

Bridging the Gaps: Uncovering the Reasons Behind Maternal Care Dropout in Bangladesh

Syeda Saima Alam, Plabon Sarkar, M. A. Rifat, Sumaiya Jahan, Rokibul Islam, Israt Jahan, Sanjib Saha

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Abstract

Background: Utilization of the maternal continuum of care (CoC)—comprising antenatal, delivery, and postnatal services—is critical for ensuring healthy pregnancy outcomes. Despite these benefits, maternal retention along the CoC remains suboptimal in Bangladesh.

Objective: This study quantifies maternal dropouts at each stage of the CoC and identifies factors associated with these discontinuities, using nationally representative data.

Methods: Data were drawn from the Bangladesh Demographic and Health Surveys (BDHS) 2017–18 and 2022. Women were considered to have completed the full maternal CoC if they received at least four antenatal care (ANC) visits, delivered with a skilled birth attendant (SBA), and obtained at least one postnatal care (PNC) contact within 48 hours of delivery. Potential determinants were identified using Andersen's behavioral model for healthcare utilization. Multivariable logistic regression was applied to assess factors associated with CoC dropout and presented as adjusted odds ratio (aOR).

Results: Among 8,424 mothers, 27.9% failed to complete all components of the maternal CoC. Dropout was most pronounced at the ANC stage (55.7%), followed by PNC (47.2%) and SBA-assisted delivery (40.2%). Key factors significantly associated with higher odds of dropout included lower maternal education (aOR 2.70, 95% CI: 1.94–3.77), higher parity (aOR 2.73, 95% CI: 2.12–3.50), being in lower wealth quintiles (aOR 4.04, 95% CI: 3.02–5.41), and rural residence (aOR 1.40, 95% CI: 1.18–1.67). Lower odds of dropout were found for older women at delivery (aOR 0.56, 95% CI: 0.42–0.74) compared to younger women (less than 19 years at delivery) and a history of ever-terminated pregnancy (aOR 0.74, 95% CI: 0.63–0.86). Other significant predictors included media exposure, pregnancy intention, and religious affiliation.

Conclusions: Maternal, socioeconomic, and contextual factors are associated with discontinuity along the maternal healthcare continuum in Bangladesh. Tailored policy interventions addressing these determinants are essential to improve maternal healthcare retention and achieve better maternal and child health outcomes.

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Original Manuscript

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Abstract

Background:

Utilization of the maternal continuum of care (CoC)—comprising antenatal, delivery, and postnatal services—is critical for ensuring healthy pregnancy outcomes. Despite these benefits, maternal retention along the CoC remains suboptimal in Bangladesh. This study quantifies maternal dropouts at each stage of the CoC and identifies factors associated with these discontinuities, using nationally representative data.

Methods:

Data were drawn from the Bangladesh Demographic and Health Surveys (BDHS) 2017–18 and 2022. Women were considered to have completed the full maternal CoC if they received at least four antenatal care (ANC) visits, delivered with a skilled birth attendant (SBA), and obtained at least one postnatal care (PNC) contact within 48 hours of delivery. Potential determinants were identified using Andersen's behavioral model for healthcare utilization. Multivariable logistic regression was applied to assess factors associated with CoC dropout and presented as adjusted odds ratio (aOR).

Results:

Among 8,424 mothers, 27.9% failed to complete all components of the maternal CoC. Dropout was most pronounced at the ANC stage (55.7%), followed by PNC (47.2%) and SBA-assisted delivery (40.2%). Key factors significantly associated with higher odds of dropout included lower maternal education (aOR 2.70, 95% CI: 1.94–3.77), higher parity (aOR 2.73, 95% CI: 2.12–3.50), being in lower wealth quintiles (aOR 4.04, 95% CI: 3.02–5.41), and rural residence (aOR 1.40, 95% CI: 1.18–1.67). Lower odds of dropout were found for older women at delivery (aOR 0.56, 95% CI: 0.42–0.74) compared to younger women (less than 19 years at delivery) and a history of ever-terminated pregnancy (aOR 0.74, 95% CI: 0.63–0.86). Other significant predictors included media exposure, pregnancy intention, and religious affiliation.

