Child Feeding Practices of Childbearing Mothers and Their Household Food Insecurity in a Coastal Region of Bangladesh

Md Abdullah Al Mamun[1,2] ⓘ, Shownak Saha[1], Jianfeng Li[2], Ruhina Binta A Ghani[3], Syed Mahfuz Al Hasan[4], and Ayesha Begum[5]

Abstract

The current condition of ensuring WHO-recommended newborn and young child feeding practice is becoming a challenge in many developing nations, particularly in places where family food security is threatened. Because many households in underdeveloped nations frequently face acute food shortage due to poverty, optimal child nutrition is jeopardized. The purpose of this study was to analyze the child feeding behaviors of mothers with children aged 0-24 months and to investigate their household food insecurity in a coastal region of Bangladesh, Suborno Char (one of Noakhali District's coastal neighbourhoods) was studied from October 2019 to April 2020. In this study, a cross-sectional survey with multistage sampling technique was employed, and Suborno Char of Noakhlai district was purposely sampled of 400 women and their children aged 0-24 months. Data were obtained using a standard questionnaire and were analyzed using statistical functions in SPSS 20.0.0. Exclusive breastfeeding 53.5%, timely supplemental feeding 75.5%, and feeding children meals from homemade, canned/formula/fortified, both homemade and canned, milk these 4 food groups were at 22.2%. The moms' education level was strongly associated with their child feeding practices. Mothers from food insecure homes were less likely to exclusively breastfeed than mothers from food secure households after drawing interpretation of univariate & multivariate analysis of variables crude odds ratio (COR) and adjusted odds ratio (AOR) and confidence interval (CI) (COR .233 at 95% CI 0.083, .655 and AOR .478 at 95% CI 0.133, 1.713). Similar outcomes were seen for early complementary feeding and minimal dietary diversification of children. In conclusion, this study discovered a less dietary inclusion trend of child feeding practices among moms (0-24 months childbearing) in Bangladesh's coastal region.

Keywords

household food insecurity, exclusive breastfeeding, complementary feeding, education of mothers, mothers age, household income

Highlights:

1. Our analyses show that household income, mother's age, and mother's education level determine how mothers feed their children and ensure household food security.

2. The study households in developing countries' far-flung coastal areas frequently confront severe food insecurity, compromising the supply of adequate child nutrition.

3. Mothers' educational attainment and other relevant sociodemographic characteristics are significantly associated with their child feeding practices and involvement in ensuring household food security.

[1]Department of Food Technology and Nutrition Science, Noakhali Science and Technology University, Noakhali, Bangladesh
[2]Department of Geography, Hong Kong Baptist University, Hong Kong
[3]Health, Nutrition and Population Program, BRAC, Dhaka, Bangladesh
[4]Nutrition and Food Technology, Jashore University of Science and Technology, Jessore, Bangladesh
[5]Department of Applied Food Science and Nutrition, Chattogram Veterinary and Animal Sciences University, Chittagong, Bangladesh

Corresponding Author:
Md Abdullah Al Mamun, Department of food technology and Nutrition Science, Noakhali Science and Technology University, Academic Building-2, 4th floor, Noakhali 3814, Bangladesh.
Email: mamun.ftns@nstu.edu.bd; 21482764@life.hkbu.edu.hk

4. Mothers' educational attainment, age, social involvement, and relevant characteristics need to consider by local and national government authorities to intervene.

Introduction

Weaning foods in insufficient quantities and of low quality, poor child-feeding procedures, and high infection levels in the first 2 years of life have negative consequences on a child's health and development.[1] World Health Organization (WHO)/ United Nations Children's Fund (UNICEF) have emphasized the first 1000 days of life as the critical window period for nutritional interventions, as the maximal brain growth occurs in this period and malnutrition in this vital period can lead to stunting and suboptimal developmental outcome.[2] According to the WHO guidelines of IYCF (Infant and Young Child Feeding), during the first 6 months of life breast milk should be fed alone. After the first 6 months, breastfeeding is necessary with other sources of nutrition until at least 2 years of age.[3,4] Poor child feeding practice and high rate of infection reduce cognitive development, educational achievement, productivity and growth.[5] Globally, undernutrition results in 3 million child deaths annually and over two-thirds of these deaths are often associated with inappropriate feeding practice and occur during the first year of life.[6,7] Annually, more than 800 000 deaths occur due to sub-optimal breastfeeding. On the other hand, optimal breastfeeding prevents 13% of the deaths occurring in children under 5, and appropriate complementary feeding results in an additional 6 percent reduction.[8] The diarrheal diseases, respiratory infections, low birth weight, and malnutrition are significant contributors to Bangladesh's high infant death rate. All of these are linked to inadequate child feeding strategies used by parents. Children aged 0-5 months who are not breastfed had a 7-fold increased risk of death from diarrhea and a 5-fold increased risk of death from pneumonia compared to exclusively breastfed infants.[9] In Bangladesh, just 62% of children aged 6-9 months consume complementary food while still breastfeeding. Complementary feeding delayed for more than one-third of infants aged 6-8 months.[10,11] IYCF-recommended feeding is rare among children aged 6-8 months (7%), rising to 34% among children aged 18-23 months. Male and female children are equally likely to be fed according to appropriate IYCF practices. Adherence to IYCF practices is better in urban areas than in rural areas.[12] However, the Bangladesh Demographic and Health Survey (BDHS) is a countrywide survey that includes mostly married women aged 15 to 49 (who are regular members of the selected households), and the data does not provide detailed information on what factors and how the factors affect mothers' choice in IYCF practices.[13] Moreover, it does not present regional rates of appropriate child feeding practices and the causes of variation in such practices between the regions. Therefore, it is vital to sort out the factors that influence IYCF practices to implement strategies and interventions for raising IYCF practices among mothers who have infants aged 0-24 months. Previous studies have clearly showed that underprivileged infant feeding practices related with cultural factors such as the selection of low-quality complementary products, taboos, conservative traditional values, and social factors like caregiver's weak knowledge on diet and lack of awareness on food variety in their surroundings.[14] Ultimately, all these factors contribute to poor dietary diversity, lower feeding frequency and inadequate intakes of food and energy for children.[14] In Bangladesh, approximately one-half of the population is food insecure. About 19% of rural households cannot have"3 full meals" a day, and approximately 10% survive on 2 meals or less for some months every year. In areas where food security is weak, providing proper nutrition for children is very challenging especially in developing countries like Bangladesh.[15] The research is original and fills a need because it examines cultural distinctions and child feeding patterns. The research study's implication is to strengthen the local IYCF intervention program's implementation strategy, which may differ in other parts of the same country. Therefore, the study's primary goal was to examine the feeding behaviors of Bangladeshi mothers who have children between the ages of 0 and 24 months.

