Investigating the role of women's education status and empowerment on accessing skilled birth attendance in Bangladesh: A structural equation modelling approach

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ABSTRACT

Background: The objective of this study was to investigate the associations between women's education and access to skilled birth attendant (SBA) services mediated by factors of women's empowerment and socio-demographic characteristics using a path analysis through a structural equation (SEM) modelling approach.
Methods: A sample of 4946 mothers from the most recent Bangladesh Demographic and Health Survey of 2017–18 was used in the SEM analysis. Accessing SBA service at childbirth was operationalized as utilizing SBA during last childbirth. After extracting the relevant variables and cleaning the original survey data, a subsample of 4,946 women were eligible for analysis in the current study.
Results: The SEM model revealed strong evidence of direct, indirect, and mediating effects of both education and empowerment of women in accessing SBA services. Educated women have more autonomy in decision making and are less susceptible to family violence and consequently are more likely to access SBA services during childbirth ($\beta = 0.094$, $p < 0.001$). In addition, age at first marriage, media exposure, husband's education, healthcare accessibility, decision marking, and household wealth index mediated the relationship between education and SBA service use.
Conclusion: Bangladesh, a country that needs to improve several societal and health indices to achieve the Sustainable Development Goals, need to prioritize women's education to increase accessibility to maternal healthcare services. Health education and mass-media-driven awareness may be potential interventions for LMICs to increase SBA coverage.

Introduction

The risk of a child dying during the first years of life remains a major health challenge for low- and middle-income countries (LMICs). Despite the recent reduction in maternal deaths globally, maternal mortality rates (MMR) remain high in some regions of the word, including Southeast Asia. The majority of global neonatal deaths occur in LMICs where access to quality health care is limited and often only accessible to the privileged (Lawn et al., 2005; Anon., UNICEF, 2014). Approximately three-quarters of maternal deaths occur from complications during labour, birth, and within the first 24 h postpartum (Khan et al., 2006) which can be reduced through access to skilled birth attendant (SBA) services at birth (Anon., WHO, 2013; Anon., World Health et al., 2004).

A plethora of studies examined the determinants of the use of SBA services and showed that sociodemographic disparities affect SBA use, specifically higher wealth, higher education, and urban residency can lead to a higher uptake of SBA services (Bhowmik et al., 2019; Gabrysch and Campbell, 2009; Moyer and Mustafa, 2013; Say and Raine, 2007; Thaddeus and Maine, 1994; Walker et al., 2021; Woldegiorgis et al., 2020). In addition, underfunded and unplanned public health systems and cultural norms can limit access to quality maternal health care services in LMICs (Bhowmik et al., 2019; Woldegiorgis et al., 2019; Zelalem Ayele et al., 2014).

Countries in South Asia have seen a 65 % decrease in the MMR between 1990 and 2013 with an average annual decline of 4.4 percent and the use of SBAs has increased from 36.2 % in 2000 to 49.8 % in 2010

(Anon., World Bank, 2017). However, this progress may not be sufficient for achieving United Nation's (UN) Sustainable Development Goal (SDG) 3.1, which specifies a reduction to 70 maternal deaths per 100 000 live births by 2030. Although the MMR in Bangladesh, a Southeast Asian nation, substantially declined by 69 %, from 574 deaths per 100 000 live births in 1990 to 176 in 2015 (Anon., World Bank Groupthe United Nations Population Division, 2015), the country remains well under the UN SDG 3.1 target.

