



Association of infant and young child feeding practices with diarrheal morbidity and hospitalization outcomes among under-five children in eastern India: A cross-sectional analytical study.

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Abstract

Background

Diarrheal illnesses remain a major cause of morbidity and hospitalization among children under five years of age in India. Infant and young child feeding (IYCF) practices strongly influence illness severity and recovery. However, adherence to optimal feeding practices remains low in several regions.

Objective

To assess the association between IYCF practices and diarrheal morbidity and hospitalization outcomes among under-five children admitted with acute diarrhoea in Eastern India.

Methods

A cross-sectional analytical study was conducted among 228 children aged 1 month to 5 years presenting with acute diarrhoea to a tertiary care hospital in West Bengal during 2023–24. Information regarding feeding habits, nutritional status, immunization profile, and clinical course was obtained from caregiver interviews and medical records. Data were analysed using Chi-square, Mann-Whitney U, and Kruskal-Wallis tests, with significance set at $p < 0.05$.

Results

Early initiation of breastfeeding (52.2%) and exclusive breastfeeding for the first 6 months (33.3%) were associated with milder diarrheal episodes ($p = 0.005$ and $p = 0.004$). Children who were top-fed (52.2%) or received mixed feeding (40.6%) had higher rates of dysentery and persistent diarrhoea ($p = 0.001$). Under-feeding was linked with prolonged hospitalization and a greater likelihood of complications ($p < 0.01$). Inadequate immunization status also showed significant association with complicated diarrhoea ($p = 0.001$).

Conclusion

Suboptimal IYCF practices substantially contribute to increased diarrheal severity and longer hospital stays among under-five children in Eastern India. Strengthening breastfeeding support and improving complementary feeding guidance can help reduce disease burden.

Recommendations

Community-level counselling, antenatal and postnatal breastfeeding support, growth monitoring during immunization visits, and targeted awareness programs are essential to improve feeding behaviours and prevent recurrent diarrheal episodes.

Keywords: Child Feeding, Diarrheal Morbidity, Nutrition, Immunization

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Introduction

Childhood diarrhoea continues to be one of the main causes of morbidity, mortality, and malnutrition in children under 5 years old. This is particularly true in rural

and low-resource settings in India [1]. While there have been gradual changes in water, sanitation, and hygiene, diarrheal diseases still pose a major public health



challenge due to persistent inequalities in child feeding practices and nutritional behaviours [2].

UNICEF and WHO identify infant and young child feeding (IYCF) practices that promote early initiation of breastfeeding within one hour of birth, exclusively breastfeeding for the first 6 months of life, and safe and sufficiently nutritious complementary feeding after six months, as key interventions to reduce severe diarrheal illnesses and mortality and improve child survival [3].

Multiple studies in India reported that although much attention has been directed toward improving feeding practices, there continues to be suboptimal adherence to IYCF recommendations, with inadequate socio-epidemiological beliefs, maternal knowledge and education, and access to health educational materials [4,5] These mediocre feeding practices included delayed initiation of breastfeeding, early introduction of complementary foods, and improper hygiene while feeding children; they continue to contribute disproportionately to episodes of diarrhoea and its complications among young children [6].

Since there was limited, regional evidence highlighting connections between certain feeding behaviours with diarrheal outcomes and hospitalization rates, The findings are intended to provide evidence for action to help strengthen nutrition education and preventive activities within child health programs. This study was designed to explore the association of IYCF practice with diarrheal morbidity and hospitalization outcomes among under-five children in Eastern India.

Methods

Study Design

This was a hospital-based analytical cross-sectional observational study conducted to assess the association between infant and young child feeding practices and diarrheal morbidity and hospitalization outcomes among children under five years of age.

Study Setting and Duration

The study was conducted in the Department of Paediatrics at Malda Medical College and Hospital (MMCH), a major government-funded tertiary care teaching institution in West Bengal. The hospital serves a large catchment area that includes rural blocks, semi-urban settlements, and

border-adjacent communities, resulting in a continuous inflow of paediatric patients with infectious, nutritional, and diarrheal illnesses. MMCH has dedicated isolation wards, a fully functional paediatric emergency unit, and round-the-clock laboratory services, which made it suitable for systematically assessing diarrheal admissions. The study was carried out over a twelve-month period from June 2023 to May 2024.

Study Population

Children aged 1 month to 5 years admitted with acute diarrhea as per WHO definition and whose caregivers provided informed consent were included. Children with chronic comorbid conditions such as known immunodeficiency, congenital malformations, or chronic gastrointestinal illness were excluded to avoid confounding.

