Article

Nutritional status and dietary adequacy amid reproductive aged women in Cumilla, Bangladesh

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Abstract: Dietary patterns are evolving greatly during the last years and various diet and lifestyle related diseases are increasing day by day. The prevalence of double burden of malnutrition and various nutritional deficiency diseases among the reproductive aged women, the most vulnerable group has become a severe concern during the last decades. Therefore, the study focused on the nutritional status of reproductive aged women, their dietary food and nutrient intake and the adequacy of these consumed nutrients as compared to their requirements. A cross-sectional study was conducted among the randomly selected 355 households in Cumilla district in Bangladesh. The results showed that only about 32% of the participants were found having a normal BMI range. The percentage of underweight, overweight and obesity among the participants were 13.3% (95% CI: 10.25, 16.36), 35.8% (95% CI: 31.49, 40.12) and 19.6% (95% CI: 16.04, 23.17) respectively. Dietary protein, carbohydrate, total fat consumption was 11.87%, 65.22% and 18.9% of energy. Consumption of vitamin A, C, D, Folic acid, calcium, sodium, riboflavin and potassium was very poor and found below EAR/AI among the most respondents. Thiamin, zinc, iron, phosphorous intake was satisfactory among the most respondents.

Keywords: reproductive aged women; nutritional status; dietary intake; nutritional adequacy; Cumilla

1. Introduction

Nutrition transition and epidemiologic transition in low- and middle-income countries have become significant topics in recent decades. The first one shows the trends in the change of diets from traditional foods to calorie dense, oily and processed foods (Drewnowski and Popkin, 2009). The later says the shift of diseases patterns from communicable to various non-communicable diseases (Miranda *et al.*, 2008). Double burden of malnutrition has increased in recent years (Shafique *et al.*, 2007; Biswas *et al.*, 2017). According to BDHS 2014, the prevalence of underweight and overweight among the reproductive aged women in Bangladesh were 19% and 24% respectively (Statistics and Mitra and Associates, 2013).This health problem is related with both their dietary quality, intake pattern and quantity. Underweight and overweight are not only problem themselves but also can generate other adverse health effect, pregnancy complications and non-communicable diseases (Sebire *et al.*, 2001; Mamun *et al.*, 2011; Chopra *et al.*, 2013).

Nutritional consideration and improved diets are required during the reproductive aged women for maintaining a good health, recovering the menstrual losses and preparing for (Kaiser and Allen, 2002; Simpson *et al.*, 2010, 2011)pregnancy. Micronutrients consumptions are still poor and various micronutrient deficiencies are prevailing (Nguyen *et al.*, 2018). Although the situation has improved, some of these like iron deficiency anemia (IDA), iodine deficiency disorder (IDD), vitamin A deficiency disorder (VADD), folate, vitamin D, zinc, calcium, magnesium, phosphorous deficiencies are the main concern (Ahmed *et al*., 2016).

Female members of the families are the most vulnerable to poor dietary consumption as in most cases they have to eat after all the male members and children have eaten. They have to compromise any shortage of food and

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have to adopt all diet related coping strategies in case of food insecurity. Very few studies available in the literature that showed Nutritional status and dietary patterns of reproductive aged women in Bangladesh. Therefore, we focused on the nutritional status of reproductive aged women, their dietary patterns and adequacy of their nutrient intake as compared to recommended intake. This paper aims to fill the research gap, which in turn can help guide maternal nutrition and reproductive health program planners and policymakers to understand the condition of nutritional status and their dietary intake to assist in implementation of maternal nutrition and reproductive health program that will improve their health conditions and dietary nutrients intake.

2. Methods and Materials

2.1. Study design, study area, sampling, materials

This was a cross-sectional study conducted in the selected areas of Cumilla district in Bangladesh (about 100 kilometers south east of Dhaka) during the Month of April 2019. The selected areas included five villages namely Kalir Bazar, Gohinkhali, Jangalia, Ujirpur and Joypur. The households were randomly selected for the study and oral consent of the respondents were taken before the interview. Information from 355 households were collected for the study. Height scale, weighing scale were used for anthropometric measurements and structured questionnaire were used for collecting the required data. Socio-economic and demographic data, anthropometric information and dietary data were taken. Data were analyzed through Statistical Package for Social Sciences (SPSS version 25.0) (Nie *et al*., 1975).

2.2. Anthropometric measurements and analysis

Height and weight of the respondents were taken using the height scale, weighing scale. From this information body mass index (BMI) were calculated. This BMI values were then categorized using the BMI cut off value, BMI<18.5kg/m^2 as underweight, BMI 23 to <27.5 kg/m^2 as overweight and BMI≥27.5 kg/m^2 as obese(Bmi and Bmi, 2004). Chi-square test was done to find the association of nutritional status with socio-economic characteristics.

