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Factors Affecting Womens' Nutrition in an Urban Area of Bangladesh

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Abstract: The main purpose of this research study is to determine the important socio-economic, demographic, and cultural factors that significantly influence the nutritional status of adult women aged 40-55 years in an urban area of Bangladesh. The study used primary data collected from 234 women residing in the Chattogram metropolitan area to carry out this research work. In the analytical stage, in addition to the descriptive measures, the study employed the Chi-square test of independence to examine the significant association between nutritional status and available background characteristics of the respondents. Moreover, multinomial logistic regression analysis was employed to identify the significant predictors of nutritional status. The findings of this study show that the maximum of the respondents belongs to the overweight stratum (n=178, 76.1%), followed by normal weight (n=38, 16.2%). The overall mean BMI of the selected respondents was found 26.46±3.66 kg/m² with marked variations by their background characteristics. The coefficient of variation (13.83%) illustrates that there exists extreme heterogeneity in the BMI of the respondents. The coefficient of skewness and access of kurtosis reflect the distribution of BMI is negatively skewed and leptokurtic. The highest mean BMI was found in the age group 40-45 years (27.78±3.34 kg/m²), and the lowest (23.87±3.39kg/m²) was in the non-Muslim respondents. Bivariate and multivariate analyses reveal that religion, respondents' education, and husbands' education significantly influence the nutritional status of adult women. The findings also show that Muslim women are relatively well-nourished compared to their non-Muslim counterparts. Nonetheless, both highly educated women and women whose husbands are also highly educated are well-nourished than those who are below secondary education level. The findings of this study will be helpful for the policymakers and concerned health workers to implement appropriate policies to raise the educational qualifications for ensuring the balanced nutritional status of adult urban women in Bangladesh.

Keywords: Nutrition, Older Women, Urban Area, Multinomial Logistic Regression, BMI

1. Introduction

Nutrition is a fundamental part of human life, health, and development across the entire life span. The most common cause of mortality and morbidity among children worldwide is malnutrition [1]. From the earliest stages of fetal development, infancy, childhood, adolescence, adulthood, old age, proper food intake and good nutrition are essential for survival, physical growth, mental development, performance and productivity, good health, and wellbeing. Malnutrition is vulnerable to severe diseases and causes about 45% of the world's children's death [2]. Nutrition is a crucial foundation of human and national development. In

Bangladesh, 5.5 million children suffer from chronic malnutrition, and 14% are malnourished [3]. An earlier study found a high prevalence and increasing trends of overweight and obesity among ever-married non-pregnant urban women in Bangladesh [4]. Moreover, the proportion of ever-married women who are undernourished has decreased since 2007 from 30% to 12%. On the other hand, the proportion of overweight women has increased from 12% to 32% [5]. The fundamental WHO goal of Health for All means that people everywhere, throughout their lives, have the opportunity to reach and maintain the highest attainable level of health. This

is impossible in the presence of hunger, starvation, and malnutrition. The number and the proportion of older persons defined as aged 60 and over are growing virtually in all countries, and present worldwide trends are likely to continue unabated [6]. Women comprise the majority of the older population in all countries largely because the longevity of women is relatively higher than men. Optimum nutrition of women is the foundation of their health and is affected by many factors. Generally, underweight and stunting are both inversely related to women's education and household wealth. Moreover, highly educated women with a high social stratum and high household wealth are likely to be overweighted [7]. Nutritional needs and problems of women are based on age, stage of development, social, economic, and cultural factors. In addition to these indicators, women have specific and special needs associated with menstruation, reproductive health, fertility, lactation, and menopause. Furthermore, 50% of pregnant and 57% of non-pregnant/non-lactating females are zinc deficient, 40% of non-pregnant females suffer from anemia, and 22% of non-lactating women are deficient in B12 [8]. Appropriate dietary pattern of women provides all nutrients needed to optimize their activity throughout life. Proper nutrition is the origin of health promotion, prevention, and treatment of diseases. The elderly population may be at risk of nutritional deficiencies or problems with health care more than young people. Emotional, social, and physical problems may interfere with their appetite and affect their ability to buy, prepare, and consume sufficient food. Therefore, considering the importance of women's nutrition, this study attempts to identify the socioeconomic, demographic, and cultural factors that significantly influence the nutritional status of adult women aged 40-55 years in an urban area of Bangladesh.