Widespread utilization of SBA services remains low in Bangladesh, where just over half of all births are assisted by skilled attendants and the uptake of these service is much slower than in other countries in the region (Bhowmik et al., 2020). The most recent Bangladesh Demographic and Health Survey (BDHS) 2017–2018 reported that 47 % of women attended the WHO recommended four or more antenatal care (ANC) visits during their last pregnancy and 53 % of births were attended by a SBA (Anon., National Institute of Population et al., 2020). SBA services generally refer to health professionals, particularly doctors, nurses, and midwives, who are trained to provide health care to mothers and newborn babies prior to and during birth to manage normal births and diagnose, manage or refer obstetric complications (Kruk et al., 2008; Shimamoto and Gipson, 2015; Anon., WHO, 2015; Anon., World Health et al., 2004; Yanagisawa et al., 2006). Access to the health care system in Bangladesh is not equitable across the population. Physical and financial access to health services for marginalized women are limited and they have little opportunity to express personal opinion or empowerment in the family, and have almost no or a low level of health literacy (Bhalotra and Rawlings, 2011; Dupas, 2011; Matsuoka et al., 2010).

Gender equality and empowerment are identified as vital factors for women in improving their access to maternal health care services. Evidence indicates that gender equality and women having a voice in their households, and in their communities, are important predictors of the health of women and their newborns (Koblinsky et al., 2006; Muluneh et al., 2021; Shimamoto and Gipson, 2019; Tunçalp et al., 2014; Anon., WHO, 2015). Some studies evaluated different dimensions of women's empowerment and revealed effects of empowerment on the use of birth care services (Shimamoto and Gipson, 2015; Singh et al., 2011, 2015, 2012). A study on six LMICs in Southeast Asia revealed that women's empowerment and access to media were related to improved maternal health care (Sohn and Jung, 2019). Very few studies (Anik et al., 2021)

looked into the association between women's empowerment and access to maternal health care services; however, none assessed the associations using a pathway analysis taking into consideration other sociographic factors and possible mediation effects of potential covariates.

Considering the lack of literature on assessing how sociodemographic and women empowerment factors are inter-related and can have a combined impact on access to SBA services, the objective of this study is to conduct a path analysis using structural equation modelling (SEM) to investigate this complex and multidimensional phenomena.

Conceptual framework

There are a host of theories and models that have been used in examining the determinants of the use of health services and potential mediation effects of sociodemographic factors. There is a need to examine the complex and contextual connections between women's empowerment and maternal health, including the use of SBA services, which could be done using a framework that explicitly lays out potential mediating pathways, where distal factors like socioeconomic status may affect the use of SBAs. An integrated conceptual framework adopted from the Theory of Gender Stratification (Blumberg, 1984; Collins et al., 1993; Shimamoto and Gipson, 2019) was used to investigate social determinants of women's competence to seek SBA services which impact health outcomes. The model presented in Fig. 1 suggests that women's education impacts empowerment mediating demographic factors and affects use of SBA services (Shimamoto and Gipson, 2015). The employed framework considers potential confounding effects of sociodemographic characteristics in assessing SBA (Thaddeus and Maine, 1994).