Materials and Methods

Study Area

The study was conducted in 6 unions the Char Jublee Union, the Char Bata Union, the Char Amanullah Union, and the Char Wapda Union of Suborno Char upazilla (sub-districts) a coastal region of Bangladesh. Suborno Char is an upazilla within Noakhali District, Bangladesh (Figure-1) Suborna Char has a population of approximately 293 000 people, 55 399 houses, and a land area of 575 square kilometers.[16] Agriculture generates more than 65% of income. This locality has a literacy rate of 32.7%, much lower than the national average of 68%. On the other hand, poverty is significantly higher (64%) than the national average of 23%.[16,17]

Study Population and Sample Size

A sample of 400 households with mothers having at least one child between 0-24 months of age was included in the study. At first, we calculated a sample size using the Cochran's formula,

$$n = Z^2 p(1-p) \backslash d^2$$

Assuming the rate of appropriate child feeding practice of 0-24 months childbearing mothers (p) as 50%, confidence interval (Z) as 95%, acceptable margin of error (d) as 5% and non-response rate as 5%. But after being refused by 15 households and excluding 12 households for not meeting the inclusion criteria we were able to collect a sample size of four hundred. The households were eligible for inclusion if they met the following criteria:

(i) The household was in the selected coastal area
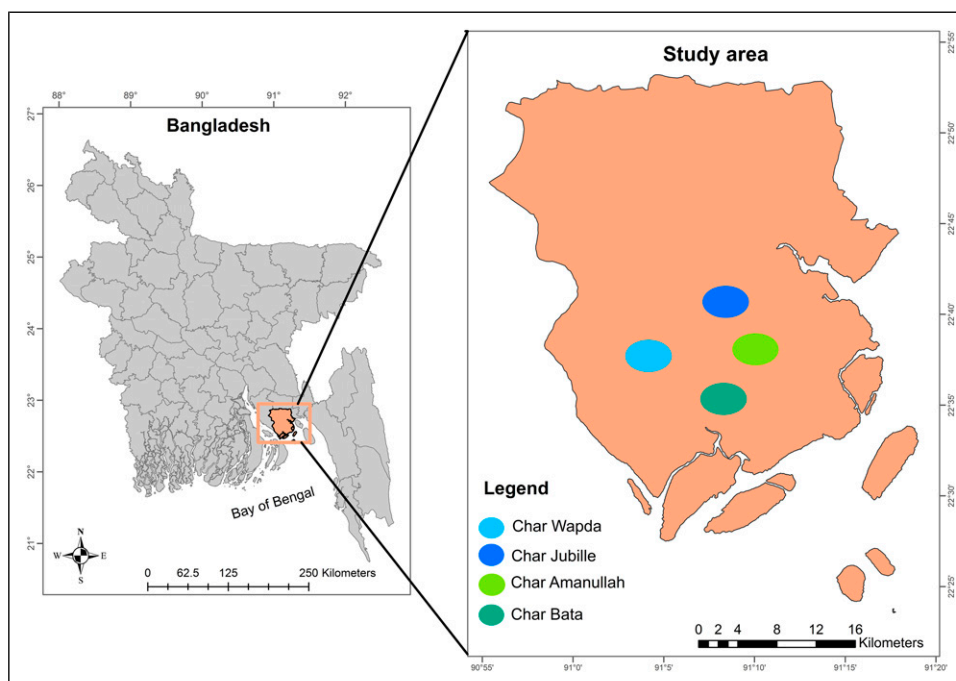(ii) The female caregiver was present and willing to be interviewed

Figure 1. Map of the study areas of Suborno Char *.

(iii) At least a child between 0 and 2 years of age was present in the household.

If the family had more than one child within the required age group, the youngest child within our age range was considered.

Study Design and Period

This study was a community-based cross-sectional survey conducted from October 2019 to April 2020.

Sampling Procedure

A multistage sampling technique was used in this study. We purposefully chose Suborno Char Upazilla (sub-district) of the Noakhali District for this study all the households survey done in the Suborno Char Upazilla (sub-district) of the Noakhali District on Bangladesh's south-eastern beaches. Suborno Char is located inside the Ganges-Brahmaputra-Meghna (GBM) delta, one of the world's largest deltas, encompassing the majority of Bangladesh and India's West Bengal state, as well as portions of China, Nepal, and Bhutan.[17] The GBM delta is formed by the convergence of the Ganges, Brahmaputra, and Meghna river systems in Noakhali district as the study's coastal region out of the 19 coastal districts in Bangladesh.[18] Then, mothers with children aged 0-24 months who had lived in this area for 4 months prior to the study were selected at the household level to participate.

Data Collection Tools and Procedures

A pretested semi-structured questionnaire was developed by adapting WHO indicators for assessing Infant and Young Child Feeding (IYCF) practices (Yonas F., 2015) to collect information about existing child feeding practices of 0-24 month's childbearing mothers in the selected area and pilot-tested before administering the questionnaire. The term "exclusive breastfeeding" refers to a baby's intake of exclusively breastmilk for the first 6 months of his or her existence. Solely breastfed refers to children who ingested breastmilk exclusively during their first 6 months of life. This category also includes the use of medicines, vitamins, and minerals with a doctor's consent. Children aged 0 to 5 months who are continuing to breastfeed exclusively were classified as continuing exclusive breastfeeding. The children who were not exclusively breastfed were classed as non-breastfed.