2. Methodology

2.1. Data Collection Technique and Study Design

To conduct this research work fruitfully, Chattogram metropolitan city was selected as the study area because this area is a cosmopolitan type, standard of living of this area is comparatively high, urban facilities are adequate, and adult women living in this area are supposed to be well-nourished. The ever-married women aged 40-55 years in the Chattogram metropolitan area were the target population. To obtain the relevant information, the field survey was conducted for this research work from April to July 2019. The study considered a sample of size 234 women and was successfully interviewed through a well-structured interview schedule, and field editing was done accordingly. In this study, retrospective information was collected because the vital registration system is incomplete, and the sampling frame of respondents was unknown in the study area. Therefore, the purposive sampling technique was considered rather than a random sampling scheme to select the sampling units. Along with other variables, the weight of the selected respondents was measured by the digital weighing machine and height, waist, and hip circumference by flexible tape.

2.2. Data Analysis

The nutritional status of adult women is one of the prime determinants of health, physical and mental development. Considering its importance, first of all, percentage distribution and mean and variability of the nutritional indicators are computed. Thereafter, mean, variability, and shape characteristics of BMI are also calculated by the background characteristics of the respondents. In addition to the descriptive statistics, a bivariate analysis was carried out using the Chi-Square test of independence along with corresponding p-values to examine the significant association between nutritional status and background characteristics of the respondents. An advanced multivariate model has been fitted for in-depth analysis to determine the prognostic factors of adult women's BMI, considering the variables found significant in bivariate analysis. In this study, the multinomial logistic regression was judiciously applied to determine the impact of the background characteristics on the dependent variable as it is a trichotomous type. All the statistical analyses of this research work were performed using SPSS version 25.

3. Results

3.1. Descriptive Study

The nutritional status of the respondents mainly depends on different anthropometric measures like height, weight, waist circumference, hip circumference, and waist to hip ratio. Thus percentage distribution of the respondents by nutritional indicators with corresponding mean and variability are computed and accordingly presented in Table 1. From the results, it is observed that the mean height among the respondents is found 152.37±6.76 cm. The findings indicate that 38.5% of the respondents lies up to 150 cm, and only about 28% of them have a height of more than 155cm. The mean weight among the respondents is found 61.46±8.45kg. Among the respondents, 15.4% have weight less than and equal to 55kg. The weight of the maximum number of women (74.8%) lies between 55.1 and 70.0 kg. The mean waist circumference among the respondents is found 94.78 ±6.89 cm and about 50.4% of the respondents have waist circumference lowest through 95 cm. The mean hip circumference among the respondents is computed as 101.74±6.26 cm, and 59.0% of them have hip circumference more than 100 cm. The mean waist to hip ratio among the sampled respondents is found 0.93±0.04, and 48.7% have a waist to hip ratio of more than the mean waist to hip ratio (0.93). The important nutritional indicator BMI was computed based on the height and weight of the respondents. The overall mean BMI among the respondents is found 26.46±3.66 kg/m^2. Among the respondents, about 16.2% have normal BMI (18.5-24.9 kg/m^2), whereas 76.1% belong to the overweight stratum (≥ 25kg/m^2). The results in Table 1 at a glance show that more than three-fourth (76.1%) of

respondents living in the study area are overweighted. The comparative figures of urban and nation as a whole confirmed that the women living in urban areas are extremely overweighted. Therefore, the concerned authorities and family members should pay attention to this issue because overweight and obesity are positively associated with different diseases.

Table 1. Mean and percentage distribution of the respondents by selected nutritional indicators.

Variables	No. of respondents	Percentage (%)	Mean ± S. D
Height (cm)			
≤150	90	38.5	
151-155	79	33.8	152.48±6.80
>155	65	27.8	
Weight (kg)			
≤55.0	36	15.4	
55.1-70.0	175	74.8	61.46±8.45
>70.0	23	9.8	
Waist circumference (cm)			
≤95	118	50.4	
96-100	82	35.0	94.78±6.89
>100	34	14.5	
Hip circumference (cm)			
≤95	28	12.0	
95-100	68	29.1	101.74±6.26
>100	138	59.0	
BMI (kg/m^2)			
Underweight (<18.5)	18	7.7	
Normal (18.5-24.9)	38	16.2	26.46±3.66
Overweight (≥25.0)	178	76.1	
Waist to hip ratio			
≤0.93	120	51.3	0.93±0.04
>0.93	114	48.7	

Being overweight and underweight both have significant implications for women's health and their children's nutritional and health status. Therefore, to observe a clear scenario of malnutrition status worldwide, Figure 1 below illustrates the prevalence of global and regional overweighted adults.