2.3. Dietary information and analysis

Household 24-hour recall dietary intake information were collected. Raw weights of the food ingredients consumed during the previous 24 hours at the household were taken. For the convenience of accurate data collection serving plates, spoons and cups were displayed to the respondents. The cooked weights were converted to equivalent raw weight s using the conversion factors. Food consumption table for Bangladesh (Shaheen *et al*., 2014) was used to estimate the nutrients consumption. The persons consumed during the previous 24-hour were recorded and they were assigned with a man value according to their age and sex. Males above 14 years of age were given a weight of 1.0, females above 11 years and boys from 11 to 14 years of age 0.9, 7 to 10 years children 0.75, 4 to 6 years children 0.4 and less than 4 years children as 0.15 (Jensen *et al.*, 1984). Per capita food and nutrients consumption was obtained by dividing the total consumption with total consumption unit. Then individual intake of reproductive age women were calculated multiplying the per capita consumption by corresponding room scale (0.9). Nutritional adequacy was obtained comparing the individual intake to the recommended intake (RDA, EAR, RNI, AI, UL) (Institute of Medicine, 2006).

3. Results

3.1. Characteristics of the respondents

Table 1 shows the background information of the respondents. More than half (57.5%) of the participants were at the ages between 20-34 years and about one-fifth were at their teen ages. More than 80% of the respondents were found leading their married lives. Mostly were found involved in domestic chores, 14.3% were students and few were engaged in other activities. Above two-third (69.1%) were found having formal education between secondary and higher secondary and the left were those having education below primary. About 58% of the households were found food secured. Almost three-fourth (73.5%) of the respondents were observed maintaining proper hygiene practices.

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Table 1. General characteristics of study participants.

	N (%)
Age in years	
15-19	92(19.4)
20-34	273(57.5)
≥ 35	110(23.2)
Marital status	
Married	386(81.3)
Unmarried	89(18.7)
Occupation	
Household activities	396(83.4)
Student	68(14.3)
other	11(2.3)
Education level	
Primary or below	146(30.7)
Secondary or higher	328(69.1)
Missing	1(0.2)
Income rank	
Lowest (<15000tk)	170(35.8)
Middle (15001-25000tk)	116(24.4)
Highest (>25000tk)	189(39.8)
Household food security status	
Food secure	275(57.9)
Food insecure	200(42.1)
Sanitation facility	
Hygienic	349(73.5)
Unhygienic	126(26.5)

3.2. Nutritional status of the participants

The distribution of nutritional status in different socio economic groups is shown on table 2. About 68% of the respondents were found either underweight, overweight or obese. Only about 32% of the participants were found having a normal BMI range. The percentage of underweight, overweight and obesity among the participants were 13.3%, 35.8% and 19.6% respectively.

Table 2. Nutritional status by different socio demographic characteristics.

	Underweight % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	*P value
All	13.3(10.25,16.36)	35.8(31.49,40.12)	19.6(16.04,23.17)	
Age in years				
15-19	27.2(18.11,36.3)	17.4(9.66,25.15)	8.7(2.95,14.46)	<0.0001
20-34	8.8(5.44,12.17)	40.3(34.49,46.12)	23.8(18.75,28.86)	
≥ 35	12.7(6.48,18.93)	40(30.85,49.16)	18.2(10.99,25.42)	
Marital status				
Married	11.4(8.22,14.59)	39.1(34.22,43.99)	21.5(17.39,25.62)	<0.0001
Unmarried	21.3(12.8,29.81)	21.3(12.8,29.81)	11.2(4.65,17.76)	
Occupation				
Household activities	10.4(7.4,13.41)	38.9(34.1,43.71)	21.7(17.65,25.76)	<0.0001
Student	30.9(19.92,41.89)	16.2(7.45,24.96)	5.9(0.3,11.51)	
other	9.1(-7.9,26.1)	45.5(16.08,74.93)	27.3(0.98,53.64)	
Education level				
Primary or below	13(7.55,18.46)	40.4(32.45,48.36)	15.8(9.89,21.72)	0.41
Secondary or higher	13.1(9.45,16.76)	33.8(28.69,38.92)	21.3(16.87,25.74)	
Income rank				
Lowest	17.6(11.88,23.33)	34.7(27.55,41.86)	16.5(10.93,22.08)	0.32
Middle	13.8(7.53,20.08)	36.2(27.46,44.95)	19(11.87,26.14)	
Highest	9(4.92,13.09)	36.5(29.64,43.37)	22.8(16.82,28.79)	

