Original Research Article

Dietary Diversity, Nutritional status and associated factors amongPregnant Women in Their First Trimester of Pregnancy in coastal region of Bangladesh: a cross-sectional study

Abstract

Introduction: A significant public health risk for expectant mothers is inadequate dietary diversification and undernutrition. Given that nutritional deficits may have a major effect on the health of both the mother and the fetus, optimal dietary diversity is crucial throughout pregnancy. The health status of expectant mothers in coastal area was unknown during the first trimester of pregnancy, despite their undernourishment and lack of dietary diversity. As a result, the objective of this research was to assess the dietary diversity, nutritional status, and associated factors among pregnant women in the coastal area of Bangladesh.

Methods:A community-based cross-sectional study design and a multi-stage sampling technique were used among 416 pregnant women. Data was gathered using a semi-structured questionnaire. The Food and Nutrition Technical Assistance questionnaire was modified to collect data on dietary diversity. The nutritional status of pregnant women was assessed by measuring BMI. Descriptive statistics were used to report the study participant's characteristics after the data were analyzed using SPSS_25. To determine the variables influencing dietary diversity, a logistic regression model was constructed.

Results: Among 71.4% pregnant women, diverse diet was seen. Intake of nutrient-rich foods varied significantly according to women's employment status, educational level, family income level, and family type categories. Pregnant women, whose monthly family income was <15,000 BDT (OR 0.057**, 95% CI, 0.007- 0.469) and 15,000-40,000 BDT (OR 0.103*, 95% CI, 0.013-0.792) had respectively the tendency of having 0.057 times and 0.103 times low dietary diversity score than the pregnant women, whose monthly family income was >65,000 BDT that indicated a statistically significant relationship.

Conclusion: Pregnant women showed good levels of dietary diversity scores (DDS) that were considered acceptable (>5 food groups), and there was a significant relationship between DDS and participant's type of family, women's education, women's job, their family's monthly income and nutritional status.

Key-words: Dietary diversity, Pregnant women, Food groups, Socio-demographic factors.

Introduction

A diverse diet is one that includes a wide range of foods or food groups consumed over a predetermined length of time. It is recognized as being essential to determining the accessibility, utilization, and quality of a person's or family's food (1). Dietary diversity can be utilized as a stand-in for adequate nutrition in pregnant women (2). Because pregnant women require more nutrients than other dietary types, it is highly advised that they diversify their diet. As a result, a varied diet is necessary for pregnant women to meet their nutritional needs and enhance their nutritional status, which will help the mother's and the child's outcome (3). Pregnant people in low- and middle-income nations typically eat a diet high in cereals and low in animal products, vegetables, and fruits (4). For the mother and child's health and nutrition, dietary diversity (DD) and mothers' healthy eating habits are essential (5). DD is defined as the total number of food groups ingested in a specific time period, including within and between food groups. Because it offers sufficient levels of micronutrients to meet pregnant women' nutritional demands, DD is the most significant factor in diet quality(6, 7). Maternity suffers from malnutrition because low-quality, repetitive diets are common in impoverished nations like Bangladesh (8). Poor DD is a reflection of the general nutritional status of pregnant women of reproductive age, with studies showing that 59% of Bangladeshi women have an inadequately diversified diet (9). Due to a diet deficient in fruits, vegetables, and foods derived from animals, as well as a reliance on grains and tubers as staple foods, previous studies have also revealed that micronutrient deficiencies, such as those in zinc and iodine, are particularly common in South Asian and Sub-Saharan African countries (10). Reduced malnutrition may result from moms' diets being more varied and incorporating a variety of dietary categories (11). In light of this, figuring out the possible causes of moms' DD may aid in enhancing the dietary and medical standing of both the mother and child. Several research have looked into the variables related to a mother's varied diet (12). Previous studies discovered that the main variables causing DD among pregnant women in

