

Logistic Regression Model of Factors Influencing Maternal Health Care Service Utilization in Bangladesh: A Nationwide Cross-Sectional Study

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Received: 19 Nov 2022

Accepted: 26 Dec 2022

Published: 03 Jan 2023

J Short Name: AJSCCR

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Citation:

Hasan F. Logistic Regression Model of Factors Influencing Maternal Health Care Service Utilization in Bangladesh: A Nationwide Cross-Sectional Study. *Ame J Surg Clin Case Rep.* 2022; 6(4): 1-10

Keywords:

Maternal Health Care Service; Bangladesh; Logistic Regression Model

1. Abstract

1.1. Background: Proper maternal health care is very important for a safe child birth. The objective of this study is to investigate the status and individual contribution of the influencing factors of maternal health care service (MHCS) utilization among reproductive women in Bangladesh.

1.2. Methodology: Bangladesh Demographic and Health Surveys (BDHS 2017-2018) data were used for this study. A total 5012 data were collected from women aged 15-49 years. Chi-square test multinomial logistic regression and population attributable fraction (PAF) was used.

1.3. Results: Only 39.6% study population utilized desirable MHCS. Urban women had a better chance of utilizing MHCS (AOR: 1.45; 95% CI: 1.14-1.84). Highly educated women were more likely to utilize MHCS (AOR: 1.94; 95% CI: 1.35-2.78), also higher educated husband's wife was more likely to use MHCS (AOR: 1.53; 95% CI: 1.13-2.06). PAF revealed that caesarean delivered women had highest contribution (60.51%) among the factors of utilizing MHCS, followed by higher education (25.09%), highest wealth quintile (22.91%), intake vitamin A (21.61%).

1.4. Conclusion: Utilization of MHCS might be reduced maternal and child mortality which is an important indicator under Sustainable Development Goals (SDGs). Partially the findings of the study would help to our Government for achieving the goals.

2. Background

Maternal health is a universal community health program. Due to gestation and childbirth-related obstacles worldwide, approximately 830 women die every day [1]. Worldwide the ratio of maternal mortality (MMR) is 211 (i.e., for 100,000 live births 211

deaths occur), of which 99% take place in developing countries [2,4]. In 2017 around 86% (254 000) appraised maternal deaths were occurred in Sub-Saharan Africa and Southern Asia, where nearly one-fifth (58 000) happened in Southern Asia alone [2-4]. These maternal deaths were caused by the obstacles through their pregnancy and childbirth and commonly from preventable causes like sepsis and eclampsia to obstructed labor and severe hemorrhage. Some other previous complications worsened during pregnancy, especially if not managed with proper attention [1]. Maternal health care services like antenatal care (ANC), skilled birth attendant (SBA), facility based delivery (FBD), post natal care (PNC) and availability of emergency obstetric care utilization and their status with continuous monitoring may enhance the development of health system and the equity-oriented initiatives. This could be helpful to provide improved health care utilization for safe childbirth which will decrease maternal and child mortality [5]. To make sure the best health outcome for child birth ANC visits are very important for mothers and children also. During pregnancy well-timed ANC visits is very useful for the detection associated disease in mother, like anemia, gestational diabetes and eclampsia. Throughout the duration of pregnancy at least eight antenatal visits were recommended by WHO in a new guideline in 2016 for safe child birth [6]. For a proper delivery it is very significant to have a skilled attendant. The people with midwifery skills (doctors, midwives, nurses) defined as 'skilled birth attendant (SBA)' who has also the proficiency and skills to manage the deliveries with diagnose and complications [5-7]. Facility based delivery (FBD) for cesarean section has no easy access to all expectant women in lower or middle income countries [8-9]. Post-natal period, (after delivery 42 days or six weeks), is very crucial

for mothers and their children [10]. Proper knowledge of postnatal care helps the new mothers to develop their skills to cop up with their motherhood.

