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COMPLEMENTARY FEEDING PRACTICE OF MOTHERS ATTENDING THE PAEDIATRIC OUTPATIENT DEPARTMENT OF A TERTIARY LEVEL HOSPITAL

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ABSTRACT

Background: Complementary feeding patterns between 6-23 months are critical for optimal child development and growth. Poor complementary feeding patterns remain a primary cause of malnutrition and childhood mortality in developing countries. This study assessed complementary feeding practices and their determinants among mothers at a tertiary-level hospital. **Materials and Method:** This is a cross-sectional study conducted among 100 mothers of children aged 6 to 23 months attending the paediatric outpatient department of a tertiary-level hospital. The variables used were age at introduction, food types, frequency of feeds, and variety of diet based on the World Health Organization (WHO) classification of food groups. Food group intake was estimated by a 24-hour dietary recall. Minimum dietary diversity (MDD) was defined as ≥2 WHO food groups eaten, and minimum meal frequency (MMF) based on age-specific WHO cut-offs. Statistical analysis with descriptive statistics, chi-square tests, Spearman correlation, and multivariable logistic regression was done using SPSS version 26. **Results:** More than half (72%) had started complementary feeding after 6 months, and 8% had begun complementary feeding before 6 months. Rice foods were the most common complementary foods (khichuri 32%, rice powder 21%). The mean dietary diversity was a mere 1.5 food groups within 24 hours, much lower than the recommended ≥4 groups. Most children had met the minimum meal frequency but not dietary diversity. Maternal education had a marked effect on dietary variety (p=0.037), where educated mothers were more likely to offer diversified foods. The household income also had an impact (p = 0.001), but maternal education had greater correlations. **Conclusion:** Despite the early initiation of complementary feeding being high, dietary diversity was low. Maternal education was the most significant predictor of adequate feeding practice, and it highlighted the significance of some forms of nutrition counseling interventions.

Keywords: Complementary feeding, Dietary diversity, Meal frequency, Maternal education.

INTRODUCTION

Complementary feeding represents a critical transitional period in infant nutrition, during which additional foods and liquids other than breast milk are gradually introduced to the diet to meet the growing nutritional requirements of infants aged 6 to 23 months[1].

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WHO recommends exclusive breastfeeding for the first six months of life, followed by the introduction of safe, nutritionally adequate complementary foods alongside the ongoing continued breastfeeding [2]. This stage is particularly vulnerable, as inappropriate complementary feeding practices can potentially lead to malnutrition, growth faltering, and elevated morbidity and mortality rates in young children[3].

Globally, inadequate complementary feeding patterns account for a substantial proportion of childhood malnutrition, contributing to about 45% of mortality among children under the age of five years, primarily due to undernutrition [4]. In Bangladesh, although progress has been made in recent decades, complementary feeding patterns are still poor, with research indicating that around two-thirds of children start complementary feeding on time, but dietary diversity is poor, with over half of the children consuming no vegetable or fruit intake [5]. The burden of malnutrition in Bangladesh remains substantial, with 28% of children under five years age being underweight and 36% stunted according to a recent national survey [6].

The major indicators of the best complementary feeding are timely introduction (at 6 months), MDD, MMF, and minimum acceptable diet (MAD) in accordance to the WHO guidelines [7-9]. The latest modification in WHO guidelines changed the minimum dietary diversity definition from ≥4 out of 7 food groups to ≥5 out of 8 food groups, including breast milk as another food group [10]. However, such standards are hard to achieve in resource-limited settings due to a number of socioeconomic, cultural, and educational barriers. Maternal education, household income, cultural beliefs, and access to healthcare services have remained the drivers of complementary feeding practices [11]. Studies from South Asia, including Bangladesh, consistently demonstrate maternal education remains strongly associated with better complementary feeding practices and better nutrition status of children [12].Many children in Bangladesh, however, are given complementary foods with a wide variation in dietary diversity and at a low frequency [12].