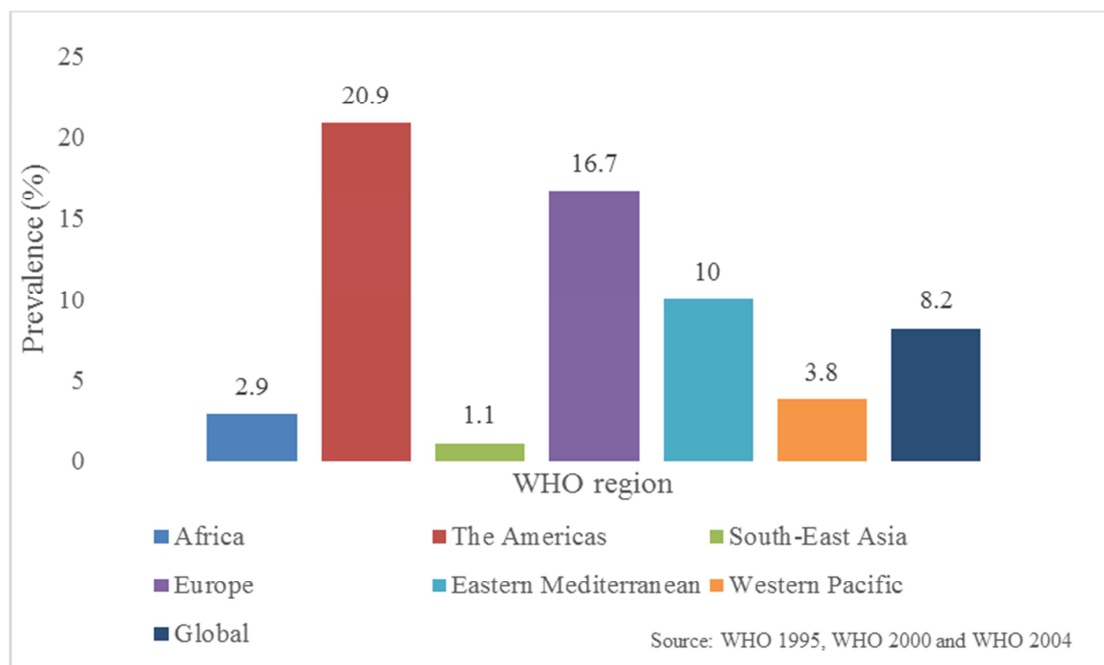*Figure 1. Regional and global prevalence of overweight adults by WHO region*

Figure 1 reflects the highest prevalence of overweight adults in the Americas, followed by Europe. On the other hand, a minimum obese is found in South-East Asia followed by Africa. In addition to the prevalence of overweighted adults in the global and regional context, Figure 2 also displays the percentage distribution of different categories of

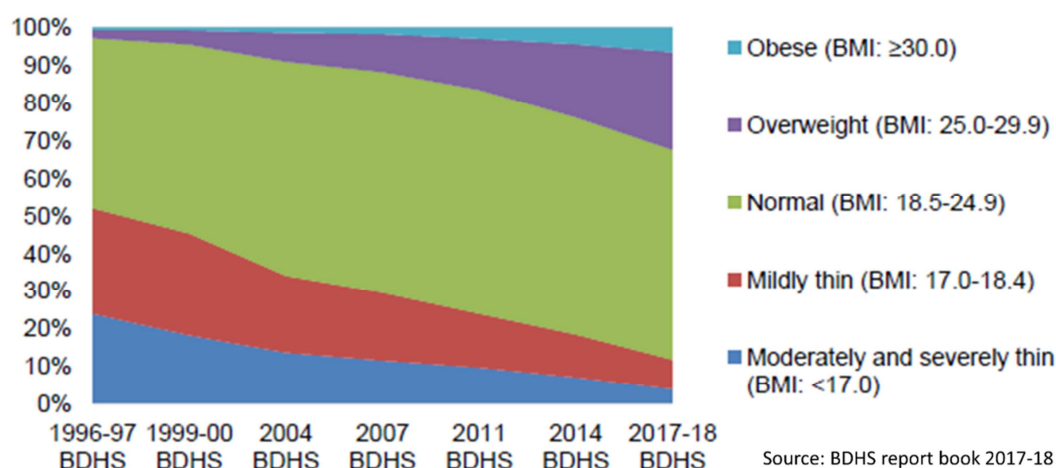BMI of the adult women in Bangladesh during 1996-2018.

Figure 2. Percentage distribution of different categories of BMI among adult married women in Bangladesh during 1996-2018.c

Figure 2 reflects that in Bangladesh, the proportion of underweight women reduced from 52% in 1996-97 to 30% in 2007 and 12% in 2017-18. This implies that a decreasing trend of undernourishment has been observed among adult women in the stated period in Bangladesh. On the contrary, the proportion of overweight women increased from 3% in 1996-97 and 12% in 2007 to 32% in 2017-18. The pattern indicates that the proportion of overweight women has been sharply increased in the same period in Bangladesh. Similarly, like Bangladesh, women have shown a higher prevalence of overweight and obesity than men every year since 2000 globally [9]. In addition to the graphical presentation, the mean, variability, and shape characteristics of the BMI by the background characteristics of the respondents are computed and presented in Table 2.

