

## ORIGINAL ARTICLE

# Nourishing Recovery: Maternal Feeding Practices during Diarrhea and Acute Respiratory Infection (ARI) among Under-five Children in a Metropolitan Resettlement Zone of the National Capital Region, in Uttar Pradesh

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### ABSTRACT

**Background:** Global evidence shows that during and after episodes of diarrhea and ARI, children's growth is severely compromised if their diet lacks the extra nutrients needed for recovery. Increasing fluid intake while continuing to feed is crucial for better health outcomes. **Aim & Objective:** To assess mothers' feeding practices during diarrhea and ARI in under-five children living in an urban resettlement zone and to identify socio-demographic and health-care factors influencing those practices. **Materials and Methods:** Design: Community-based cross-sectional study. **Setting:** Metropolitan resettlement zone of the National Capital Region, in Uttar Pradesh. **Sample:** 418 mothers of children < 5 years were selected via multi-stage random sampling. **Data Collection:** Face-to-face interviews using a pre-tested interview schedule. **Data analysis:** Descriptive statistics; Chi-Square analysis revealed significant associations between feeding practices with different sociodemographic and healthcare-related factors. **Results:** Appropriate feeding practices (continued feeding + increased fluids) during/after illness were observed in 19.9% of mothers/ caregivers. Associations between inappropriate feeding practices and younger maternal age, older child's age, and fewer PNC visits for the mother were identified as statistically significant. ( $P < 0.05$ ). **Conclusion:** Only one-fifth of mothers followed appropriate feeding practices during diarrhea and ARI, highlighting a critical gap. Strengthening postnatal care services, targeting younger mothers, and reinforcing continued breastfeeding and feeding during illness are essential interventions to improve child nutrition and recovery outcomes.

### KEYWORDS

Feeding practices; Diarrhea; ARI; Child nutrition; Mothers; Child Health

### INTRODUCTION

Diarrhea and acute respiratory infections (ARI) contribute significantly to malnutrition and sickness in children below 5 years of age. According to the WHO, diarrhea and pneumonia combinedly result in 29% of all deaths in children aged below 5 years, and are highest in South Asia and Sub-Saharan Africa.<sup>(1)</sup> An integrated approach, including proper

feeding practices, during these illnesses, is crucial for under-five children's health outcomes, particularly in low-resource settings.

Mothers of under-5 children play a vital role as primary caregivers responsible for feeding and nursing of children.<sup>(2)</sup> However, previous research revealed that risky practices are adopted by the following proportion of mothers: 31, 25, and 11%,

respectively, who feed nothing, stop breastfeeding, and reduce fluid administration during illnesses like diarrhea, which exacerbate undernutrition and morbidity(3,4,5)

A significant percentage of mothers reduce feeding amounts and frequency during ARI in under-five children, driven by anorexia (real/perceived), lack of caregiver knowledge, traditional beliefs, and poor health worker advice, leading to harmful feeding practices and worsening child health.(6) Most earlier studies have focused on caregivers' practices of feeding healthy children aged 6-23 months. Whereas less is known about feeding practices during and after diarrhea and ARI in the 0-59 months age group, in metropolitan resettlement areas with challenges like lack of awareness, financial constraints, limited access to nutritious food, misconceptions about food restrictions, and inadequate access to healthcare.

Maternal, child, and health service factors are known to play a significant role in shaping feeding behaviours in young children. Hence, this study aimed to find out maternal (caregivers') feeding practices during diarrhea and ARI in children (below five years of age) living in metropolitan resettlement areas of the National Capital Region in Uttar Pradesh.

#### **Aim & Objective(s):**

- Assess maternal feeding practices during diarrhea and ARI in their under-five children in metropolitan resettlement areas
- Determine the factors (socio-demographic and health care related) influencing the feeding practices

#### **MATERIAL & METHODS**

**Study Design:** A Cross-sectional study was conducted from May to October 2024 among mothers (caregivers) with under-five children in a metropolitan resettlement area of the National Capital Region in Uttar Pradesh, India

**Study Area and Setting:** The study was conducted in a metropolitan resettlement area, which is within the catchment area under Urban Health Training Centre (UHTC) of a Medical College located in the National Capital Region in Uttar Pradesh. There was a total of fourteen urban resettlement colonies within the study area.