underdeveloped nations were food security status, sociodemographic features of the household, economic issues, and a lack of nutrition advice (13). Few studies revealed a significant relationship between lactating women's dietary diversity in Sub-Saharan African countries and socioeconomic factors such as women's employment status, monthly income, household assets, family size, information about nutrition, sanitation conditions and food insecurity in the home (14). According to research by Shamim et al., the main factors influencing pregnant women's DD in rural Bangladesh were family size, husbands' occupations, and educational attainment (15). Pregnant women who have inadequate dietary diversity and become malnourished face a range of challenges, both maternal and fetal. Fetal issues include low birth weight, preterm birth, congenital impairment, increased risk of intrauterine growth restriction, prenatal mortality, and newborn morbidity and mortality. Due to its detrimental effects on pregnancy outcomes, undernutrition is a serious public health concern for women of reproductive age, especially those who are pregnant (16). According to a United Nations Children Fund (UNICEF) report from 2016, access to health care facilities, maternal care practices, household food security, and a healthy environment are the fundamental determinants that determine a mother's nutritional status (17).

The dietary diversity and nutritional status of pregnant women are also influenced by sociodemographic factors like age, wealth index, residence, occupation, size of farmland, illiteracy or low education, as well as maternal and health-care-related factors like age at marriage, ANC visits, counseling during antenatal care, level of knowledge, awareness, attitude, and practices regarding nutritious food intake, food taboos, women's empowerment, and craving (18). According to the preceding discussion, the majority of previous studies dealt with DD in pregnant women. Few studies have been conducted in Sub-Saharan African countries to identify the factors associated with DD in lactating women. There are limited studies on mothers DD in the South Asian context, particularly in the Bangladeshi context. Few studies in Bangladesh have identified the factors influencing rural women's DD. As a result, this study adds to the existing literature by determining the DD of mothers in urban setting and identifying the drivers of DD.

This study contributes to the body of literature on predictors of dietary diversity and nutritional status of pregnant women in the first trimester of pregnancy by evaluating the reinforcing factors (women's decision-making power and support from family and community since giving birth) as well as the predisposing factors (level of knowledge, attitude, and practices regarding optimal

nutrition and health). Furthermore, there may be regional variations in socioeconomic traits, culture, ethnicity, and geographic location that affect risk factors for dietary diversity and undernutrition. It is appropriate to investigate the factors influencing the nutritional status and diversity of a pregnant woman's diet during the early stages of pregnancy in order to plan appropriate and effective interventions for the next stage of pregnancy. Similarly, health care professionals could focus on significant modifiable risk factors based on study results.

Unfortunately, pregnant Bangladeshi women may not become aware that they are pregnant during the first trimester of their pregnancy since their eating habits were identical to their pre-pregnancy habits. This study is therefore unique from the others in that it was conducted during the first trimester of pregnancy, a gestational age at which the majority of studies have not been conducted. As a result, the aim of this research was to determine the dietary diversity, nutritional status, and associated factors among pregnant women in the first trimester of pregnancy in the costal district, Noakhali of Bangladesh.

Methods and Materials

Study design

A community based cross-sectional survey was conducted to collect data during June-July, 2023 in the study area.

Study area and population

The study was conducted among pregnant women in the first trimester of pregnancy of Patuakhali Sadar Upazilla (sub-district) and Noakhali Sadar upazilla (sub-district) of Patuakhali and Noakhali district, Bangladesh. Patuakhali and Noakhali both are the south-eastern coastal district of Bangladesh in Barisal and Chattogram division. The area was selected randomly from this district by multistage cluster sampling procedure.

Source population and study population

The source population consisted of all pregnant women in the district, while the study population consisted of randomly selected pregnant women from the selected study area.

Inclusion criteria

This study included pregnant women between the ages of 18 and 49 who had resided in the study area for at least 6months, and the women must be in their first trimester of pregnancy, as determined by a laboratory test.

Exclusion criteria

Severely sick pregnant women and/or those unable to respond to the questions were not included. Because the nutritional needs and dietary practices of pregnant women with chronic diseases like hypertension, diabetes mellitus and tuberculosiswere different from those of their counterparts; these pregnant women were excluded from the study.

Sample size and Sampling technique

Using a 5% margin of error, a 95% confidence level, a design effect of 2, and a 10% non-response rate, the sample size was estimated using a single population proportion under the premise that 38.7% of pregnant mothers had poor diet diversity during pregnancy and this gave us a sample size of 416 pregnant women. The participants in the study were chosen using a multistage sampling technique.Eligible households were chosen via simple random sampling from among selected districts using a computer-generated random number that was proportional to the size allocation of each Upazilla.