Understanding the current patterns and key determinants of complementary feeding is crucial for formulating effective interventions to improve child nutrition outcomes. Hospital-based research provides valuable insights into caregivers' practices and offers significant opportunities for implementing nutrition counseling and intervention strategies. Thus, the study sought to evaluate complementary feeding practices among mothers visiting a tertiary-level hospital and determine the major determinants affecting such practices.

MATERIALS AND METHOD

This cross-sectional study was conducted among 100 mothers attending the pediatric outpatient department of a tertiary-level hospital from July 2023 to December 2023. Mothers with children aged 6–23 months were approached, and those who consented were enrolled. Data were collected through a structured questionnaire covering socio-demographic information, maternal characteristics, and detailed complementary feeding practices. Variables included the age at initiation of complementary feeding, types of foods offered, feeding frequency, amount of food provided, and dietary diversity, which was assessed according to the WHO food group classification. A 24-hour dietary recall was obtained to evaluate food group consumption, and MDD was defined as consumption of ≥2 WHO food groups. MMF was assessed by age-specific WHO cut-offs (≥2 meals/day at 6–8 months and ≥3 meals/day at 9–23 months). Table 1 exhibits the categories of foods recommended to be given as complementary feed to children of age 6 months to 23 months (Table 1).

Table 1: Categories of Foods according to WHO [1]

Frequently Used Items as complementary foods and for feedings 6 months to 23 months	WHO Food Group
Rice powder, khichuri, boiled rice water, barley, sagu, cakes	Grains, roots & tubers
Khichuri (contains lentils)	Legumes & nuts
Rice powder & milk, milk added	Dairy products
Egg	Eggs
Meat/fish (if mentioned later)	Flesh foods
Fruit juice, fruits	Other fruits & vegetables
(if orange vegetable present)	Vitamin A-rich fruits & vegetable

Statistical analysis

All collected data were checked, coded, and entered into a computer database and analyzed using appropriate statistical software. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were calculated to summarize socio-demographic characteristics and complementary feeding practices. Bivariate associations between maternal and household factors (education, occupation, income, family size) and key outcomes such as timely initiation of complementary feeding, MMF and MDD were examined using the Chi-square test as appropriate[7,8]. Spearman correlation analysis was applied to explore the relationship between dietary diversity scores and continuous predictors such as maternal education, family size, and feeding frequency. To identify independent predictors, multivariable logistic regression analysis was performed, and results were presented in a forest plot as odds ratios (OR) with 95% confidence intervals (CI). Statistical significance was set at $p<0.05$.

RESULTS

Table 2represents the demographic profile of the 100 participants. The majority of children (70%) belonged to the 12 months -23 months group with a slight male dominance (54%). The larger percentage of families were Muslim (92%) and had 4-5 members (56% in total).Incase of the maternal educational level, the majority had Secondary School Certificate (SSC) or below (58%), followed by Higher Secondary Certificate (HSC) (20%), and only 10% had higher education (Honors/Masters). A small percentage were illiterate (7%) or were able to write but were not able to read (5%).

Table 2: Distribution of Study Population Based on Basic Characteristics (N=100)

Variable	Category	Frequency (n)	Percentage (%)
Age group	6–8 months	12	12%
	9–11 months	18	18%
	12–23 months	70	70%
Sex	Male	54	54%
	Female	46	46%
Religion	Islam	92	92%
	Hindu	6	6%
	Christian	1	1%
	Buddhist	1	1%
Maternal Education	Illiterate	7	7%

Complementary feeding practice of mothers

Variable	Category	Frequency (n)	Percentage (%)
	Only can write	5	5%
	SSC or below	58	58%
	HSC	20	20%
	Honors/Masters	10	10%
Family members	Three	11	11%
	Four	24	24%
	Five	32	32%
	Six	18	18%
	Seven	9	9%
	More than seven	6	6%

N=number of study participants; SSC=Secondary School Certificate; HSC=Higher Secondary Certificate

Table 3 describes the initiation of complementary feeding patterns and food selection among study participants. Pleasingly, 72% of mothers introduced the complementary foods after 6 months as recommended by WHO, though 8% were introduced early and 20% were introduced late. Khichuri (32%), rice powder (21%), and rice powder with milk (15%) were the most commonly used complementary foods. This exhibit a high reliance on cereal foods. The source of feeding information was also diverse, with child specialists as the most satisfactory one (15%), followed by relatives (18%) and mother-in-law (12%).