Conclusion:

Maternal, socioeconomic, and contextual factors are associated with discontinuity along the maternal healthcare continuum in Bangladesh. Tailored policy interventions addressing these determinants are essential to improve maternal healthcare retention and achieve better maternal and child health outcomes.

Keywords: Maternal dropout; Continuum of Care; Antenatal Care; Skilled Birth Attendants; Postnatal Care; Demographic and Health Survey; Bangladesh

Background:

The maternal Continuum of Care (CoC) consists of four or more Antenatal Care (ANC) visits, childbirth by a Skilled Birth Attendant (SBA), and a Postnatal Care (PNC) visit by skilled healthcare providers within 48 hours of delivery (Atnafu et al., 2020). When a woman and child pair fulfills all three criteria, they are considered to have attained a complete CoC (Atnafu et al., 2020). The CoC encompasses integrated service delivery for mothers and children, ensuring that women have access to quality care throughout pregnancy, childbirth, and the postpartum period (WHO, 2016a). It is critical for improved health outcomes, efficient and effective delivery of nutritional interventions, increased service utilization, and addressing underlying factors (Saito & Kondo, 2024).

Completion of CoC demonstrates a marked reduction in undernutrition indicators, for example, stunting, wasting, and underweight among children alongside decline in maternal and child mortality rates (Saito & Kondo, 2024; Zelka et al., 2023). Empirical research indicates that adequate continuity of care can avert half a million maternal fatalities, four million neonatal fatalities, and six million pediatric fatalities worldwide (Kerber et al., 2007; Tinker et al., 2005; WHO, 2005). Consequently, withdrawal from the CoC signifies noncompliance with prescribed maternal care measures. (Sserwanja et al., 2022).

In Bangladesh, around 53% of pregnant women drop out from receiving four or more ANC visits, 47% of the childbirth are not supported by SBA, and 48% of women do not receive PNC visits within two days after the delivery (NIPORT & ICF, 2020). The dropouts of women and children from the CoC can severely impact maternal and child nutrition. For instance, lower ANC and PNC visits result in poor infant and young child feeding practices that increase the risk of malnutrition and impaired cognitive development, which may result in long-term adverse educational and economic outcomes for children (Parvin et al., 2022). In addition, insufficient ANC visits and nutrition counseling can lead to maternal malnutrition such as anemia and pregnancy complications, while lack of SBA during delivery and PNC visits might pose a risk to maternal mortality and poor reproductive health (Parvin et al., 2022). Considering the significance of the CoC components, these are being evaluated for consistency to safeguard the survival and welfare of both mother and

newborn. This, in turn, may serve as a crucial strategy for achieving the Sustainable Development Goals' target of maternal mortality ratio under 70 per 100,000 live births and a neonatal mortality rate under 12 per 1,000 live births by 2030 (Kerber et al., 2007; Parvin et al., 2022).

The CoC is fundamental for improving maternal and child nutrition outcomes, as discontinuity in one service often leads to disruption across others. For instance, evidence from Bangladesh shows that women discontinuing ANC are more likely to also forgo SBA and PNC (Parvin et al., 2022; Rahman et al., 2021). Understanding the multifaceted determinants of dropout across both individual and combined elements of the CoC is vital for developing holistic and effective interventions. Key factors—such as maternal age, socioeconomic status, education level, place of residence, religion, parity, and occupation—play significant roles in influencing both adherence to and gaps within the continuum, impacting the success of maternal and child nutrition efforts (Muluneh et al., 2020; Parvin et al., 2022). Robust identification and analysis of these determinants are essential for designing targeted and comprehensive services that can address barriers, ensure service continuity, and ultimately support improved health and nutrition for mothers and children in Bangladesh.

This study aims to comprehensively quantify maternal dropouts at each stage of the CoC and from overall CoC and to identify the factors associated with these discontinuities, utilizing nationally representative data from Bangladesh. By exploring where and why women disengage from critical services, the research provides crucial insights into gaps that undermine maternal and child health outcomes. The findings from this study will help inform targeted strategies and policy interventions to reduce dropouts, improve service uptake, and ultimately contribute to achieving maternal and child health goals nationwide.