**Study Participants:** Mothers having children below 5 years who had single/repeated episodes of diarrhea or ARI in the 4 weeks preceding the survey were chosen based on the following:

**Inclusion Criteria:** Mothers with children under 5 years of age living for 6 months or more in the study area and who consented to participate in our study were included.

**Exclusion Criteria:** Non-primary caregiver mothers, mothers with cognitive disability, and mothers having children with congenital anomalies or other severe illnesses were excluded.

**Sample Size Calculation:** The sample size was estimated using Cochran's formula  $Z^2PQ/L^2$ , where P was taken as 69.94%; for the estimated proportion of mothers who continued proper feeding practices during an episode of illness (diarrhea) from an earlier study conducted in urban areas of Nellore, Andhra Pradesh.(7) Taking the absolute error (L) of 5% and 95% confidence interval, the calculated sample size was 336.

Taking a non-response rate of 10%, the required sample size was 370. Finally, data were collected from 418 respondents. A multistage sampling method was adopted. In the metropolitan resettlement area, 7 colonies were selected by simple random sampling (lottery method). Depending on the number of under-five children in every urban resettlement colony chosen, the required sample size was assigned proportionately using the Probability Proportionate to Size (PPS) method. A list of households with children aged 0-59 months who had an episode of diarrhea or ARI in the four weeks preceding the survey was used as the sampling frame. A random sampling process (computer-generated) was used to pick the participants from every chosen colony, and his/her mother (who fulfilled the inclusion criteria) was interviewed. If two or more qualifying children were identified in the same household, the child with the most recent complaint was chosen to eliminate recall bias.

**Ethical Clearance:** The study proposal was cleared by the Institutional Ethical Committee (IEC).

**Data Collection:** Data on the socio-demographic characteristics of study participants and their children included: maternal age, marital status, education level, religion, per capita family income per month, socioeconomic status, child's age in completed months, exclusive breastfeeding status, his/her immunization status, and information related to symptoms and episodes of diarrhea and ARI, along with feeding practices of mothers. To ensure internal consistency, the schedule was pre-tested to identify and address any inconsistencies. A structured, validated interview schedule was used to collect data by trained Medico-social workers. Data was validated through regular checks and cleaning to ensure accuracy and completeness. Mothers were also questioned regarding the breastfeeding status of their children, the correct use of ORS in diarrhea, and correct handwashing practices. Healthcare utilization characteristics covered the utilization of maternal health care services (like ANC/PNC visits).

Feeding practice during an episode of diarrhea or ARI and its recovery period was addressed by four criteria: (i) continue breastfeeding as before illness (for the breastfed child); (ii) continue feeding age-appropriate, nutrient-dense foods; (iii) encourage adequate fluids; (iv) avoid food/fluid restrictions.

**Measurement of variables:** Feeding practices during ARI and diarrhea in the child was the dependent variable in the study.

#### **Working Definition of Feeding Practice During An Episode of Acute Respiratory Infection/Diarrhea:**

**'Appropriate feeding practice'** during and in the recovery period of diarrhea/ ARI: Caregivers continue breastfeeding (for the breastfed child), offer the child age-appropriate, nutrient-dense foods in the same amount as before the illness, and provide adequate fluids, while avoiding restriction of food as per the WHO guidelines.(8) **'Inappropriate feeding practice':** Caregivers stop breastfeeding, restrict fluid or food intake, or give diluted feeds during the acute episode and in the recovery period. Each criterion was scored (1 for yes, 0 for no), and a composite score was calculated. The score categorized feeding practices as Appropriate (all criteria met) and Inappropriate (any criteria missing). The scoring was validated in a pilot study.

**Diarrhea:** It is defined as three or more loose stools per day, or more frequently than is normal for the individual.(9)

**ARI:** It is defined as the sudden onset of one/ more of these four respiratory symptoms: cough, soreness of throat, shortness of breath, and runny nose, along with/ without fever.(10)

The information on feeding practices and symptoms of diarrhea and ARI was collected from mothers' verbal responses.

The predictor variables were: sociodemographic, maternal health services-related, and child feeding practices-related variables.