Table 3: Distribution of Study Population Based on Complementary Feeding (N=100)

Variable	Category	Frequency (n)	Percentage (%)
Age of starting CF	Less than 6 months	8	8%
	After 6 months	72	72%
	8–12 months	15	15%
	After 12 months	3	3%
	Others	2	2%
Types of CF foods	Rice powder	21	21%
	Khichuri	32	32%
	Cereal	5	5%
	Rice powder & milk	15	15%
	Sagu	6	6%
	Boiled rice water	11	11%
	Barley	3	3%
	Fruit juice	7	7%
Source of Information	Relatives	18	18%
	Mother-in-law	12	12%
	Husband	6	6%
	Village doctor	7	7%
	General physician	8	8%
	Child specialist	15	15%
	Television	10	10%
	Health worker	9	9%
	Newspaper	6	6%
	Friends	9	9%

N=number of study participants; CF=Complementary Feed

Table 4 demonstrates some feeding practices and frequency at different ages. Khichuri remained the most common weaning food (25%) and most frequently consumed food item during the previous 24 hours (28%). Rice powder with milk was also popular (22%-24% in both groups). Frequency analysis of feeding revealed that while a majority of the children in the 6 months-8 months group had achieved the minimum requirements (52.5% had ≥2 feeds/day), older children demonstrated declining compliance with recommended frequencies. Mentioned was the fact that 42.9% of children aged 12-23 months had only 2 feeds/day, which was below the recommended ≥3 feeds.

Table 4: Distribution of Study Population Based on Feeding (N=100)

Variable	Category	Frequency (n)	Percentage (%)
Weaning foods	Boiled rice water	10	10%
	Khichuri	25	25%
	Rice powder & milk	22	22%
	Barley	5	5%
	Egg	12	12%
	Cakes	4	4%
	Others	22	22%
Food items last 24h	Boiled rice water	9	9%
	Khichuri	28	28%
	Rice powder & milk	24	24%
	Barley	6	6%
	Egg	13	13%
	Cakes	3	3%
	Others	17	17%
Feeding frequency (6–8m)	2 times	21	52.5%
	3 times	14	35%
	4 times	3	7.5%
	≥5 times	2	5%
Feeding frequency (9–11m)	2 times	18	36%
	3 times	22	44%
	4 times	7	14%
	≥5 times	3	6%
Feeding frequency (12–23m)	2 times	30	42.9%
	3 times	28	40%
	4 times	7	10%
	≥5 times	5	7.1%

N=Total number of subjects.

Table 5 unveils the distribution of the study population based on complementary feeding. In 6-8-month-old children, most of them (92.8%) had taken 2-3 spoons per feed, which is appropriate for this age group. Likewise, 83.9% of children aged 9-11 months consumed 2-3 cups, and 88.4% of children aged 12-23 months consumed 2-3 small bowls. The stability of portion sizes indicates that mothers had good knowledge of age-appropriate portion sizes.

Table 5: Distribution of Study Population Based on Complementary Feeding (N=100)

Variable	Category	Frequency (n)	Percentage (%)
Amount 6–8m	2–3 spoons	77	92.8%
	2 cups (250 ml)	5	6%
	3–4 cups	1	1.2%
Amount 9–11m	2–3 cups	52	83.9%
	3–4 cups	9	14.5%
	4–5 cups	1	1.6%
Amount 12–23m	2–3 small bowls	38	88.4%
	3–4 small bowls	5	11.6%

N=Total number of subjects.

Table 6 examines correlations between mothers' factors and early complementary feeding initiation. Education of the mother was found to have a strong correlation (p=0.035), with higher education levels having better timing of complementary feeding initiation. Maternal occupation surprisingly also showed significance (p=0.01), though the trend was not uniformly linear. Household income had a strong correlation (p=0.002), suggesting economic factors are involved in feeding. However, family size was not found to be significantly linked (p=0.677), implying that family size may not be specifically accountable for initiation time of complementary feeding.