Methods

Data overview

This study used data from the Bangladesh Demographic and Health Survey (BDHS) 2017–18. A two-stage stratified sampling method was used to collect nationally representative data. The sampling frame of the study was set up based on the Population and Housing Census of 2011 (Anon., National Institute of Population et al., 2020). In the first stage, enumeration areas (EAs), the primary sampling unit, were extracted
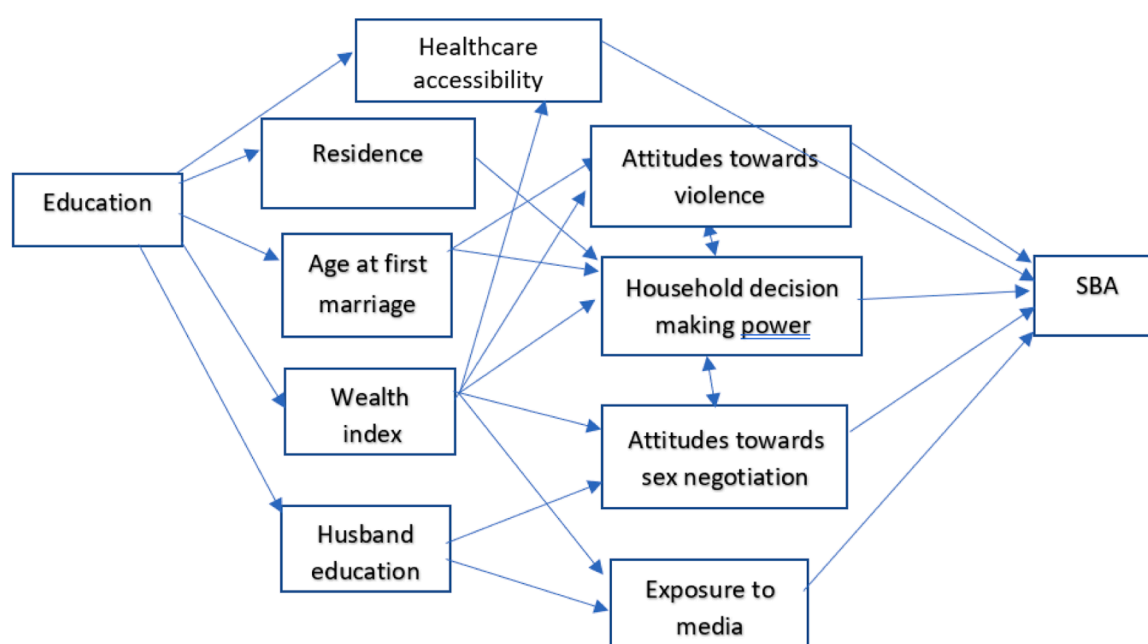

Fig. 1. Conceptual framework of the inter-relationships among key indicators of skilled birth attendance in Bangladesh.

from the census information. EAs are based on the lowest administrative areas of Bangladesh: Mahallas (urban) or Mouzas (rural), comprising 120 households on average. A total of 675 EAs (250 from urban and 425 from rural) were sampled using probability proportional to EA size. In the second stage, a systematic sampling of 30 households on average per EA were selected. These stages resulted in a sample of 19,457 households and multiple questionnaires were used for data collection. The BDHS women's questionnaire was used to interview 20,127 women aged between 15 and 49 years with a response rate of 98.8 % (Anon., National Institute of Population et al., 2020). After extracting the relevant variables with listwise deletion, a subsample of 4946 women were eligible for analysis in the current study. It was assumed data is missing at random and therefore the listwise deletion method was used to exclude women from the study.

The BDHS 2017–2018 was approved by the International Institutional Review Boards at ICF and the Bangladesh Medical Research Council. The BDHS conformed to international ethical standards of confidentiality, anonymity and informed consent (Anon., National Institute of Population et al., 2020). Permission for this project was provided by the Demographic and Health Surveys (DHS) Program authority and the secondary data sets were obtained from the MEASURE DHS Archive.

Variables

In this study, the primary outcome of interest was SBA use, with female education as the main predictor variable. Other sociodemographic factors, such as wealth index, husband's education, age at first marriage, residence, decision-making, attitudes towards violence, attitudes towards sex, exposure to media, and healthcare accessibility, were considered mediating variables. SBA use was recoded as binary according to the WHO definition (Anon., World Health et al., 2004). In grouping the service providers into skilled and other providers, we followed Bangladesh's DHS 2017–18 report as well as DHS VI standard recode manual (Rutstein and Johnson, 2004). In Bangladesh, qualified doctors, nurses, midwives, paramedics, family welfare visitors (FWV), medical assistants (MA) and sub-assistant community medical officers (SACMO) are considered as SBAs (Gamage et al., 2022).

Household decision-making power was accessed as a latent construct based on four questions: "Person who usually decides on respondent's health care", "Person who usually decides on large household purchases", "Person who usually decides on visits to family or relatives " and "Person who usually decides what to do with money husband earns", and each question was recorded on a 1–6 scale: 1-Respondent alone, 2-Respondent and husband/partner, 3-Respondent and other person, 4-Husband/partner alone, 5-Someone else, 6-Other.

