

Original article

## Factors associated with utilization of antenatal care service in Bangladesh: a country based cross-sectional study

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### ABSTRACT

Antenatal care (ANC) is essential for pregnant women to be safe and healthy throughout the pregnancy and childbirth. The objective of this study was to determine the influencing factors related to receiving ANC among Bangladeshi mothers. A total number of 4454 Bangladeshi mothers were considered in this study. This study revealed that only 31.97% mothers received four or more times ANC from health care facilities while a remarkable number (21.46%) of mothers did not receive ANC during their last pregnancy period. It was found that respondent educational level, BMI, respondents' husbands' education level, and place of residence were found to be a significant factor for influencing ANC visits. Several socio-economic and demographic factors have a strong and significant effect on receiving ANC services in Bangladesh. Our findings might help Government and Non-government organizations to improve their policy for making awareness among Bangladesh mothers about the benefits of ANC service.

**Key words:** Antenatal Care; Bangladesh; Logistic Regression; Nationally Representative Sample; Pregnant Women.

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## **INTRODUCTION**

Antenatal care (ANC) is an essential part of maternal healthcare services which includes history taking, screening for maternal illnesses such as hypertensive disorders, diabetes and anemia, prevention and management of infectious diseases, provision of prophylactic medication and essential health education (Interventions 2011; Mario et al. 2005 and Abou-Zahr et al. 2003). Recently the World Health Organization (WHO 2015) recommended that not only to receive a minimum of four ANC visits, but also to use a core set of items of ANC services for ensuring safe motherhood (Lincetto et al. 2006). The WHO reported that in 2017, around 810 women was died every day form pregnancy and childbirth related problems (WHO 2019). Women constitute about half of the total population in the world. Women's health is the key to a better individual, family and community health that leads to national development (WHO 2015). Approximately two thirds of the maternal death is caused by direct obstetric complications such as hemorrhage (31%), eclampsia (20%) obstructed or prolonged labor and or abortion (1%) (Roy et al. 2016). Indirect causes of maternal deaths accounts for about a third of maternal deaths such as diabetes, infectious diseases like tuberculosis, malaria and anemia (NIPORT 2014 and WHO 2015). Another reason of maternal death is malnutrition. The nutritional status of women in Bangladesh is highly alarming. 52% women of reproductive age belongs to low body mass index (BMI) (BMI<18.5) (HPNSDP 2011). More than 41% of women are facing iron deficiency, anemia (Kamruzzaman et al. 2015). A significant portion are suffering from unrecognized vitamin A and iodine deficiency, which may impact on health of both mother and babies (NIPORT 2014). Maternal malnutrition, anemia, infection during pregnancy and repeated pregnancies contributes to low-birth-weight babies who have higher risk of death than children with normal weight (UNICEF 2009). Thus, ANC is very important for pregnant women for early screening and detection of diseases, promotion of health, nutrition and hygiene knowledge, information on birth preparedness and complication readiness. Though WHO recommends at least four ANC, very few pregnant women have the access to this service (WHO 2006). In 2011, Bangladesh Health Population and Nutrition Sector Development Program (HPNSDP) results framework sets a target of 50 percent of pregnant women will receive at least four antenatal care by 2016 (HPNSDP 2011). Data from the 2014 BDHS shows that Bangladesh

lags far behind in reaching this target. A comparison of the 2014 BDHS with the 2004, 2007, and 2011 BDHS surveys showed that the percentage of women who did not receive ANC was declined from 42 percent in 2004 to 21 percent in 2014 (NIPORT 2014). Alternatively, the percentage of pregnant women who received four or more antenatal visits increased from 17 percent in 2004 to 31 percent in 2014 (NIPORT 2014). Bangladesh Demographic and Health Survey 2014 showed that only 78% women received antenatal care at least once from any provider and 64% from medically trained provider and only 31% received antenatal care for four or more times (NIPORT 2014). The household wealth quintile and women education as well as medical facilities have been increasing in Bangladesh during the last two decades (NIPORT 2014). Nowadays mothers in Bangladesh can easily receive ANC service during their pregnancy. It is important to determine the number of mothers (percentage) not receiving ANC service, and need to know why they do not interest to take the service. This study might help Bangladesh Government to take necessary step for increasing awareness among mothers and family members about the benefits of ANC for health and wellbeing of mother and baby. This study also will help to Government of Bangladesh to achieve maternal and children health related goal under sustainable development goals by 2030.