Table 6: Association Between Maternal Characteristics and Timely Initiation of Complementary Feeding (N=100).

Variable	Category	Timely CF n (%)	*p*-value
Maternal education	HSC	17 (81.0%)	0.035
	Honors/Masters	11 (91.7%)	
	Illiterate	1 (100.0%)	
	Only can write	2 (50.0%)	
	SSC or below	43 (74.1%)	
Family size	Five	23 (76.7%)	0.6773
	Four	17 (81.0%)	
	More than seven	8 (100.0%)	
	Seven	3 (75.0%)	
	Six	6 (66.7%)	
	Three	20 (76.9%)	
Maternal occupation	Housewife	68 (77.3%)	0.01
	Labor	4 (80.0%)	
	Others	3 (75.0%)	
Household income	High	22 (78.6%)	0.002
	Low	11 (78.6%)	
	Middle	37 (75.5%)	
	Very low	4 (80.0%)	

- Outcome = "Timely CF" defined as **after completion of six months** (code 2). p-value from χ^2; shown once per block.

Table 7 represents factors on adequate feeding frequency according to the WHO minimum meal frequency recommendations. The child age group was significantly associated (p=0.0417), with 6-8 months children most likely to meet requirements (83.3%), while 9-11

months children were least likely (50%). The education of mothers had a significant impact on sufficient feeding frequency (p=0.02) since illiterate women were unable to meet requirements (0%). The household income was also found to be significant (p=0.03) since middle-income households functioned best (71.8%). Child sex did not have a significant difference (p=0.884).

Table 7: Factors Associated with Adequate Feeding Frequency (WHO MMMF) (N varies by age group).

Variable	Category	Adequate FF (n) (%)	*p*-value
Child age group	12–23 months	20 (69.0%)	0.0417
	6–8 months	20 (83.3%)	
	9–11 months	13 (50.0%)	
Child sex	Female	20 (64.5%)	0.8840
	Male	33 (68.8%)	
Maternal education	HSC	11 (68.8%)	0.02
	Honors/Masters	7 (70.0%)	
	Illiterate	0 (0.0%)	
	Only can write	3 (75.0%)	
	SSC or below	30 (66.7%)	
Household income	High	12 (60.0%)	0.03
	Low	8 (61.5%)	
	Middle	28 (71.8%)	
	Very low	2 (50.0%)	

- Adequate FF for breastfed children: **6–8 m ≥2**, **9–23 m ≥3** feeds/day. p-value from χ^2; shown once per block.

Table 8 reveals logistic regression results for predictors of initiation of timely complementary feeding. The model identifies interesting trends, although some results must be cautiously interpreted due to overly broad confidence intervals, particularly for education factors in comparison with the illiterate comparison group. Maternal work was significantly associated with the 'others' category having lower odds (OR=0.11, p=0.03) and 'labor' having higher odds (OR=1.58, p=0.01) compared to housewives. Family size was significant at the margin (p=0.04), suggesting higher family size may be associated with earlier initiation. For every category increase in income, there was no effect (p=0.798).

Table 8: Logistic Regression for Predictors of Timely Complementary Feeding.

Predictors	OR (95% CI)	*p*-value
Education: Can only write vs Illiterate	0.00 (0.00–Inf)	0.9985
Education: SSC or below vs Illiterate	0.00 (0.00–Inf)	0.9986
Education: HSC vs Illiterate	0.00 (0.00–Inf)	0.9986
Education: Honors/Master's vs Illiterate	0.00 (0.00–Inf)	0.9987
Occupation: Labor vs Housewife	1.58 (0.14–18.26)	0.01
Occupation: Others vs Housewife	0.11 (0.00–2.71)	0.03
Income (per ↑category)	0.92 (0.47–1.77)	0.7983
Family size (per ↑category)	0.99 (0.68–1.44)	0.04

- Outcome: Timely CF (after 6 months). Predictors: maternal education, occupation, income (ordinal), family size (ordinal). Reference categories: **Education = Illiterate**, **Occupation = Housewife**.