Attitudes towards violence were accessed as a latent construct based on five questions: "Beating justified if the wife goes out without telling husband", "Beating justified if wife neglects the children", "Beating justified if wife argues with husband", "Beating justified if wife refuses to have sex with husband", and "Beating justified if wife burns the food", and each question was recorded as binary; 1=yes and 0=no. Attitudes towards sex negotiation were also assessed as a latent construct based on two questions: "Respondent can refuse sex", "Respondent can ask partner to use a condom" and each question was recorded as binary; 1=yes and 0=no.

The latent construct, Healthcare accessibility based on three questions: "Distance to a health facility", "Getting money for treatment, and "Not wanting to go alone.", and each question was recorded as; 0=no problem and 1= big problem and 2= not a big problem

Based on previous literature and pre-analysis, the following sociodemographic variables were included in the SEM model, age, age at first marriage, husband's education, mobile ownership, residence (urban, rural), wealth index (poorest, poorest, middle, richer, richest), working status of women (yes, no) (Fig. 2).

Statistical analysis

Initially, a bivariate analysis was conducted where SBA use was tabulated across sociodemographic factors including women's education, wealth index, husband's education, women's age, working status, residence, and mobile phone ownership. These unweighted associations were tested using Chi-square tests. Following that, a SEM was employed to evaluate the compound associations between education and SBA use by adopting mediation analysis. SEM is a technique used to describe linear relationships among measured or latent variables (MacCallum and Austin, 2000), which allows the testing of a number of inter-relationships simultaneously, including mediational effects
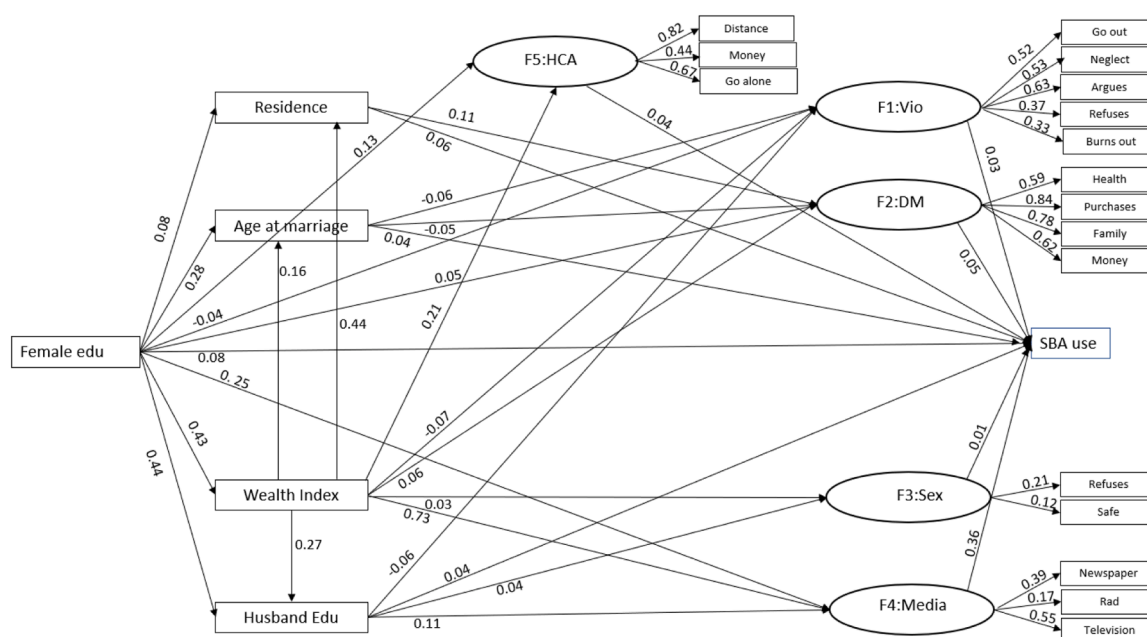

Fig. 2. Final SEM model on women's education status and empowerment to SBA use with all latent variables. *F1: Vio-* Attitude towards violence, *F2: DM-* Household decision making, *F3: Sex neg-* Attitude towards sex negotiation, *F4: Media-* Exposure to media and *F5: HCA-*Healthcare accessibility.