Table 2. Summary measures of body mass index by some selected background characteristics of the respondents.

Variables	Mean of BMI (kg/m²)	S. D	γ_1	γ_2	95% CI Min.	95% CI Max.	No. of respondents
Respondents' current age (years)							
40-45	27.78	3.34	-0.46	0.44	18.26	33.06	100
46-50	26.02	4.19	-0.12	0.14	18.15	37.21	67
51-55	26.41	3.54	-1.29	0.54	18.26	30.74	67
Religion							
Muslim	26.90	3.39	-0.52	0.81	18.15	37.21	200
Others	23.83	4.12	-0.25	-1.46	18.26	29.58	34
Place of origin							
Rural	26.37	3.76	-0.42	-0.07	18.15	34.27	116
Semi-urban	26.52	3.71	-1.09	0.44	18.26	32.71	52
Urban	26.56	3.47	-0.45	1.69	18.26	37.21	66
Current place of residence							
Semi-urban	24.33	4.59	-0.01	-1.38	18.26	31.86	22
Urban	26.68	3.49	-0.58	0.75	18.15	37.21	212
Waist to hip ratio							
≤0.93	26.46	3.61	-0.58	0.73	18.15	37.21	120
>0.93	26.45	3.72	-0.58	0.09	18.26	34.27	114
Respondents' educational level							
Illiterate	24.37	4.71	-0.11	-1.64	18.26	30.74	20
Primary	24.65	4.73	0.03	-1.24	18.26	32.25	22
Secondary and above	26.88	3.26	-0.53	1.23	18.15	37.21	192
Respondents' occupation							
Housewife	26.46	3.65	-0.43	0.40	18.15	37.21	161
Service and others	26.44	3.69	-0.89	0.40	18.26	32.96	73
Marital status							
Presently married	26.61	3.49	-0.58	0.71	18.15	37.21	211
Widowed, Separated/Divorced	24.99	4.77	-0.13	-1.24	18.26	33.06	23
Age at marriage (years)							
11-15	24.29	4.55	0.14	-0.89	18.26	32.71	25
16-20	27.39	3.25	-0.51	1.47	18.26	37.21	129
21 and above	25.62	3.52	-0.75	-0.20	18.15	32.42	80
Husband's age							
41-50	26.17	3.46	-0.39	0.51	18.26	33.06	66
51-60	26.78	3.50	-0.48	0.80	18.26	37.21	128
61 and above	25.89	4.38	-0.80	-0.77	18.15	32.71	40

Variables	Mean of BMI (kg/m^2)	S. D	γ_1	γ_2	95% CI Min.	95% CI Max.	No. of respondents
Husband's educational level							
Primary	24.62	3.99	0.26	-0.72	18.26	31.86	18
Secondary	25.79	4.89	-0.14	-0.62	18.15	37.21	47
Above secondary	26.83	3.13	-0.81	1.23	18.26	34.27	169
Husband's occupation							
Service	26.59	3.47	-0.59	0.42	18.15	34.27	133
Business	26.82	3.52	-0.72	1.58	18.26	37.21	77
Others	24.54	4.59	0.16	-0.93	18.26	33.06	24
Type of family							
Nuclear	26.67	3.59	-0.53	0.58	18.15	37.21	185
Joint	25.63	3.84	-0.70	-0.41	18.26	32.71	49
Monthly family income (Tk.)							
≤30000	26.06	3.89	-0.32	-0.39	18.15	34.27	75
31000-45000	26.39	3.72	-0.77	0.52	18.26	32.96	65
>45000	26.81	3.42	-0.65	1.41	18.29	37.21	94
Age at menarche (years)							
10-13	26.73	3.62	-0.48	0.45	18.15	37.21	178
>13	25.57	3.67	-0.94	-0.18	18.26	30.74	56
Parity							
≤2	26.49	3.36	-0.61	0.41	18.26	33.06	116
3	26.82	3.65	-0.48	0.99	18.26	37.21	88
4 and above	25.21	4.57	-0.39	-1.11	18.15	32.42	30
Age at 1st delivery (years)							
15-20	26.64	4.19	-0.17	0.07	18.26	37.21	67
21-25	26.94	3.15	-0.98	1.11	18.15	32.96	127
26 and above	24.60	3.69	-0.62	-0.89	18.26	30.14	40
Delay from menarche to first livebirth (years)							
≤8	26.34	4.29	-0.31	-0.21	18.26	37.21	93
>8	26.53	3.18	-0.91	0.85	18.15	32.96	141
Cumulative breast-feeding (years)							
<2	26.43	3.56	-0.86	0.40	18.26	33.06	94
≥2	26.47	3.73	-0.42	0.39	18.15	37.21	140
Use of family planning method							
No	25.39	3.69	-0.59	-0.36	18.26	32.71	55
Yes	26.78	3.59	-0.58	0.65	18.15	37.21	179
Preferring method							
Pills	26.86	3.56	-0.79	0.95	18.15	37.21	158
Others	25.60	3.73	-0.18	-0.04	18.26	34.27	76
Exercising habit							
No	26.89	3.50	-0.83	1.28	18.15	37.21	143
Yes	25.76	3.80	-0.22	-0.29	18.26	34.27	91
Food intake							
Low	25.92	4.74	-0.04	-0.34	18.15	37.21	49
Normal	26.89	3.19	-0.93	0.85	18.26	33.06	124
Rich	26.01	3.51	-0.62	0.34	18.26	32.96	61
Overall	26.46	3.66	-0.58	0.37	18.15	37.21	234
C. V. (%)	13.83						