**Statistical Analysis:** Included the responses of 418 participants; data were analysed using the Statistical Package for the Social Sciences version 25 (SPSS Inc., Chicago, IL) statistical software. Descriptive statistics were used to summarize the data.

Chi-square test was used to find the significance of association between various socio-demographic and health care factors related to maternal feeding practices during diarrhea and ARI in under-five children.

## **RESULTS**

### **Sociodemographic Characteristics and Maternal Health Care Utilization**

Data were collected from 418 mothers/ caregivers with 0-59-month-old children (who had diarrhea

and/or ARI in the 4 weeks preceding the survey). The mean age of the mothers/ caregivers and children was, respectively, 26.7 years and 25.24 months. Majority of mothers/caregivers (89%), (79.2%), and (67.4%), respectively, were housewives, Hindu by religion, and belonged to the Socioeconomic Status of Upper Lower and below, according to the modified Kuppuswamy Classification updated for 2024.(11) Almost two-thirds (65%) had an education of middle school and below, and 23.2% were illiterate/ just literate women. More than two-thirds (68.2%) had a parity status of 2 or more living children. The majority (90.7%) had less than four antenatal care (ANC) visits in their last pregnancy. Half of the study participants (50%) received none or only one postnatal care (PNC) visit after their last delivery. More than half (57.9%) of study participants did not receive information on child feeding during an episode of diarrhea or ARI from health care workers (**Table 1**).

### **Child Healthcare Related Variables and Common Childhood Morbidities**

(55.3%) Of the under-five children were male, 49.6% of them belonged to the age group of 0-23 months, and 37.5% were currently being breastfed. Exclusive breastfeeding was present for 47.8% of the children. Regarding symptoms, 37.5%, 38% and 24.2% had fever, cough, and diarrhea, respectively, in the last 4 weeks preceding the survey (**Table 2**).

### **Feeding Practices During an episode of Diarrhea or ARI**

Of the 418 affected under-five children (10.5 %) were on exclusive breastfeeding. Among the study participants, 19.9% mothers followed appropriate feeding practices during the episode of diarrhea and/or ARI in their children. The majority (71.3%) had reduced the amount and frequency of feeds in their children during the acute episode as well as during the recovery period. More than half (59.6%) of mothers had restricted certain food items/breastmilk during the acute illness and in the recovery period, which included restriction of food items like rice, curd, buttermilk, and bananas by (14.6%) of mothers and non-vegetarian foods like egg and fish by (8.9%) of mothers. More than one-third (33.7%) of mothers didn't practice handwashing with soap and water during feeding the child affected with diarrhea/ARI (**Table 3**).

### **Factors associated with Maternal Feeding Practices during an episode of Diarrhea or ARI in the children**

The majority of the mothers who had appropriate practices for feeding their sick children were aged 26 years and above (86.7%); received PNC visits 3 or above (87.95%), and had good knowledge and practiced handwashing with soap and water before

and after child feeding (96%). More than two-thirds (66.26%) of affected children whose mothers had appropriate feeding practices were in the age group (0-23 months). More than half (53%) of mothers with appropriate feeding practices had an education of middle school and above, and the majority (78.3%) of them had the head of the household with an education level of high school and above.

Bivariate analysis: Associations between the appropriate feeding practices and the child's age,

maternal age, PNC visits availed by the mother, and the current breastfeeding status of the child were found statistically significant.

Religion, family income, socioeconomic status, education status of the head of the household, gender, child's gender, mother's parity status, and number of ANC visits received by the mother had no statistically significant associations with the appropriate feeding practices (Table 4).