Bangladesh is one of the emerging countries where maternal mortality ratio is high (MMR) [14]. But in last two decades Bangladesh has attained notable success in dropping maternal deaths [11]. In 2017 the maternal mortality was reduced to 173 per 100,000 live births in comparison to 194 per 100,000 live births in 2010 [12,13,14]. In Bangladesh adolescent mother gives birth before age 20 in every year and the rate is the highest in the world [15]. In low and middle income countries it is estimated that almost 11% births occurred in females in aged 15-19 years [16, 17]. It is evident that socioeconomic and demographic factors act as the trigger in the availability and affordability to avail the services of maternal healthcare [18-22].

With increasing financial development and achieved various targets of millennium development goals it has become a lower- middle income country, but the target to reduce maternal death and the employment of provided obstetric and reproductive amenities by trained health workers is far enough to met [16]. In Bangladesh inequality and disparities are persistent to provide convenient accessible quality health services. Therefore, to determine the current status and application of maternal health care service there is a vigorous want to explore the possible factors. Previous study demonstrated that various socioeconomic and demographic factors such as wealth status, area of residence, education, occupation, age, social stain, religious views and so on act as the contributing factor of health care utilization [23-24]. In order to improve health care utilization and establish positive post-implementation effects, it is tough to realize the status of discrepancies and standing barricades in accessing health care in Bangladesh. Besides this, to determine the effective demand-side interventions, an analysis including culturally sensitive demand-side mediation implemented in low-and middle-income countries is a high priority in the context of Bangladesh. This study aimed to explore the determinants for utilization of maternal healthcare, which requires the understanding of social, demographic and structural issues connected with this aspect. For the investigation of the contemporary status of employment of maternal healthcare; ANC, SBA, FDA and PNC by using a wide range of socio-demographic indicators Bangladesh Demographic and Health Survey (BDHS-2017) data was used. And significant findings are highlighted as an effort to build up equitable policies for the prevention of maternal mortality. However, our path is so long to touch the sustainable development goal (SDG) mark that is less than 70 maternal deaths per 100,000 live births.

Thus, to recognize the influencing factors of maternal health care service, this present study developed an indicator variable, named maternal healthcare service (MHCS) utilization, which combines four important maternal health services such as the number of

ANC visits, SBA (doctor, nurse or midwives), FBD (normal or caesarean) and PNC visits. Hence, the objective of this study was to explore the status of MHCS utilization and to determine the social factors that underwrite mostly to the discriminatory access in utilization of MHCS. The findings of the study can make an endowment to facilitate the strategies which can assure service access and use easy.

3. Materials and Methods

3.1. Data Sources

For this study secondary data was derived from the recent Bangladesh Demographic and Health Surveys (BDHS 2017-2018). To identify the population's health status, Demographic and Health Surveys are conducted periodically. BDHS provides a widespread scenario of the study population including the overall status of mother and child health. This study is a two-stage stratified sample design which simplify the selected pointers at the national level. Detail Survey design and reports are described elsewhere [25]. The survey was conducted on the questions of females' background features (age, education, religion, etc.), information on reproduction, maternal medical care, breastfeeding etc. and data was collected by skilled field staff through direct interviews. The BDHS 2017–2018 data was collected by maintaining all the principled standards and the procedure was approved by the National Ethics Review Committee, Bangladesh Ministry of Health and Family Welfare [26]. Bangladesh consists of eight administrative divisions The study used a record of enumeration areas (EAs) and in the first stage, 675 EAs were selected with probability proportional to EA size, from 250 EAs in urban and 425 in rural areas respectively. In the second stage a systematic sample of 30 households on average per EA was selected for each of the eight divisions and 20,250 residential households were selected. Completed interviews were expected from about 20,127 ever-married women age 15–49. Data were collected from ever married women aged 15-49 years by using structured quantitative survey tools and considered the mothers who had a live delivery in the last five years. The total sample was 8759 but after exclusion of unusual, inconsistent and missing observations a total of 5012 observations were included for the analysis.

3.2. Outcome variables

The initial outcome variables for this study were four or more ANC visits, delivery assistance by an SBA, getting adequate facility for delivery FBD and PNC visits. For ANC visits if a woman reported less than four visits coded '0' and four or more visits coded '1'. The SBA variable denoted to 'yes' if the delivery was done by a doctor, midwife, or nurse coded by '1' otherwise '0' is coded for no. Next outcome variable was getting FBD which was coded '0' for 'no' and '1' for 'yes'. The last outcome variable was after delivery having PNC checkup where '1' indicated positive response otherwise '0' for negative answer.