Methods

Study design, data sources, and sampling

This study used data from BDHS 2017–18 and BDHS 2022 to determine how CoC utilization and its covariates have changed over time. Both surveys are nationally representative, cross-sectional in design, and employed two-stage stratified random sampling. The overall response rate for both surveys was 98%. The detailed methods are outlined elsewhere (NIPORT & ICF, 2020, 2023).

A total of 8,424 ever-married women aged 15–49 years who had a live birth within the last three and two years prior to the surveys, respectively, for BDHS 2017–18 and BDHS 2022, were retrieved. However, the study only analyzed samples with complete information regarding maternal utilization

of CoC and coupled with respective covariates. The sample selection process for this study is illustrated in [Figure 1](#).

Conceptual model

This study employed Andersen's Behavioral Model of Healthcare Services to systematically identify factors influencing the utilization of CoC services (Andersen, 1995; Kabir, 2021). The Andersen model is a widely used conceptual framework for understanding healthcare utilization, positing that service use is shaped by three key domains: predisposing, enabling, and need factors. Predisposing factors refer to demographic and social characteristics such as age, gender, education, and health beliefs that influence an individual's inclination to seek care. Enabling factors encompass the means and resources that facilitate or hinder access to services, including household wealth, community resources, and healthcare availability. Need factors include both perceived and evaluated health status, reflecting the actual or subjective necessity for medical attention. In this study, the categorization and definitions of analytical variables closely followed the schema set out by (Kabir, 2021) ensuring conceptual alignment. Figure 2 below illustrates the interplay between these domains as described in Andersen's Behavioral Model, highlighting how combinations of predisposing, enabling, and need factors drive the utilization of CoC services and ultimately influence maternal and child health outcomes.

Outcome variable

The outcome variable is maternal dropout from CoC, which consists of dropping out from three integral components, which are 1) at least four antenatal care (ANC) visits by skilled care providers during pregnancy, 2) delivery assisted by skilled birth attendants (SBA), and 3) at least one postnatal care (PNC) visit by skilled care providers within 48 hours of delivery (Rahman et al., 2021). The skilled care providers in this aspect are designated as doctors, nurses, midwives, paramedics, community skilled birth attendants, and sub-assistant community medical officers. A mother was considered dropped out from the full CoC if she had not received any of these components. The mothers were assigned code 1 if they received all three components of the CoC, otherwise 0. Similarly, mothers who utilized any specific component of the CoC were assigned a code 1, otherwise 0, and analyzed separately.

Covariates

We considered covariates, including age at delivery (< 19 years, 19-30 years, 31-49 years), education level (no education, primary, secondary, and higher), husband's education level (no education, primary, secondary, and higher), occupation (not working, working), husband's occupation (not working, working), parity (1, 2-3, > 3), ever terminated pregnancy (never/no, ever/yes), desired pregnancy (yes, no), wealth index (poorest, poorer, middle, richer, richest), any exposure to television, radio, or news (yes, no), facing problems such as getting permission and money and long

distance to access healthcare (big problem, not a big problem), religion (Muslim, other), place of residence (rural, urban), division of residence (Barisal, Chittagong, Dhaka, Khulna, Mymensingh, Rajshahi, Rangpur, Sylhet), and survey round (BDHS 2017-18, BDHS 2022). These covariates were categorized based on how they align with the Anderson's behavioral model ([Figure 2](#)).

Statistical analysis

The distribution of covariates by maternal dropout from CoC was examined using cross-tabulations in a frequency distribution table, and the differences among four individual components were observed using the chi-square test.

The association between prevalence of dropout from maternal CoC and covariates was analyzed using logistic regression models. Four models were utilized based on the outcome variables, including dropout from 1) 4 ANC, 2) delivery assisted by SBA, 3) PNC within 48 hours of delivery, and 4) all CoC components. Given that the selection of variables was guided by a theoretical framework, Andersen's Behavioral Model of Health Services, no covariate was excluded in the multivariable models, irrespective of the level of significance of the association in the univariable models.