**Table 1: Sociodemographic and Maternal Health Care-Related Characteristics of Study Participants (N=418)**

Variable	Category	Frequency	Percentage (%)
Age of the mother/caregiver (yrs.)	19-25	195	46.6
	26-30	148	35.4
	31-35	62	14.8
	36-40	13	3.1
Religion	Hindu	331	79.2
	Muslim	87	20.8
Educational level	Illiterate/ Just Literate	97	23.2
	Primary	54	12.9
	Middle	121	28.9
	High School	103	24.6
	Intermediate and above	43	10.3
Mother's Occupation	Housewife	372	89
	Unskilled	24	5.7
	Semi-skilled	18	4.4
	Skilled	4	0.9
Socioeconomic Status (Modified Kuppuswamy 2024)	Lower	19	4.5
	Upper Lower	263	62.9
	Lower Middle	136	32.5
Parity status	One	133	31.8
	Two	237	56.7
	Three or more	48	11.5
No of ANC visits (for last pregnancy)	None	14	3.3
	One	71	17
	Two	188	45
	Three	106	25.4
	Four and above	39	9.3
No of PNC visits (for last pregnancy)	None	65	15.5
	One	144	34.4
	Two	132	18.4
	Three and above	77	15.5

**Table 2: Child's Sociodemographic and Health-Related Characteristics (N=418)**

Variable	Category	Frequency	Percentage (%)
Age of the child (months)	0-6	51	12.2
	7-11	68	16.3
	12-23	88	21.1
	24-35	104	24.9
	36-59	107	25.6
Gender	Male	231	55.3

<b>Whether the child is currently being breastfed</b>	Female	187	44.7
	Yes	157	37.5
	No	261	62.5
<b>His/her Breastfeeding history in the first 6 months, or whether currently on exclusive breastfeeding</b>	Got /on Exclusive breastfeeding	200	47.8
	Didn't get exclusive breastfeeding	218	52.2
<b>Symptoms (in the last 4 weeks)</b>	Fever	157	37.5%
	Cough and cold	159	38%
	Diarrhea	102	24.2%

**Table 3: Participants' feeding practices during illness of the (0-59 months) child (N=418)**

Variable	Category	Frequency	Percentage (%)
<b>Whether the child is currently exclusively breastfed</b>	Yes	44	10.5
	No	374	89.5
<b>Whether liquids (including breastfeeds) increased and solids continued as before illness</b>	Liquids increased+solids continued as before	83	19.9
	Diluted top feeds were given	37	8.9
	Solids were reduced in amount and/or frequency	298	71.3
<b>Whether any feed/ food was restricted during illness</b>	Breastfeed	151	36.1
	Non-veg food (eggs, fish, meat)	37	8.9
	61	14.6	
	Curd, buttermilk, bananas ('typical cold food')	169	40.4
	No restriction on any specific food		
<b>Whether the mother practices handwashing with soap and water before/ after feeding the child during illness</b>	Yes	277	66.3
	No	141	33.7

**Table 4: Association of maternal feeding practices during illness with socio-demographic and health care-related characteristics**

Variable	Appropriate Feeding	Inappropriate Feeding	Total	Chi-square	P-value
<b>Age of the Child:</b>					
<b>0-11 months</b>	41(34.4%)	78(65.5%)	119 (100%)	26.01	P<0.001
			299 (100%)		
<b>12-59 months</b>	42(14.0%)	257(85.9%)		0.910	P=0.340
<b>Gender of the child:</b>	41 (21.9%)	146 (78.1%)	187 (100%)		
<b>Female</b>	42 (22.2%)	189 (81.8%)	231 (100%)		
<b>Male</b>					
<b>Age of the Mother:</b>					
<b>19-25</b>	11 (5.64%)	184 (94.4%)	195 (100%)	131.3	P<0.001
			148 (100%)		
<b>26-30</b>	23 (15.5%)	125 (84.5%)	62 (100%)		
			13 (100%)		
<b>31-35</b>	37 (59.7%)	25 (40.3%)			
<b>36-40</b>	12 (92.3%)	01 (7.7%)			