The final outcome variable for this study was the maternal health care service (MHCS) package utilization. This indicator variable is a combination of four variables named number of ANC visits, SBA, FBD and PNC visits. These variables are very important fac-

tors on utilization maternal health care service. As an outcome variable the MHCS package utilization was adopted idea from some previous study [27,28]. The labeling of the outcome variables has been provided in (Table 1).

Table 1: Categorization of outcome variable

Variables	Description	Categories
Maternal health care service (MHCS) utilization package	<p>Maternal healthcare service (MHCS) utilization package as indicator outcome variable generated from the following variables:</p> <p>ANC Visit(Antenatal care visit) SBA(Skilled birth attendance) FBD (Facility based delivery) PNC visit (Post natal care visit)</p>	<p>1. Desirable category: women attended at least 4 ANC visits; assisted by a skilled personnel; delivered in a health facility and took their first post-natal check-up within 2 days following delivery</p> <p>2. Moderate category: women received less than 4 ANC visits; had supervised delivery; delivered from a health facility; and received postnatal care, or had at least 4 ANC visits but did not receive any of the other facilities; Women who had received no ANC visits but received other components of care also included</p> <p>3. Undesirable category: women made no ANC visits, no SBA, no FBD and did not take PNC visits.</p>

3.3. Independent variables

This study considered a extensive choice of socio-demographic predictors as independent variables based on previous studies [12,13,15,27,28]. The household variables were place of residence (urban or rural), wealth index. Ever-married reproductive women’s characteristics were as follows: age (years), maternal education, husband’s education, husband’s age, current working status, age at first cohabitation, age at first birth, mode of birth, number of total children ever born and intake vitamin A during pregnancy. The details of these variables were given in the published report [25].

3.4. Analytical Strategy

Statistical software SPSS version 25.0 was used to analyze the data. To highlight the background characteristics, descriptive statistics were used to present frequency distribution with percentages. The association between independent and outcome variables were identified by applying Pearson’s chi-square test. Significant (p<0.05) variables of bivariate analysis were included in the multinomial logistic regression analysis. A multinomial logistic regression model was used to estimate the variation in the effect of receiving maternal health care services among reproductive women. The model equation of multinomial logistic regression is as follows [9]

$$\text{Log} \left\{ \frac{p_r(Y=j)}{p_r(Y=j^*)} \right\} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k$$

$$= \alpha + \sum_{i=1}^k \beta_i X_i$$

Where j is the known response category and j* is the reference response category. Here the model generates j-1 sets of parameter estimates, one for each category relative to the reference category, which explain the relationship between dependent and independent variables.

In this study, the final outcome variable MHCS was categorized as taking no MHCS as undesirable, taking one MHCS to three MHCS as moderate and lastly taking all four MHCS packages categorize as ideal or desirable category. Utilizing no MHCS category was preferred to be the reference category. So, the regression model exhibits the effect of predictor variables on the outcome variables describing the propensity of a woman using at least one, two or all MHCS bundle relative to no MHCS. Adequacy of the fitted model was verified using the likelihood ratio test of goodness of fit, and multicollinearity among predictors was also checked by variance inflation factor values (VIF<2.0). Therefor the regression model was used to calculate the adjusted odds ratios (AORs) with 95% confidence interval (95% CI) as the strength of association

between the outcome variables and the relevant independent variables. Based on bivariate findings the significant variables were included in multiple regression models.

4. Results

4.1. General Characteristics

(Table 1) represents the combine level of categories of the outcome variable.

The socio-economic and demographic characteristics of ever married re-productive women aged 15-49 years are given in (Table 2). The majority (66%) of women lives in rural areas and is from Chittagong (17%). More than 90% of women were Muslims and (35.4%) women were in the 20–24 years of age category. were married. The completion of secondary education level rate for respondents and their husband were around 48% and 33%, respectively and around 37% women were currently working. More than 80% women got married at age under 18 years and from them almost 56% give births within the same age. Around 67% women give natural delivery and more than 71% women have two children. More than half of the women did not take any kind of vitamins during pregnancy. A large portion of the women belonged to the poor (41.8%) household wealth index. Finally, only 39.6% study population reported that they utilize desirable maternal health care service during pregnancy.