Study variables

The dependent variable of this study was dietary diversity status, and independent variables like age, marital status, occupation, residence, educational status, family size and nutritional status of pregnant women.

Data collection tools and procedures

Data were gathered using a semi-structured English questionnaire. Language experts translated the questionnaire into Bengali before returning it to English in order to maintain consistency. In order to identify any ambiguity, completeness, consistency, and acceptability of the questionnaire, it was pretested on 5% of the total sample size. To gather data, 16 diploma nurses were recruited. The data were collected through face-to-face interviews using pretested structured and semi-structured questionnaires adapted from different kinds of literature(19). The data were collected by well-trained Nurse professionals. The questionnaire had three parts. The first part includes socio-demographic factors (age, marital status, residence, family size, education, occupation, and others). The second part was dietary-related information

questionnaires which were adapted and modified from the Food and Agriculture Organization of the United Nations (FAO) 2016 (1). The dietary diversity questioner has ten different food groups based on their nutrients:1) grains, white root, tubers, and plantains, 2) pulses (beans, peas, and lentils), 3) nuts and seeds, 4) dairy, 5) meat and fish (poultry and fish), 6) eggs, 7) dark green leafy vegetables, 8) vitamin A-rich fruits and vegetables, 9) others vegetables, and 10) others fruits. It was assessed by using 24-h open dietary recall methods; one point was given to each food group consumed over the past 24 h before the survey period. The third part was nutritional status of pregnant women was assessed by BMI score using height & weight of the women.

Ethical approval

After receiving approval from the Noakhali Science and Technology University Ethics Council permission from head of the school, the research was carried out. Informed consent was taken from all of the participants before the data collection and all the pros and cons of the study were also discussed.

Data analysis

All the data was entered in SPSS 25.0. The data was cleaned and all outliers were discarded after verification with actual questionnaires. Data editing, coding, recoding, missing values and other problems about data was identified and rechecked if necessary. Data was analyzed using SPSS Software package (SPSS 25.0), and ENA (Emergency Nutritional Assessment). Individual Dietary Diversity Score (DDS) was defined as the number of food groups consumed over a 24-h period. The aggregation of foods included in the questionnaire into 10 groups was done according to Food and Agriculture Organization (FAO) guidelines to create the Women Dietary Diversity Score (WDDS). Dietary diversity was scored using the 10 food group categories and a cut-off score of ≥ 5 was considered appropriate (highest sensitivity and specificity) hence was used as the minimum cut off point for having a high dietary diversity during analysis.

Results

General information

The different characteristics of study population described below includes 416 pregnant women were selected for this study, eighteen to twenty-three years of ages with 9.1%, pregnant women (age between 24-36 years) 90.1% and thirty-seven to forty-nine years of age of .7% of the total

study populations. In general, the education level of the women's showed that 7% were completed primary level education with respect to the educational level 41.1% had completed secondary level, and a larger proportion 51.9% had completed higher secondary education. Large numbers of women were unemployed like 87.7% mothers were housewife of the study region. At the same time, 12.3% had been occupied. Most of women about 86.3% of them reside in urban area. The monthly income level of the households was less than 15000 Tk of monthly income with 11.1%, monthly income between 15000 – 40000 Tk with 40.6% & monthly income 40000-65000 Tk of 44.2% of the total study households respectively. The assessed information is summarized in Table 1.

Table 1, Descriptive statistics of Socio-demographic variables

Variable	**Percentage (%)**	**N (416)**
Age (years)		
18-23 years	9.1	38
24-36 years	90.1	375
37-49 years	0.7	3
Family Type		
Nuclear family	81.5	339
Joint family	18.5	77
Women's Education		
Primary	7	29
Secondary	41.1	171
Higher Secondary	51.9	216
Women's Employment		
Unemployed	87.7	365
Employed	12.3	51
Family Income		
< 15000 BDT	11.1	46
15000- 40000 BDT	40.6	169
40000- 65000 BDT	44.2	184
> 65000 BDT	4.1	17
BMI		

Underweight	33.4	139
Normal	65.6	273
Obese	1.0	4
Minimum Dietary diversity		
No	28.6	119
Yes	71.4	297