(Morrison et al., 2017). Required descriptive analyses on the items and factors analyses were conducted before fitting SEM. Exploratory factor analysis (EFA) identified the number of factors/latent constructs and the underlying dimension of empowerment. Consequently, a five factor confirmatory factor analysis (CFA) examined the appropriateness and generalizability of the measurement portion of the SEM through the examination of the fit statistics (Kline, 2015).

The model was developed based on the inspection of standardized residuals, modification indices, and guided by past research, the final model was derived by an iterative process of adding pathways and removal of variables and the model fit was assessed using recommended model fit indices, including root mean square error of approximation (RMSEA) < 0.08 and a comparative fit index (CFI) and Tucker-Lewis index (TLI) with > 0.95 (Hu and Bentler, 1999). All data compilations and analyses were conducted in *R* (Version 4.2.1) and *AMOS* (Version 28).

Results

Data were extracted from the BDHS 2017–18 survey for women aged between 15 and 49 years. The mean age of women was 24.96 (SD=5.56) years with a median age of 24 years. Almost half of the women in the study (48 %) had a secondary education, while approximately one-third (33.8 %) had either no or primary education. Most of the women (65.6 %) resided in rural areas. Nearly half (46.1 %) of the sampled respondents did not use SBA services. The detailed breakdown of sociodemographic factors is given in Appendix 1 in the supplementary document.

Table 1 presents bivariate association between SBA use and potential sociodemographic factors. Several Chi-square tests of independence were performed to examine the relations between SBA use and socio-demographic variables. Strong bivariate association between SBA use and sociodemographic factors such as female education (X^2 (3)= 611.97, $p < 0.001$), wealth index (X^2 (4)= 762.70, $p < 0.001$), residence (X^2 (1)= 189.55, $p < 0.001$), husband's education (X^2 (3)= 560.55, $p < 0.001$) currently working (X^2 (1)= 91.37, $p < 0.001$) and mobile ownership (X^2 (1)= 117.55, $p < 0.001$) were observed.

A CFA revealed that the five latent constructs; household decision-making, attitudes towards violence, attitudes toward sex negotiation, exposure to media and healthcare accessibility are clearly distinct (Table 2). These five factors were shown to be correlated and their correlations are <0.25 ($p < 0.05$), which suggests that each factor is distinct. The CFA results, including fit statistics, support the appropriateness of the SEM ($\chi^2(108) = 6.20$, TLI=0.94, CFI=0.96, RMSEA=0.03). The factor loadings are presented in Table 2.

In the SEM, all the socio-demographic variables were included as mediators and paths based on previous research and the support of the modification indices. Variables that were not contributing to SBA use in the model were removed. The final SEM model and the standardized path coefficients are given in Fig. 2. The model had a reasonable fit ($\chi^2(204) = 9.18$, TLI=0.93, CFI=0.93, RMSEA=0.04).

As shown in Fig. 2, the relationship between female education (primary predictor) and SBA (primary outcome) use is partially mediated via several variables, residence, husband's education, age at first marriage, and the constructs of media exposure, acceptance of violence, sex negotiation and decision-making and healthcare accessibility. The direct and indirect effects of women's education on SBA use are given in Table 3. Female education ($\beta = 0.098$), residence ($\beta = 0.058$), age at first marriage ($\beta = 0.040$), husband's education ($\beta = 0.039$), and healthcare accessibility ($\beta = 0.036$) all had small direct positive effects on SBA use, while media exposure ($\beta = 0.347$) had a moderate direct positive effect on SBA use, suggesting that each of these factors contributes directly to an increase in SBA use, with media exposure being the most influential and significant among them. However, female education had a moderate positive effect on the medicating factors, wealth index ($\beta = 0.424$), age at first marriage ($\beta = 0.277$), husband education ($\beta = 0.438$), media ($\beta = 0.249$), healthcare accessibility ($\beta = 0.128$) and sex negotiation ($\beta = 0.208$), suggesting these factors are mediating the relationship between female education and SBA use (Fig. 2 and Tabe3). For each additional year of female education, the age at first marriage increases by 0.979

Table 1
Bi-variate association (unweighted) between SBA use and the selected sociodemographic factors ($n = 4946$).

