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Research article

Socio-economic status and pregnancy complications and their impact on antenatal care services provided at home and Upazila health complex

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ABSTRACT

The stage of pregnancy is crucial for women of reproductive age and their families. However, in low- and middle-income countries like Bangladesh, antenatal and postnatal care are not widely practiced due to various socio-economic factors, such as low education levels, income, age, pregnancy knowledge, and limited healthcare facilities. The objective of this study was to examine the factors associated with antenatal care in two locations in Bangladesh based on the data collected from the Bangladesh Demographic and Health Survey (BDHS) 2017–2018. We explored different variables as explanatory variables related to ANC service. The results showed that most of the respondents were from rural areas, with 77.02% receiving antenatal care at home. Women with secondary education were more likely to receive care at home than those without education. The Chi-square test indicated a positive correlation between antenatal care at home with several variables, whereas, in the case of Upazila health complexes, only three variables showed a positive association. Logistic regression analysis further showed some specific variables such as geographical division, religion, iron intake during pregnancy, and reporting pregnancy complications had a significant impact on ANC at home. In contrast, covariates such as residence, division, and wealth index were significant for antenatal care at Upazila health complexes. The division was a significant covariate in both cases. Interestingly, we observed that mothers who had been informed about the signs of pregnancy complications were 92% more likely to receive antenatal care at home than those who had not experienced pregnancy complications. Conversely, the results revealed that mothers who were unaware of pregnancy complications were 32% more likely to receive antenatal care at home than those who had been informed about complications. This suggests that when women are educated about pregnancy complications, they are more likely to receive more antenatal care. However, Bangladesh's situation is quite different due to a lack of proper education and knowledge of antenatal care services.

Abbreviations: WHO, World Health Organization; SSA, Sub-Saharan African; DHS, Demographic and Health Survey; χ^2, Chi-square; ANC, Antenatal care.

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1. Introduction

Worldwide every day 830 mothers die due to pregnancy complications during childbirth period, labor, and the postpartum period [1]. There are several reasons behind this maternal health hazard such as scarcity of antenatal and postnatal care, knowledge of the ovulatory cycle, consumption of proper diet or physics during pregnancy, and the phenomenon of child-bearing in the absence of any skilled birth attendants. According to WHO, 94% of maternal mortality takes place in poor developing countries globally [2]. So, it can be assumed that to overcome this issue, maternal health should be checked and followed up properly during the whole pregnancy period. Sometimes women use self-medication to defend pregnancy-related issues [3]. Several medical care facilities including the increasing number of doctors can contribute to mitigating mortality rates which increases life expectancy among people [4]. However, maternal death is still a remarkable issue, especially in developing countries like Bangladesh.

To ensure a better wholesome childbearing completion and maternal health improvements, antenatal care is regarded as one of the most indispensable components during pregnancy. Antenatal care is considered a maternal health care service that is delivered by skilled personnel during pregnancy [5]. During the whole pregnancy period and even after childbirth, skilled maternity care could save the lives of pregnant mothers and their newborn children [6]. Quality antenatal care can mitigate low childbirth weight and premature childbirth along with pregnancy complications [7]. This procedure consists of supplementation, vaccination, health-related education, and counseling which are also good for reducing the death of newborns [8] World Health Organization (WHO) recognized antenatal care as a defensive factor for any successful childbirth [9]. Along with mothers, to mitigate the newborn child mortality and morbidity it has a significant contribution to the welfare of maternal health [10]. Women who do not get proper antenatal care services are at a high risk of giving birth to lower-weight children as well [11]. This service includes several potential activities such as discussing nutrition, facilities during pregnancy and delivery, checking up on the health condition of mothers and infants, etc. Despite these facilities, some of the Sub-Saharan African (SSA) countries still do not provide quality antenatal care to pregnant mothers [12] because women in these countries do not get social and economic advantages which cause maternal death due to pregnancy. Though antenatal care cannot estimate obstetrical exigencies, it is regarded as an important outline of any secured child delivery process and pregnancy knowledge of serious complications can lead women to take proper steps in this case.