Dietary diversity and socio-demographic status among pregnant women in the study area

In this section, we established correlational aspect to understand the relation between dietary diversity score categories & several socio-demographic indices of different indicators of pregnant women. The dietary diversity score of the study pregnant women is significantly describe by the various socio-demographic and economic factors namely women's education, women's employment, family income level & family size because the Pearson Chi-square (p-value) significance level is .000 (.05) for each of the dietary diversity indicator. Table 2 describes that 86.6% of pregnant women's have low household dietary diversity score whom living in nuclear family. Also, 49.6% mothers were secondary educated having poor food consumption of the respective women. At the same time, women whom family monthly income level between 15000-40000 BDT were belonging with the larger rate 53.8% of low diversity score in the respective study participants, 51.9% of women whom family income level between 40000-65000 BDT having high dietary diversity. This means that the dietary diversity of the pregnant women's is greatly influenced with socio-demographic factors. There is a strong association between socio-demographic factors and dietary diversity observed and significant difference exists between the socio-demographic factors and dietary diversity for the respective households.

Table 2. Correlation between Dietary Diversity Score (DDS) and associated socio-demographic factors.

Characteristic	**N (416)**	**Dietary Diversity Score n(row%)**		**p-value**
		<5	**≤5**	
Family Type				

Nuclear family	339	103 (86.6)	236 (89.5)	0.042
Joint family	77	16 (13.4)	61 (20.5)	
Women's Education				
Primary	29	17 (14.3)	12 (4.0)	
Secondary	171	59 (49.6)	112 (37.7)	0.000
Higher Secondary	216	43 (36.1)	173 (58.2)	
Women's Employment				
Unemployed	365	118 (99.2)	247 (83.2)	0.000
Employed	51	1 (.8)	50 (16.8)	
Family income				
< 15000 BDT	46	24 (20.2)	22 (7.4)	
15000- 40000 BDT	169	64 (53.8)	105 (35.4)	0.000
40000- 65000 BDT	184	30 (25.2)	154 (51.9)	
> 65000 BDT	17	1 (.8)	16 (5.4)	

*5% level of significance Note: 10 food categories were considered as recommended by FANTA. Individual dietary diversity is categorized as "low dds" if less than 5 food groups consumed, and as "diverse" if ≥5.

Factors associated with dietary intake among pregnant in the study area:

Table-03 described that, the study had examined the relation of dietary diversity score associated with some factors such as family type, women's education, women's occupation, living area and family income among households of pregnant women in the study area which were statistically significant. women belonging to nuclear family (OR 0.601*, 95% CI, 0.331-1.092) were 0.601 times less likely to achieve higher dietary diversity score than the pregnant from joint family and the association was significant. Participants, whose women had completed primary (OR 0.175**, 95%, 0.078-0.395) education and secondary (OR 0.472**, 95% CI, 0.298-0.747) education had respectively 0.175 times and 0.472 times low tendency of receiving higher dietary diversity score than those whose women had completed higher secondary education. Here, the correlations were statistically significant ($p < 0.01$). Respondents, whose women were unemployed/housewives (OR 0.042**, 95% CI, 0.006-0.307) were 0.042 times less likely to achieve higher dietary diversity score than the women who were employed. women, who lived in the rural area (AOR 2.20, 95% CI, 1.05-4.61) were 2.20 times more likely to gain higher dietary diversity score than

those who lived in urban area. Pregnant women, whose monthly family income was <15,000 BDT (OR 0.057**, 95% CI, 0.007- 0.469) and 15,000-40,000 BDT (OR 0.103*, 95% CI, 0.013-0.792) had respectively the tendency of having 0.057 times and 0.103 times low dietary diversity score than the women whose monthly family income is >65,000 BDT that indicated statistically significant relationship.