The association between MCHS utilization and selected predictors were described Chi-square (χ^2) test in (Table 3). The bivariate analysis demonstrated that all the variables were significant predictors of the outcome variable ($p < 0.05$) except religion and maternal age respectively. It was found that compared to other divisions Rangpur division had the higher (44.0%) percentage to utilize desirable MHCS in the country. Mothers living in urban areas utilize desirable MHCS more than their rural counterparts. The test reveals that the application of desirable or moderate MHCS increased with the enhanced level of education, both for women and their husbands ($p < 0.001$). Highly educated women 46.1% utilized desired MHCS bundle, where 34.3% illiterate women utilized the desirable MHCS bundles. Higher number of unemployed women (46.9%) avail moderate MHCS with significance association ($p < 0.05$). There is highly significant ($p < 0.001$) association between MHCS utilization and respondent's first marriage age and first birth age respectively. It was found that desired

MHCS utilization is highly associated ($p < 0.001$) with caesarean delivery (53.1%). The desirable MHCS utilization also started to decrease with the parity; the desirable MHCS was informed to be higher when women had one or two child ($p < 0.001$). It was also found that there was highly significant ($p < 0.001$) association between taking vitamin and desired MHCS utilization during pregnancy. Respondents wealth was also found statistically significant ($p < 0.001$) effect on MHCS utilization, and there was not much difference between the poor and rich wealth quintiles. About 49% women from the rich household utilized desired MHCS bundle, and 38.6% women with poor wealth quintile uses this MHCS.

(Table 4) presents the results derived from multinomial logistic regression analysis. The analysis reveals that women living in Rangpur division had more than two times (OR: 2.56; 95% CI: 1.69-3.86) higher chance to utilize desirable MHCS than women living in Sylhet. Urban women had a better chance (AOR: 1.45; 95% CI: 1.14-1.84) of utilizing desirable MHCS than rural women. It was found that education significantly influenced the utilization of the desirable and moderate package of maternal health care services. Keeping other variables constant, highly educated women and their partners were more likely to utilize desirable category of maternal health care services (AOR: 1.94; 95% CI: 1.35-2.78) and (AOR: 1.53; 95% CI: 1.13-2.06) respectively than their counterparts. There was no effect of respondent's current working status on outcome variables followed by women's first marriage age and age at first birth respectively. Women having caesarean delivery were more likely to utilize desirable maternal health care services (AOR: 17.56; 95% CI: 10.51-29.33) than the women who have normal delivery. The analysis reveals that women having more than one child had two times (AOR: 2.36; 95% CI: 1.61-3.45) higher chance for utilizing moderate MHCS than women having child five or more. It was noted that mother who takes vitamin A during pregnancy were less likely to use desirable MHCS than mothers having no vitamins (AOR: 0.59; 95% CI: 0.48-0.72). Significant statistical effects were found with wealth index and MHCS utilization; women with middle to rich wealth quintile had more than two times (AOR: 2.54; 95% CI: 1.57- 4.10 and AOR: 2.02; 95% CI: 1.61-2.52) higher chance to utilize desirable and moderate MHCS respectively than their poor counterpart.

Table 2: Socioeconomic and demographic characteristics of reproductive women aged 15-49 years of BDHS-2017