There are several sources from which pregnant women can take their antenatal service. According to WHO, there should be four antenatal care visits for any uncomplicated pregnancy events [13]. Though remarkable progress has been noticed in the initial healthcare services over the last few decades, in Bangladesh only 31% of childbirths take place at healthcare facilities [14]. According to the Bangladesh Maternal Mortality Survey, only 37% of women received at least four antenatal care service contacts during their pregnancy period. A cross-sectional study was conducted to examine several socio-demographic factors that affect antenatal care contacts for the BDHS data in 2014 [15]. Several benefits are affiliated with the higher level of the socio-economic situation of women such as a decrease in child mortality, better nutrition, participation in the labor force, and defense against abusing women, etc. [16]. A large portion of maternal deaths occur due to any kind of pregnancy complication and to ensure the reduction of infant and maternal mortality these pregnancy complications should be recognized timely and required care should be provided effectively [17].

Several socioeconomic attributes affect the condition of receiving antenatal care and antenatal care at different places has distinctive service facilities. The women who are living in rural areas do not get enough facilities required for safe delivery. The educated women have more knowledge about delivery than the uneducated pregnant women. The economic family background also affects the environment of a pregnant woman and antenatal care service facilities drastically. A cross-sectional study in Sunamganj district in Sylhet conducted their survey to substantiate the associated factors that tend to child delivery at home with traditional skilled birth attendants [18]. Proper antenatal care service utilization and the associated socio-economic factors have been studied in pregnant women in a study. Regression analysis of this association study shows that half of the pregnant women were not able to get proper antenatal care commencement. In this case, appropriate care was affected by socioeconomic factors apparently [19]. During pregnancy to tackle different health hazards, using proper drugs might be a challenge. In this case, in a study of Ethiopia, it was claimed that most of the women had no access to health clinics which diverted them to the inappropriate use of drugs [20].

In a study, Papua New Guinea attempted to explore the impact of antenatal care first visit. Culturally unique and economically distinctive areas were selected for this survey [21]. A recent study in Bangladesh focused on appreciating the preparedness of the health care facility to ensure antenatal care among pregnant women for the welfare of both mothers and newborn children using data from the Bangladesh Health Facilities Survey (BHFS) 2014 and 2017 [22].

In analyzing the antenatal coverage and content in rural Bangladesh a previous study explored two sub-districts in Netrokona where a chi-square test has been performed to show potential association among variables in that case [23]. The impact of socio-demographic variables on antenatal care has been explored in many previous studies. A retrospective study in Malaysia conducted their survey to examine the extent of context to require antenatal care service and to determine the associated factors influencing it [24]. Antenatal care is a crucial step in the life of pregnant women to conduct any effective delivery process and there are different places where people can take their antenatal care service; however, this study considered two places among them for analysis. It aimed to compare the effects of different socio-demographic attributes on antenatal care at these two places.

2. Materials and methods

2.1. Type of the study

The type of the study described is a cross-sectional observational study. This study utilizes statistical analysis of data collected from

the Bangladesh Demographic and Health Survey (BDHS) 2017–2018 to examine the factors associated with antenatal care in two locations in Bangladesh. The analysis includes the identification of significant variables related to receiving antenatal care at home and Upazila health complexes which aims to understand the relationship between socio-economic factors with antenatal care services at two specific places.

2.2. Data source

This study has been conducted based on both categorical and numerical responses of data from the respondents from the whole of Bangladesh. The information of the respondents has been collected from the women recode (IR) file of the Bangladesh Demographic and Health Survey (BDHS) 2017–2018. This survey was conducted by the execution of the National Institute of Population Research and Training (NIPORT) through a cluster random sampling method. The women's recode file includes the information of ever-married women who were 15–49 years old during this survey. In the data file, information was collected from everyone by questionnaire method and the survey was conducted from October 2017 to March 2018 which represents the summary output of the health of the nation of Bangladesh. From the database of BDHS 2017–2018, 14 variables have been selected as explanatory, and antenatal care at two different places has been fixed as the dependent variable for this research. The analysis has been conducted on the 2058 ever-married women aged 15–49 years old which was obtained after deducting the missing observations from the whole dataset. These 2058 complete observations are the study respondents and the data from the whole of Bangladesh is our survey area. During data collection from the data file each of the individuals contained distinctive information which has been selected for further analysis. This paper analyzed these samples for both antenatal care services provided at home and at Upazila Health Complex. There are several areas where antenatal care is provided. However, at the Upazila level of any district, most of the people do not get proper healthcare facilities. In this case, a portion of people take their antenatal care at home, while others prefer Upazila Health Complex.