To ensure the accuracy of the estimates, the analyses were adjusted for sampling weight, strata, and primary sampling units. Standard errors (SEs) of the odds ratio and variance inflation factors (VIF) were observed to examine the multicollinearity. A standard error of the odds ratio > 2 was considered to indicate multicollinearity among the covariates (Mahfuzur et al., 2022). All the statistical tests were conducted considering $p < 0.05$ as the significance level. The software STATA 17 (StataCorp, College Station, Texas, USA) was used for data analysis.

Ethical considerations

The Demographic and Health Survey (DHS) received approval from the ICF Macro Institutional Review Board (USA), which complies with all the criteria of 45 CFR 46 'Protection of Human Subjects.' As the data were collected in Bangladesh, the BDHS was also reviewed and validated by the National Research Ethics Committee of the Bangladesh Medical Research Council (BMRC), Dhaka, Bangladesh. Before being enrolled in the study, verbal informed agreement was obtained from each participant and their intimate partners (all ever-married women aged 15–49 years old). If the respondents were incapable of reading, verbal consent was considered the most appropriate method to confirm participation.

Results

In this study, 8,424 mothers with complete information about outcome and covariates were analyzed. In the analyzed sample, maternal dropout from having ≥ 4 ANC, delivery assisted by SBA, PNC within 48 hours of delivery, and full CoC were 55.7%, 40.1%, 47.2%, and 27.9%, respectively (Figure 3).

The distribution of respondents based on their dropout status from ≥ 4 ANC, SBA-assisted delivery, and PNC within 48 hours of delivery, as well as all CoC components, demonstrated significant differences ($p < 0.05$) by several maternal characteristics, e.g., respondents' education level, husbands' education, parity, ever terminated pregnancy, desired pregnancy, wealth index, access to healthcare, religion, place of residence, and survey round. Table 1 demonstrates the difference in dropout from individual and all CoC components according to maternal characteristics.

Table 1: Distribution of the coverage of ≥ 4 ANC, PNC and delivery by SBA, and full CoC by maternal characteristics in Bangladesh

Covariates	Dropout from ≥ 4 ANC			Dropout from SBA			Dropout from PNC			Dropout from all CoC components		
	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value
Age at delivery												
< 19y	715 (56.1)	560 (43.9)	0.437	527 (41.3)	748 (58.7)	0.194	599 (46.9)	676 (53.0)	0.192	347 (27.2)	928 (72.8)	0.172
19-30y	3187 (54.1)	2703 (45.9)	0.437	2297 (39.0)	3593 (61.0)	0.194	2726 (46.3)	3164 (53.7)	0.192	1598 (27.1)	4292 (72.9)	0.172
31-49y	688 (54.7)	571 (45.4)	0.437	514 (40.8)	745 (59.2)	0.194	618 (49.1)	641 (50.9)	0.192	374 (29.7)	885 (70.3)	0.172