Variables	Number	%	Variables	Number	%
Division			Current Working status		
Barishal	533	10.6	No	3132	62.5
Chittagong	835	16.7	Yes	1880	37.5
Dhaka	741	14.8	Age at first cohabitation		
Khulna	524	10.5	<18	4105	81.9
Mymensingh	603	12	>=18	907	18.1
Rajshahi	527	10.5	Age at first birth		
Rangpur	559	11.2	<18	2788	55.6
Sylhet	690	13.8	18-24	1939	38.7
Place of residence			25+	285	5.7
Urban	1725	34.4	Mode of birth		
Rural	3287	65.6	Normal	3341	66.7
Religion			Caesarean	1671	33.3
Islam	4589	91.6	No. of total children ever born		
Hinduism	396	7.9	<=2	3553	70.9
Others	27	0.5	3-4	1214	24.2
Maternal age			5+	245	4.9
15-19	869	17.3	Intake vitamin A during pregnancy		
20-24	1773	35.4	No	2912	58.1
25-29	1310	26.1	Yes	2100	41.9
30-34	749	14.9	Respondent's wealth index		
35+	311	6.2	Poor	2096	41.8
Mother's education level			Middle	1893	37.8
No education	312	6.2	Rich	1023	20.4
Primary	1392	27.8	MHCS utilization		
Secondary	2402	47.9	Desirable	1987	39.6
Higher	906	18.1	Moderate	2342	46.7
Husband's education level			Undesirable	683	13.6
No education	698	13.9			
Primary	1667	33.3			
Secondary	1653	33			
Higher	994	19.8			

Table 3: Association of women's health care service (MHCS) utilization across socio-demographic characteristics

Variables	Desirable n (%)	Moderate n (%)	Undesirable n (%)	p-value
Division				
Barishal	175(32.8)	249(46.7)	109(20.5)	<0.001
Chittagong	337(40.4)	377(45.1)	121(14.5)	
Dhaka	304(41.0)	358(48.3)	79(10.7)	
Khulna	211(40.3)	272(51.9)	41(7.8)	
Mymensingh	231(38.3)	283(46.9)	89(14.8)	
Rajshahi	220(41.7)	252(47.8)	55(10.4)	
Rangpur	246(44.0)	264(47.2)	49(8.8)	
Sylhet	263(38.1)	287(41.6)	140(20.3)	

Place of Residence				
Urban	742(43.0)	844(48.9)	139(8.1)	< 0.001
Rural	1245(37.9)	1498(45.6)	544(16.6)	
Religion				
Islam	1823(39.7)	2128(46.4)	638(13.9)	0.096
Hinduism	155(39.1)	202(51.0)	39(9.8)	
Others	9(33.3)	12(44.4)	6(22.2)	
Maternal age				
15-19	330(38.0)	428(49.3)	111(12.8)	0.06
20-24	694(39.1)	846(47.7)	233(13.1)	
25-29	521(39.8)	617(47.1)	172(13.1)	
30-34	321(42.9)	318(42.5)	110(14.7)	
35+	121(38.9)	133(42.8)	57(18.3)	
Respondent's education level				
No education	107(34.3)	95(30.4)	110(35.3)	<0.001
Primary	529(38.0)	552(39.7)	311(22.3)	
Secondary	933(38.8)	1223(50.9)	246(10.2)	
Higher	418(46.1)	472(52.1)	16(1.8)	
Husband's education level				
No education	255(36.5)	246(35.2)	197(28.2)	<0.001
Primary	640(38.4)	719(43.1)	308(18.5)	
Secondary	643(38.9)	856(51.8)	154(9.3)	
Higher	449(45.2)	521(52.4)	24(2.4)	
Currently working				
No	1269(40.5)	1470(46.9)	393(12.5)	0.012
Yes	718(38.2)	872(46.4)	290(15.4)	
Age at first cohabitation				
<18	1588(38.7)	1895(46.2)	622(15.2)	<0.001
>=18	399(44.0)	447(49.3)	61(6.7)	
Age at first birth				
< 20	1050(37.7)	1265(45.4)	473(17.0)	<0.001
20-34	800(41.3)	942(48.6)	197(10.2)	
35+	137(48.1)	135(47.4)	13(4.6)	
Mode of birth				
Normal	1100(32.9)	1574(47.1)	667(20.0)	<0.001
Caesarean	887(53.1)	768(46.0)	16(1.0)	
No. of total children ever born				
<=2	1427(40.2)	1759(49.5)	367(10.3)	<0.001
4-Mar	468(38.6)	519(42.8)	227(18.7)	
5+	92(37.6)	64(26.1)	89(36.3)	
Mother receive vitamin A during pregnancy				
No	1103(37.9)	1308(44.9)	501(17.2)	<0.001
Yes	884(42.1)	1034(49.2)	182(8.7)	
Wealth index				
Poor	810(38.6)	806(38.5)	480(22.9)	<0.001
Middle	675(35.7)	1040(54.9)	178(9.4)	
Rich	502(49.1)	496(48.5)	25(2.4)	