The main objective of this study is to determine the rate of mothers who do not receive ANC services in Bangladesh and to investigate the factors which are related to proper utilizing ANC services in this country.

## **METHODOLOGY**

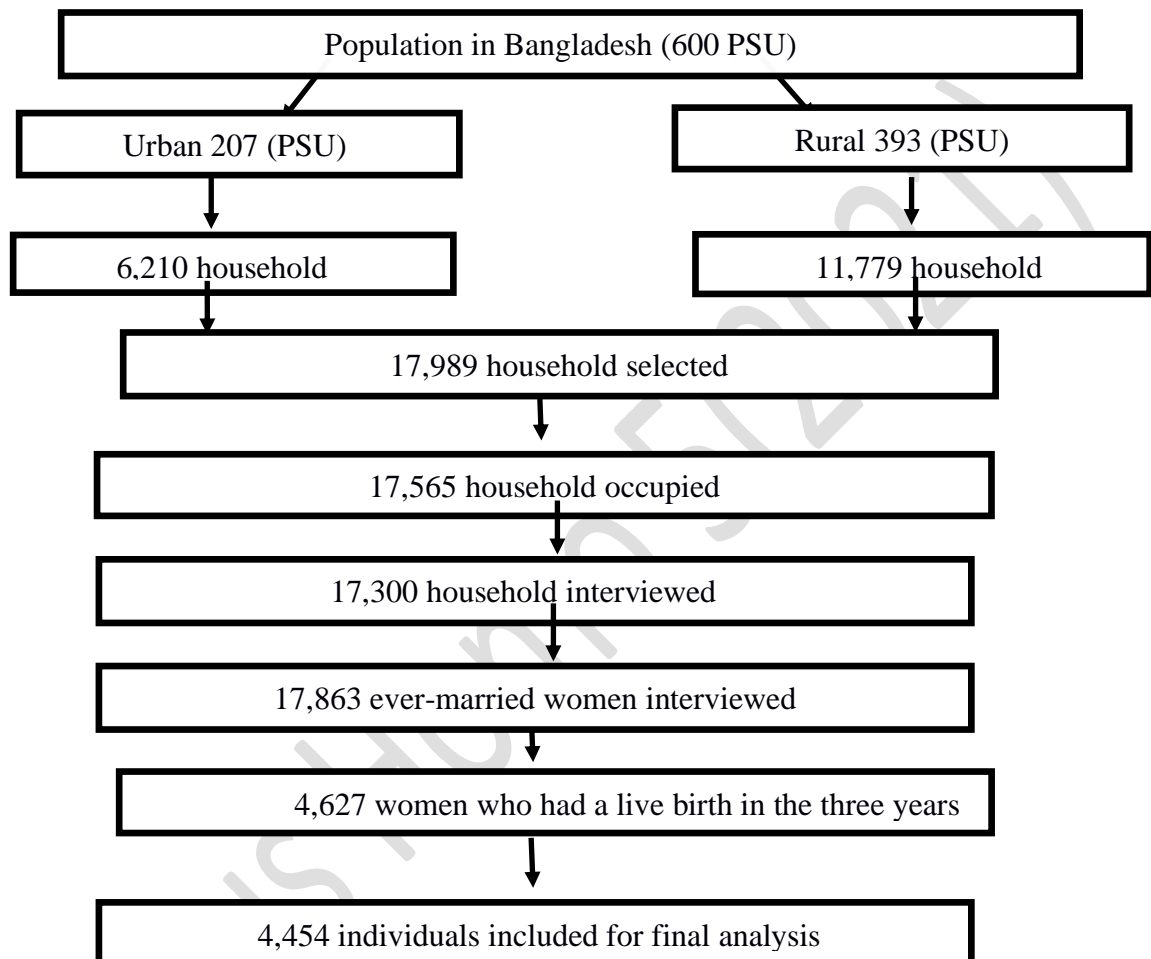
The data were extracted from the recent dataset of Bangladesh Demographic and Health Survey (BDHS-2014) 2014. The BDHS-2014 collected data from all divisions of Bangladesh covered urban and rural. It was nationally representative sample. In our study, a total of 4454 mothers were considered as the sample. The different age group, socio-economic, demographic and anthropometric data were available for in-depth analysis. A standard semi-structured questionnaire was used for data collection for this cross-sectional study (NIPORT 2014).

