugarh district, Assam. Mixed method study. **Methods and Material**: It was a case-control study that interviewed mothers of children between 6-59 months between June 2021 to May 2022. Using a pre-tested semi-structured questionnaire Interviews of a total of 164 under-five children's mothers (82 cases and 82 controls)] were done. Qualitative data was also collected by in-depth interviews of Anganwadi workers (AWWs). **Statistical analysis used**: SPSS version 25.0. Chi-Square test, unadjusted OR for Bivariate analysis and adjusted odds ratio using Multiple logistic regression was calculated. **Results**: Determinants of severe acute malnutrition were joint family (AOR 3.08, 95% CI 1.02-9.31, p= 0.046); birth weight less than 2.5 kg (AOR 20.6, 95% CI 4.50-94.03, p=<0.0001); mothers with less than 4 antenatal check-ups (AOR 5.13, 95% CI 1.28-29.47, p=0.021); partial immunization (AOR 9.2, 95%CI 1.83-46.59, p=0.007); and irregular utilization of ICDS services (AOR 27.36, 95%CI 5.73-130.66, p=<0.0001). Problems faced by AWWs during service delivery were communication barriers, community resistance during home visits, and increased workload during COVID-19. **Conclusions**: IYCF practices need to be promoted with screening and growth monitoring for early detection and timely referral of malnutrition along referred back and linkages of services so that home-based and community-based management can be done to prevent severe acute malnutrition.

KEYWORDS
Severe Acute Malnutrition, Under-Five Children, ICDS, Assam, CMAM, AWW

INTRODUCTION

Under-5 children are most vulnerable population and their nutritional status is a sensitive indicator to determine community health and nutrition.(1) Wasting in children is life-threatening condition as they have weak immunity and are highly susceptible to long-term developmental delays and mortality.(2)

Prevalence of wasting amongst under-5 children is 17.3% in India higher than average of Asia region (8.9%).(4)

Severe Acute Malnutrition (SAM), a major threat to under-5 children as mortality rates of SAM children are nine times more than well-nourished children. Efforts have been made by Government of India to tackle malnutrition through Integrated Child Development Services (ICDS), but inequality in utilization of services especially among tribal population has led to very slow progress.[3] As per NFHS-5, nutritional status and child feeding practices indicators is poor, especially in tea garden-intensive districts of Assam.(5) Moreover, utilization and delivery of nutrition services was affected resulting from the total shutdown of Anganwadi centers (AWCs) during the pandemic.

Dibrugarh is known as the *'Tea City of India'*, highest tea producing district in Assam, where 23% lives in tea garden lines and 19% population lives in flood-affected riverine areas in Southern bank of river Brahmaputra, where chances of having Acute Malnutrition is high and access to healthcare services and other facilities are poor.(6) A better evidence generation to know the root cause contributing to malnutrition is utmost necessary in these areas.

Aim & Objective

1. To assess determinants of Severe Acute Malnutrition (SAM) in under-five children of Dibrugarh district.
2. To assess knowledge and practice of Infant, Young Child Feeding Practices (IYCF) of Anganwadi workers.
3. To assess the knowledge and practice of identification of Severe Acute Malnutrition (SAM) of Anganwadi workers in selected areas of Dibrugarh district.

MATERIAL & METHODS

This mixed method study was conducted among under-five (6-59 months) children in Dibrugarh district from June 2021 to May 2022. Quantitative part was conducted using case control study design and qualitative part was conducted using in-depth interview method.

Taking the percentage of controls exposed as 51.7%,(8) odds ratio 2.5,(17) and considering confidence level 95%, power of study 80%, ratio of controls to case as 1, sample size was calculated to be 164 (Cases = 82, Controls = 82) using EPI-Info Version 7.2.