After 6 months of exclusive nursing, the kid should begin supplemental feeding alongside breastfeeding. There were 2 categories of children: those who began eating complementary meals after the age of 6 months and those who began eating complementary foods before the age of 6 months. The first were labeled as having started supplementary feeding on time, whereas the latter were labeled as not having started complementary feeding on time. Household Food Insecurity Access Scale (HFIAS) by the USAID-funded FANTA project including 9 dichotomous (yes/no) and 9 follow-up questions to indicate severity of house hold food insecurity [(1 = rarely (1-2 times); 2 = sometimes (3-10 times) and 3 = often (more than 10 times)] was utilized to find out the level of household food insecurity, this scale of questions was validated by many previous studies.[19] The food security and access situation for the 1 month prior to the data collection date was collected. The questionnaire consisted of socio-demographic characteristics of mothers and children, general information about

child feeding practices from 0-24 months, and some questions about food insecurity related situation in the previous 30 days of the survey. Data were collected by trained data collectors through conducting a face-to-face interview.

Ethical Approval

This work was authorized by the ethics board of Bangladesh's Noakhali Science and Technology University. Permission to conduct the research was also secured from the local government. The ethical criteria for this observational investigation were followed (Declaration of Helsinki).[20] Participants signed a written consent form, and the study's goals were verbally described in accordance with the guidelines.

Statistical Methods

SPSS (Statistical Package for the Social Sciences) for Windows version 20.0.0 was used to clean, input, and analyze the data.[21] The categorical variables were analyzed using frequencies and percentages. We utilized cross tabulation and chi-square testing to evaluate univariate relationships. To assess characteristics linked to various child feeding habits, we used univariate and multivariate logistic regression. The logistic model's we analyzed dependent variables such as exclusive breast feeding, timely initiation of weaning food, and the children's dietary diversity with different independent variables.

In the logistic regression model, those variables that were substantially linked with distinct child feeding behaviors in the univariate analysis were employed. The odds ratios and their related 95% confidence intervals were provided as the results. In all analyses, a P-value less than .05 was considered statistically significant.

Results

Descriptive Statistics of Different Characteristics of the Participants

This study investigated child feeding practices among mothers of children aged 0-24 months. Household food insecurity level of those mothers was also examined by the HFIAS method.

The 400 mother-child pairs were chosen of 151 (37.75%) from the Char Jublee Union, 135 (33.75%) from the Char Bata Union, 61 (15.25%) from the Char Amanullah Union, and 53 (13.25%) from the Char Wapda Union, respectively. Around 353 respondents (88.25%) were identified as Muslim, while the remainder were identified as Hindu, Religion was a significant factor that can influence childcare practices.[22] No other religions were found in the study area as participants from a religious perspective. More than half of the mothers (54.80%, N = 219) were 25 years of age or less. Mother was illiterate in 87 cases (21.75%), followed by primary education in 136 cases (34.0%), secondary education or dakhil

(equivalent to secondary education in Muslims Special education system called madrasa) in 132 cases (33.0%), higher secondary or alim in 19 cases (4.75%), graduate in 14 cases (3.50%) and madrasha education in 12 cases (3.0%). Almost all the mothers were housewife (98.5%, N = 395). The majority of the mothers (63.75%, N = 255) had ≤2 children. Children's sex was male in 207 cases (51.75%) and female in 193 cases (48.25%). Most of the (81.25%, N = 325) children were delivered at home rather than other facilities.

In this study, joint family was identified in 205 (51.25%) cases (Table 1). Family size was equal to 10 members or more than that in 46 cases (11.50%). The majority households were identified to have only one earning member (68.25%, N = 273). Monthly family income was less than 12 000 Taka equivalent to 140 USD in 96 cases (24.0%), 12 000-20 000 Taka equivalent to 140-232 USD in 160 cases (40.0%) and more than 20 000 Taka equivalent to 232 USD in 144 cases (36%). From the analysis, 209 (52.25%) families were belonging to a per capita income of less than 3000 Taka equivalent to 35 USD and 23 (5.75%) families had a per capita income of 7000-taka equivalent to 81 USD or more.

The children were not fed colostrum of 16.25% (N = 65) (Table 2). After the birth of the children, only 78.75% (N = 319) mothers-initiated breastfeeding within 1 hour. The frequency of breastfeeding was <5 times in a day in 151 cases (37.75%), 5-8 times in a day in 180 cases (45.0%), and more than 8 times in a day in 69 cases (17.25%). Nearly, all mothers were familiar with the term exclusive breastfeeding (98.25%, N = 393). Exclusive breastfeeding of the child was "No" in 186 cases (46.5%) and was "Yes/Ongoing" in 214 cases (53.5%). Water was given to 38.0% of the total children before the age of 6 months.

Homemade complementary feeding was given to most of the children (76.2%, N = 218). The prevalence of timely initiation of complementary feeding was 75.5% (N = 216). Continuation of breastfeeding was noted yes in 366 cases (91.5%) and no in 34 cases (8.5%). Only 22.2% (N = 65) children were found to have minimum dietary diversity (MDD).

Households' Response to the Nine Household Food Insecurity Access Scale Items

Affirmative responses were high for items describing mild to moderate forms of food insecurity such as worry about food, unable to eat preferred foods, eat a limited variety of foods, and eat smaller meals a day (Table 3).

Question 2 and Question 3 received the most frequent affirmative responses (81.3%). Affirmative responses for items indicating severe forms of food insecurity such as Questions 8 and 9, were low. The lowest affirmative responses were noted for Question 9 (1.0%).

In this study 16.5% households were identified as food secure 34% households were identified as mildly food insecure 44% households were identified as moderately food

Table 1. Characteristics of study household family and economic conditions of the participants.