2.3. Variables

Additionally, we have considered 12 explanatory variables for both types of antenatal care services. These variables include the type of residence (rural and urban), age (15–49 years old women), number of household numbers, geographical division (Dhaka, Chittagong, Barisal, Khulna, Mymensingh, Rajshahi, Rangpur, and Sylhet), highest educational level (no education, primary, secondary and higher), religion (Islam, Hinduism, Buddhism and Christianity), wealth index (poorest, poorer, middle, richer and richest), knowledge of the ovulatory cycle (during her period, after period ended, middle of the cycle, before period begins, at any time and don't know), iron supplementation during pregnancy (no, yes and don't know), getting money for medical treatment (big problem and not a big problem), taking iron (no, yes and don't know), and told pregnancy complications (no, yes and don't know). Antenatal care service was considered as the response variable.

At first, we included two more variables as explanatory named "weight' and "body mass index"; however, we have checked the multicollinearity problem and found these two variables created multicollinearity issues. Therefore, we omitted these two variables from the list of covariates and conducted the logistic regression.

There are several sources from where antenatal care can be received, in this study two of the antenatal care places were selected for analysis and a comparison of the effects of several factors on these places has been performed. Since data was collected from the latest BDHS data, the information was collected from the DHS website. Several variables could be considered for the analysis; however, the relevant variables are collected so that the information of the respondents can be obtained. Basically, after removing the missing and repeated data from the dataset, only the reasonable variables from the DHS file are considered in this study, which tend to be pregnancy-related variables. Since this study aimed at the antenatal care service of pregnant women for this issue, women's file was selected to elicit maternal information from this health dataset. Different statistical techniques were performed to find out the association of the variables. Binary logistic regression was employed to explore the significant variables for two different cases from the value of the odds ratio.

3. Data analysis

In this phase, statistical analysis has been conducted to conclude the final decision. The chi-square test has been performed to find out the association between each explanatory variable and the response variable. Here two places of antenatal care were selected as dependent variables and for this reason two of the descriptive statistics tables have been built up to show the association among variables and to compare the results of two different places.

After that, binary logistic regression was conducted to explore the significant variables for two different cases from the value of the odds ratio.

3.1. Chi-square test

The chi-square test is usually used to test the association of two or more attributes. It is a non-parametric (distribution-free) test that is used in two cases such as to test the independence of two attributes and to test the goodness of fit of any statistical model to observed data. In this study, we conducted a chi-square test to explore the effect of each variable on the antenatal care service at two different locations.

3.2. Binary logistic regression

If the response variable is binary and the analysis explains the relationship between the multiple predictors and that response variable which has two categories is called binary logistic regression. In this study, binary logistic regression has been conducted to find out the relationship between all of the explanatory variables (socio-demographic factors) with the dependent variable (antenatal care). This statistical analysis aimed to explore the effects and relationship of several factors on antenatal care.

3.3. Odds ratio

The odds ratio can be found from logistic regression in the presence of independent variables where the impact of each explanatory variable on the odds ratio of the outcome variable is examined. From the value of the odds ratio, the effect of the explanatory variables can be detected and the decisions of the analysis are made.

4. Results

The association between each explanatory variable and outcome variable has been examined and expressed here in the overall descriptive statistics for antenatal care at respondents' homes and antenatal care at Upazila Health Complex. Here antenatal care at

Table 1
Descriptive statistics and χ^2 association (n = 2058).