Inclusion and Exclusion Criteria

Inclusion Criteria

Children aged 1 month to 5 years admitted with acute diarrhea as defined by WHO.

Caregivers who provided written informed consent for participation.

Exclusion Criteria

Children with chronic gastrointestinal disorders, such as celiac disease, inflammatory bowel disease, or malabsorption syndromes.

Known cases of congenital anomalies or syndromes affecting feeding or nutritional status.

Children with diagnosed immunodeficiency disorders.

Cases where reliable feeding history or immunization details could not be obtained despite caregiver interview and record verification.

Sample Size and Sampling Technique

A total of 228 consecutive eligible admissions were enrolled using convenience sampling.

The minimum required sample size was estimated assuming an expected difference in the prevalence of improper feeding practices between groups with and without diarrheal morbidity, with 80% power and 5% level of significance. All eligible cases admitted during the study period were included until the sample size was achieved.

Data Collection Procedures

Data were collected by interviewing caregivers using a pretested structured questionnaire in their native language.

Collected information included:

- **Socio-demographic profile:** age, gender, birth order, maternal age, education, occupation, and family size.
- **Feeding history:** initiation of breastfeeding, exclusive breastfeeding, use of prelacteal or top feeding, age and type of weaning, complementary feeding (type, frequency, hygiene).
- **Nutritional assessment:** anthropometric measures (weight, height/length), z-scores (WFA, HFA, WFH), and mid-upper arm circumference (MUAC).
- **Hospitalization outcomes:** duration of stay (1–3, 4–6, or ≥ 7 days), type and severity of diarrhea, complications (dehydration, sepsis, electrolyte imbalance), and prior hospitalizations.
- **Immunization status:** verified from immunization cards or caregiver recall for missing records.

Variables and Definitions

- **Early initiation of breastfeeding:** within 1 hour of birth.
- **Exclusive breastfeeding:** only breast milk (no other fluids/solids) until 6 months of age.

- **Top feeding:** bottle or formula feeding.
- **Weaning:** introduction of complementary foods classified as early (<6 months), ideal (6 months), or delayed (>6 months).
- **Complementary food type:** homemade vs. packed/processed.
- **Malnutrition:** categorized using WHO growth standards based on z-scores and MUAC.
- **Immunization completeness:** receipt of all age-appropriate vaccines under the Universal Immunization Program.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee of Malda Medical College and Hospital. Written informed consent was obtained from all caregivers prior to data collection.

Bias

Several steps were taken to minimize potential sources of bias. Selection bias was reduced by enrolling all consecutive eligible admissions during the study period, ensuring that no admitted child meeting inclusion criteria was omitted. Information bias was controlled by using a pretested, structured questionnaire administered in the caregiver's native language, which helped reduce misinterpretation of questions. Feeding histories and immunization details were verified using available records such as immunization cards to limit recall-related errors. To minimize observer bias, measurements and clinical assessments were performed using standardized procedures followed uniformly across all participants. Data entry was cross-checked by two independent investigators to avoid transcription errors.

Statistical Analysis

Data were analysed using SPSS version 21.0 (IBM Corp., Armonk, NY, USA).

Descriptive statistics summarized demographic and feeding practice data.

Associations between feeding practices and diarrheal morbidity, hospitalization duration, and complications were tested using the Chi-square test or Fisher's exact test

for categorical variables, and Mann–Whitney U or Kruskal–Wallis tests for continuous nonparametric variables. Only bivariate analyses were performed; no multivariable regression modelling was conducted. A two-sided p value < 0.05 was considered statistically significant.

The mean age of study participants was 16.4 ± 14.2 months, with infants constituting over half (56.1%) of the study population. Males accounted for 60.5% of admissions. The mean maternal age was 22.2 ± 4.6 years, and nearly half (49.1%) of the mothers had completed primary education. Most mothers were homemakers (62.7%), and a majority of children were firstborns (56.2%).

Results

Table 1. Demographic Profile of Admitted Under-Five Children (n = 228)

Variable	Distribution
Mean Age (months)	16.4 ± 14.2
Age group (% infants)	56.1
Male	60.5%
Mother's age (years)	22.2 ± 4.6
Maternal education	Primary: 49.1% Secondary: 44.8%
Occupation	Homemaker: 62.7% Business: 31.6%
First child	56.2%
Single child	46.5%

Legend: Descriptive statistics; data presented as mean $\pm$ SD or percentage.