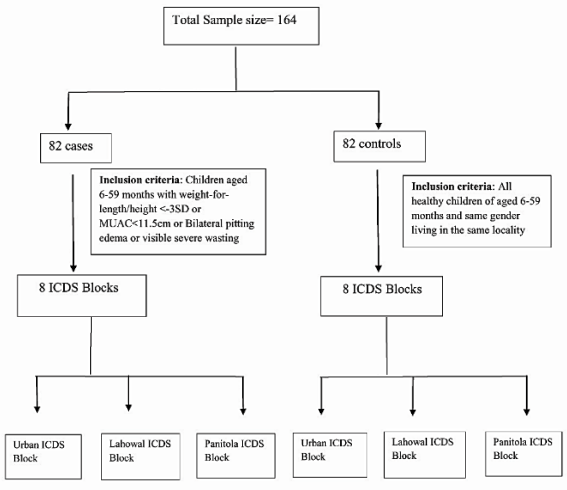
Selection of Cases: Case definition: A case is a child of aged 6-59 months who have either weight-for-length/height <-3SD (Z-Score of Median WHO growth reference), or Mid-upper arm circumference <11.5 cm.(25)

Selection of controls: A control is defined as all healthy children of same age group 6-59 months (up to 1 calendar month) and same gender living in the same locality. Matching was done for age and gender.

Children with serious illness (admitted in ICU) and chronic disorders like Cardiac, Renal, Central nervous system or metabolic disorders and hhouseholds that were found to be locked during two consecutive visits were excluded.

Sampling Design: Multistage sampling technique was used. Active search of SAM cases was done in selected ICDS blocks from a list of children identified in AWCs. Those fulfilling the criteria were included as case and matched control was selected from the same community.

Figure 1 Flowchart for selection of cases and controls:



Data Collection Technique:

a. Data collection of cases and controls: Data was collected by personal interviews using a predesigned and pretested questionnaire after taking written consent from the mother/caregiver. Households of selected under-5 children fulfilling the criteria of controls were visited. Interviews

of the mothers/caregivers were taken followed by household assessment, general examination and nutritional status of the children were assessed using anthropometric measures as per WHO guidelines on Anthropometry after taking written informed consent from the mother/caregiver after confirming the exact age of the child from MCP card or birth certificates or by using available conventional tools.

b. Data collection of Anganwadi workers: An in-depth interview was conducted using a pre-designed and pre-tested questionnaire to assess the knowledge and practice of Anganwadi worker present at the time of visit.

Statistical Analysis: Data was analyzed using SPSS Software, version 25.0. Normality check was done. Logistic regression analysis was done to test associations. Chi-Square test was applied to see difference between two groups for categorical variables. Strength of association, odds ratio (OR) along with 95% CI (confidence interval) were estimated. Unadjusted OR was calculated by Bivariate analysis and adjusted odds ratio was analyzed using Multiple logistic regression in variables found to be significant in Bivariate analysis. A significance level of $p \leq 0.05$ was considered for statistical significance.

Ethical clearance: Ethical clearance was obtained from the Institutional Ethics Committee (Human). Written informed consent were taken from the child's mother/caregiver and all participants.

RESULTS

Total 164 participants were selected, out of which 82 were cases and 82 were controls. Mean age was 23.55 ± 11.65 (23.99 ± 1.30 months in cases vs 23.12 ± 1.28 months in controls). Majority were male (53.7%). As per Modified BG Prasad scale, 58.8% cases and 41.2% control group belonged to Class IV socio-economic status. Socio-demographic characteristics of the participants are presented in Table 1.

Table.1: Socio-demographic characteristics of the study participants:

Variables		Cases n (%)	Controls n (%)	Total n (%)	(Chi-square) p-value
Religion	Hindu	69 (48.9)	72 (87.8)	141 (100)	0.076
	Muslim	6 (40.0)	9 (11.0)	15 (100)	
	Christian	7 (87.5)	1 (1.2)	8 (100)	
Caste	General	20 (42.6)	27 (57.4)	47 (100)	0.129
	OBC	55 (56.7)	42 (43.3)	97 (100)	
	SC/ST	7 (35)	13 (65)	20 (100)	
Education of mother/caregiver	Illiterate	24 (53.3)	21 (46.7)	45 (100)	0.045
	Primary	21 (65.6)	11 (34.4)	32 (100)	
	Middle school	19 (50.0)	19 (50.0)	38 (100)	
	High school	15 (41.7)	21 (58.3)	36 (100)	
	≥HS Passed	3 (23.1)	10(76.9)	13 (100)	
Occupation of mother/caregiver	Housewife	49 (45.4)	59 (54.6)	108 (100)	0.126
	Service	5 (55.6)	4 (44.4)	9 (100)	
	Laborer/self employed	28 (59.6)	19 (40.4)	47 (100)	
Type of family	Nuclear	21 (35.6)	38 (64.4)	59 (100)	0.006
	Joint	61 (58.1)	44 (41.9)	105 (100)	
Type of housing	Pucca	1 (9.1)	10 (90.9)	11 (100)	0.010
	Kutcha	67 (55.4)	54 (44.6)	121 (100)	
	Semi-pucca	14 (43.8)	18 (56.3)	32 (100)	
Socio-economic status	Class II	1 (14.3)	6 (85.7)	7 (100)	0.002
	Class III	21(37.5)	35 (62.5)	56 (100)	
	Class IV	57 (58.8)	40 (41.2)	97 (100)	
	Class V	3 (75.0)	1 (25.0)	4 (100)	