Variables	Categories	Antenatal Care: Respondent's Home				P –Value	Antenatal Care: Upazila Health Complex				P -Value
		No		Yes			No		Yes		
		N	%	n	%		N	%	n	%	
Types of residence	Urban	346	28.71%	196	22.98%	0.004[a]	446	25.62%	96	30.28%	0.084
	Rural	859	71.29%	657	77.02%		1295	74.38%	221	69.72%	
Division	Barisal	143	11.87%	92	10.79%	0.000[a]	178	10.22%	57	17.98%	0.000[a]
	Chittagong	253	21.00%	101	11.84%		300	17.23%	54	17.03%	
	Dhaka	159	13.20%	91	10.67%		224	12.87%	26	8.20%	
	Khulna	100	8.30%	71	8.32%		146	8.39%	25	7.89%	
	Mymensingh	129	10.71%	164	19.23%		243	13.96%	50	15.77%	
	Rajshahi	114	9.46%	92	10.79%		187	10.74%	19	5.99%	
	Rangpur	90	7.47%	157	18.41%		203	11.66%	44	13.88%	
	Sylhet	217	18.01%	85	9.96%		260	14.93%	42	13.25%	
Highest educational level	No Education	96	7.97%	55	6.45%	0.604	123	7.06%	28	8.83%	0.386
	Primary	436	36.18%	317	37.16%		629	36.13%	124	39.12%	
	Secondary	570	47.30%	411	48.18%		839	48.19%	142	44.80%	
	Higher	103	8.55%	70	8.21%		150	8.62%	23	7.26%	
Religion	Islam	1139	94.52%	781	91.56%	0.013	1630	93.62%	290	91.48%	0.103
	Hinduism	63	5.23%	62	7.27%		98	5.63%	27	8.52%	
	Buddhism	1	0.08%	5	0.59%		6	0.34%	0	0%	
	Christianity	2	0.17%	5	0.59%		7	40.21%	0	0%	
Wealth index	Poorest	334	27.72%	267	31.30%	0.000[a]	475	27.28%	126	39.75%	0.000[a]
	Poorer	282	23.40%	241	28.25%		439	25.22%	84	26.50%	
	Middle	236	19.59%	167	19.58%		354	20.33%	49	15.46%	
	Richer	227	18.84%	123	14.42%		310	17.81%	40	12.62%	
	Richest	126	10.46%	55	6.45%		163	9.36%	18	5.68%	
Ovulatory Cycle	During her period	23	1.91%	20	2.34%	0.029[a]	32	1.84%	11	3.47%	0.136
	After period ended	592	49.13%	433	50.76%		873	50.14%	152	47.95%	
	Middle of the cycle	353	29.29%	277	32.47%		528	30.33%	102	32.18%	
	Before period begins	29	2.41%	17	1.99%		44	2.53%	2	0.63%	
	At any time	91	7.55%	37	4.34%		107	6.15%	21	6.62%	
	Don't know	117	9.71%	69	8.09%		157	9.02%	29	9.15%	
During pregnancy, given or bought iron	No	328	27.22%	144	16.88%	0.000[a]	406	23.32%	66	20.82%	0.565
	Yes	876	72.70%	709	83.12%		1334	76.62%	251	79.18%	
	Don't know	1	0.08%	0	0.00%		1	0.06%	0	0%	
Getting Money	Big problem	562	46.64%	433	50.76%	0.067	823	47.27%	172	1.19%	0.024[a]
	Not a big problem	643	53.36%	420	49.24%		918	52.73%	145	45.74%	
Taking iron	No	1153	95.68%	813	95.31%	0.474	1663	95.52%	303	95.58%	0.913
	Yes	52	4.32%	39	4.57%		77	4.42%	14	4.42%	
	Don't know	0	0.00%	1	0.12%		1	0.06%	0	0%	
Pregnancy complications	No	916	76.02%	525	61.55%	0.000[a]	1224	70.30%	217	68.45%	0.536
	Yes	287	23.82%	326	38.22%		513	29.47%	100	31.55%	
	don't know	2	0.17%	2	0.23%		4	0.23%	0	0%	

[a] Significant at 5% level.

home and antenatal care at Upazila Health Complex were selected as two response variables. The association of every explanatory variable with these two different predicted variables has been analyzed separately and then merged in the following table to show the comparison between them.

In the case of antenatal care at home, the result of the present study (Table 1) shows that 77.02 % of the mothers who received antenatal care services at home belong to rural areas. The study also displays that mothers with secondary education have the highest percentage of antenatal care at home compared to those who have no education. For mothers who choose not to utilize antenatal care at home, similar scenarios do exist. The above table (Table 1) depicts that there is a positive association between antenatal care at home and all other variables except people with the highest educational level and those who take iron pills, sprinkles, or syrup, as well as those who are getting medical help or money for self-treatment. Based on knowledge of the ovulatory cycle, both categories of antenatal care are dominated by the people who got the knowledge after the period ended as well as those who were in the middle of the period. Both groups of antenatal care are prevalent in the case of mothers who get or buy iron pills or syrup. For antenatal care at Upazila Health Complex, the above result (Table 1) shows that there is no positive association between antenatal care at Upazila Health Complex and all other variables except division and wealth index as well as those who are getting medical help or money for self-treatment. Based on taking iron pills, sprinkles, or syrup, both categories of antenatal care are dominated by the people who do not take it. Also, both categories of antenatal care are dominated by mothers who have not been told about the signs of pregnancy complications. The study also displays that mothers with secondary education have the highest percentage of ANC at the Upazila health complex compared to those who have no education.