### **Sampling**

The survey of BDHS-2014 was based on a two-stage stratified sampling. The respondents were selected following inclusion criteria such as (i) married at the time of survey, (ii) aged between 15 and 49 years, and (iii) had their most recent births within the 3 years preceding

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the survey. Finally, a total of 4627 women met the above-mentioned criteria. The statistical techniques were used to check the data set for outliers. It was determined that 4454 ever-married women aged 15-49 were available for the study sample (Fig. 1).



**Fig. 1:** Selected sample for this study

### **Outcome variable**

In this study, the outcome variable was ANC status. Our sample was classified according to ANC status recommended by WHO such as (i) no ANC received (code, 1), (ii) 1-3 times ANC received (code, 2) and (iii) 4 or more times ANC received (code, 3).

### **Independent variables**

The respondent's socioeconomic, demographic, household information and anthropometric factors were considered as independent variables. Most of the independent variables were

considered on the basis of previous studies (Mario et al. 2005; Abou-Zahr et al. 2003) and were available in BDHS-2014 dataset. All independent variables were mentioned with their groups and code numbers in Table 1. More detail on the definition of these variables is available in the 2014 BDHS surveys report (NIPORT 2014).

**Table 1:** Selected independent variables with groups and codes

Variable	Group	Code No	Variable	Group	Code No
Division	Barisal	1	Wealth index	Poor	1
	Chittagong	2		Middle	2
	Dhaka	3		Rich	3
	Khulna	4	Family Member	1 children	1
	Rajshahi	5		2 children	2
	Rangpur	6		Greater than or equal to 3 children	3
	Type of place of residence	Sylhet	7	Total ever born children	Less than or equal to 15 years
Urban		1	16-20 years		2
Rural		2	Greater than or equal to 21 years		3
Educational level	No education	0	Age at first birth	Less than or equal to 15 years	1
	Primary	1		16-20 years	2
	Secondary	2		Greater than or equal to 21 years	3
Religion	Higher	3	Respondents' body mass index	Under weight	1
	Muslim	1		Normal weight	2
	Others	2		Over weight	3
Sex of child	Male	1	Size of child at birth	Obese	4
	Female	2		Larger than average	1
Mode of delivery	Vaginal,	0	Size of child at birth	Average	2
	Caesarean	1		Smaller	3