Variable		SBA Use		
		No	Yes	p-value
Female education (n,%)	None	219 (9.6)	85 (3.2)	$p < 0.001$
	Primary	896 (39.3)	474 (17.8)	
	Secondary	1015 (44.5)	1357 (50.9)	
	Higher	150 (6.6)	750 (28.1)	
Wealth index (n,%)	Poorest	766 (33.6)	300 (11.3)	$p < 0.001$
	Poorer	591 (25.9)	407 (15.3	
	Middle	409 (17.9)	482 (18.1)	
	Rich	352 (15.4)	628 (23.6)	
	Richest	162 (7.1)	849 (31.8)	
Husband education (n,%)	None	471 (20.6)	221 (8.3)	$p < 0.001$
	Primary	963 (42.2)	694 (26.0)	
	Secondary	677 (29.7)	958 (35.9)	
	Higher	169 (7.4)	793 (29.7)	
Currently working(n,%)	No	1266 (55.5)	1832 (68.7)	$p < 0.001$
	Yes	1014 (44.5)	834 (31.3)	
Residence(n,%)	Urban	554 (24.3)	1145 (42.9)	$p < 0.001$
	Rural	1726 (75.7)	1521 (57.1)	
Mobile ownership(n,%)	No	1105 (48.5)	799 (30.0)	$p < 0.001$
	Yes	1175 (51.5)	1867 (70)	
Age (M, SD)		25.14 (5.64)	24.81 (5.64)	$p < 0.001$
Age at first marriage (M, SD)		17.82 (2.66)	19.30 (3.55)	$p < 0.001$

Table 2
Results obtained from factors analysis for the indicators of empowerment and healthcare accessibility.

Latent construct	Questions asked in the survey	Factor Loading
Household decision making	Person who usually decides on respondent's health care	0.59
	Person who usually decides on large household purchases	0.84
	Person who usually decides on visits to family or relatives	0.78
	Person who usually decides what to do with money husband earns	0.62
Attitudes towards violence	Beating justified if wife goes out without telling husband	0.52
	Beating justified if wife neglects the children	0.53
	Beating justified if wife argues with husband	0.63
	Beating justified if wife refuses to have sex with husband	0.37
	Beating justified if wife burns the food	0.33
Attitudes towards sex	Respondent can refuse sex	0.18
	Respondent can ask partner to use a condom	0.37
Exposed to media	Frequency of reading newspaper or magazine	0.38
	Frequency of listening to radio	0.22
	Frequency of watching television	0.46
Healthcare accessibility	Distance to a health facility.	0.83
	Getting money for treatment	0.43
	Not wanting to go alone	0.67

Table 3
Path coefficients in the SEM model.