The results of the binary logistic regression test (Table 2) to identify the factors affecting antenatal care at home indicate that some variables have a significant relationship with the indicator variable, such as division, religion, whether iron was provided, and whether pregnancy complications were reported. However, there is no significant relationship between antenatal care at home and other

Table 2
Binary logistic regression of socio-demographic factors in antenatal care for both home and Upazila health complex (n = 2058).

Variables		Antenatal Care: Respondent's home				Antenatal Care: Upazila Health Complex		
		P-Value	OR	95% C.I.		P-Value.	OR	95% C.I.
Residence: Rural	0.105	1.211	0.960	1.527	0.002[a]	0.640	0.479	0.853
Age	0.452	1.007	0.989	1.025	0.275	0.987	0.964	1.010
Household members	0.780	0.995	0.958	1.033	0.516	1.016	0.968	1.068
Division	0.000[a]				0.008[a]			
Chittagong	0.015	0.636	0.441	0.916	0.045	0.643	0.418	0.990
Dhaka	0.956	1.011	0.685	1.493	0.001	0.415	0.245	0.702
Khulna	0.944	0.985	0.644	1.507	0.039	0.567	0.330	0.972
Mymensingh	0.000	1.949	1.361	2.791	0.062	0.662	0.429	1.021
Rajshahi	0.195	1.299	0.875	1.927	0.001	0.376	0.213	0.664
Rangpur	0.000	2.468	1.679	3.629	0.030	0.598	0.376	0.951
Sylhet	0.034	0.662	0.452	0.970	0.002	0.487	0.305	0.776
Education	0.701				0.827			
Primary	0.448	1.165	0.786	1.726	0.614	0.885	0.551	1.422
Secondary	0.546	1.132	0.757	1.692	0.435	0.823	0.505	1.342
Higher	0.891	0.965	0.575	1.617	0.405	0.754	0.387	1.466
Religion	0.027[a]				0.269			
Hinduism	0.271	1.253	0.839	1.872	0.047	1.619	1.005	2.608
Buddhism	0.025	12.437	1.364	113.39	0.999	0.000	0.000	–
Christianity	0.075	4.791	0.856	26.807	0.999	0.000	0.000	–
Wealth index	0.233				0.002[a]			
Poorer	0.488	1.094	0.848	1.412	0.114	0.775	0.564	1.064
Middle	0.879	1.022	0.771	1.355	0.003	0.560	0.384	0.816
Richer	0.238	0.828	0.605	1.133	0.001	0.495	0.325	0.755
Richest	0.118	0.716	0.471	1.089	0.004	0.421	0.234	0.757
Knowledge ovulatory cycle	0.092				0.200			
After period ended	0.995	0.998	0.517	1.924	0.129	0.567	0.273	1.179
Middle of the cycle	0.711	1.134	0.582	2.209	0.286	0.667	0.317	1.4030
Before period begins	0.448	0.704	0.284	1.744	0.015	0.138	0.028	0.680
At any time	0.185	0.598	0.279	1.280	0.277	0.620	0.262	1.468
Don't know	0.938	0.972	0.474	1.993	0.219	0.598	0.263	1.358
During pregnancy given iron	0.000[a]				0.744			
Yes	0.000	1.761	1.394	2.223	0.442	1.127	0.832	1.526
Don't know	1.000	0.000	0.000	–	1.000	0.000	0.000	–
Getting money:	0.321	0.905	0.744	1.102	0.361	0.887	0.686	1.147
Not a big problem								
Taking iron	0.975				0.973			
Yes	0.823	0.949	0.598	1.504	0.814	1.075	0.589	1.962
Don't know	1.000	44446129	0.000	–	1.000	0.000	0.000	–
Told complications	0.000[a]				0.635			
Yes	0.000	1.917	1.562	2.354	0.340	1.141	0.870	1.495
Don't know	0.795	1.324	0.160	10.980	0.999	0.000	0.000	–