Table 4: Effects of demographic and socioeconomic factors on maternal health care service (MHCS) utilization using multinomial logistic regression

Variables	Desirable			Moderate		
	AOR	95% CI of AOR		AOR	95% CI of AOR	
Division						
Barishal	0.72	0.5	1.02	0.87	0.62	1.23
Chittagong	1.11	0.8	1.54	1	0.73	1.38
Dhaka	1.09	0.76	1.57	1.17	0.82	1.67
Khulna	1.51	0.98	2.33	1.68	1.1	2.57
Mymensingh	1.38	0.97	1.97	1.52*	1.07	2.16
Rajshahi	1.54*	1.03	2.3	1.51*	1.02	2.25
Rangpur	2.56**	1.69	3.86	2.47**	1.65	3.75
Sylhet	Reference			Reference		
Place of residence						
Urban	1.445*	1.14	1.84	1.37*	1.07	1.74
Rural	Reference			Reference		
Respondent's education level						
No education	Reference			Reference		
Primary	4.56**	2.39	8.72	5.22**	2.75	9.92
Secondary	1.50*	1.07	2.1	1.55*	1.1	2.17
Higher	1.94**	1.35	2.78	2.39**	1.67	3.42
Husband's education level						
No education	Reference			Reference		
Primary	2.23*	1.33	3.76	2.70**	1.62	4.51
Secondary	1.22	0.95	1.58	1.28	0.99	1.65
Higher	1.53*	1.13	2.06	1.83**	1.36	2.46
Current Working status						
No	0.91	0.74	1.12	0.85	0.70	1.04
Yes	Reference			Reference		
Age at first cohabitation						
<18	0.97	0.67	1.39	0.1	0.65	1.33
>=18	Reference			Reference		
Age at first birth						
< 20	0.81	0.42	1.61	0.9	0.46	1.79
20-34	0.94	0.48	1.85	1.02	0.52	1.98
35+	Reference			Reference		
Mode of birth						
Normal	Reference			Reference		
Caesarean	17.56**	10.51	29.33	9.34**	5.59	15.61
Total children ever born						
<=2	1.36	0.95	1.95	2.36**	1.61	3.45
4-Mar	1.18	0.82	1.7	1.84*	1.25	2.7
5+	Reference			Reference		
Mother receive vitamin A during pregnancy						
No	0.59**	0.48	0.72	0.58**	0.47	0.71
Yes	Reference			Reference		
Respondent's wealth index						
Poor	Reference			Reference		
Middle	2.54**	1.57	4.1	3.02**	1.88	4.85
Rich	1.25	0.99	1.57	2.02**	1.61	2.52

5. Discussion

To expand the employment of maternal health care services, several national and international efforts has been imposed, but a notable portion of women are not getting adequate health care services in Bangladesh. This study demonstrated that divisional region, area of residence education level, mode of birth, parity, use of vitamin A and respondent's wealth index were significantly influenced the likelihood of utilizing a desirable, moderate or undesirable level of MHCS bundles.

The analysis reveals that some divisional region and women living in urban areas of the country were more likely to utilize desirable MHCS. This finding is coincide with other studies by Rutaremwa et al. (2010) [27], Rai et al. (2008) [38], Paul & Chouhan (2020) [33] and Kabir (2021) [28]. Urban women gets many privileges than the rural women. Women from urban areas have high educational knowledge, substantial consciousness and easy access to public and private health care facilities, whereas rural women are often deprived of these facilities [29-30]. Respondents and their husband's education level plays a significant role to predicts the MHCS utilization and with the progress of educational status the use increases. The mothers having secondary or higher school education were more likely to utilize desirable maternal health care services than those with no education. This finding is supported by some previous studies which were conducted in low- and middle-income countries [31-34]; infers that educated women have better knowledge of health care related information and aware about the negative consequences of not availing maternity care. This is because an educated women have the ability to take decision regarding health issues. Moreover, if her husband is well educated, then he also conscious about the usefulness of maternal health care services. Some other studies discovered the utilization of ANC, skilled birth attendance and health facility based delivery care described a strong contribution of women and partner's education on healthcare service utilization [24,27,28 29]. Community based focus on education levels may be supportive as previous studies have highlighted the development of understanding and literacy, which help mother and their families to take women's health condition seriously and keep care at every stage of pregnancy and child delivery [27-30]. This is evident that education plays a dynamic role to attend improved maternal healthcare. Education may assist one to make autonomous decisions for more access to the utilization of maternal health care services. A retrospective study conducted by using the data from Health and Demographic Surveillance System (HDSS) in Matlab, Bangladesh, revealed the increasing rate of cesarean delivery with greater socioeconomic and education status and utilization of antenatal care services [35]. The findings of this study demonstrated that mothers who go through caesarean delivery are more likely to utilize desirable MHCS. In a facility founded study in Busia, Eastern Uganda, demonstrated that belong to high socio-economic status, parity less than four,