The results in Table 2 illustrate that the overall mean BMI is found 26.46± 3.66 kg/m^2 with considerable variations by background characteristics of the respondents. The coefficient of skewness (γ_1) and access of kurtosis (γ_2) indicate that the distribution of BMI is negatively skewed and leptokurtic. The coefficient of variation of 13.83% suggests extreme heterogeneity in the BMI of the respondents. Findings in Table 2 also reveal that the mean BMI is low (26.02±4.19 kg/m^2) in the age group 46-50 years, and is found 26.41 kg/m^2 and 27.78 kg/m^2 in the age groups 51-55 and 40-45 years respectively. The study found that the mean BMI among Muslim women is 26.90 kg/m^2 whereas it is 23.83 kg/m^2 among non-Muslim. The study shows that the mean BMI is relatively high among the respondents living in the urban areas (26.68±3.49 kg/m^2) compared to their semi-urban counterparts (24.33±4.59). Among illiterate women, the mean BMI is recorded as 24.37 kg/m^2 followed by women of primary (24.65 kg/m^2), and secondary and above educational (26.88 kg/m^2) levels. The highest mean BMI is found among the respondents whose age at marriage is 16-20 years (27.39 kg/m^2) and the lowest among those who got married in the 11-15 years (24.29 kg/m^2). Family income is one of the important factors for the variation of BMI of females. It has been observed that the mean BMI is the lowest (26.06 kg/m^2) among the respondents whose monthly family income is less than and equal to 30,000 takas, followed by 31,000 to 45,000 (26.39 kg/m^2) and above 45000 (26.81 kg/m^2) respectively. This implies that family income is positively associated with the body mass index of the respondents. The mean BMI is the highest among the respondents whose age at menarche is 10-13 years (26.73 kg/m^2) followed by 13 years and above (25.57 kg/m^2). This means that age at menarche is inversely correlated with the BMI of the respondents. In regards to parity, the mean BMI is the highest who have three children (26.82±3.65 kg/m^2) and it is the lowest among those who have four and more children (25.21±4.57kg/m^2). Moreover, the mean BMI is higher among those whose age at first delivery occurred

between 21 and 25 years (26.94 kg/m^2) than those whose age at first delivery is 15-20 years (26.64 kg/m^2) and 26 years and above (24.60 kg/m^2) respectively. Among the respondents who are using the family planning method have a higher BMI (26.78±3.59 kg/m^2) compared to those who are not using (25.39±3.69 kg/m^2) any method. As expected, regular exercise has an impact on respondents' nutritional status. The highest mean BMI (26.89±3.50 kg/m^2) is found among the respondents' who have no exercise habit compared to those who have regular exercise habits. Mean BMI is the highest among the respondents who intake normal food (26.89 kg/m^2). In addition to the descriptive statistics, to examine the significant association between nutritional status and available background characteristics, Chi-square test statistics along with the corresponding p-values have been computed and presented in Table 3.