SAM was higher among children with mothers doing service (OR 1.5, 95% CI 0.38-5.91, p= 0.5581), children belonging to joint family (OR 2.5, 95% CI 1.29-4.85) and children belonging Class III (OR 3.6, 95% CI 0.40-32.0, p 0.2506), class IV (OR 8.5, 95% CI 0.99-73.79, p 0.0510) and class V socio-economic status (OR 18.0, 95% CI 0.81-399.18, p 0.0675). (Table 2). Low birth weight (<2.5 Kg) was found to be significantly associated with SAM (OR 10.4, 95% CI 4.0-26.61, p= <0.0001). Regarding maternal factors, SAM was higher among children with mother's age group ≤20 years (OR 10.0, 95% CI 0.78-128.78, p= 0.0774) and mothers having <4 antenatal check-ups (OR 4.4, 95%CI 1.94-10.15, p=0.0004). (Table 2). It was seen that SAM was higher among children who were partially immunized (OR 5.4, 95% CI 1.90-15.23, p= 0.0015) and non-immunized children (OR 3.1, 95% CI 0.78-12.69, p=0.1084). (Table 2)

Table.2: Factors associated with Severe Acute Malnutrition (SAM):

Variables		Cases n (%)	Controls n (%)	Odds Ratio (95% CI)	p-value
Occupation of mother/caregiver	Housewife	49 (45.4)	59 (54.6)	Reference	-
	Service	5 (55.6)	4 (44.4)	1.5 (0.38-5.91)	0.5581
	Laborer/self employed	28 (59.6)	19 (40.4)	1.8 (0.89-3.56)	0.1058
Type of family	Nuclear	21 (35.6)	38 (64.4)	Reference	-
	Joint	61 (58.1)	44 (41.9)	2.5 (1.29-4.85)	0.0062
Socio-economic status	Class II	1 (14.3)	6 (85.7)	Reference	-
	Class III	21(37.5)	35 (62.5)	3.6 (0.40-32.00)	0.2506
	Class IV	57 (58.8)	40 (41.2)	8.5 (0.99-73.79)	0.0510
	Class V	3 (75.0)	1 (25.0)	18.0 (0.81-399.18)	0.0675
Birth weight	≥ 2.5	45 (37.2)	76 (62.8)	Reference	-
	<2.5	37 (86.0)	6 (14.0)	10.4 (4.0-26.61)	<0.0001
Age of mother at last pregnancy (in years)	≤20	6 (66.7)	3 (33.3)	10.0 (0.78-128.78)	0.0774
	20-25	57 (62.6)	34 (37.4)	8.4 (0.94-74.79)	0.0569
	25-30	18 (31.6)	40 (68.4)	2.3 (0.24-20.67)	0.4736
	>30	1 (16.7)	5 (83.3)	Reference	-
Total ANC visits	<4	29 (76.3)	9 (23.7)	4.4 (1.94-10.15)	0.0004
	≥4	53 (42.1)	73 (57.9)	Reference	-
Immunization status	Fully-immunized	55 (42.6)	74 (57.4)	Reference	-
	Partially immunized	20 (80.0)	5 (20.0)	5.4 (1.90-15.23)	0.0015
	Non-immunized	7 (70.0)	3 (30.0)	3.1 (0.78-12.69)	0.1084
Purification of drinking water	Yes	32 (47.8)	35 (52.2)	Reference	-
	No	50 (51.5)	47 (48.5)	1.2 (0.62-2.17)	0.6338
Handwashing by mother/caregiver before feeding	Yes	52 (40.6)	76 (59.4)	Reference	-
	No	8 (88.9)	1 (11.1)	11.7 (1.42-96.31)	0.0223
	Not frequently	22 (81.5)	5 (18.5)	6.4 (2.29-18.07)	0.0004
Health-seeking behavior	Home remedies	10 (76.9)	3 (23.1)	4.3 (1.13-16.49)	0.0326
	Pharmacist	14 (70.0)	6 (30.0)	3.0 (1.08-8.40)	0.0344
	Govt hospital	51 (43.6)	66 (56.4)	Reference	-
	Private hospital	2 (28.6)	5 (71.4)	0.51 (0.09-2.78)	0.4424
	Consult ASHA/ ANM/ AWW/others	5 (71.4)	2 (28.6)	3.2 (0.60-17.36)	0.1708
Utilization of ICDS services	Yes	41 (35.0)	76 (65.0)	Reference	-
	No	18 (90.0)	2 (10.0)	16.7 (3.69-75.48)	0.0003
	Irregular	23 (85.2)	4 (14.8)	10.7 (3.45-32.92)	<0.0001
History of fever in last 2 weeks	Present	26 (66.7)	13 (33.3)	2.5 (1.16-5.23)	0.0190
	Absent	56 (44.8)	69 (55.2)	Reference	-
	Present	15 (88.2)	2 (11.8)	8.9 (1.98-40.57)	0.0045