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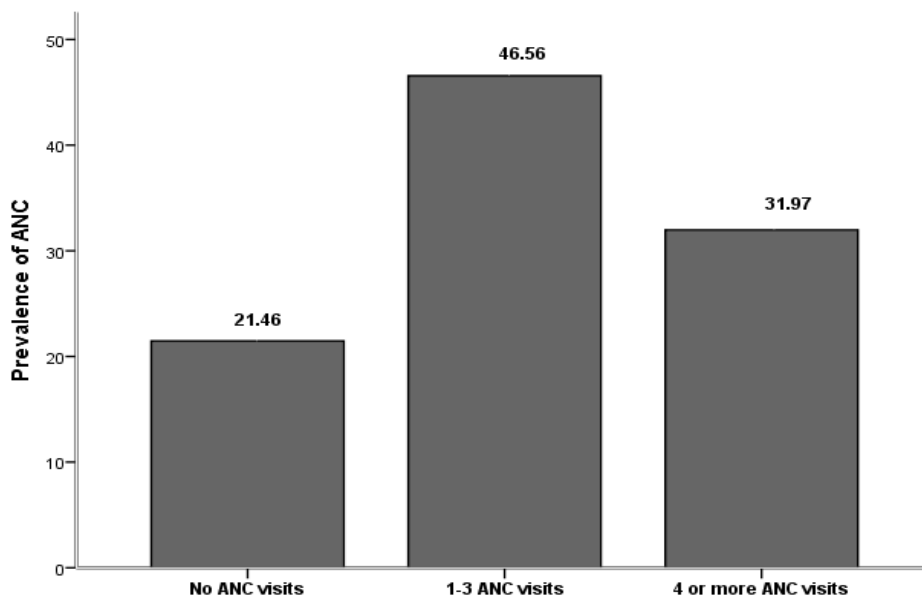
Current marital status	Married	1	Husbands' occupation	Farmer/ Hard worker	1
	Widowed	2		Service holder	2
	Divorced	3		Businessman	3
	No longer living together/separated	4		Others	4
Husbands' education level	No education	0	Respondents' occupation	Housewife	1
	Primary	1		Others	2
	Secondary	2		Less than or equal 20 years	1
Respondents' currently working status	Higher	3	Respondents' Age group	21-29 years	2
	No	0		30-40 years	3
	Yes	1		41-49 years	4

**Statistical analysis**

Frequency distribution (percentage) was used to determine the prevalence for receiving ANC services. Chi-square ( $\chi^2$ ) test was utilized to find the association between ANC services and their socio-economic, demographic, anthropometric and behavior factors. The significantly associated factors that provided by  $\chi^2$ -test were used as independent variables in logistic regression models. Since, number of receiving of ANC services was three in categories; multiple multinomial logistic regression model was used to find the effect. There is an important assumption in multiple regressions, either linear or logistic, that there is no multicollinearity problem among the independent variables. However, there is no exact method to detect the multicollinearity problem in multiple logistic regression analysis. In this study the magnitude of the standard error (SE) was used to detect the multicollinearity problem, if the magnitude of the SE lies between 0.001 and 0.5, it is judged that there is no evidence of multicollinearity (Chan 2004). Statistical significance was accepted at  $p < 0.05$  level. Statistical analyses were carried out using STATA (version 13) and SPSS software (version IBM 20).

## RESULTS

In this study, 4,454 Bangladeshi mothers were considered as a sample to investigate the status of receiving antenatal care (ANC) influenced by socio-economic and demographic factors. This study revealed that a remarkable number (21.46%) of mothers did not receive ANC during their last pregnancy period, while 46.56% and 31.97% mothers received ANC 1-3 times and four or more times respectively (Fig. 2).



**Fig. 2:** Prevalence of antenatal cares among Bangladeshi mothers

It was found that the highest number of mothers who received four or more ANC were living in Rangpur (43.5%) and Khulna (40.9%) divisions, respectively. Chi-square ( $\chi^2$ ) test demonstrated that the association between the ANC and their geographic location was statistically significant ( $p < 0.01$ ). The highest number of participants (67.9%) came from rural environment. The mothers in urban area (45.7%) received more ANC than rural area (25.4%). The association between ANC and residence was statistically significant ( $p < 0.01$ ). Similarly, the  $\chi^2$ -test also showed that the association between ANC and education, number of ANC, mode of delivery, husband's education, mothers age group, wealth index and total number of ever born children was statistically significant ( $p < 0.01$ ). Table 2 also highlighted the association between ANC and age at marriage and first birth was statistically significant

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( $p < 0.01$ ). The percentage of underweight, normal, overweight and obese mothers were 24.8%, 58.4%, 14.1% and 2.7% respectively.  $\chi^2$ -test demonstrated that the association between ANC and their body mass index (BMI) was significant ( $p < 0.01$ ) (Table 2).