Variable	%	N	Variable	%	N
Type of the family			**House ownership**		
Nuclear family	48.75	195	Govt. Quarter	7.75	31
Joint family	51.25	205	Rented house	2.00	08
Family size			Own house	90.25	361
≤4 members	24.50	98	**Monthly income of the family**		
5-6 members	37.50	150	Less than 12 000 Taka	24.00	96
7-9 members	26.50	106	12 000-20 000 Taka	40.00	160
≥10 members	11.50	46	More than 20 000 Taka	36.00	144
Earning member in the family			**Per capita income of the family**		
1 member	68.25	273	Less than 3000 taka	52.25	209
2 members	20.00	80	3000-4999 taka	31.25	125
3 members	9.75	39	5000-6999 taka	10.75	43
4 members	1.50	06	7000 taka or more	5.75	23
5 members	.50	02			

insecure, and only 5.5% households were identified as severely food insecure according to HFIAS.[19]

Factors Associated With Exclusive Breastfeeding

Univariate and multivariate analyses of variables were conducted to see the associated factors of exclusive breastfeeding (Table 4). The analyses showed that, factors like religion of the family, mother's education level and frequency of breastfeeding have a significant association with mother's exclusive breastfeeding practice. Hindu mothers were more likely to exclusively breastfeed than Muslim mothers (AOR 5.928 at 95% CI 2.302, 15.264). Mother's age was negatively associated with exclusive breastfeeding. Mothers of 26-35 years age were less likely to exclusively breastfed their children compared to ≤25 years old mothers (AOR .825 at 95% CI 0.374, 1.819). Primary educated mothers were more likely to exclusively breastfeed their children (AOR 3.359 at 95% CI 1.709, 6.604) than illiterate mothers. Cesarean children were more likely to exclusively breastfed than their counterparts (AOR 1.339 at 95% CI 0.578, 3.102).

AOR stands for Adjusted Odds Ratio and COR for Crude Odds Ratio, CI stands for Confidence interval, with COR representing the result (effect measure) from binary logistic regression and AOR representing the output (effect measure) from multivariate logistic regression. Children who were not fed colostrum have lower odds in exclusive breastfeeding than colostrum fed children (AOR .579 at 95% CI 0.257, 1.303). EBF (exclusive breastfeeding) practice was less likely among mothers who had initiated breastfeeding after 1 day or later of childbirth compared to mothers who had initiated breastfeeding within 1 hour of childbirth (AOR .134 at 95% CI 0.012, 1.442). Similarly, if we see the (Table 4) household food security variables, mothers of severely food insecure households were less likely to exclusively breastfed than mothers of food secure households (AOR .478 at 95% CI 0.133, 1.713).

Determinants of Timely Initiation of Complementary Feeding

The determinants of timely initiation of complementary feeding of the 6-24 months children in the study area (Table 5). Mother's age shows a significant association with timely initiation of complementary feeding. Mothers of 36 years or more age were less likely to timely initiate the feeding compared with ≤25 years old mothers (AOR .184 at 95% CI 0.040, .852).

Primary educated mothers were more likely to timely initiate the complementary feeding than illiterate mothers (AOR 1.180 at 95% CI 0.490, 2.839). Mothers of non-colostrum fed children showed lower odds of timely initiation of complementary feeding. Household food insecurity level are also a significantly associated factor of timely initiation of complementary feeding. Mothers of severely food insecure households were less likely to practice timely initiation of complementary feeding (AOR .193 at 95% CI 0.041, .914) than mothers of food secure households.

Discussion

In this part, our results were compared with previous studies in different regions and different times to discuss the reliability and contributions of our study. Our results were discussed in 3 aspects (1) socio-demographic characteristics that affect child feeding practices, (2) the prevalence of WHO recommended breast feeding practices, and (3) weaning food practices with household food security. At last, the limitations of our study were analyzed.

Socio-demographic characteristics that affect child feeding practices: The Study investigate the relationship between household food insecurity and sociodemographic variables such as mothers' education, age, religion, and social possessions that is crucial in cultural context for the national policy decision making stages to develop appropriate policy

Table 2. Characteristics of child feeding practice.

Variable	%	N	Variable	%	N
Colostrum feeding of the child			**Heard about exclusive breastfeeding**		
Yes	83.75	335			
No	16.25	65	Yes	98.25	393
Reasons for not feeding colostrum			No	1.75	07
Did not feel necessary	6.15	04	**Exclusive breastfeeding of the children**		
Lack of time	26.15	17	Yes/Ongoing	53.5	214
Mother's illness	27.69	18	No	46.5	186
Other problems	40.00	26			
Breastfeeding initiation			**Reason for not feeding breast milk exclusively**		
Within 1 hour of birth	78.75	319	Insufficient breastmilk emission	36.56	68
Between 1-2 hours of birth	11.25	45	Mother's illness	5.91	11
After 2 hours-within 24 hours of birth	6.50	26	Others problem	57.33	107
After 1 day or later	2.50	10			
Frequency of breastfeeding			**Anybody advised you to give other food before 6 months of the baby?**		
Less than 5 times in a day	37.75	151	Yes	38.20	71
5-8 times in a day	45.00	180	No	61.80	115
More than 8 times in a day	17.25	69			
Who advised you to give other food?			**Water feeding before 6 months**		
Husband	4.20	03	Yes	38.00	152
Mother-in-law	19.70	14	No	62.00	248
Health worker	14.10	10			
Others	62.00	44			
Variable	%	N	Variable	%	N
Heard about complementary feeding			**Continuation of breastfeeding**		
Yes	97.5	390	Yes	91.5	366
No	2.5	10	No	8.5	34
Initiation of complementary feeding of the children			**Reason for not continuing breastfeeding**		
Yes	71.5	286	Insufficient breastmilk emission	91.17	31
No	28.5	114	Other problems	8.83	3
Type of complementary food given			**Frequency of giving solid, semi-solid, soft foods/day to the child**		
Home made	76.2	218	No food given only breast milk	3.8	11
Canned/formula/fortified	13	37	Less than 2 times in a day	24.9	73
Both homemade and canned milk	3.1	09	Two times in a day	31.4	92
Others	7.7	22	Three times in a day	37.5	110
Timely initiation of complementary feeding			Four or more times in a day	2.4	07
Yes	75.5	216	**Minimum Dietary Diversity (MDD) of the child**		
No	24.5	70	Have MDD	22.2	65
			Not have MDD	77.8	228

to address variation in child feeding practices. Farooq's 2020 study in Pakistan's Punjab region reveals relevant interest in South Asian regions underweight child nutrition management and the importance of mother socio-demographic profile analysis.[23]

The majority of the mothers who participated were Muslim, with the remainder being Hindu. Religion was important because religion-based feeding practices can have an impact on childcare practice.[22] In our study, half of the moms were less than 25 years old mother's age and more than 40% had a secondary education or higher, mothers' education play a role for child feeding practice. Similar findings from a study on factors associated with antenatal and health facility delivery care in the same study area indicated that 45% of mothers had a secondary or higher level of education, which was slightly higher than our study finding and demonstrated a relationship between mother education level and child care and health services provision.[24] The contribution of female mothers income percentage has positive influence in child feeding practice shown in many studies are not assess here in

Table 3. Affirmative responses to items on the Household Food Insecurity Access Scale (HFIAS) by the participants.