Variables		Cases n (%)	Controls n (%)	Odds Ratio (95% CI)	p-value
History of diarrhea in last 2 weeks	Absent	67 (45.6)	80 (54.4)	Reference	-
History of other illness	Present	77 (78.6)	21 (21.4)	41.8 (15.95-125.49)	<0.0001
	Absent	5 (7.6)	61 (92.4)	Reference	-

Hygiene practices like water consumption without purification (OR 1.2, 95% CI 0.62-2.17, p 0.6338) was associated with SAM but not statistically significant and risk of SAM was higher in children whose mother did not practice handwashing before feeding (OR 11.7, 95% CI 1.42-96.3, p=0.022) and was statistically significant. (Table 2). Health seeking behavior among mothers/caregivers showed higher SAM among those who preferred home remedies (OR 4.3, 95% CI 1.13- 16.49, p= 0.0326), pharmacist (OR 3.0, 95% CI 1.08-8.40, p= 0.0344) and those who consult either ASHA/ANM/AWW/Others (OR 33.2, 95% CI 0.60-17.36, p= 0.1708) as compared to those who preferred government hospital and was found statistically significant in case of home remedies and pharmacist. (Table 2). Odds of having SAM were higher among whose mothers did not utilize ICDS service (OR 16.7, 95% CI 3.69-32.92, p= 0.0003) and irregular utilization of ICDS services (OR 10.7, 95% CI 3.45-32.92, p= <0.0001). (Table 2). It was found that previous history of fever (OR 2.5, 95% CI 1.16-5.23, p= 0.0190), diarrhea (OR 8.9, 95% CI 1.98-40.57, p=0.0045) and other illness (OR 41.8, 95% CI 15.95-125.49, p=<0.0001) were significantly associated with SAM. (Table 2)

Regarding IYCF practices, factors like breastfeeding within 1-6 hours of birth (OR 2.6, 95% CI 1.04-6.38, p= 0.04), no colostrum feeding (OR 4.4, 95% CI 1.38-13.79, p= 0.0120), no exclusive breastfeeding up to 6 months (OR 5.6, 95% CI 1.18-26.21, p= 0.0303) and not receiving energy dense foods (OR 5.6, 95% CI 2.68-11.61, p= <0.0001) were significantly associated with SAM. (Table 3).