**Table 2:** Frequency distribution of antenatal care among mothers by various socio-economic demographic factors and association between these factors

Variable	Group, N (%)	Antenatal care			$\chi^2$ -value	P-value
		No ANC visits, N (%)	1-3 ANC visits, N (%)	$\geq 4$ ANC visits, N (%)		
Division	Barisal, 529(11.9)	132 (25.0)	259 (49.0)	138 (26.0)	191.667	0.0001
	Chittagong, 852 (19.1)	194 (22.8)	417 (48.9)	241 (28.3)		
	Dhaka, 787(17.7)	122 (15.5)	383 (48.7)	282 (35.8)		
	Khulna, 530 (11.9)	60 (11.4)	253 (47.7)	217 (40.9)		
	Rajshahi, 541 (12.1)	114 (21.1)	262 (48.4)	165 (30.5)		
	Rangpur, 545 (12.3)	96 (17.6)	212 (38.9)	237 (43.5)		
	Sylhet, 670 (15.0)	238 (35.5)	288 (43.0)	144 (21.5)		
Education level	No education, 601(13.5)	265 (44.1)	249 (41.4)	87 (14.5)	613.052	0.0001
	Primary, 1227 (27.5)	380 (31.0)	587 (47.8)	260 (21.2)		
	Secondary, 2112 (47.4)	293 (13.9)	1061 (50.2)	758 (35.9)		
	Higher, 514 (11.5)	18 (3.5)	177 (34.4)	319 (62.1)		
Mode of delivery	Vaginal, 3378 (75.9)	919 (27.2)	1614 (47.8)	845 (25.0)	432.958	0.0001
	Caesarean, 1075 (24.1)	36 (3.3)	460 (42.8)	579 (53.9)		
Husbands' education level	No education, 1020(22.9)	83 (37.6)	446 (43.7)	191 (18.7)	531.436	0.0001
	Primary, 1345(30.2)	370 (27.5)	652 (48.5)	323 (24.0)		
	Secondary, 1412(31.7)	172 (12.2)	713 (50.5)	527 (37.3)		
	Higher, 675 (15.2)	31 (4.6)	262 (38.8)	382 (56.6)		
Working status	No, 3475(78.1)	721 (20.7)	1616 (46.5)	1138 (32.8)	6.763	0.034
	Yes, 977(21.9)	235 (24.1)	456 (46.7)	286 (29.3)		