Among the participants, 28.9% had received prelacteal feeds, while only 52.2% were breastfed within one hour of birth. Exclusive breastfeeding up to six months was practiced in one-third of children (33.3%), whereas 52.2% received top feeding. Weaning at the recommended age of

six months was reported by 42.6%, with 47.1% introducing complementary foods after six months. Homemade complementary foods were used by 59.4%, while 40.6% depended on packed or processed foods. The average feeding frequency was 6.0 ± 0.9 times per day.

Table 2. Infant and Young Child Feeding Practices

Practice	n (%)
Prelacteal feeding	66 (28.9)
Breastfeeding initiated within 1 hr	119 (52.2)
Exclusive breast feeding	76 (33.3)
Top feeding	119 (52.2)
Early weaning (<6 mo)	16 (10.3)
Ideal weaning (6 mo)	66 (42.6)
Delayed weaning (>6 mo)	73 (47.1)
Homemade complementary food	92 (59.4)
Packed complementary food	63 (40.6)
Mean feeding frequency/day	6.0 ± 0.9

Legend: Frequency distribution of feeding practices among enrolled children.

Acute watery diarrhoea was the predominant presentation (80.3%), followed by dysentery (13.6%) and persistent diarrhoea (6.1%). Associated health problems were

documented in 61.8% of the cases, and 42.1% had a prior history of hospitalization for similar illness, indicating recurrent or severe disease burden.

Table 3. Diarrheal Morbidity and Associated Outcomes

Diarrhea Type	n (%)
Acute watery	103 (80.3)
Dysentery	31 (13.6)
Persistent	14 (6.1)
Associated problems	141 (61.8)
Past hospitalization	96 (42.1)

Legend: Descriptive analysis of diarrhoea types and related outcomes.

Initiating breastfeeding early was significantly related with decreased prevalence of dysentery and persistent diarrhoea ($p = 0.005$). Additionally, exclusive breastfeeding had an inverse relationship with the occurrence of the severe forms of diarrhoea ($p = 0.004$). Furthermore, use of packed complementary foods was positively associated

with dysentery and persistent diarrhoea ($p = 0.001$). This indicates that children fed processed foods are at increased risk for these complications. While neither prelacteal feeding nor top feeding were significant statistically, they did occur more in those with complicated diarrhoea.

Table 4. Association Between Feeding Practice and Diarrheal Morbidity Types

Feeding Practice	Acute Watery	Dysentery	Persistent	p-value	χ^2 value
Prelacteal feed: Yes	26.8%	38.7%	35.7%	0.338	2.17
Early initiation	57.9%	32.3%	21.4%	0.005	10.82
Exclusive BF	35.5%	22.6%	28.6%	0.004	11.27
Top feeding	46.4	77.4	71.4	0.001	14.93
Packed food	28.9%	72.4%	75.0%	0.001	18.56

Legend: Association tested using Chi-square/Fisher's exact test; $p < 0.05$ considered significant.

Infants breastfed within one hour of birth had shorter lengths of stay ($p = 0.001$), but infants who were given prelacteal feeds or top feeds had significantly longer length of stay ($p = 0.010$; $p = 0.004$, respectively). A decrease in mean feeding frequency was also associated

with longer length of stay ($p = 0.013$), indicating poorer nutritional resilience. Exclusive breastfeeding was protective against a longer length of stay, while delaying or early weaning resulted in longer lengths of stay.

Table 5. Feeding Practice and Duration of Hospitalization

Practice	1–3 days stay	4–6 days	≥ 7 days	p-value	χ^2 value
Prelacteal feed: Yes	22.7%	43.3%	35.7%	0.010	9.31
Early initiation	64.3%	26.7%	28.6%	0.001	13.94
Exclusive BF	40.9%	16.7%	21.4%	0.004	11.68
Top feeding	39.6%	78.3%	78.6%	0.004	12.45
Frequency (mean $\pm$ SD)	6.1 $\pm$ 0.9	5.9 $\pm$ 0.8	5.4 $\pm$ 0.8	0.013	-

Legend: Comparison of feeding factors across hospitalization duration using Chi-square and Kruskal–Wallis tests.