Table 3. *Test of association between nutritional status and selected background characteristics of the respondents.*

Background characteristics	Body mass index (kg/m^2)			Value of test statistic (χ^2)	p-value
	<18.5	18.5 to 24.9	≥25.0		
Respondents' current age (years)					
40-45	6 (6)	17 (17)	77 (77)	2.126	0.713
46-50	6 (9)	13 (19.4)	48 (71.6)		
51-55	6 (8.9)	8 (11.94)	53 (79.1)		
Religion					
Muslim	8 (4)	32 (16)	160 (80)	27.241	0.000
Others	10 (29.4)	6 (17.46)	18 (52.94)		
Current place of residence					
Semi-urban	7 (29.17)	5 (20.83)	12 (50)	18.769	0.000
Urban	11 (5.2)	33 (15.71)	166 (79.04)		
Respondents' educational level					
Illiterate	5 (25)	6 (30)	9 (45)	34.078	0.000
Primary	6 (27.27)	6 (27.27	10 (45.45)		
Secondary and above	7 (3.6)	26 (13.54)	159 (82.81)		
Husband's educational level					
Primary	5 (27.78)	4 (22.22)	9 (50.00)	14.366	0.026
Secondary	5 (10.0)	6 (12.0)	39 (78.0)		
Above secondary	14 (7.2)	20 (10.3)	160 (82.5)		
Age at marriage					
11-15	6 (2.6)	6 (2.6)	13 (5.6)	16.414	0.003
16-20	7 (3.0)	15 (6.4)	107 (45.7)		
21 and above	5 (2.1)	17 (7.3)	58 (24.8)		
Husbands age					
41-50	1 (1.6)	14 (14.5)	47 (35.88)	12.116	0.015
51-60	10 (7.63)	19 (9.2)	102 (82.2)		
61 and above	7 (17.07)	5 (12.19)	29 (70.73)		
Husband's occupation					
Service	13 (8.3)	23 (14.7)	120 (76.9)	12.116	0.017
Business	6 (6.9)	5 (5.7)	76 (87.4)		
Others	5 (26.3)	2 (10.5)	12 (63.2)		
Type of family					
Nuclear	19 (9.0)	25 (11.8)	167 (79.1)	0.187	0.911
Joint	5 (9.8)	5 (9.8)	41 (80.4)		
Monthly family income (Tk.)					
≤30000	17 (19.5)	9 (10.3)	61 (70.1)	16.870	0.000
31000-45000	7 (4.0)	21 (12.0)	147 (84.0)		
>45000	6 (6.3)	12 (12.77)	76 (80.85)		
Age at menarche (yeas)					
10-13	20 (10.2)	21 (10.7)	156 (79.2)	1.290	0.525
>13	4 (6.2)	9 (13.8)	52 (80.0)		
Parity					
1-2	9 (7.1)	17 (13.5)	100 (79.4)	1.962	0.375
≥3	15 (11.0)	13 (9.6)	108 (79.4)		
Age at 1st delivery (years)					
15-20	16 (7.2)	27 (12.2)	178 (80.5)	6.648	0.036
26 and above	8 (19.5)	3 (7.3)	30 (73.2)		
Cumulative breast-feeding					
<2 years	13 (11.6)	12 (10.7)	87 (77.7)	1.443	0.486
≥2 years	11 (7.3)	18 (12.0)	121 (80.7)		
Exercising habit					
Yes	16 (15.8)	11 (10.9)	74 (73.3)	8.830	0.012
No	8 (5.0)	19 (11.8)	134 (83.2)		
Food intake					
Low	8 (14.0)	8 (14.0)	41 (71.9)	3.636	0.457
Normal	11 (7.9)	13 (9.4)	115 (82.7)		
Rich	5 (7.6)	9 (13.6)	52 (78.8)		
Overall	24 (29.5)	30 (37.0)	208 (233.4)		

Note: The values in the parenthesis indicate the percentage of the respondents.

The findings in Table 3 illustrate that religion is significantly associated with women's nutritional status. There are 80% and 52.94% Muslim and non-Muslim women respectively belong to the overweight stratum. The place of residence is highly significantly associated with the nutritional status of adult women. Moreover, the percentage of overweight women (79.04%) is the highest in the urban area. As expected, the respondents' educational level is highly significantly associated with the respondents' nutritional status. The finding shows that the age at marriage of the respondents is significantly associated with nutritional status. The husband's age is found to have a significant association with BMI. Like respondents' education, husband's education and occupation are also significantly associated with the nutritional status of the informants. Family income is an important factor that is substantially associated with the BMI of adult women. In this study, 84% of the respondents are found to have overweighted, whose monthly family income is between 31,000 and 45,000 takas. Generally, proper food intake is a prerequisite for good health. The finding of this study confirms that food intake is

significantly associated with respondents' nutritional status. Age at first delivery and exercising habit of the selected women also have significant associations with the nutritional status in the urban area of Bangladesh. In this study, in addition to univariate and bivariate analyses, multivariate analysis has also been carried out to identify the covariates of body mass index, and the results are given in Table 4.