Logistic regression showed joint family, birth weight less than 2.5 kg, mothers with antenatal check-up less than 4 visits, duration of exclusive breastfeeding more than 6 months, partial immunization, no utilization of ICDS services and irregular utilization of ICDS services were found to be independent predictors of Severe Acute Malnutrition. (Table 4)

Regarding knowledge and practice of IYCF and SAM identification and management, majority of the Anganwadi workers had good knowledge. (Table 5). On in-depth interview, regarding service delivery, majority of AWWs responded that "*As Anganwadi centers were shut down during Covid-19 pandemic, services were delivered by doing household visits following Covid-19 protocols*". Regarding practice, majority of AWWs responded that *"They ensure weight monitoring and did growth monitoring monthly by measuring weight and height of children, distribution of THR, screening of SAM children and counselling of beneficiaries by doing house-to-house visits or in open space near AWC with the help of ASHA and ANM and followed their supervisor's orders."* Majority of the AWWs responded that "*During service delivery in Covid-19 situation they had face barriers like communication gap between ASHA and ANM, they were not allowed to enter house during home visits in some places and work load was increased."*

Table.3: Factors associated with SAM in under-5 children according to Infant and Young Child Feeding practices (IYCF):

Variables		Cases n (%)	Controls n (%)	Odds Ratio (95% CI)	p-value
Child ever breastfed	Yes	78 (49.1)	81 (50.9)	Reference	-
	No	4 (80.0)	1 (20.0)	4.2 (0.45-37.99)	0.2073
Time of initiation of breastfeeding	0-1 hour	61 (45.5)	74 (54.5)	Reference	-
	1-6 hours	17 (68.0)	8 (32.0)	2.6	0.0405

Variables		Cases n (%)	Controls n (%)	Odds Ratio (95% CI)	p-value
				(1.04-6.38)	
	None	4 (80.0)	1 (20.0)	4.8 (0.53-44.56)	0.1627
Pre-lacteal feeds	Received	2 (66.7)	1(33.3)	2.02 (0.18-22.78)	0.5677
	Not received	80 (49.7)	81 (50.3)	Reference	-
Frequency of breastfeeding	On demand	48 (42.9)	64(57.1)	Reference	-
	Hourly	11 (42.3)	15 (57.7)	0.98 (0.41-2.32)	0.9593
	Others	23 (88.5)	3 (11.5)	10.2 (2.89-36.04)	0.0003
Colostrum feeding	Received	67 (46.2)	78 (53.8)	Reference	-
	Not received	15 (78.9)	4 (21.1)	4.4 (1.38-13.79)	0.0120
Exclusive breastfeeding up to 6 months	Received	72 (47.4)	80 (52.6)	Reference	-
	Not received	10 (83.3)	2 (16.7)	5.6 (1.18-26.21)	0.0303
Duration of Exclusive breastfeeding	6 months	38 (36.5)	66 (63.5)	Reference	-
	>6 months	29 (70.7)	12 (29.3)	4.2 (1.92-9.18)	0.0003
	<6 months	5 (71.4)	2 (28.6)	4.3 (0.80-23.48)	0.0881
	None	10 (83.3)	2 (16.7)	8.7 (1.81-41.73)	0.0070
Bottle feeding	Received	8 (80.0)	2 (20.0)	4.3 (0.89-21.02)	0.0696
	Not received	74 (48.1)	80 (51.9)	Reference	-
Time of initiation of complementary feeding	6 months	8 (80.0)	2 (20.0)	4.3 (0.89-21.05)	0.0694
	After 6 months	73 (48.0)	79 (52.0)	Reference	-
	Not started	1 (50.0)	1 (50.0)	1.08 (0.07-17.62)	0.9557
Frequency of feeding of semi-solid/solid food per day	≤ 3 times	26 (96.3)	1 (3.7)	37.0 (4.984-286.98)	0.0004
	≥ 4 times	55 (40.7)	80 (59.3)	Reference	-
	Not started	1 (50.0)	1 (50.0)	1.4 (0.089-23.75)	0.7926
Feeding of energy dense foods	Yes	40 (36.7)	69 (63.3)	Reference	-
	No	42 (76.4)	13 (23.6)	5.6 (2.68-11.61)	<0.0001

Table.4: Determinants of Severe Acute Malnutrition: Logistic regression analysis

Variables		Adjusted Odds Ratio	95% Confidence interval		p-value
			Lower	Upper	
Type of family	Nuclear	Reference	-	-	-
	Joint	3.08	1.022	9.312	0.046
Socio-economic status	Class II	Reference	-	-	-
	Class III	1.34	0.53	33.66	0.859
	Class IV	4.5	0.190	110.77	0.348
	Class V	0.8	0.010	72.08	0.941
Birth weight	≥ 2.5 kg	Reference	-	-	-
	<2.5 kg	20.6	4.505	94.032	<0.0001