Children who were given prelacteal feeds, top feeding, or pre-packed complementary foods experienced higher rates of complications ($p = 0.001$). Early initiation alcohol

children with complications (5.74 ± 0.86 vs. 6.33 ± 0.83 ; $p = 0.013$). Incomplete immunizations were also identified as an independent risk factor, as it was significantly correlated with complications ($p = 0.001$).

exclusive breastfeeding was shown to provide protection, as they had fewer complications ($p = 0.001$ and $p = 0.004$ respectively). The mean feeding frequency was lower in

Table 6. Feeding Practices, Immunization, and Presence of Complications

Risk Factor	No Complication	Complication	p-value	χ^2 value
Prelacteal feed: Yes	11.5%	39.7%	0.001	16.42
Early initiation	72.4%	39.7%	0.001	15.11
Exclusive BF	44.8%	26.2%	0.004	8.29
Top feeding	31.0%	65.2%		14.73
Packed food	15.1%	53.9%	0.001	18.06
Frequency (mean $\pm$ SD)	6.33 $\pm$ 0.83	5.74 $\pm$ 0.86	0.013	-
Incomplete immunization	1.1%	24.1%	0.001	21.53

Legend: Chi-square and Mann-Whitney U tests used for categorical and continuous variables, respectively.

Discussion

The study demonstrates important relationships between infant and young child feeding practices and diarrheal morbidity among children under five years of age in Eastern India. Early initiation of breastfeeding within one hour of birth and exclusive breastfeeding during the first six months emerged as strong protective factors against severe forms of diarrhoea such as dysentery and persistent diarrhoea. These findings mirror global and national evidence showing reduced morbidity and mortality with optimal breastfeeding practices [7,8].

Bottle or formula feeding and the use of packed or processed complementary foods were associated with higher risks of severe diarrhoea and longer hospital stays. These patterns reflect established concerns regarding contamination, poor feeding hygiene, and increased microbial exposure linked to artificial feeding and processed foods [9,10]. Initiating complementary feeding either earlier than six months or significantly later was also linked to prolonged hospitalization, underscoring the importance of introducing safe, age-appropriate complementary foods at the recommended time to support gut function and immunity [11–14].

A lower feeding frequency was also associated with adverse outcomes, suggesting that inadequate nutritional intake may weaken immune responses and worsen disease severity. Both feeding quality and feeding quantity are essential for maintaining child health [15]. Incomplete immunization status further increased the likelihood of complications, reinforcing that full vaccination coverage plays an important role in reducing diarrheal morbidity and enhancing recovery [16–18].

Conclusion

There are strong links between inappropriate infant and young child feeding practices, such as late initiation of

breastfeeding, failure to provide exclusive breastfeeding, giving other foods/drinks, and poor quality and timing of complementary foods, and diarrheal morbidity and prolonged hospitalization among children under five years of age in eastern India. This highlights the urgent need for strengthened community-based nutrition education, increased promotion of breastfeeding, and safe

feeding practices for complementary foods. Simultaneous improvement in immunization coverage will minimize morbidity related to diarrhoea and will enhance childhood outcomes.

Strengths and Limitations

The study's strength is in examining a broad array of feeding practices connected with hospital morbidity outcomes in a tertiary-care context to support public health programmatic interventions. Greater reliability is achieved by collecting primary data from caregiver interviews alongside immunization records for verification.

Weaknesses of the study include the cross-sectional design, making causal inference complex, and the study's reliance on participant recall of feeding histories may lead to additional biases. The single-center study and universal sampling strategy also limit the generalizability that could be expected for heterogeneous Indian populations. In order to confirm these associations, the interrelation and potential mechanisms warrant future prospective and multi-centric research with a larger sample size in socio-culturally distinct circumstances.

Recommendations

Strengthening breastfeeding counselling should begin during antenatal visits and continue through postnatal home-based care. Mothers and caregivers need clear, practical guidance on early initiation, exclusive breastfeeding, and safe preparation of complementary



foods. Community health workers can demonstrate appropriate feeding frequency, hand hygiene, and safe storage of food. Growth monitoring and nutrition advice should be integrated into routine immunization visits. Awareness drives in local languages, peer-support mother groups, and involvement of ASHA and Anganwadi workers can reinforce healthy feeding habits. Ensuring timely and complete immunization will further reduce the severity of diarrheal episodes and related complications in under-five children.

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Abbreviations

IYCF: Infant and Young Child Feeding
BF: Breastfeeding
MUAC: Mid-Upper Arm Circumference
WHO: World Health Organization
UNICEF: United Nations Children's Fund

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Conflict of interest

The authors declare no conflict of interest.

Author contributions: **SS**-Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript. Statistical analysis and interpretation, revision of manuscript. **SM**-Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript. Statistical analysis and interpretation, revision of manuscript. **GB**-Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript. Statistical analysis and interpretation, revision of manuscript. **SS**-Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript. Statistical analysis and interpretation, revision of manuscript.

Data availability

Data available on request

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