Predictor variable	Response variable	Unstandardised coefficients	S.E.	P
Age at first marriage	Violence	−0.003	0.001	<0.001
Age at first marriage	Decision making	−0.013	0.004	0.001
Age at first marriage	SBA use	0.006	0.002	0.008
Decision making	SBA use	−0.008	0.011	0.049
Female education	Wealth index	0.755	0.023	<0.001
Female education	Age at first marriage	0.979	0.051	<0.001
Female education	Residence	0.047	0.008	<0.001
Female education	Husband education	0.544	0.016	<0.001
Female education	Media	0.052	0.005	<0.001
Female education	Violence	0.008	0.004	0.054
Female education	Decision making	0.041	0.014	0.004
Female education	Healthcare accessibility	0.034	0.005	<0.001
Female education	Sex negotiation	0.041	0.007	<0.001
Female education	SBA use	0.052	0.013	<0.001
Healthcare accessibility	SBA use	0.083	0.035	0.018
Husband education	Violence	−0.008	0.003	0.014
Husband education	Media	0.018	0.004	<0.001
Husband education	SBA use	0.019	0.009	0.033
Media	SBA use	0.986	0.077	<0.001
Residence	Decision making	0.160	0.024	<0.001
Residence	SBA use	0.057	0.015	<0.001
Sex negotiation	SBA use	0.060	0.086	0.483
Violence	SBA use	−0.019	0.055	0.730
Wealth index	Residence	−0.145	0.005	<0.001
Wealth index	Husband education	0.188	0.009	<0.001
Wealth index	Age at first marriage	0.334	0.029	<0.001
Wealth index	Violence	−0.007	0.002	0.002
Wealth index	Decision making	0.028	0.009	0.001
Wealth index	Sex negotiation	0.005	0.004	0.141
Wealth index	Media	0.086	0.004	<0.001
Wealth index	Healthcare accessibility	0.033	0.003	<0.001

Violence: Attitude towards violence, Decision making: Household decision making, Sex Negotiation: Attitude towards sex negotiation and Media- Exposure to media.

years. Additionally, for each year increase in the age at first marriage, SBA use increase by 0.06 % (exp(0.006) ≈ 1.006). This indicates a slight increase in the odds of SBA use with increasing age at first marriage (Table 3).

Discussion

This study investigated the compound framework through which women's education status and empowerment affect the use of SBA services during childbirth in Bangladesh using the latest nationally representative survey from 2017 to 18. The findings demonstrated strong evidence of direct, indirect, and mediating effects of women's education status and empowerment on SBA service use. The results corroborate the multidimensional and contextual nature of women's empowerment and its relationship with maternal health services previously reported in

studies in other geographical areas (Moyer and Mustafa, 2013; Shimamoto and Gipson, 2017, 2019; Woldegiorgis et al., 2020). Consistent with the previous research, the relationship between the latent construct of sex negotiation and attitude toward violence was not directly related to SBA use (K. Shimamoto and Gipson, 2017).

Several important findings arise from this study. The study found a direct significant positive impact of women's education, exposure to media, residence, and husband's education on the use of SBA services. These findings support the argument made in previous studies that women's education and sociodemographic factors are significant predictors of SBA use (Shimamoto and Gipson, 2017, 2019; Walker et al., 2021; Woldegiorgis et al., 2020). As expected, education is a key driver of maternal services utilization as educated women are expected to be more concerned about their health and their newborn child as compared to their uneducated counterparts (Amwonya et al., 2022; Yadav et al., 2021). Education was found to be significantly associated with the wealth index, which has an indirect effect on SBA service use through its mediation effect by women's decision-making power. That means SBA service use was partly driven by the wealth index, and women's empowerment, consistent with past studies (Dickson et al., 2021; Kwagala et al., 2016).

As hypothesized in the conceptual framework, the effects of education on birth care use were mediated through women's exposure to media and decision-making power. The positive impact of exposure to media and household decision-making power on SBA service use are in line with the existing global evidence (Bhowmik et al., 2020, 2019; Dickson, 2021; Dickson et al., 2021; Rizkianti et al., 2020; Singh et al., 2021). Previous studies investigated how the direct and indirect pathways of women's empowerment impact on the use of SBA service (Shimamoto and Gipson, 2015); however, this study has revealed that exposure to media is an independent significant mediator of SBA service use. These suggest a potential causal pathway on how education can influence increased exposure to media and empower women, which then subsequently influences SBA service use. This provides evidence of the far reaching benefits of investing in women's education which empowers household decision-making and potentially has an indirect effect on increased access to maternal health services (Bhowmik et al., 2020; Mason et al., 2014; Shimamoto and Gipson, 2017, 2019). Household decision-making power, especially related to health care, is a complex issue in LMICs where resources are limited and there are many social constraints related to women's empowerment which have been addressed by others (Koblinsky et al., 2006; Shimamoto and Gipson, 2019).