3.2. Covariates of Body Mass Index

Body mass index is the measurement of the health status of human healthiness. It is an important indicator that explains human health conditions with just a numerical value. Generally, this value is influenced by many social, economic, and demographic characteristics. Therefore, to identify the significant effect of these factors, a multinomial logistic regression was employed, and the outputs are presented in Table 4. The table contains the estimates of the logistic regression coefficients of the explanatory variables, relative odds for each category of the explanatory variables with a 95% confidence interval, and corresponding p-values.

Table 4. The multinomial logistic estimates of BMI by background characteristics among adult women aged 40-55 years in the Chattogram metropolitan area.

Variables	BMI (18.5 to 24.99)					BMI (≥25.0)				
	Coefficient	p-value	Odds	95% CI		Coefficient	p-value	Odds	95% CI	
				Min	Max				Min	Max
Intercept	-0.737					-2.088				
Religion						0				
Muslim	3.13	0.002	22.9	3.29	159.6	4.01	0.000	54.92	8.32	362.78
Others (R)	-	-	-	-	-	-	-	-	-	-
Current place of residence						0.598				
Semi-urban	-0.31	0.778	0.74	0.09	6.14	0.47	0.645	1.61	0.21	12.07
Urban (R)	-	-	-	-	-	-	-	-	-	-
Respondents' educational level						0.014				
Illiterate	-1.03	0.411	0.36	0.03	4.13	-3.09	0.014	0.05	0.004	0.54
Primary	-1.35	0.223	0.26	0.03	2.28	-2.37	0.028	0.09	0.011	0.78
Secondary and above (R)				-		-	-	-	-	-
Marital status						0.471				
Married	0.99	0.319	2.68	0.39	18.66	1.18	0.217	3.259	0.5	21.26
Widowed, separated or divorced (R)				-		-	-	-	-	-
Age at marriage (years)						0.386				
15-Nov	0.38	0.828	1.46	0.05	45.08	0.21	0.899	1.23	0.05	31.88
16-20	0.41	0.775	1.5	0.09	24.35	1.23	0.364	3.42	0.24	48.72
21 and above (R)				-		-	-	-	-	-
Husband's educational level						0.065				
Primary	-0.9	0.462	0.41	0.04	4.48	-2.72	0.029	0.06	0.01	0.76
Secondary	-1.59	0.123	0.2	0.03	1.54	-1.99	0.046	0.14	0.02	0.97
Above secondary (R)				-	-	-	-	-	-	-
Husband's occupation						0.085				
Service	0.43	0.651	1.53	0.24	9.75	0.71	0.448	2.03	0.33	12.7
Business	-0.14	0.894	0.87	0.11	6.98	1.43	0.157	4.19	0.58	30.37
Others (R)	-	-	-	-	-	-	-	-	-	-
Age at 1st delivery						0.875				
15-20	0.33	0.809	1.39	0.09	19.57	1.04	0.449	2.84	0.19	42.45
21-25	0.69	0.557	2	0.19	20.32	1.05	0.366	2.85	0.29	27.64
26 and above (R)				-		-	-	-	-	-
Delay from menarche to 1st livebirth						0.701				
≤8	-0.61	0.719	0.55	0.02	14.84	-1.14	0.481	0.31	0.01	7.69
>8 (R)	-	-	-	-	-	-	-	-	-	-
Use of family planning method						0.571				
No	-0.63	0.587	0.53	0.06	5.15	0.03	0.982	1.03	0.1	10.15
Yes (R)	-	-	-	-	-	-	-	-	-	-

Variables	BMI (18.5 to 24.99)					BMI (≥25.0)				
	Coefficient	p-value	Odds	95% CI Min	95% CI Max	Coefficient	p-value	Odds	95% CI Min	95% CI Max
Preferring method						0.076				
Pills	-0.1	0.931	0.9	0.09	9.45	1.24	0.303	3.46	0.33	36.84
Others (R)	-	-	-	-	-	-	-	-	-	-
Exercising habit						0.445				
No	-0.41	0.585	0.66	0.15	2.89	0.14	0.848	1.15	0.28	4.79
Yes (R)	-	-	-	-	-	-	-	-	-	
Model fitting information										
-2log likelihood			196.701							
Chi-square			103.301							
p-value			0							

Note: (R) indicates the reference category.