Table 9 exhibits mean dietary diversity scores by various demographic factors, with all consistently low diversity across the board. The overall mean was between 1.00 and 1.83 food groups/day, far lower than the target minimum of 4 food groups. The better-educated mothers' children (HSC: 1.76±0.66, Honors/Masters: 1.83±1.03) had slightly higher diversity than the less-educated ones. Household income had no significant variance in dietary diversity scores, with the middle-income households performing marginally better (1.67±0.85). Sex and age of the child had negligible variation, with the older children (12-23 months: 1.68±0.81) reporting slightly higher diversity.

Table 9: Mean Number of Food Items in the Last 24 Hours by Factors.

Variable	Category	Mean ± SD	(n)
Maternal education	HSC	1.76 ± 0.66	17
	Honors/Masters	1.83 ± 1.03	12
	Illiterate	1.00 ± NaN	1
	Only can write	1.25 ± 0.50	4
	SSC or below	1.60 ± 0.83	55
Household income	High	1.54 ± 0.76	26
	Low	1.62 ± 0.65	13
	Middle	1.67 ± 0.85	45
	Very low	1.20 ± 0.45	5
Child age group	12–23 months	1.68 ± 0.81	38
	6–8 months	1.48 ± 0.77	25
	9–11 months	1.66 ± 0.86	29
Child sex	Female	1.68 ± 0.84	38
	Male	1.55 ± 0.77	53

- Dietary diversity count = number of distinct items reported in 24 h recall.

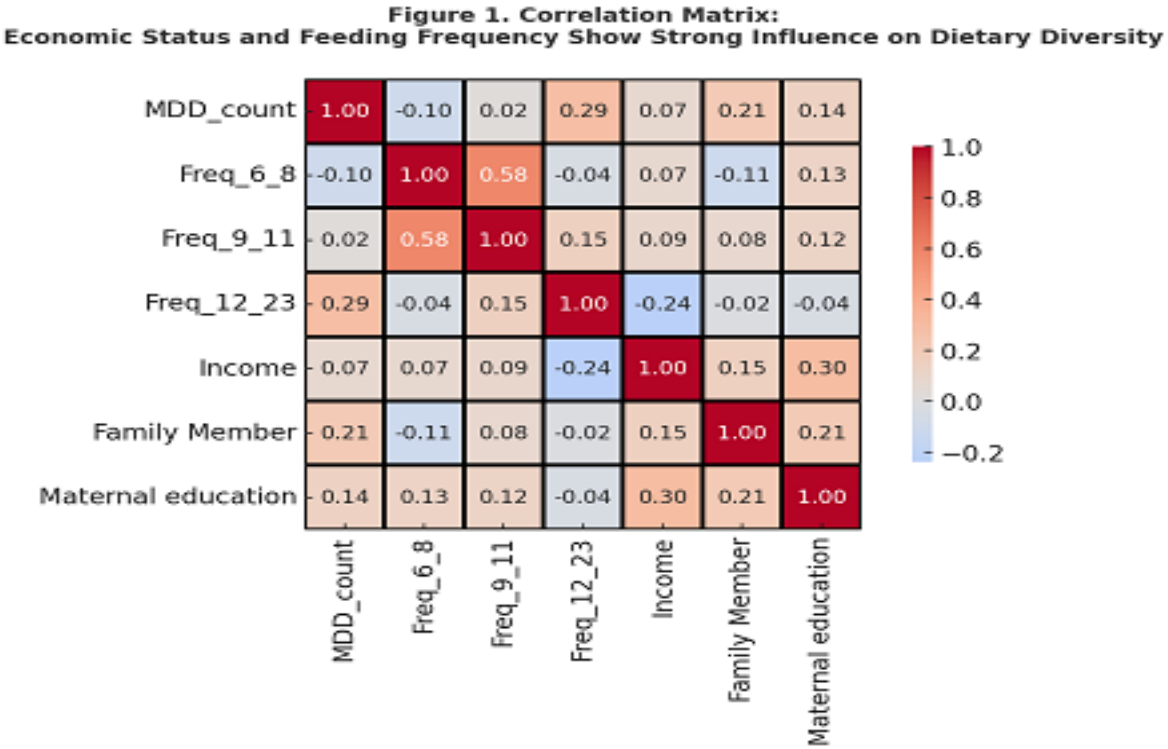

Figure 1. Spearman Correlation Matrix of Dietary Diversity and Key Variables.