Covariates	Dropout from ≥ 4 ANC			Dropout from SBA			Dropout from PNC			Dropout from all CoC components		
	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value
Education level												
No education	366 (78.4)	101 (21.6)	0.000	311 (66.6)	156 (33.4)	0.000	331 (70.9)	136 (29.1)	0.000	254 (54.4)	213 (45.6)	0.000
Primary	1488 (68.6)	682 (31.4)	0.000	1275 (58.8)	895 (41.2)	0.000	1389 (64.0)	781 (36.0)	0.000	940 (43.3)	1230 (56.7)	0.000
Secondary	2235 (53.2)	1970 (46.9)	0.000	1542 (36.7)	2663 (63.3)	0.000	1846 (43.9)	2359 (56.1)	0.000	1005 (23.9)	3200 (76.1)	0.000
Higher	501 (31.7)	1081 (68.3)	0.000	210 (13.3)	1372 (86.7)	0.000	377 (23.8)	1205 (76.2)	0.000	120 (7.6)	1462 (92.4)	0.000
Husbands' education												
No education	848 (70.6)	353 (29.4)	0.000	730 (60.8)	471 (39.2)	0.000	811 (67.5)	390 (32.5)	0.000	563 (46.9)	638 (53.1)	0.000
Primary	1731 (64.8)	941 (35.2)	0.000	1383 (51.8)	1289 (48.2)	0.000	1527 (57.2)	1145 (42.9)	0.000	969 (36.3)	1703 (63.7)	0.000
Secondary	1469 (51.9)	1362 (48.1)	0.000	973 (34.4)	1858 (65.6)	0.000	1185 (41.9)	1646 (58.1)	0.000	643 (22.7)	2188 (77.3)	0.000
Higher	542 (31.5)	1178 (68.5)	0.000	252 (14.6)	1468 (85.4)	0.000	420 (24.4)	1300 (75.6)	0.000	144 (8.4)	1576 (91.6)	0.000
Occupation												
Not working	3072 (54.3)	2586 (45.7)	0.612	1948 (34.4)	3710 (65.6)	0.000	2462 (43.5)	3196 (56.5)	0.000	1403 (24.8)	4255 (75.2)	0.000
Working	1518 (54.9)	1248 (45.1)	0.612	1390 (50.3)	1376 (49.8)	0.000	1481 (53.5)	1285 (46.5)	0.000	916 (33.1)	1850 (66.9)	0.000
Husbands' occupation												
Not working	64 (53.8)	55 (46.2)	0.876	26 (21.9)	93 (78.2)	0.000	55 (46.2)	64 (53.8)	0.897	23 (19.3)	96 (80.7)	0.044
Working	4526 (54.5)	3779 (45.5)	0.876	3312 (39.9)	4993 (60.1)	0.000	3888 (46.8)	4417 (53.2)	0.897	2296 (27.6)	6009 (72.4)	0.044
Parity												
1	1554 (48.8)	1652 (51.5)	0.000	919 (28.7)	2287 (71.3)	0.000	1201 (37.5)	2005 (62.5)	0.000	593 (18.5)	2613 (81.5)	0.000
2-3	2368 (55.1)	1929 (44.9)	0.000	1821 (42.4)	2476 (57.6)	0.000	2110 (49.1)	2187 (50.9)	0.000	1253 (29.2)	3044 (70.8)	0.000
>3	668 (72.5)	253 (27.5)	0.000	598 (64.9)	323 (35.1)	0.000	632 (68.6)	289 (31.4)	0.000	473 (51.4)	448 (48.6)	0.000
Terminated Pregnancy												
No/never	3850 (55.4)	3101 (44.6)	0.000	2807 (40.4)	4144 (59.6)	0.002	3299 (47.5)	3652 (52.5)	0.009	1957 (28.2)	4994 (71.9)	0.005
Yes/ever	740 (50.2)	733 (49.8)	0.000	531 (36.1)	942 (64.0)	0.002	644 (43.7)	829 (56.3)	0.009	362 (24.6)	1111 (75.4)	0.005
Desired pregnancy												
Yes	3543 (53.0)	3146 (47.0)	0.000	2499 (37.4)	4190 (62.6)	0.000	2999 (44.8)	3690 (55.2)	0.000	1710 (25.6)	4979 (74.4)	0.000
No	1047 (60.3)	688 (39.7)	0.000	839 (48.4)	896 (51.6)	0.000	944 (54.4)	791 (45.6)	0.000	609 (35.1)	1126 (64.9)	0.000
Wealth index												
Poorest	1276 (71.7)	504 (28.3)	0.000	1160 (65.2)	620 (34.8)	0.000	1240 (69.7)	540 (30.3)	0.000	869 (48.8)	911 (51.2)	0.000
Poorer	1114 (64.8)	604 (35.2)	0.000	873 (50.8)	845 (49.2)	0.000	984 (57.3)	734 (42.7)	0.000	618 (36.0)	1100 (64.0)	0.000
Middle	901 (56.6)	692 (43.4)	0.000	608 (38.2)	985 (61.8)	0.000	729 (45.8)	864 (54.2)	0.000	396 (24.9)	1197 (75.1)	0.000
Richer	797 (47.9)	867 (52.1)	0.000	482 (29.0)	1182 (71.0)	0.000	620 (37.3)	1044 (62.7)	0.000	316 (19.0)	1348 (81.0)	0.000
Richest	502 (30.1)	1167 (69.9)	0.000	215 (12.9)	1454 (87.1)	0.000	370 (22.2)	1299 (77.8)	0.000	120 (7.2)	1549 (92.8)	0.000
Media exposure ^a												
No exposure	2266 (68.4)	1047 (31.6)	0.000	1764 (53.2)	1549 (46.7)	0.000	1976 (59.6)	1337 (40.4)	0.000	1350 (40.8)	1963 (59.3)	0.000
Any exposure	2324 (45.5)	2787 (54.5)	0.000	1574 (30.8)	3537 (69.2)	0.000	1967 (38.5)	3144 (61.5)	0.000	969 (19.0)	4142 (81.0)	0.000
Accessing healthcare ^β												
Not a big problem	1615 (46.1)	1892 (54.0)	0.000	1124 (32.1)	2383 (68.0)	0.000	1389 (39.6)	2118 (60.4)	0.000	722 (20.6)	2785 (79.4)	0.000
Big problem	2975 (60.5)	1942 (39.5)	0.000	2214 (45.0)	2703 (55.0)	0.000	2554 (51.9)	2363 (48.1)	0.000	1597 (32.5)	3320 (67.5)	0.000
Religion												
Muslim	4272 (55.3)	3456 (44.7)	0.000	3140 (40.6)	4588 (59.4)	0.000	3696 (47.83)	4032 (52.2)	0.000	2194 (28.4)	5534 (71.6)	0.000
Others	318 (45.7)	378 (54.3)	0.000	198 (28.5)	498 (71.6)	0.000	247 (35.49)	449 (64.5)	0.000	125 (18.0)	571 (82.0)	0.000
Residence												
Urban	1190 (42.0)	1643 (58.0)	0.000	766 (27.0)	2067 (73.0)	0.000	1007 (35.6)	1826 (64.5)	0.000	506 (17.9)	2327 (82.1)	0.000