<b>Socioeconomic status of household (Modified Kuppuswamy 2024):</b>					
<b>Lower</b>	02 (10.5%)	17 (89.5%)	19 (100%) 136 (100%)	4.51	P=0.126
<b>Lower Middle</b>	21 (15.4%)	115 (84.5%)	236 (100%)		
<b>Upper Lower</b>	60 (25.4%)	203 (86%)			
<b>Religion:</b>					
<b>Hindu</b>	66 (28.6%)	265 (71.4%)	331 (100%) 87 (100%)	0.007	P=0.934
<b>Muslim</b>	17 (19.5%)	70 (80.5%)			
<b>Parity Status:</b>					
<b>Single</b>	33 (24.8%)	100 (75.2%)	133 (100%) 237 (100%)	3.063	P=0.216
<b>Two</b>	41 (17.3%)	196 (82.7%)	48 (100%)		
<b>Three/ more</b>	09 (18.7%)	39 (81.3%)			
<b>ANC Visits (during last pregnancy):</b>					
<b>None/ One</b>	13 (15.3%)	72 (84.7%)	85 (100%) 188 (100%)	3.767	P=0.438
<b>Two</b>	34 (18.2%)	154 (81.8%)	106 (100%) 39 (100%)		
<b>Three</b>	26 (24.5%)	80 (75.5%)			
<b>Four/more</b>	10 (25.6%)	29 (74.4%)			
<b>PNC Visits (during last pregnancy):</b>					
<b>None/ One</b>	04 (1.9%)	205 (98.1%)	209 (100%) 132 (100%)	333.5	P<0.001
<b>Two</b>	06 (4.5%)	126 (95.5%)	77 (100%)		
<b>Three and above</b>	73 (94.8%)	04 (5.2%)			
<b>Current breastfeeding status of the child:</b>					
<b>On Exclusive Breastfeeding</b>	19 (43.2%)	25 (56.8%)	44 (100%) 110 (100%)		
<b>On Solid food + Breastfeeding</b>	28 (25.4%)	82 (74.6%)	264 (100%)	18.6	P<0.001
<b>Not breastfed at all</b>	36 (13.6%)	228 (86.4%)			

## DISCUSSION

The purpose of the research was to assess the maternal (caregivers) practices during feeding their under-five children affected with diarrhea and ARI, and to determine the factors influencing the practices. In this study, 19.9% of mothers/caregivers in the urban resettlement areas followed appropriate feeding practices during episodes of diarrhea and ARI in their children. Maternal age and education level, the number of PNC visits availed by the mother, child's age, and the current breastfeeding status of the child were associated with appropriate feeding practice. The proportion of mothers practicing appropriate feeding in this study (19.9%) was much lower than

that in a study conducted in the Nellore District, Andhra Pradesh (where 69.94 % mothers practiced appropriate feeding).(7) The difference might be because the earlier research targeted mothers/caregivers with younger age group children (age less than two years), whereas the current study captured all mothers/ caregivers with children under five years of age. Also, different regions have varying cultural practices, access to healthcare, and socioeconomic factors influencing feeding practices.

The findings show that a relatively smaller proportion of children, 15.4 % had been given an increased amount of both liquid and solid food during the acute illness as well as the recovery

period. A comparable finding was seen in the Ethiopian Demographic Health Survey 2016(12). However, a study conducted in the Karachi region of Pakistan had observed this in a higher proportion of children (26.2%).(13) In South Asian Demographic Health Surveys (Bangladesh, Nepal, India and Pakistan), the proportion of children (6-23 months) given increased fluids during acute illness was variable; Bangladesh (21-25%; 2011), India (7.9-11%; 2006); Nepal (9.3-14.7%; 2011) and Pakistan (5.3-8.2%; 2012).(6) Different factors, like personal (awareness of mothers) and socio-cultural, might explain this. Mothers who have better knowledge about feeding their children are more likely to practice this appropriately during an illness than those who lack the knowledge.(14,15) More than half (57.9%) of participants in the current study were not informed by health care workers about ways to feed the child properly during diarrhea or ARI, although advice for medication was given. Earlier work has shown that inadequate guidance and counselling by health care workers can result in a lower quantity of complementary feeding done less frequently when the child is sick.(16) Besides food taboos, often rooted in social beliefs, might add to inadequate feeding practices. The current study found that certain food items like bananas, curd, non-veg items like eggs, and fish were restricted in 23.5 % affected children. This finding is consistent with previous studies where complementary foods were withheld during illnesses because of the caregiver's perception of anorexia in the sick child. (17,18)