Variables		Adjusted Odds Ratio	95% Confidence interval		p-value
			Lower	Upper	
Total ANC visits	≥ 4 times	Reference	-	-	-
	< 4 times	5.13	1.286	20.476	0.021
Type of delivery	SVD	Reference	-	-	-
	Caesarean	1.86	0.499	6.936	0.355
Iron supplements taken by mother during pregnancy	Yes	Reference	-	-	-
	No	0.75	0.28	20.076	0.863
Time of initiation of breastfeeding	0-1 hour	Reference	-	-	-
	1-6 hours	1.4	0.269	7.468	0.681
	None	0.097	0.001	6.931	0.285
Colostrum feeding	Received	Reference	-	-	-
	Not received	2.54	0.355	18.277	0.352
Duration of EBF	6 months	Reference	-	-	-
	>6 months	3.7	1.082	12.435	0.037
	<6 months	4.6	0.236	89.675	0.313
	None	4.1	0.165	100.62	0.390
Immunization status	Fully-immunized	Reference	-	-	-
	Partially immunized	9.2	1.834	46.596	0.007
	Non-immunized	1.35	0.186	9.802	0.767
Health seeking behavior	Govt hospital	Reference	-	-	-
	Home remedies	2.9	0.197	41.596	0.440
	Pharmacist	2.4	0.511	11.290	0.267
	Private hospital	1.0	0.053	18.828	0.999
	Consult ASHA/ ANM/AWW/Others	4.93	0.439	55.416	0.196
ICDS services utilization	Yes	Reference	-	-	-
	No	9.7	1.158	80.585	0.036
	Irregular	27.36	5.730	130.662	<0.0001
History of diarrhea	Absent	Reference	-	-	-
	Present	3.5	0.465	26.737	0.223

**EBF= Exclusive breastfeeding, ANC =Antenatal check-up, SVD=Spontaneous vaginal delivery, AWW= Anganwadi worker, ASHA=Accredited Social Health Activist, ANM= Auxiliary Nurse Midwifery*

Table.5: Knowledge and practice of IYCF practices and identification of SAM among AWWs (n=27)

Knowledge of AWW about		Desired response	Correct [n (%)]	Incorrect [n (%)]
IYCF Practices	Time of initiation of breastfeeding	Within 1 hour of birth	26 (96.3%)	1 (3.7%)
	Age of exclusive breastfeeding	Up to 6 months	25 (92.6%)	2 (7.4%)
	Colostrum feeding	Should be given	25 (92.6%)	2 (7.4%)
	Age of initiation of complementary feeding	After 6 months	26 (96.3%)	1 (3.7%)
	Total food groups	7 food groups	23 (85.2%)	4 (14.8%)
	Minimum food groups to be given to maintain dietary diversity	At least 4 or more food groups	25 (92.6%)	2 (7.4%)
Identification of Severe acute malnutrition	Frequency of growth monitoring in children	Monthly	26 (96.3%)	1 (3.7%)
	Identification of SAM parameters	Weight-for-height, MUAC	26 (96.3%)	1 (3.7%)
	Use of growth monitoring charts	Yes	25 (92.6%)	2 (7.4%)
	Referral of SAM children with medical complications	NRC	24 (88.9%)	3 (11.1%)
	Use of POSHAN app	Yes	22 (81.5%)	5 (18.5%)
	Services under CMAM program	Antibiotics, double THR, weekly home visits, micronutrient supplements, follow-up visits	21 (77.8%)	6 (22.2%)

DISCUSSION

First two years of life is considered crucial, because key interventions like adequate maternal nutrition, early initiation and exclusive breastfeeding, optimal nutrition with nutritious and diverse foods and healthy environment in early childhood can prevent malnutrition with three generational effects. Cause of malnutrition is multifactorial and has a great impact on the physical and socio-economic condition of a country.(2) Previous studies have shown that malnutrition is more of a social problem.