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Household food security				
Food secure	10.9(7.22,14.59)	37.1(31.4,42.81)	19.6(14.91,24.3)	0.35
Food insecure	16.5(11.36,21.65)	34(27.44,40.57)	19.5(14.01,25)	
Family size				
≤4 members	9(4.16,13.85)	43.3(34.92,51.69)	20.1(13.32,26.89)	0.09
>4 members	15(11.13,18.88)	32.8(27.71,37.9)	19.4(15.11,23.7)	
Sanitation facility				
Hygienic	12.9(15.26,23.55)	37(31.94,42.07)	18.9(14.8,23.01)	0.81
Unhygienic	14.3(8.19,20.42)	32.5(24.33,40.68)	21.4(14.24.28.57)	

*p-value from chi-square test

3.3. Consumption of various food groups

Per day intake of different food groups is presented on table 3. The median consumption of staple cereal was 500 g per day. Consumption of fruits and vegetables, meat and fish, milk and dairy products was about 171 g, 134 g and 141 g respectively. Total fats and oil intake was about 33.5 g and sugar and beverages intake was about 53 g.

Table 3. Weight of different food groups consumed by reproductive aged women, in grams per day.

	Mean (SD)	Median (IQR)	Min-max
Cereal	570.829(340.438)	500.00(312.50-754.70)	28.57-3041.47
Nuts and legume	95.462(83.273)	71.429(40.741-114.286)	11.11-500.00
Roots and tubers	153.329(119.986)	120.00(67.20-208.950)	7.68-765.47
Fruits and vegetables	238.954(235.383)	171.435(91.40-309.315)	8.86-2310.90
Meat and fish	201.098(192.817)	134.00(75.00-240.40)	9.00-1360
Egg	57.926(42.633)	48.333(34.118-69.979)	2.18-232
Milk and dairy products	183.603(132.197)	140.659(87.50-264.285)	6.67-571.43
Fats and oil	46.571(39.820)	33.466(17.324-63.833)	2.22-248.00
Sugar and beverages	88.337(106.539)	52.778(15.250-124.519)	1.54-719.42

3.4. Dietary macronutrients consumption and adequacy

Table 4 shows dietary energy and macronutrients consumption and their adequacy in comparison to the recommended intake. Although dietary protein consumption was in the recommended range, the median dietary carbohydrate (65.224%) and fiber (31g) consumption exceeded the RIR. About one-fourth (25.9%) of the participants were found to consume protein less than recommended range. Almost all (97.7%) the respondents consumed carbohydrate above or equal to RIR value. On the other hand, total fat (18.9%) consumption was below the RIR and more than half (56.8%) the respondents were found to consume less fat in comparison to RIR.

Table 4. Consumption of energy and macronutrients and their adequacy.

	Intake/ person/day			Recommended Intake Range (RIR)	Percentage with intakes	
	Median	Q_{25}	Q_{75}		Below RIR	Above/equal to RIR
Energy (kcal)	2827.96	1768.08	4175.1			
Carbohydrate (E%)	65.224	57.992	72.358	45-65%	2.3	97.7
Protein (E%)	11.871	9.773	15.353	10-35%	25.9	74.1
Total fat (E%)	18.899	11.840	26.556	20-35%	56.8	43.2
Dietary fiber (g/day)	31.057	18.172	45.138	25g/day	40.0	60.0

%E: percentage of total energy intake

3.5. Dietary micronutrients consumption and adequacy

Table 5 describes the dietary intake of various micronutrients along with their adequacy compared to recommended intake. Median consumption of vitamin A, D, Folic acid, calcium, sodium, potassium was very poor and found below EAR/AI among the most respondents. About half of the participants consumed vitamin C and riboflavin below EAR/AI. On the other hand, niacin and magnesium consumption was found exceeding the UL in about 60% respondents.

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Table 5. Consumption of micronutrients and their adequacy.