Respondents' age group	≤20 years, 1240(27.8)	246 (19.8)	607 (49.0)	387 (31.2)		
	21-29 years, 2344 (52.7)	490 (20.9)	1066(45.5)	788 (33.6)		
	30-40 years, 828 (18.6)	203(24.5)	383 (46.3)	242 (29.2)	22.029	0.001
	41-49 years, 42 (0.9)	17(40.5)	18 (42.9)	7 (16.6)		
Wealth index	Poor, 1780(40.0)	649 (36.5)	801 (45.0)	330 (18.5)		
	Middle, 856 (19.2)	169 (19.7)	465 (54.4)	222 (25.9)	620.123	0.0001
	Rich, 1818(40.8)	138 (7.6)	808 (44.4)	872 (48.0)		
No of ever born children	1 children, 1809(40.6)	277 (15.4)	851 (47.0)	681 (37.6)		
	2 children, 1327(29.8)	265 (20.0)	602 (45.3)	460 (34.7)		
	≥3 children, 1318(29.6)	414 (31.4)	621 (47.1)	283 (21.5)	161.289	0.0001
Body mass index	Under weight, 1104 (24.8)	335 (30.4)	506 (45.8)	263 (23.8)		
	Normal weight, 2603 (58.4)	557 (21.4)	1251 (48.1)	795 (30.5)		
	Overweight, 627 (14.1)	62 (9.9)	274 (43.7)	291 (46.4)	207.539	0.0001
	Obese, 120(2.7)	2 (1.7)	43 (35.8)	75 (62.5)		
Husbands' occupation	Farmer/Hardworker,3026 (67.9)	760 (25.1)	1419 (46.9)	847 (28.0)		
	Service holder, 286(6.4)	11 (3.8)	95 (33.3)	180 (62.9)		
	Businessman, 1009 (22.7)	158 (15.7)	495 (49.1)	356 (35.2)		
	Others, 133(3.0)	27 (20.3)	65 (48.9)	41 (30.8)	192.883	0.0001
Age at first marriage	AAFMs≤18 years, 3760(84.4)	883 (23.5)	1772 (47.1)	1105 (29.4)	97.881	0.0001
	AAFMs>18 years, 694(15.6)	73 (10.5)	302 (43.5)	319 (46.0)		
Place of residence	158 (11.7) urban	609 (42.6)	654 (45.7)			
	788 (26.1) rural	1465 (48.5)	770 (25.4)		224.486	0.0001

Multinomial logistic regression analysis showed that uneducated, primary and secondary educated mothers were 11.26 times (AOR=11.26; CI=6.10-20.77;  $p<0.001$ ), 6.54 times (AOR=6.54; CI=3.71-11.55;  $p<0.001$ ) and 2.72 times (AOR=2.72; CI=1.58-4.68;  $p<0.001$ ) were less likely to receive four or more times of ANC than higher educated mothers. Husband with no formal education and primary education were 3.90 times (AOR=3.90;

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CI=2.38-6.38;  $p<0.001$ ) and 3.50 times (AOR=3.50; CI=2.19-5.61;  $p<0.001$ ) were less likely to receive four or more times of ANC compared to secondary and higher educated husbands. For respondents' BMI, underweight and normal weight mothers were less likely to receive ANC than obese mothers (AOR=24.48; CI=5.82-102.94;  $p<0.001$ ) and (AOR=16.19; CI=3.88-67.62;  $p<0.001$ ) respectively. Bangladeshi mothers who married before 18 year of their life, they were 1.51 times (AOR=1.51; CI=1.10-2.06;  $p<0.05$ ) less likely to receive ANC than their counterparts (Table 2).

The mothers who had primary and secondary level education were 3.97 times (AOR=3.97; CI=1.63-9.65;  $p<0.01$ ) and 2.24 times (AOR=2.24; CI=1.19-4.21;  $p<0.05$ ) more likely to receive 1-3 ANC services compared to higher education. It was also found that underweight and normal weight mothers were more likely to receive 1-3 ANC services 3.29 times and 2.41 times higher than obese mothers respectively. It was observed that rural mothers were more likely to receive 1-3 ANC compared to their urban counterparts (AOR=0.58; CI= 0.37-0.90;  $p<0.05$ ). Bangladeshi mother who came from middle income family had chance to receive 1-3 ANC than mothers belonging rich family ( $p<0.01$ ) (Table 3).

**Table 3:** Effects of demographic and socio-economic factors on number of ANC visits among Bangladeshi mothers

ANC Visits		B	SE	Wald	df	p-value	AOR	95% CI for AOR		
								Lower	Upper	
No ANC visit	<b>Educational level (The reference category is Higher)</b>									
	No education vs Higher	2.421	0.313	59.986	1	0.000	11.255	6.099	20.768	
	Primary vs Higher	1.878	0.290	42.014	1	0.000	6.543	3.707	11.545	
	Secondary vs Higher	1.000	0.277	13.007	1	0.000	2.718	1.579	4.681	
	Higher	0 <sup>b</sup>	.	.	0	.	.	.	.	
<b>Husbands' education level (The reference category is Higher)</b>										
No education vs Higher	1.360	0.252	29.245	1	0.000	3.898	2.381	6.382		

Primary vs Higher	1.254	0.240	27.383	1	0.000	3.504	2.191	5.605
Secondary vs Higher	0.454	0.235	3.726	1	0.054	1.574	0.993	2.495
Higher	0 <sup>b</sup>	.	.	0	.	.	.	.