HFIAS Occurrence Questions	(% Yes)	N
Q1. In the past 4 weeks, did you worry that your household would not have enough food?	72.5	290
Q2. In the past 4 weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	81.3	325
Q3. In the past 4 weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	81.3	325
Q4. In the past 4 weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	56	224
Q5. In the past 4 weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	68.8	275
Q6. In the past 4 weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	38	152
Q7. In the past 4 weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	30.5	122
Q8. In the past 4 weeks, did you or any household member go to sleep at night hungry because there was not enough food?	9.3	37
Q9. In the past 4 weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	1.0	04

our study where total family income are consider.[24] The age of the children, income level, family size all is important socio-demographic parameter for the childcare physically as well as mentally and household food security seen in many research studies.[25]

The prevalence of WHO recommended breast feeding practices: A comparison of our results in Bangladesh and previous studies in other regions showed WHO recommended breast feeding practices are less prevalent in Bangladesh. Our study discovered that 84% of children received colostrum following birth, which was much less than the 99% prevalence found in a study in Jashore.[26] Seventy 9 (79) percent of children were breastfed at an early age, which was higher than the national prevalence of 51% reported in the 2014 BDHS (Bangladesh Demographic Health Survey).[27] Another study in the Rajshahi area of Bangladesh found that the prevalence of early breastfeeding beginning was 88.4%, which is remarkably similar to our findings due to the similar sociodemographic profile.[28] Alternatively, a lower rate of moms initiating nursing early and offering breast milk to their child immediately after delivery was observed in various areas of the country, with only 46.9% doing so in Jessore district.[26]

The prevalence of EBF (early breast feeding) in this study was below medium range, which is in line with findings of other studies in Bangladesh.[27,29] Hence, studies of Myanmar and West Bengal showed EBF prevalence similar like this studies.[30,31] Although the prevalence we detected almost same to other study findings in Bangladesh but it is far below from WHO recommended prevalence of ninety percent.[32] So, the Breastfeeding is heavily reliant on demographic, economic, social, and biological factors, all of which have an impact on the quality of care provided to the infant and their health mostly seen in developing countries like Bangladesh, India, Myanmer and Pakistan as well.[33] In our study finding was lower than the WHO cut off point for good practice of

complementary feeding[7] as well as from India.[34] However it was more than the reports from Northern Ethiopia[35] and Nigeria geographical dynamics may play a part for this difference in regions.[36]

Weaning food practices with household food security: The children had a minimum dietary diversity from 4 food groups, which was lower than reported prevalence in BDHS (Bangladesh Demographic Health Survey) 2014[37,38] shows concern of households were food insecure (mild, moderate, and severe food insecure altogether), which was higher than the prevalence of Cox's Bazar perspective with similar food insecurity study parameters in similar coastal areas.[39] The findings of similar food insecurity[17] reveals in the hatiya island of Noakhali districts need to put emphasis by the administration and local government to address the issue in national policy. The factors associated with exclusive breastfeeding in our study were religion, mother's age, mother's level of education, type of delivery, child's birth rank, colostrum feeding of the child, breastfeeding initiation, frequency of breastfeeding & household food insecurity level. The logistic regression analysis (Table 5) showed that older mothers (≥36 years) practiced lower EBF than mothers ≤25 years of age. The reason could be that older mothers usually face problems like insufficient breastmilk emission, many social taboos in feeding their children.[8] Graduate mothers were more likely to practice EBF than illiterate mothers. It might be due to more scientific knowledge and more caring to their children by the graduate mothers.[8] The type of delivery showed significant association with EBF in univariate analysis. This association disappeared in multivariate analysis. Parallel findings were found in a previous study.[40] Mothers who had initiated BF after 1 day or later have lower odds in EBF practice than mothers who had initiated BF within 1 hours of childbirth. Mothers of severely food insecure households practiced less EBF than mothers of food secure households.

Table 4. Analysis of factors influencing exclusive breastfeeding practice.