Increased interaction with healthcare providers and facilities leads to better health knowledge and awareness, promoting preventive care and healthy behaviours. In the current study, 15.5% mothers didn't receive any PNC visits after delivery. As per NFHS (2019-2021) data of urban areas of Uttar Pradesh, 20.8% mothers didn't receive any PNC care within 2 days of delivery.(19) The present study showed that mothers who were paid regular visits in the postnatal period by healthcare workers were more likely to practice appropriate feeding. This finding may be because enhanced engagement with healthcare services and professionals fosters a surge in health-related information, including on feeding practices during diarrhea and ARI. An earlier study in 15 Sub-Saharan African countries to assess the role of PNC care in feeding practices showed that PNC care was associated with improved maternal feeding practices.(21)

Consistent with previous studies conducted in Bereh district of Ethiopia and in Lucknow, Uttar Pradesh, the present study found that nearly half (47.8%) of mothers gave exclusive breastfeeding to their children in the first 6 months.(21,22) However,

a study conducted in Amritsar, Punjab, had found a lower proportion of mothers practising exclusive breastfeeding (34.49%). (23) In the current study, it was found that mothers/ caregivers of children aged less than 12 months were more apt to engage in proper feeding during diarrhea and ARI in their sick children compared to women with older children. Also, our study revealed that children on exclusive breastfeeds were more likely to receive appropriate feeding practice from mothers/ caregivers than those not currently breastfed. This could be because mothers with younger children might better recall the feeding advice they received during ANC or PNC care, influencing their feeding decisions.

Earlier research has shown that failure to meet additional nutrient needs during illness can hinder children's growth and development (24,25) Some caretakers use harmful practices to treat diarrhea, like restricting fluid intake and reducing breastfeeding, which can deprive children of essential nutrients and antibodies. (26)

The current research found that mothers aged 31 and older were more inclined to increase food and fluids in their sick children in comparison to younger mothers. Similarly, a study conducted in Nellore, Andhra Pradesh, a greater proportion of older mothers (more than 30 years) gave more amounts of solids and liquids to sick children as compared to younger mothers.(7) This could be because with age, mothers may develop a better understanding of child health and nutrition, enabling them to make more appropriate feeding decisions during illness.

The strengths of the current study include: it identified the variables affecting feeding practices during childhood illnesses like diarrhea and ARI in children less than 5 years of age; these findings can guide interventions to improve feeding practices and reduce morbidity in the vulnerable age group. Lastly, it provides insights into the specific needs of mothers in urban resettlement areas.

## CONCLUSION

The study revealed suboptimal feeding practices during diarrhea/ARI among children in the metropolitan resettlement area. These findings suggest a need for targeted interventions to educate caregivers in the resettlement areas about the importance of postnatal care and optimal feeding practices, during diarrhea and ARI (particularly younger mothers), emphasizing continued breastfeeding, nutrient-rich foods, and adequate fluids to improve child health outcomes.



**RECOMMENDATION**

Nutrition education programs should be tailored to caregivers in urban resettlement areas, focusing on practical skills, emphasizing the importance of regular postnatal care visits, and addressing specific gaps in feeding practices, such as continuing breastfeeding, offering nutrient-dense foods, and ensuring adequate fluid intake during diarrhea and ARI episodes.

**LIMITATION OF THE STUDY**

Self-reported data from mothers, which may result in recall and social desirability bias; its cross-sectional study design, which might hamper causal inferences, and limited exploration of cultural factors influencing feeding practices in the study population. Lastly, as the study used only quantitative methods, it might have missed nuanced insights into mothers' experiences and perspectives.

**RELEVANCE OF THE STUDY**

The study adds to the current knowledge by providing insights into feeding practices during Diarrhea and ARI in urban resettlement areas. It identifies factors like the child's age, the mother's age, and postnatal care visits that influence feeding practices. The study's findings can help healthcare providers, policymakers, and researchers develop more effective strategies to improve child health outcomes.

**AUTHORS CONTRIBUTION**

KB: Study Concept and Design, Literature Search, Data collection, Analysis, Interpretation, Manuscript writing, and Review. MMG: Study Concept and Design, Interpretation, Manuscript editing, and Review. HM: Study Concept and Design, Interpretation, Manuscript editing, and Review. SS: Study Concept, Manuscript editing, and Review. NPS: Study Concept, Manuscript editing, and Review. IK: Study Concept, Manuscript editing, and Review.

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**CONFLICT OF INTEREST**

None

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**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.

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