Table 3. Factors associated with dietary intake among pregnant women

Variables	**Minimum Dietary diversity (No/Yes)**	
	Crude OR, 95% CI	AOR, 95% CI
Family Type		
Nuclear family	.601* (.331-1.092)	.654 (.330-1.29)
Joint family	1	1
Women's Education		
Primary	.175** (.078-.395)	.162** (.064-.414)
Secondary	.472** (.298-.747)	.580* (346-.971)
Higher Secondary	1	1
Women's Employment		
Unemployed	.042** (.006-.307)	2.203 (1.05-4.61)
Employed	1	1
Living area		
Rural	1.592 (.810-3.130)	2.20* (1.05-4.61)
Urban	1	1
Family income		
< 15000 BDT	.057** (.007-.469)	.162 (.018-1.47)
15000- 40000 BDT	.103* (.013-.792)	.235 (.028-1.98)
40000- 65000 BDT	.321 (.041-2.512)	.674 (.079-5.71)
> 65000 BDT	1	1

** Significant at <0.01; * significant at <0.05; the study also considered age, number of

siblings and religion for controlling their effects; “Yes” being the reference in the outcome variables

Discussion

This study aimed to assess the magnitude of dietary diversity, nutritional status, and associated factors among pregnant women in the first trimester of pregnancy(20).

In our findings, the prevalence of high dietary diversity among pregnant women in the first trimester of pregnancy was 71.4% (95% CI: (23.5, 29.6)(21). Our finding was comparable with the study done in Dhaka town (65.4%) (12) and the Southern Nations, Nationalities, and Peoples’ Region government (SNNPRG) region of Ethiopia (67%) (22). However, it is superior to those of a comparable study conducted in Kenya, Ethiopia (40.3%) (2)and (20.2%), respectively and while it is lower than research in the United States (54%), Ghana (40.3%), Kenya (60.6%)(23-25) . The possible disparity could be attributed to their study technique, gestational age, geographical location, socio-demographic, and seasonal differences. Differences in the measurement of dietary diversity also result in differences in the prevalence of dietary diversity; some studies used 10 food groups, while other studies used 14 food groups, and others differ in the cutoff points for categorization of dietary diversity as high or low(26). The study indicated that women nutritional status was significantly associated with the dietary diversity of pregnant women(27). The study indicated that living area was significantly associated with the nutritional status (undernutrition) of pregnant women(28). The odds of having good nutritional status were higher among pregnant women with a household live in urban area(29). This implies that as the living in rural area, the pregnant women will have lower consumption of diversified foods, which can affect their nutritional status(30).

Dietary diversity score was another factor shown to have a significant association with the nutritional status of pregnant women. Women with high dietary diversity scores were more likely to be well nourished compared to their counterparts(31). This finding is in congruent to the study done in central refit valley of Ethiopia and Kenya (32). The possible reason for this might be that dietary diversity can be utilized as a proxy indicator for nutritional adequacy so that it enhances immunity and thus improves their nutritional status(33). Nutrition and health practiced was also significantly associated with the nutritional status of pregnant women(34). Those women having

optimal nutrition and health practice were more likely to be well nourished compared to their counterparts. This could be explained by the fact that when women have optimal nutrition and health-related habits, their nutritional status is affected as a result of the dietary practice(35). This data is replicated by the study in northern and Southwest Ethiopia (36). Major strengths of this study included assessing the magnitude of dietary diversity, nutritional status, and associated factors in pregnant women in the first trimester of pregnancy, which most studies have not done at this gestational age, which is very important to provide effective intervention for the next stage of pregnancy; predisposing factors like level of knowledge, attitude, and practices regarding optimal nutrition and health; and reinforcing factors (women's decision-making power and support from family and community)(37).

As a constraint, there may be recall bias on dietary consumption because respondents may forget what they ate the day before. To reduce recall bias, a multiple pass 24hours probing method was adopted. Due to the cross-sectional nature of the study, it does not show the temporal or causal effect relationships between the independent and the outcome variables, and seasonal variations were not considered.

Conclusion

According to the current study, there was a high prevalence of a low dietary diversity and undernutrition among pregnant women in the study area who were in their first trimester. Having good knowledge and favorable attitude, and residing in food secured households were significantly associated with the dietary diversity score of the pregnant women while household size, household food security status, dietary diversity score and nutrition and health practices were predictors of nutritional status (undernutrition). As a result, nutrition and health behavior change and communication must be adjusted to suit the needs of pregnant women in terms of dietary diversity and nutritional status.

Ethics declarations

Ethical approval was obtained from the Committee of Research cell, Faculty of Sciences, Noakhali Science & Technology University.

Data availability

Data can be available upon request.

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