It is observed from the results of multivariate analysis in Table 4 that religion, respondents' and husbands' educational levels are found to be significant predictors of BMI (p<0.05) while in bivariate analysis, type of place of residence, husband's age and occupation, age at first marriage, monthly family income, age at first delivery, and exercising habit are significantly associated with the nutritional status of the urban adult females. In this study, the Muslim respondents, compared to the non-Muslim have a 22.9 times higher probability of becoming nourished and 54.92 times higher in becoming overweight than that of their underweight cohort. The educational level of the respondents is found to have a considerable influence on the nutritional status (p<0.05). The respondents who are illiterate and completed primary education have a 0.36 and 0.26 times lower probability of becoming nourished than those who completed secondary and above education. Furthermore, the illiterate and primary educated respondents have only 0.05 and 0.09 times lower chance of being overweight than those who completed secondary and above education. The estimate of logistic regression also reveals that husbands' education significantly impacts the BMI of adult females (p<0.05). The odds ratio and corresponding p-values indicate that the respondents whose husbands are illiterate and primary educated are only 0.06 and 0.14 times less likely to be overweighted than underweighted respondents and whose husbands are higher educated.

4. Discussion

Bangladesh is the 8th most populous and one of the densely populated countries in the world. Underdeveloped countries like Bangladesh are still facing several problems: the shortage of cultivable land, scarcity of food, and inadequate health facilities. These causes nutrition deficiency across the country, mainly in the vast rural, semi-urban and slum areas. But the scenario regarding the nutritional status is almost quite different among urban inhabitants. Moreover, the country has achieved low progress towards diet-related communicable diseases and limited progress for achieving the target for good nourishment [10]. Therefore, to investigate the nutritional status of urban adult females, the study selected Chattogram metropolitan city as the study area because the city has adequate urban facilities like electricity, medical and educational institutions, industries, and a developed transportation network. This study reveals important information regarding the nutritional status of adult women aged 40-55 years in the Chattogram metropolitan area. This study found a significant association of the explanatory factors like religion, type of residence, respondents' educational level, and age at marriage with the nutritional status. Furthermore, the study also reveals that husbands' education, age, and occupation, monthly family income, and exercising habits are also significantly associated with the nutritional status of adult women aged 40-55 years.

In the multivariate analysis, the variables religion and respondents' education are found to have a significant impact on the women's nutritional status. The study shows that women with lower educational levels are more at risk of malnutrition. A study found that educational level, socio-economic status, and family size were significantly associated with nutritional status in schoolchildren [11-14]. The results in this study elucidate that, like respondents' education, husbands' education also has a significant impact on the BMI. An earlier study confirms that educational attainment is one of the important factors that have a significant impact on nutritional status [15, 16]. Moreover, a study reveals that chronic energy deficiency was lowest among illiterate, and women belong to a low economic stratum [17]. Type of place of residence is significantly associated with the BMI index among children, women, and adults of both gender [18]. A study conducted in Northeast Ethiopia discloses that physical activity was an important factor that is highly significantly associated with the nutritional status among adult psychiatrist patients [19]. Similar to our study, a research study found that marital status was significantly associated with low BMI [20]. An earlier study demonstrates that family income was significantly related to one or more indices of malnutrition [21, 22]. A similar study on rural Nigerian women elicits that household income and age at marriage are significantly correlated with BMI [23]. Another research work in Tanzania also elucidates that respondents' age, family income, and marital status are significant risks for undernutrition [24]. Similar to the result of this study, a study found that females with no education or primary education and residing in rural areas are more likely to be undernourished than those who

are higher educated and living in urban areas in Bangladesh [25].

5. Conclusion

The main focus of this study is to thoroughly investigate the determinants of the nutritional status of adult urban women in Bangladesh. In this context, the body mass index is considered as the nutritional indicator because BMI is the most common measure of health-related fitness status. BMI is the ratio of mass (kg) and height (m^2), indicating body stunting, fitness, or fatness based on the ranges of BMI. Based on the multidimensional analyses, the factors religion, place of residence, respondents' educational level, age at marriage, husbands' education, age, and occupation, monthly family income, and exercising habits have significant associations with the nutritional status of adult women. In addition, the variables religion, respondents and husbands' education are the significant covariates of women's nutritional status. Malnutrition and obesity are the leading cause of the higher prevalence of diabetes, hypertension, cardiovascular and other chronic diseases. Therefore, to reduce malnutrition as well as obesity of adult women to a greater extent, the appropriate policies should be adopted by the concerned persons and authorities. Moreover, proper campaigns and counseling should be ensured among the vast majority Muslim community for the reduction of overweight. Nevertheless, considering the importance of educational attainment, policymakers can take the necessary steps to improve the educational levels of males and females for the awareness of a balanced diet, physical activities, and body weight, which in turn, are likely to reduce malnutrition among urban adult women in Bangladesh.

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