This study, found that odds of having SAM was higher among children with mothers doing service (OR 1.5, 95% CI 0.38-5.91, p 0.5581) as compared to children whose mothers were housewives but it was not statistically significant. The findings in this study were comparable with other studies(9,11); which is probably because working mothers have less time for child care and less feeding time resulting in more risk of malnutrition. Children belonging to joint family found to have higher risk of malnutrition, which is similar to study done in Maharashtra, although other studies have shown that SAM was more associated with nuclear family.(12,22,23)Although in joint family, almost every family member were either employed or tea garden labour (daily wage worker) so child care gets neglected and also more family members staying in tea garden quarters in labour lines, leads to overcrowding and more chances of infection then malnutrition as vicious cycle. This indicates need to focus on timely break in workplace and creation and improvement of creche services and other interventions to support child care by working lady in tea industry.

The present study reported that SAM was more common among lower socio-economic status. This was probably because families belonging to lower socio-economic status have less access to quality nutrition, healthcare and food security thus leading to malnutrition as seen in other studies.(12,13) Maternal factors like low mother's age (<20years) and inadequate antenatal check-ups were found to be significantly associated with SAM in this study, which is comparable to previous studies.(10,14) This may be probably because lack of proper antenatal care affects both mother and child's health. In the present study, low birth weight was found statistically significant with SAM. This indicates that low birth weight babies grow up to be more prone to developing malnutrition in later life as compared to normal weight babies as seen in other studies.(15,17)

It was observed that IYCF factors like late initiation of breastfeeding, no colostrum feeding, no exclusive breastfeeding and not receiving energy dense foods were significantly associated with SAM. Previous studies also reported that IYCF factors like late initiation of breastfeeding, sub-optimal complementary feeding, bottle feeding and pre-lacteal feeds were significantly associated with SAM.(8,16)Immunization status like partially immunized and non-immunized were associated with SAM in this study. As infection and malnutrition is a vicious cycle and non/partially immunized children are a greater risk of infection leading to malnutrition due to lack of immunity which was seen in previous studies.(7,11,19) It also indicates poor adherence to health services available free of cost through routine health care delivery system. It was observed that poor hygiene practices, health seeking behavior of mother/caregiver and poor utilization of ICDS services were associated with SAM. Previous studies also found that poor hygiene practices is associated with malnutrition which indicates need to improve water, sanitation and hygiene of community to protect them from infection and malnutrition as one major interventions.(14,19)Another study in Rajasthan also found that malnutrition was significantly associated with poor utilization of ICDS service by the target population.(15)Utilization of ICDS services was found to be poor in this study as compared to other studies which may be due to total shut down of the Anganwadi centers and interruption in service delivery during COVID-pandemic. Present study documented history of previous illness and severe acute malnutrition was significantly associated which

is similar to findings observed in studies in Kolkata and Nepal.(20,26)

Overall knowledge of AWWs regarding IYCF practices, SAM identification and management was better in our study as compared to other studies (21,22) which may be probably because the Anganwadi workers in the study area had remote supportive supervision of all the nutritional services before the study.(24)

Conclusion

Factors like type of family, low birth weight, mothers with less ANC visits, duration of exclusive breastfeeding, partial immunization and poor utilization of ICDS services are found to be associated with SAM of under-five children. Although, overall knowledge of AWWs about IYCF and identification of SAM was adequate but service delivery may be affected by nationwide lockdown and engagement of these workers in Covid-19 related tasks like contact tracing and containment allotment.

Recommendation

The findings in this study indicates the need to address the following areas:

Need to address water, sanitation and hygiene practices in the community and discover ways to improve them. Emphasis to be given by the ICDS and other health workers to ensure timely completion of vaccination and also to ensure full utilization of ICDS services by the beneficiaries. Need to address the barriers in service delivery to improve the utilization of ICDS services. Counselling of mothers/caregivers on appropriate age-specific infant and young child feeding practices. Intersectoral coordination and convergence between health, ICDS, Panchayat system and local community-based organizations and other stakeholders has potential to improve overall nutritional status and services in the community.

Limitation

As it is a case-control study, selection bias could have influenced the exposure status. Since the study assesses history of exposure retrospectively it may be prone to recall bias during data collection which could have influenced the exposure status.

Relevance of the Study

COVID Pandemic affected overall scenario of service delivery and service utilization causing a lacunae in smooth functioning that was going on prior to the pandemic and this in turn led to worsening of the malnutrition status of the children. There is a need to do further study to assess the availability and utilization of creche services amongst tea garden workers and coverage and quality of ICDS services in riverine areas.

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Authors Contribution

All authors have contributed equally.

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Conflict of Interest

There are no conflicts of interest.

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