[a] Significant at 5% level.

variables, such as residence, age, household members, education, wealth index, knowledge of the ovulatory cycle, the amount of iron given during pregnancy, and the amount of iron taken. Regarding the residence variable, it does not appear to have an impact on the decision to receive antenatal care at home, but it does play a significant role in the choice of receiving care at Upazila health complexes (P-value = 0.002 < 0.05). Notably, individuals residing in rural areas are 0.640 times less likely to seek antenatal care services than those in urban areas (OR = 0.640, 95% CI 0.479–0.853) which may be due to the relatively lower frequency of Upazila health complexes in rural areas. Regarding antenatal care at home, families in Chittagong have 0.636 times less chance of being involved than families in Barisal (OR0.636; 95% CI 0.441–0.916). Families in Dhaka are 1.011 times more likely to be involved in antenatal care at home than families in Barisal, with all variables held constant (OR 1.011; 95% CI 0.685–1.493). The likelihood of involvement in antenatal care at home is decreased by 34%for families in Sylhet compared to those in Barisal (OR 0.662; 95% CI 0.452–0.970). Similarly, the likelihood of involvement in antenatal care at home is also higher for families in other divisions, such as Rajshahi, Khulna, Mymensingh, and Rangpur, compared to Barisal.

Hindu or Christian mothers are more likely to be involved in antenatal care at home (OR 1.253 and OR4.791, respectively), while Buddhists are 12.437 times more likely to be involved than Muslim mothers (OR 12.437), with all other variables held constant. If mothers have been informed about pregnancy complications, the probability of involvement in antenatal care at home is increased by92%as compared to those who have not been informed (OR 1.917; 95% CI 1.562–2.354). However, if mothers are unaware of any pregnancy complications, the likelihood of involvement in antenatal care at home is increased by 32% as compared to those who are aware of complications (OR 1.324; 95% CI0.160–10.980). The binary logistic regression test (Table 2) results for antenatal care at Upazila Health Complex show that only residence, division, and wealth index have a significant relationship with the indicator variable, while age, household members, education, religion, knowledge of the ovulatory cycle, the amount of iron given during pregnancy, and taking iron pills have no significant relationship. Rural women are 0.640 times less likely to be involved in antenatal care at Upazila Health Complex than those in urban areas (OR 0.640; 95% CI 0.479–0.853). Families in Chittagong have 0.643 times less chance of involvement in antenatal care at Upazila Health Complex than families in Barisal (OR 0.643; 95% CI 0.418–0.990). For Dhaka, the likelihood of involvement is decreased by 59% times as compared to families in Barisal (OR 0.415; 95% CI 0.245–0.702). However, families in Khulna and Rangpur are less likely to be involved in antenatal care at Upazila Health Complex.

5. Findings and discussion

Our analysis revealed that variables such as residence, religion, awareness of pregnancy complications, and wealth index play a crucial role in differentiating between antenatal care provided at home and Upazila health complexes. On the other hand, division is a factor that is commonly associated with both types of antenatal care locations. From our findings, we can infer that people tend to choose Upazila health complexes for antenatal care over home-based care, which may be attributed to variations in their wealth index.

The results above indicate that most respondents in this study are from rural areas of Bangladesh. To ensure proper antenatal care for rural women, it is essential to implement community-based responses and allocate basic needs and healthcare facilities [25]. Women with a secondary education level have the highest percentage of antenatal care compared to those with other educational levels. Research indicates that low-income families are unable to spend significantly on healthcare services, and accessing care from government or private clinics increases their risk of expenditure [26]. The division plays a significant role in both cases, with women from the Chittagong division having the most significant relationship in receiving antenatal care in both home and Upazila health complexes. According to BDHS 2017–18, the Sylhet division showed the lowest ANC service which was 71% and the Khulna division witnessed the highest rate (91%) [27]. This study reveals that there are regional variations in receiving antenatal care for both places, which can be attributed to factors such as distance from service centers, transportation issues, availability of healthcare facilities, and quality of services [28]. It was found in other studies that in low and middle-income countries poor maternity knowledge exists, where people with secondary education had better maternity knowledge as compared to the women who did not complete their secondary education [29].