Variables	Exclusive Breastfeeding		Univariate		Multivariate	
	No	Yes/ Ongoing	COR (95% CI upper & lower value)	P- value	AOR (95% CI upper & lower value)	P- value
Religion						
Islam	50.7%	49.3%	I		I	
Hindu	14.9%	85.1%	5.878 (2.564, 13.477)	.000**	5.928 (2.302, 15.264)	.000**
Mother's age						
≤25 years	38.8%	61.2%	I		I	
26-35 years	51.7%	48.3%	.594 (.390, .903)	.015*	.825 (.374, 1.819)	.633
36 years or more	76.7%	23.3%	.193 (.079, .469)	.000**	.554 (.142, 2.154)	.394
Mother's level of education						
Illiterate	72.4%	27.6%	I		I	
Primary	37.5%	62.5%	4.375 (2.439, 7.849)	.000**	3.359 (1.709, 6.604)	.000**
S.S.C/Dakhil	43.2%	56.8%	3.454 (1.928, 6.186)	.000**	1.955 (.967, 3.950)	.062
H.S.C/Alim	31.6%	68.4%	5 .687 (1.940, 16.673)	.002*	1.823 (.527, 6.304)	.343
Graduate	28.6%	71.4%	6.562 (1.878, 22.933)	.003*	4.407 (1.000, 19.419)	.050
Madrasha education	41.7%	58.3%	3.675 (1.063, 12.702)	.040*	5.080 (1.309, 19.722)	.019*
Type of delivery of the child						
Non-Cesarean	48.4%	51.6%	I		I	
Cesarean	33.3%	66.7%	1.878 (1.011, 3.487)	.046*	1.339 (.578, 3.102)	.496
Birth rank of the child						
First child	43.0%	57.0%	I		I	
Second child	31.9%	68.1%	1.611 (.961, 2.70)	.071	1.690 (.912, 3.132)	.096
Third child	52.5%	47.5%	.681 (.393, 1.181)	.172	.991 (.391, 2.513)	.985
Fourth child or latter	72.3%	27.7%	.288 (.153, .545)	.000**	.834 (.274, 2.532)	.748
Colostrum feeding of the child						
Yes	41.5%	58.5%	I		I	
No	72.3%	27.7%	.272 (.151, .488)	.000**	.579 (.257, 1.303)	.187
Breastfeeding initiation						
Within I hour of birth	44.2%	55.8%	I		I	
Between I and 2 hours of birth	51.1%	48.9%	.758 (.406, 1.415)	.384	.980 (.409, 2.347)	.964
After 2 hours-within 24 hours of birth	50.0%	50.0%	.792 (.356, 1.763)	.568	1.195 (.380, 3.754)	.760
After I day or later	90.0%	10.0%	.088 (.011, .703)	.022*	.134 (.012, 1.442)	.097
Frequency of breastfeeding						
Less than 5 times in a day	58.3%	41.7%	I		I	
5-8 times in a day	40.0%	60.0%	2.095 (1.349, 3.253)	.001*	2.050 (1.238, 3.393)	.005*
More than 8 times in a day	37.7%	62.3%	2.310 (1.288, 4.145)	.005*	2.493 (1.267, 4.908)	.008*
Household food insecurity level						
Food secure	33.3%	66.7%	I		I	
Mildly food insecure	43.4%	56.6%	.653 (.353, 1.206)	.173	.849 (.423, 1.703)	.645
Moderately food insecure	51.1%	48.9%	.478 (.265, .863)	.014*	.795 (.392, 1.612)	.525
Severely food insecure	68.2%	31.8%	.233 (.083, .655)	.006*	.478 (.133, 1.713)	.257

AOR = Adjusted Odd Ratio; COR = Crude Odds Ratio; P value >.05*

Timely initiation of complementary feeding was associated with some factors (Table 5) in this study. Mother's age was negatively associated with timely initiation of complementary feeding. Mothers of 36 years or more age practiced timely initiation of complementary feeding less than ≤25 years old mothers in our study. Similar findings were observed in a previous study where <34 years old mothers showed lower odds in timely initiation of complementary feeding than 15-24 years old mothers may be the reason of more experience and maturity comply with education.[8] Mothers of severely food insecure households were less likely to practice timely initiation of complementary feeding than mothers of food secure households.

In this study, mother's education level and household food insecurity level have shown a strong association with exclusive breastfeeding, timely initiation of complementary

Table 5. Analysis of factors influencing timely initiation of complementary feeding.

Variables	Timely Initiation of Complementary Feeding				Univariate	Multivariate
	No, %	Yes, %	COR (95% CI Upper & Lower Value)	P-value	AOR (95% CI Upper & Lower Value)	P-value
Mother's age						
≤25 Years	13.1	86.9	1		1	
26-35 Years	28.7	71.3	.375 (.20, .703)	.002*	.606 (.196, 1.870)	.384
36 years or more	69.2	30.8	.067 (.026, .175)	.000**	.184 (.040, .852)	.030*
Mother's level of education						
Illiterate	38.4	61.6	1		1	
Primary	17.7	82.3	2.892 (1.429, 5.852)	.003*	1.180 (.490, 2.839)	.713
S.S.C/Dakhil	22.7	77.3	2.116 (1.065, 4.203)	.032*	.713 (.288, 1.763)	.463
H.S.C/Alim	22.2	77.8	2.178 (.422, 11.235)	.353	.647 (.102, 4.115)	.645
Graduate	11.1	88.9	4.978 (.591, 41.959)	.140	1.349 (.123, 14.799)	.807
Madrasha education	18.2	81.8	2.80 (.564, 13.912)	.208	2.906 (.378, 22.339)	.305
Birth rank of the child						
First child	13.8	86.2	1		1	
Second child	16.7	83.3	.802 (.348, 1.850)	.606	1.214 (.457, 3.229)	.697
Third child	19.4	80.6	.669 (.283, 1.581)	.359	1.287 (.317, 5.227)	.724
Fourth child or latter	61.5	38.5	.100 (.045, .225)	.000**	.377 (.088, 1.617)	.189
Colostrum feeding of the child						
Yes	18.5	81.5	1		1	
No	50.0	50.0	.228 (.121, .426)	.000**	.762 (.278, 2.090)	.598
Breastfeeding initiation						
Within 1 hour of birth	19.2	80.8	1		1	
Between 1-2 hours of birth	44.4	55.6	.297 (.142, .620)	.001*	.546 (.202, 1.475)	.233
After 2 hours-within 24 hours of birth	47.1	52.9	.267 (.097, .733)	.010*	.546 (.142, 2.105)	.380
After 1 day or later	33.3	66.7	.475 (.114, 1.976)	.306	.774 (.126, 4.761)	.782
Frequency of breastfeeding						
Less than 5 times in a day	32.6	67.4	1		1	
5-8 times in a day	16.9	83.1	2.373 (1.307, 4.306)	.004*	1.803 (.908, 3.582)	.092
More than 8 times in a day	14.8	85.2	2.784 (.910, 8.522)	.073	3.122 (.819, 11.896)	.095
Household food insecurity level						
Food secure	15.4	84.6	1		1	
Mildly food insecure	17.5	82.5	.856 (.310, 2.361)	.763	.927 (.296, 2.903)	.897
Moderately food insecure	26.5	73.5	.504 (.195, 1.305)	.158	.780 (.251, 2.422)	.667
Severely food insecure	66.7	33.3	.091 (.025, .337)	.000**	.193 (.041, .914)	.038

feeding and dietary diversity of children. Mother's age, birth rank of the child, colostrum feeding of children, breastfeeding initiation and frequency of breastfeeding also have shown strong relation (univariate analysis) with exclusive breastfeeding practice and timely initiation of complementary feeding practice.[33] The profound influence of household food security on dietary intake and health and nutritional status of children is supported by a substantial body of research.[41] As far as we know, very few studies have investigated the association between household food insecurity and child feeding practices in Bangladesh. The results we have got confirms that there is a significant relationship between household food insecurity level and different child feeding practices of the mothers in this coastal area of Bangladesh.