Covariates	Dropout from ≥ 4 ANC			Dropout from SBA			Dropout from PNC			Dropout from all CoC components		
	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value	Yes, n (%)	No, n (%)	p-value
Rural	3400 (60.8)	2191 (39.2)	0.000	2572 (46.0)	3019 (54.0)	0.000	2936 (52.5)	2655 (47.5)	0.000	1813 (32.4)	3778 (67.6)	0.000
Division												
Barisal	554 (61.9)	341 (38.1)	0.000	384 (42.9)	511 (57.1)	0.000	446 (49.8)	449 (50.2)	0.000	304 (34.0)	591 (66.0)	0.000
Chittagong	824 (58.6)	582 (41.4)	0.000	574 (40.8)	832 (59.2)	0.000	666 (47.4)	740 (52.6)	0.000	433 (30.8)	973 (69.2)	0.000
Dhaka	621 (49.2)	641 (50.8)	0.000	401 (31.8)	861 (68.2)	0.000	530 (42.0)	732 (58.0)	0.000	280 (22.2)	982 (77.8)	0.000
Khulna	426 (47.0)	480 (53.0)	0.000	225 (24.8)	681 (75.2)	0.000	288 (31.8)	618 (68.2)	0.000	127 (14.0)	779 (86.0)	0.000
Mymensingh	537 (51.6)	504 (48.4)	0.000	515 (49.5)	526 (50.5)	0.000	579 (55.6)	462 (44.4)	0.000	322 (30.9)	719 (69.1)	0.000
Rajshahi	468 (53.3)	403 (46.3)	0.000	309 (35.5)	562 (64.5)	0.000	365 (41.9)	506 (58.1)	0.000	201 (23.1)	670 (76.9)	0.000
Rangpur	467 (48.5)	495 (51.5)	0.000	397 (41.3)	565 (58.7)	0.000	470 (48.9)	492 (51.1)	0.000	225 (23.4)	737 (76.6)	0.000
Sylhet	693 (64.1)	388 (35.9)	0.000	533 (49.3)	548 (50.7)	0.000	599 (55.4)	482 (44.6)	0.000	427 (39.5)	654 (60.5)	0.000
Survey round												
BDHS 2017-18	2541 (51.8)	2367 (48.2)	0.000	2290 (46.7)	2618 (53.3)	0.000	2309 (47.1)	2599 (53.0)	0.604	1544 (31.5)	3364 (68.5)	0.000
BDHS 2022	2049 (58.3)	1467 (41.7)	0.00	1048 (29.8)	2468 (70.2)	0.000	1634 (46.5)	1882 (53.5)	0.604	775 (22.0)	2741 (78.0)	0.000