	Intake/ person/day				Percentage with intakes	
	Median	Q_{25}	Q_{75}	EAR/AI	Below EAR/AI	Above UL
Vitamin A (µg/day)	98.658	42.397	233.266	500 µg/day	87.6	-
Vitamin C (mg/day)	64.301	35.166	119.457	60 mg/day	46.9	-
Vitamin D (µg/day)	0.7667	0.0013	3.156	10 µg/day	99.2	-
Thiamin (mg/day)	1.898	1.156	2.795	0.9 mg/day	12.0	-
Riboflavin (mg/day)	0.910	0.605	1.418	0.9 mg/day	49.5	-
Niacin (mg/day)	41.998	23.899	61.227	11 mg/day	1.3	60.4
Folic acid (µg/day)	187.251	126.314	301.680	320 µg/day	77.9	0.2
Iron (mg/day)	11.626	7.498	16.837	8.1 mg/day	28.0	2.1
Zinc (mg/day)	13.841	8.370	20.083	6.8 mg/day	14.9	4.2
Calcium (mg/day)	258.420	143.373	644.136	800 mg/day	78.9	5.7
Phosphorous (mg/day)	1312.839	829.287	1893.071	580 mg/day	8.2	4.2
Sodium (mg/day)	267.990	148.085	611.571	1500 mg/day	94.1	1.9
Potassium (mg/day)	2407.311	1467.63	3618.138	4700 mg/day	88.4	-
Magnesium (mg/day)	420.948	272.028	625.568	255 mg/day	20.6	62.7

4. Discussion

This paper reveals the nutritional status of the reproductive aged women, their dietary food and nutrients intake patterns and adequacy of dietary energy and nutrients in comparison to the recommended intake. In our study, we found only about 32% respondents at their normal BMI cut off points which is lower than the percentage of Bangladesh Demographic and Health Survey 2014 (Statistics Bureau and Mitra Associates, 2013). The percentage of underweight in our study was 13.3%, lower than the percentage in Bangladesh Demographic and Health Survey 2014. Overweight and obesity have been increased in Bangladesh during the last decades and we also found so. The chi-square test shows that age, marital status and occupation of the respondents are significantly associated with their nutritional status. Though underweight was prevalent among the teen agers, over weight and obesity were higher among the adults. Prevalence of underweight was higher among the unmarried and overweight and obesity were higher among the married. Percentage of underweight was higher and overweight, obesity were lower among the students. Although educational level, income rank, food security, family size, sanitation facility were not significantly associated, the percentage of overweight and obesity was higher among the highest income group, food secured families, families with low member.

Dietary information found in this study showed that the consumption of cereal, nuts and legume, roots and tubers, fruits and vegetables, meat and fish, egg, milk and dairy products, fats and oil, sugar and beverages have increased as compared to that of from the national surveys (NIPORT and Mitra Associates, 2016). Dietary energy, carbohydrate, protein, fat, fiber consumption have increased over the years.

Although dietary protein consumption was in the recommended range, about one-fourth (25.9%) of the respondents were found to consume protein below the lower boundary of the recommended intake range. Carbohydrate intake met the recommended value and mostly exceed the upper boundary of recommended intake range. Total fat (18.9% of the total energy) consumption was below the RIR and more than half (56.8%) of the respondents were found to consume less fat in comparison to their RIR. Dietary fiber consumption was higher than the recommended value but still 40% of the participants were found to consume less dietary fiber compared to the recommended value. In case of the micronutrients, dietary consumption of several vitamins like vitamin A, vitamin D, Folic acid was very poor among the most respondents. Although median vitamin C and riboflavin consumption was higher than the RIR value, about half of the participants were found to consume below EAR/AI. In case of minerals, the consumption of calcium, sodium, potassium was very poor as compared to the requirements. Thiamin, zinc, iron, phosphorous intake was satisfactory among the most respondents. On the other hand, niacin and magnesium consumption was higher than the recommended value and was found exceeding the UL in about 60% respondents.

5. Limitation of the study

As 24-hour recall dietary data were collected, actual weight of food consumed was not found and the weight was adjusted by approximation. Because individual intake was not taken, the intake obtained from the household consumption might deviate from their actual intake.

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6. Conclusions

The prevalence of underweight and normal nutritional status among reproductive aged women were lower than the prevalence in national prevalence. But the prevalence of overweight and obesity was increased over the years. Age, marital status and occupation of the respondents were significantly associated with their nutritional status. Dietary intake of various food groups increased as compared to national surveys. Dietary energy, protein, fats and oils intake also increased. Adequacy of dietary energy, carbohydrate and protein consumption was satisfactory but still fats and oil consumption was very low compared to their requirements. Consumption of vitamin A, D, Folic acid, vitamin C, riboflavin, calcium, sodium, potassium was unsatisfactory, below EAR/AI among the most respondents but niacin and magnesium consumption was found exceeding the UL. Thiamin, zinc, iron, phosphorous consumption was found satisfactory among most of the respondents. Therefore, priority should be given on their nutritional status and improved diet in terms of quality and quantity. \

Conflict of interest

None to declare.

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