The study will add to the body of knowledge regarding pertinent literature and the relationship between child feeding practices and household food security in a contextual manner. The neutrosophic statistics are generated using the neutrosophic normal distribution, and they can be utilized in future comparison research studies to see if there are any strong relationships between the study parts.[42]

Limitations of the study: There are several limitations to the study. To begin with, because we used a non-probability sampling method in our study, we cannot generalize our findings. Furthermore, due to the cross-sectional design of the study, conclusions on the cause-effect relationship cannot be drawn. We were also unable to account for the effect of seasonal variation on food consumption and the children's

dietary diversity. Measuring food insecurity using HFIAS has some limitations as well because it relies on recall of events that occurred within the last 4 weeks or last month. It is also incapable of measuring food intake and evaluating dietary quality. Furthermore, because the study period coincides with harvest season, the situation of household food insecurity in the setting may be underestimated. Furthermore, issues concerning monthly family income and expenditure (based on a report from the household head) could be potential limitations of this study.

Conclusion

This study has found a low prevalence of child feeding practices among the mothers (0-24 months childbearing) in the coastal region of Bangladesh. Majority of the mothers had at least education of primary level but many of them not followed the WHO recommended feeding practices. Nearly all mothers were familiar to exclusive breastfeeding practice but only half of them practiced it appropriately. Majority of mothers had given homemade complementary food to their children, but diversified diets were not included. Fruits, vegetables, and eggs were not provided by most of the mothers during preparation of complementary foods. Many of them had given weaning food not suitable to their babies less than 6 months age children because of some traditional superstition of their community. All of this contribute to poor child feeding practices and indicates immediate action to promote appropriate child feeding practices. Almost half of the households were identified as moderately food insecure and one third were mildly food insecure in this study. Moreover, this study also revealed that household food insecurity has a strong impact on child feeding practices of the mothers. Although we have not investigated the factors associated with food insecurity in this study, but factors such as low family income, poor education may be contributing towards household food insecurity in this region. So, the findings implicated that timely and well-organized interventions are necessary to improve the child feeding practices of mothers as well as their household food security in this coastal region of Bangladesh.

Author Contributions

This research was carried out by all authors in collaboration. Author, Md Abdullah Al Mamun firstly suggested the study, wrote the proposal, and checked the analysis. First Author, Shownak Saha designed the study, taken the survey interviews and went to different stakeholder's office, run the analysis, and wrote the first draft of the manuscript. Authors, Dr LI Jianfeng, Ruhina Binta A Ghani, Syed Mahfuz-Al-Hasan and Ayesha Begum helped vigorously to carry out the research by giving opinions about study, interview questionnaire preparation, consent from subject, liaison with different government and non-government offices for interviewing, SPSS analysis and manuscript write up, English language improvement, Map creation of the study area etc.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Consideration

This study was approved by Ethical Review Board of Noakhali Science and Technology University, Noakhali. The researchers clarified the objective of this research and obtained informed consent from the respondents.

Availability of Data and Materials

Available upon request.

Consent for Publication

All of authors read and approved the final manuscript considering for publication.

ORCID iD

Md Abdullah Al Mamun ⬤ https://orcid.org/0000-0002-0816-1808

References

1. Paul SK, Islam QR, Roy S, Rudra PK. Complimentary feeding practices in under-2 children. *Chattagram Maa-O-Shishu Hospital Med Col J*. 2014;13(3):35-41.
2. Tiwari S, Bharadva K, Yadav B, et al. Infant and young child feeding guidelines, 2016. *Indian Pediatr*. 2016;53(8):703-713.
3. Allen J, Hector D. Benefits of breastfeeding. *New South Wales Pub Health Bull*. 2005;16(4):42-46.
4. Faruque A, Begum F, Khan N, Mullick M. Impact of an education programme on mothers' knowledge on infant and child feeding practices [Bangladesh]. *Bangladesh J Nutr*. 1992.
5. Roba KT, O'Connor TP, Belachew T, O'Brien NM. Infant and young child feeding (IYCF) practices among mothers of children aged 6–23 months in two agro-ecological zones of rural Ethiopia. *Int J Nutr Food Sci*. 2016;5(3):185-194.

6. Black R, Alderman H, Bhutta Z, Gillespie S, Haddad L, Horton S. Executive summary of The Lancet maternal and child nutrition series. *Maternal and Child Nutrition Study Group* (eds), Maternal and Child Nutrition. 2013:1-12.

7. WHO. *Global Strategy for Infant and Young Child Feeding.* World Health Organization; 2003.

8. Sisay W, Edris M, Tariku A. Determinants of timely initiation of complementary feeding among mothers with children aged 6–23 months in Lalibela District, Northeast Ethiopia, 2015. *BMC Public Health.* 2016;16(1):884.

9. Saizuddin M, Hasan MS. Infant and young child feeding (IYCF) practices by rural mothers of Bangladesh. *Journal of National Institute of Neurosciences Bangladesh.* 2016;2(1):19-25.

10. Demographic B. Health Survey (2004): Dhaka, Bangladesh and Calverton, MD, USA, National Institute of Population Research and Training, Mitra and Associates, and ORC Macro, 2005. 2007.

11. Owais A, Suchdev PS, Schwartz B, et al. Maternal knowledge and attitudes towards complementary feeding in relation to timing of its initiation in rural Bangladesh. *BMC nutrition.* 2019;5(1):7.

12. Research NIoP, Training M, Associates, International I. Bangladesh Demographic and Health Survey BDHS 2014: key indicators. National Institute of Population Research and Training (NIPORT), Mitra and ; 2014.

13. Mihrshahi S, Kabir I, Roy SK, et al. Determinants of infant and young child feeding practices in Bangladesh: secondary data analysis of Demographic and Health Survey 2004. *Food Nutr Bull.* 2010;31(2):295-313.

14. Mekonnen TC, Workie SB, Yimer TM, Mersha WF. Meal frequency and dietary diversity feeding practices among children 6–23 months of age in Wolaita Sodo town, Southern Ethiopia. *J Health Popul Nutr.* 2017;36(1):18.