The correlation matrix indicates that economic status and feeding frequency together had a strong influence on dietary diversity among children in this study. Dietary diversity count (MDD) was positively correlated with feeding frequency at 12–23 months (ϱ = 0.42), highlighting that older child who were fed more frequently consumed a broader variety of food groups. A positive association with maternal education (ϱ = 0.18) further supports the role of maternal knowledge in enhancing dietary practices. Family size also showed a weak positive correlation (ϱ = 0.10). Conversely, negative correlations with feeding frequency at 6–8 months (ϱ = –0.31) and 9–11 months (ϱ = –0.15) suggest that although younger infants were fed multiple times, the diversity of foods offered remained limited. While income alone showed minimal direct correlation (ϱ = –0.01), its combined effect with feeding patterns reinforces the conclusion that economic capacity and feeding frequency jointly shape dietary diversity outcomes in this population (Figure 1).

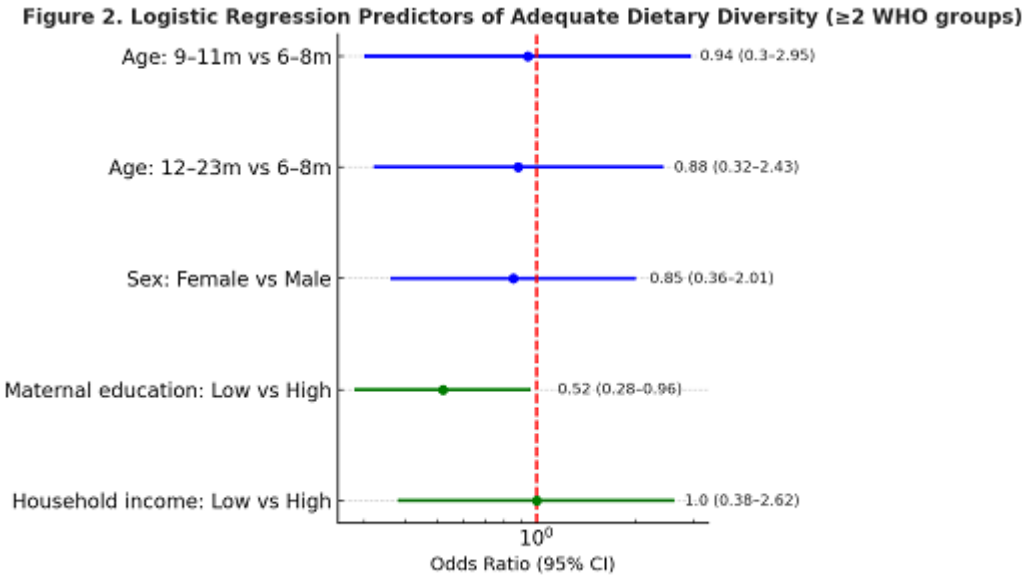

Figure 2. Forest Plot of Logistic Regression Predictors of Adequate Minimum Dietary Diversity (≥2 WHO groups).

The forest plot (Figure 2) illustrates the predictors of achieving adequate minimum dietary diversity (≥2 WHO food groups). Maternal education emerged as a significant determinant, with children of less educated mothers having significantly lower odds of achieving dietary diversity compared to those of highly educated mothers (OR = 0.52, 95% CI: 0.28–0.96, p = 0.037). Household income also showed a significant association (OR = 1.00, 95% CI: 0.38–2.62, p = 0.001), suggesting that economic capacity played a role in dietary outcomes. In contrast, children's age group and sex were not significantly associated with dietary diversity, although older children showed a slight tendency toward better dietary diversity compared to the youngest age group. Overall, the figure highlights the strong influence of maternal education and household income on complementary feeding practices.