**Respondents' body mass index (The reference category is obese )**

Under weight vs Obese	3.198	0.733	19.040	1	0.000	24.478	5.821	102.940
Normal weight vs Obese	2.785	0.729	14.582	1	0.000	16.195	3.878	67.623
Over weight vs Obese	1.942	0.741	6.866	1	0.009	6.973	1.631	29.806
Obese	0 <sup>b</sup>	.	.	0	.	.	.	.

**Age at first marriage (The reference category is AAFM>18 years )**

AAFM≤18 years vs >18 years	0.411	0.159	6.651	1	0.010	1.508	1.104	2.061
AAFM>18 years	0 <sup>b</sup>	.	.	0	.	.	.	.

**Type of place of residence (The reference category is Rural)**

Urban vs Rural	-0.545	0.225	5.844	1	0.016	0.580	0.373	0.902
Rural	0 <sup>b</sup>			0				

**Educational level (The reference category is Higher)**

1-3 ANC visit	No education vs Higher	1.139	0.592	3.702	1	0.054	3.123	0.979	9.962
	Primary vs Higher	1.379	0.453	9.251	1	0.002	3.970	1.633	9.654

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Secondary vs Higher	0.805	0.322	6.238	1	0.013	2.237	1.189	4.209
Higher	0 <sup>b</sup>	.	.	0	.	.	.	.
<b>Wealth index (The reference category is rich )</b>								
Poor vs rich	0.209	0.362	0.332	1	0.564	1.232	0.606	2.504
Middle vs Rich	0.888	0.325	7.448	1	0.006	2.430	1.284	4.599
Rich	0 <sup>b</sup>	.	.	0	.	.	.	.
<b>Respondents' body mass index (The reference category is obese)</b>								
Under weight vs Obese	1.190	0.503	5.598	1	0.018	3.286	1.226	8.802
Normal weight vs Obese	0.879	0.398	4.880	1	0.027	2.409	1.104	5.256
Over weight vs Obese	0.420	0.405	1.080	1	0.299	1.523	0.689	3.365
Obese	0 <sup>b</sup>	.	.	0	.	.	.	.

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The reference category is:  $\geq 4$  ANC visits.

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## DISCUSSION

Antenatal care (ANC) has been used as a strategy to reduce maternal and neonatal morbidities and mortalities. Various approaches and strategies have been implemented to improve ANC. This study investigated the factors behind the current ANC status among Bangladeshi mothers. Though a several studies in Bangladesh have examined the effect of socio-economic, demographic and anthropometric factors (BMI) on antenatal and postnatal care among Bangladeshi mothers, we investigated the status of ANC and its associated factors using nationally representative data extracted from BDHS 2014 (Ali et al. 2018; Ansari et al. 2014). This study revealed that the number of ANC visits for four or more than four times among Bangladeshi mothers was 31.97% which was lower than India (39.0%) and

Nigeria (54.0%) (Dahiru et. al. 2015; Agrawal et al. 2009). Several studies in Bangladesh found the similar results (Ali et al. 2018; Ansari et al. 2014). In developed countries, it was found that 97% of women made at least one antenatal visit. Alternatively, in developing countries, the coverage of at least one ANC visit was relatively high at 69% in Sub-Saharan Africa, compared to 54% in Asia (UNICEF 2006).