being autonomous in decision to attend antenatal care and depending on other people (e.g. spouse) in making a decision of where to deliver from were significant determinants to utilize maternal health care service [36]. In this study it was reported that mothers having child more than one desired to utilize MHCS than those mother who have children more than five. The current study found that during pregnancy consume vitamin A is highly associated with MHCS utilization. Mothers who did not take vitamin A during pregnancy were more likely to utilize desirable maternal health care service. Vitamin A is very essential for baby's embryonic growth, which includes the development of heart, lungs, kidneys, eyes, and bones as well as the circulatory, respiratory, and central nervous systems. It also helps to repair postpartum tissue. But the real scenario is in Bangladesh mothers are badly suffers from the lack of vitamin consumption. A study revealed by Lee et al. (2008) [37] that rural pregnant women in Bangladesh were badly suffers with the deficiency of vitamin A during pregnancy. Respondents economic status plays the most powerful roll in utilization of maternal health care service. The link between wealth of household and health seeking behavior expounded the fact that those who have more wealth are more likely to afford the health care facilities and get better health outcomes [38]. In the literatures by Ahmed et al. (2010) [15] and Khan et al. (2020) [39] documented that the wealthier individual has the higher likelihood to occupy ideal maternal health services. Consistent with the findings of previous studies, [28,30,33,34] our study also documented that rich wealth index has a significant positive influence on maternity health care utilization. Financially rich women have greater access to health care information and would go for better hospital facility.

5.1. Strength and Limitations of the Study

The present study has several strengths. For this study the data were from nationally representative demographic and health surveys which provides internationally validated questionnaires and applied maternal health care status combined with a strong methodology. The response rate of this survey is very high (>94%) which has generalized for the research findings of the entire nation. The present study examines the status and determinants of maternal health care services combination in Bangladesh. This finding gives an indication for future development and provides a benchmark for future comparisons. There are some limitations of the study also. Firstly, for cross-sectional data it is difficult to establish a causal relationship. Beside this, sampling distribution varies across the regions. The variables selected as the components of the combination of MHCS bundle cannot be stated full-scale for entire maternal healthcare service utilization. Since there are some other factors like effective utilization ANC care, patient-provider's quality of communication, distance to health facility, patient's satisfaction, etc., were not involved in the service bundle. Furthermore, the definition of urban and rural regions has shifted with the speedy rise of urbanization in Bangladesh which potentially leads to urban-rural calculation discrepancies.

6. Conclusion

This study aimed at the investigation of factors associated with utilization of maternal health care services in Bangladesh and noted that the ideal utilization of maternal health care service influenced with the distinction of demographic and socioeconomic characteristics. The discoveries revealed that higher levels of education for women and their partner, being in urban area, go through caesarean section delivery, parity, consume vitamin A` at gestation period and rich wealth status, are associated with increased utilization of desirable maternal health care services. Therefore, to establish improved maternal health care service utilization, it is needed to implement policies and strategies, which target rural women with no education and lower income categories to enhance their present condition. Women health-care strategies that improves socioeconomic discrepancies and imbalances by initiating public awareness to access and utilize accessible healthcare facilities might decrease maternal mortality high rate in Bangladesh.

7. Conflicts of Interest

The authors declare no conflict of interest.

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