15. Saaka M, Osman SM. Does household food insecurity affect the nutritional status of preschool children aged 6–36 months? *International Journal of Population Research.* 2013;2013:1-12.

16. Statistics BBO. *Statistical Yearbook of Bangladesh.* Statistics Division, Ministry of Planning, Dhaka, Government of the People's Republic of Bangladesh; 2011.

17. Islam MM, Al Mamun MA. Beyond the risks to food availability–linking climatic hazard vulnerability with the food access of delta-dwelling households. *Food Secur.* 2020;12(1):37-58.

18. Minar MH, Hossain MB, Shamsuddin M. Climate change and coastal zone of Bangladesh: vulnerability, resilience and adaptability. *Middle East J Sci Res.* 2013;13(1):114-120.

19. Vaitla B, Coates J, Glaeser L, Hillbruner C, Biswal P, Maxwell D. The measurement of household food security: Correlation and latent variable analysis of alternative indicators in a large multi-country dataset. *Food Pol.* 2017;68:193-205.

20. Zion D, Gillam L, Loff B. The Declaration of Helsinki, CIOMS and the ethics of research on vulnerable populations. *Nat Med.* 2000;6(6):615-617.

21. Arbuckle JL. *IBM SPSS Amos 20 User's Guide.* Amos Development Corporation, SPSS Inc; 2011:226-229.

22. Rao A. Managing diversity: Impact of religion in the Indian workplace. *J World Bus.* 2012;47(2):232-239.

23. Farooq R, Khan H, Khan MA, Aslam M. Socioeconomic and demographic factors determining the underweight prevalence among children under-five in Punjab. *BMC Public Health.* 2020;20(1):1-11.

24. Kabir MR, Ghosh S, Al Mamun MA, Islam H, Ghani RBA. *Factors Associated with Antenatal and Health Facility Delivery Care in Selected Areas of Subornochor Upazilla, Noakhali, Bangladesh.* Clinical Epidemiology and Global Health; 2020.

25. Encinger A, Shizu Kutaka T, Chernyavskiy P, Acar IH, Raikes HH. Relations among low-income preschool children's self-regulation, marginal food security, and parent stress. *Early Educ Dev.* 2020;31(8):1264-1280.

26. Sharmin A, Mahmud N, Ferdaus MJ, et al. Assessment of infant and young child feeding practices of caregiver's in Jashore City, Bangladesh. *Food Nutr Sci.* 2020;11(03):194-206.

27. Karim F, Khan ANS, Tasnim F, et al. Prevalence and determinants of initiation of breastfeeding within one hour of birth: An analysis of the Bangladesh demographic and health survey, 2014. *PLoS One.* 2019;14(7):e0220224.

28. Ayesha U, Al Mamun ASM, Islam MN, Hossain MR, Tasmia SA, Hossain MG. Factors influencing early initiation of breastfeeding among mothers in Rajshahi district, Bangladesh. 2020.

29. Ahmed R, Sultana P, Al-Fuad S, Islam A. Association between Breastfeeding Practices and Nutritional Status of Children Aged 6-24 Months in Jessore, Bangladesh.

30. Thet MM, Richards L-M, Sudhinaraset M, Paw NET, Diamond-Smith N. Assessing rates of inadequate feeding practices among children 12–24 months: results from a cross-sectional survey in Myanmar. *Matern Child Health J.* 2016;20(8):1688-1695.

31. Das N, Chattopadhyay D, Chakraborty S, Dasgupta A. Infant and young child feeding perceptions and practices among mothers in a rural area of West Bengal, India. *Ann Med Health Sci Res.* 2013;3(3):370-375.

32. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS, Group BCSS. How many child deaths can we prevent this year? *The lancet.* 2003;362(9377):65-71.

33. Arif S, Khan H, Aslam M, Farooq M. Factors influencing exclusive breastfeeding duration in Pakistan: a population-based cross-sectional study. *BMC Public Health.* 2021;21(1):1-10.

34. Rao S, Swathi P, Unnikrishnan B, Hegde A. Study of complementary feeding practices among mothers of children aged six months to two years-A study from coastal south India. *Australas Med J.* 2011;4(5):252-257.

35. Shumey A, Demissie M, Berhane Y. Timely initiation of complementary feeding and associated factors among children aged 6 to 12 months in Northern Ethiopia: an institution-based cross-sectional study. *BMC Public Health.* 2013;13(1):1050.

36. Ogunlesi T, Ayeni V, Adekanmbi A, Fetuga B. Determinants of timely initiation of complementary feeding among children

aged 6-24 months in Sagamu, Nigeria. *Niger J Clin Pract.* 2014;17(6):785-790.

37. Khanal V, Sauer K, Zhao Y. Determinants of complementary feeding practices among Nepalese children aged 6–23 months: findings from demographic and health survey 2011. *BMC Pediatrics*. 2013;13(1):131.

38. Sheikh N, Akram R, Ali N, et al. Infant and young child feeding practice, dietary diversity, associated predictors, and child health outcomes in Bangladesh. *J Child Health Care*. 2020; 24(2):260-273.

39. Abdullah AA, Rifat M, Hasan MT, Manir MZ, Khan MMM, Azad F. Infant and Young Child Feeding (IYCF) Practices, Household Food Security and Nutritional Status of Under-Five Children in Cox's Bazar, Bangladesh. *Current Research in Nutrition and Food Science Journal*. 2018;6(3):789-797.

40. Joshi PC, Angdembe MR, Das SK, Ahmed S, Faruque ASG, Ahmed T. Prevalence of exclusive breastfeeding and associated factors among mothers in rural Bangladesh: a cross-sectional study. *Int Breastfeed J.* 2014;9(1):7.

41. Saha KK, Frongillo EA, Alam DS, Arifeen SE, Persson LA, Rasmussen KM. Household food security is associated with infant feeding practices in rural Bangladesh. *J Nutr.* 2008; 138(7):1383-1390.

42. Aslam M. A variable acceptance sampling plan under neutrosophic statistical interval method. *Symmetry.* 2019;11(1): 114.