The findings suggest that women with secondary education levels are more likely to receive antenatal care at home compared to those with no education, and there should be a focus on encouraging less-educated or uneducated mothers to receive antenatal care by providing formal and informal education that includes knowledge about antenatal care services [30]. In previous studies, it was also found that educated mothers took proper antenatal care as compared to illiterate pregnant women [31]. For antenatal care at home, the significant variable is whether respondents informed their birth attendants or doctors about their pregnancy complications or not. This scarcity of required antenatal care can lead to maternal deaths, and there may be structural challenges in addressing these pregnancy complications, such as a lack of necessary laboratories and equipment, as well as qualified and skilled attendants [32]. Poor antenatal care services can also result in giving birth to a child with low birth weight, and proper training of employees and the appropriate employment of human resources can help improve antenatal care [33].

This study further reveals that religion is a statistically significant variable for antenatal care at home. Though non-Muslim women have a higher possibility to take antenatal care at home as compared to Muslim women in this study, Muslim women have comparatively lower vaccination achievement for their children as compared to women of other religions [34]. Religion also has a negative effect on maternal health for women who depend on their male partners to receive antenatal care or child healthcare [35]. In this study, Hindu, Buddhist, and Christian women receive more antenatal care at home than Muslim women. The reason behind this is that most of the people of Bangladesh are Muslim. Since Muslims prefer more children than people from other religions, therefore, they prefer more effective antenatal care and choose to get this from Upazila Health Complex. Division is a significant factor in two places, indicating that when receiving antenatal care service there must be a regional association. Finally, the wealth index plays a crucial role in antenatal care at the Upazila Health Complex, indicating that higher economic conditions increase the likelihood of receiving

antenatal care at the Upazila Health Complex rather than at home. Since different factors have different effects on antenatal services, overall, it is suggested to implement some practical policies to ensure proper antenatal care regardless of the places where antenatal care is received.

6. Strength and limitations

Antenatal care has been discussed in many studies earlier. However, the major strength of this study is considering two locations of antenatal care services where most of the people receive their service. There was no study in Bangladesh about the comparison between two places where antenatal care is provided, which has been explored in this study. Most of the people of Bangladesh live in rural areas and they receive antenatal care at home and Upazila Health Complex, because these two places are comparatively available as compared to private clinics or hospitals. Therefore, these two places were more relevant to be considered for the analysis in this study. Additionally, there was a time when several pregnant women died due to pregnancy-related issues and antenatal care is one of the greatest crucial steps which has ensured an effective delivery process. This study explores different socio-demographic effects on antenatal care. The limitation of our study is not considering other places of antenatal care service. We would consider other antenatal service places to compare, so we recommend further study to compare other places. Moreover, other countries could also be considered for this research and the comparison among different countries could also be highlighted which a limitation of this study is. Additionally, BDHS 2021–2022 data also exists at present, which was not available during our study. Therefore, further study using the latest BDHS data can also be recommended.

7. Conclusion

The study highlights that most respondents are from rural areas, which may result in inadequate antenatal care services. Wealth index indicates a significant variable in the case of the Upazila Health Complex which implies that low wealth indexes or income levels can contribute to suboptimal antenatal care, which can endanger both the mother's and the child's health.

Since a significant number of women in Bangladesh still prefer antenatal care at home, it is important to employ skilled birth attendants and provide effective training for healthcare workers involved in childbirth activities regardless of any kind of antenatal care location. It is also important to provide adequate facilities at healthcare centers and emphasize clinical follow-up of antenatal care at home. Further exploration of antenatal care services at other locations and comparison with current services may be useful to implement effective policies to ensure the improvement of maternal and child healthcare.

Ethical approval

The authors certify that this research is totally based on the data that was collected from the Bangladesh Demographic Health Survey (BDHS), and it is freely available on the Internet. Therefore, ethical approval was not obtained for this research. The authors are responsible for themselves.

Data availability statement

Data will be made available on request.

CRediT authorship contribution statement

Fariha Alamgir: Writing – original draft, Software, Methodology. **Md. Farhad Hossain:** Validation, Supervision. **Mohammad Safi Ullah:** Supervision, Methodology, Conceptualization. **Md. Safayet Hossain:** Writing – review & editing, Software. **Mahmud Hasan:** Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e27716.

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