In the present study, it was found the positive association between mothers' education level and their ANC status. Illiterate mothers were less likely to receive ANC and the practice rate of ANC was improved with mothers' educational status. Higher educated mothers were more likely to receive ANC than uneducated and lower educated mothers. The previous study in Ethiopia found a strong association between literacy status and ANC service (Geda et al. 2017). The effect of education may be explained by the likelihood that educated mothers are more able to receive ANC. Educated mothers are more conscious about their own as well as baby's health and wellbeing. They are more knowledgeable about the complication which may appear during their pregnancy, delivery and or post-natal period. It is also noted that most of the educated mothers live in rich family as they can able to expense more money to get services. A study in Bangladesh also demonstrated that education, income and urban residence increasing the rate of caesarean delivery (Hasan et al. 2019). However, our study showed that Bangladeshi mothers living in urban areas received more recommended ANC services than rural. A study in Bangladesh also found similar results and validated our findings (Rahman et al. 2017). Most of the villages don't have adequate road condition and transport facilities. They usually have to walk a long distance of muddy road to reach health facility. Along with socio-economic factors, such geographic proximity and road communication also influencing the access to health care services for rural people in Bangladesh. The higher rate of illiterate mothers and husbands were living in rural area, this might be the important causes for receiving lower rate of ANC by rural mothers.

Our findings indicated that wealth index was a crucial determinant of receiving ANC services. The mothers from rich family utilize more ANC than mothers from poor family. Surprisingly, highest ANC was received by mothers from middle income families. Bangladeshi mother who came from middle income family had more chance to ANC than who came from rich family. A similar results were found in another study conducted in

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Bangladesh (NIPORT 2014). The higher utilization of ANC among women in the wealthiest households suggests that affordability could be an important issue in ANC service utilization. In the present study, underweight and normal weight mothers were less likely to receive any ANC service than obese mothers. Similar picture was found in a study conducted in England that women with obesity were more likely to access care in the third trimester compared to women with a recommended BMI (Barber et al. 2017). Obese mothers are usually considered as high risk groups in pregnancy period in this region; they were receiving more recommended ANC. It may be one of the most important reasons that most of the obese mothers live in urban area with belonging rich family, all favorable facilities were usually available for urban rich mothers.

In our study found that the Bangladeshi mothers who were married before age 18 year, they were less likely to receive ANC than their counterparts. Similar result was found in Pakistan that child marriage was significantly associated with decreased likelihood of any antenatal care. They also found that child marriage was associated with high fertility with rapid repeated births who had less likely to utilize antenatal care (Nasrullah et al. 2015). Mothers who got early married, most of them were uneducated, poor, rural dwellers with inadequate messages about the benefits of ANC.

#### **Limitation of the study**

First, the secondary data was used in this study, and it was bounded limitation of those data. Second, this study was cross-sectional nature of the survey, it was impossible to infer causality in the associations between the covariates in this study and the outcome variables as such we could only do probabilistic conclusions. Third, we considered the variable which was present in BDHS data but in some variable which was most important factor for ANC.

#### **CONCLUSION**

In this study, the number of mothers who received four or more times ANC was 31.97%, while a remarkable number (21.46%) of mothers in Bangladesh did not receive any ANC service. The rural and uneducated mothers, uneducated husbands, underweight mothers who were married before 18 years and belonging in poor families in Bangladesh did not seek any ANC service. Community awareness about the benefits of ANC, increase number of skilled

birth attendant at all level with no or low cost service would improve ANC status in Bangladesh.

### **Recommendations**

Based on this study some policy implications and recommendations have been suggested that would help the government and other policy makers to take proper initiative for promoting the awareness of ANC in Bangladesh. It is very important to increase the number of maternal and child health (MCH) providers who provide maternal health services as well as maternal education to the pregnant women door to door. Further research should be conducted to explore and describe more similarities and differences between indigenous and western antenatal care practices in other areas of Bangladesh.

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