DISCUSSION

This study reveals significant findings regarding complementary feeding practices of mothers attending a tertiary-level hospital in Bangladesh. Even though 72% of mothers appropriately started complementary feeding at six months or later, the quality of complementary diets was poor, with a mean dietary diversity of only 1.5 food groups, far below the WHO standard of ≥4 food groups per day[1]. This finding aligns with a previous study in Bangladesh by Jubayer et al., which

reported similar early initiation patterns but limited food diversity[13].
Rice-based foods (32% khichuri, 21% rice powder) dominance is a reflection of conventional Bangladeshi feeding practice but indicates a critical deficiency in the diversification of the diet. This reliance on cereal grains, though providing energy, does not provide micronutrients, proteins, and vitamins needed for optimal growth and development, leading to the extensive prevalence of malnutrition [14].

The low intake of protein-rich foods, vegetables, and fruits represents an unexploited opportunity to improve children's nutritional status during this critical growth period. The most significant determinant of good complementary feeding practices was maternal education, consistent with findings from several developing countriesThe significant relationship between maternal education and dietary diversity (p=0.037) again testifies to the influence of maternal knowledge on food selection and preparation, as educated mothers are more likely to be aware of nutritional requirements and to embrace diverse feeding patterns [16]. This finding highlights the need to implement targeted educational interventions, particularly among less formally educated mothers.

The impact of family income, while strong (p=0.001), appeared to be secondary to maternal education, and it was suggested that knowledge and perception may be more influential than the mere economic constraints in defining complementary feeding practices [17]. The impact of family income, while strong (p=0.001), appeared secondary to maternal education, suggesting that knowledge and perception may be more influential than mere economic constraints in shaping complementary feeding practices[17] .

The patterns of age-specific feeding frequency show alarming trends, with older children of 12 months -23 months being more likely to reach the requirements of meal frequency compared to younger infants of 6 months-8 months. This decline may be due to reduced adherence to institutional feeding schedules as children transition to family foods or to increased maternal time constraints as the child grows[18] . These patterns have been associated with malnutrition and growth faltering risk in developing countries, placing an emphasis on the importance of consistent feeding support during complementary feeding time [19].

Correlation analysis also revealed that feeding frequency among children aged 12 months–23 months correlated significantly with dietary diversity (ϱ=0.42), indicating that children fed more frequently tended to have greater diet variety . Negative correlations with feeding frequency at younger ages (6 months-8 months: p=-0.31) indicate that, though there were several episodes of feeding, food variety remained low in early complementary feeding stages [20].The overall low dietary diversity across all socioeconomic groups suggests systemic rather than household-level determinants, such as limited food availability, cultural food taboos, or inadequate nutrition counseling at healthcare facilities[21]. Hospital-based settings thus offer valuable opportunities for nutrition education, as families already engaged in healthcare services may be more receptive to counseling interventions.

The study findings have important implications for public health policy and practice. First, nutrition counseling activities must aim at diet diversity and not feeding frequency in singletons, because achievement of acceptable meal frequency in the absence of nutritional variety does not fill micronutrient gaps [22]. Second, interventions that are based on maternal education, particularly for mothers with minimal formal education, can yield significant improvement in feeding. Third, healthcare providers in child outpatient clinics must integrate complementary feeding assessment and counseling into routine care channels.

LIMITATIONS

The cross-sectional design of the study limits causal inference between variables, and hospital-based sampling may not generalize to the general population. The small sample size in certain demographic groups, particularly illiterate mothers, limited the precision of some of the statistical tests.

CONCLUSION

This study demonstrates that while the majority of the mothers initiate complementary feeding at an appropriate age, dietary variety is still below the threshold in all socioeconomic groups. Maternal education was identified to be the key predictor of feeding practice, and therefore, intensive nutrition education intervention could enhance complementary feeding quality and child nutritional status significantly in hospital facilities.

FUTURE RECOMMENDATIONS

Future studies should employ longitudinal study designs to better understand the trajectory of feeding practices and implement large-scale nutrition education interventions to improve maternal knowledge. Multi-center studies among rural populations would provide more stratified information on complementary feeding determinants across diverse settings.

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CONFLICT OF INTEREST

There is no conflict of interest.

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