In-line with the literature, age at first marriage was found to be significantly associated with SBA service use. The indirect effect of education on SBA service use through age at first marriage guaranteed the importance of women's education for improving women's health by reducing early marriage through women's empowerment (Biswas et al., 2019; Mason et al., 2014; Requejo et al., 2015; Shimamoto and Gipson, 2017, 2019). The findings on the direct and indirect effect of age at first marriage on SBA service use are supported by the evidence of the critical influence of early marriage on women's empowerment and reproductive health care (Abera et al., 2020; Bliznashka et al., 2021; Raj et al., 2014; Shimamoto and Gipson, 2019). Therefore, the complex association between women's education and SBA service use was mediated by the age at which women are getting married, which revealed the inter-relations of social policies with health outcomes. In this study, healthcare accessibility is identified as a significant factor for women in accessing SBA services, consistent with findings from previous research (Dotse-G-borgbortsi et al., 2020; Fisseha et al., 2017; Nesbitt et al., 2016).

In the dynamic social settings of LMICs including Bangladesh, it is necessary to gather evidence through research to empower women and to achieve broader goals including the SDGs on gender equality and women's empowerment (Mason et al., 2014; Requejo et al., 2015; Shimamoto and Gipson, 2019). The direct and indirect effect of education, age at first marriage, residence, healthcare accessibility, exposure to

media and husband's education on SBA service use outline the complex mechanisms of various sociodemographic factors on reproductive and maternal health care. In summary, this study's findings support previous studies examining the influences of sociodemographic characteristics on SBA service use. Bangladesh, a country that needs to improve on many societal and health indices if they are to achieve the SDGs by 2030, could focus on educating women, particularly in higher education, as important strategy for reducing inequality in healthcare (Bhowmik et al., 2020).

The study has some limitations. Firstly, as the data were cross-sectional, the study could only reflect on the association of the factors, effects should not be interpreted as causal. Secondly, the representativeness of the study sample and generalizability of the findings are limited due to the selection of only currently married women. The omission of younger adolescents in the survey is a significant gap. Thirdly, the measurement of empowerment was informed by the selected items available in the DHS and not based on a unified index. Finally, some qualitative data based on women's reasons on why they did or did not access SBA services, may have provided further insight on potential local interventions.

Findings from this study affirm the importance of women's education and the multi-dimensionality of empowerment and its mediating role in the complex structure leading to the use of SBA services. The study demonstrated the direct and indirect influences of both sociodemographic characteristics and women's empowerment dimensions on the use of SBA in Bangladesh. The findings confirm the need to evaluate critical intervening factors that influence reproductive and maternal health service use and subsequent outcomes. For the purpose of reducing MMR across Bangladesh, greater investment in women's education, healthcare accessibility and providing pathways to empower them could lead to increased use of SBA.

Ethical approval

This article does not contain any studies with human participants that was conducted by any of the authors. Data used in the research was obtained from the MEASURE Evaluation, funded by the United States Agency for International Development (USAID). All respondents were de-identified before publishing the data. Views expressed in this study do not necessarily reflect those of USAID, the US government, or MEASURE Evaluation. The secondary datasets analyzed in the current study are freely available upon request from the DHS website (https://dhsprogram.com/data/available-datasets.cfm). The authors obtained permission for this project from the Demographic and Health Survey (DHS) program authority.

Data sharing statement

This study used existing datasets from the Demographic and Health Survey (DHS) Program. Data are accessible free of charge on registration with the DHS Program from the following DHS website: https://dhsprogram.com/data/available-datasets.cfm.

CRediT authorship contribution statement

Jahar Bhowmik: Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing. **Pragalathan Apputhurai:** Formal analysis, Resources, Software, Visualization, Writing – review & editing. **Joanne Williams:** Investigation, Validation, Writing – review & editing. **Raaj Kishore Biswas:** Conceptualization, Data curation, Formal analysis, Resources, Software, Visualization, Writing – review & editing.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.midw.2024.104140.

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