^aMedia exposure: newspaper or television or radio; ^bProblem to access healthcare: permission to go or monetary constraints or distance to health facilities

Table 2 demonstrates the association of dropout from individual and all CoC components with maternal characteristics. Certain maternal characteristics demonstrated significant ($p < 0.05$) association in all logistic regression models, indicating these characteristics are significant factors in all maternal healthcare aspects. These characteristics include age at delivery, respondents' education, husbands' education, parity, ever-terminated pregnancy, desired pregnancy, wealth index, exposure to media, religion, and residence.

Lower educational levels (both respondents and their husbands'), occupation of the respondents, higher parity, those whose pregnancy was not desired, poor economic status, lack of media exposure, Muslim religion, and residence in rural areas were more likely to drop out from antenatal care (ANC). Likewise, high dropout from SBA and PNC was observed among lower educational levels (both respondents and their husbands), high parity, those whose pregnancy was not desired, poor economic status, lack of media exposure, Muslim religion, and rural residence. Furthermore, factors associated with high dropout from the CoC include lower maternal (aOR 2.70; 95% CI (1.94, 3.77), $p = 0.000$) and husband education levels (aOR 2.09; 95% CI (1.59, 2.76), $p = 0.000$), higher parity (aOR 2.73; 95% CI (2.12, 3.50), $p = 0.000$), poor economic status (aOR 4.04; 95% CI (3.02, 5.41), $p = 0.000$), lack of media exposure (aOR 1.58; 95% CI (1.38, 1.82), $p = 0.000$), those whose pregnancy was not desired (aOR 1.27; 95% CI (1.09, 1.48), $p = 0.002$), rural residence (aOR 1.40; 95% CI (1.18, 1.67), $p = 0.000$), and Muslim religion (aOR 1.78; 95% CI (1.33, 2.38), $p = 0.000$). Respondents of the BDHS 2022 survey demonstrate greater odds of discontinuing ANC and a reduction in the likelihood of dropout from CoC than those of BDHS 2017-18 (Table 2).

Table 2: Factors associated with dropout from maternal continuum of care

Covariates	Model 1: Dropout from ANC		Model 2: Dropout from SBA delivery		Model 3: Dropout from PNC		Model 4: Dropout from all CoC components	
	AOR (95% CI)	P value	AOR (95% CI)	P value	AOR (95% CI)	P value	AOR (95% CI)	p value
Age at delivery								
< 19y	ref		ref		ref		ref	
19-30y	0.92 (0.78, 1.09)	0.362	0.74 (0.62, 0.89)	0.001	0.84 (0.72, 0.99)	0.042	0.75 (0.62, 0.91)	0.004
31-49y	0.78 (0.61, 0.99)	0.045	0.53 (0.41, 0.69)	0.000	0.67 (0.54, 0.84)	0.001	0.56 (0.42, 0.74)	0.000
Education level								
Higher	ref		ref		ref		ref	
Secondary	1.25 (1.04, 1.49)	0.014	1.58 (1.30, 1.93)	0.000	1.32 (1.12, 1.57)	0.001	1.52 (1.19, 1.94)	0.001
Primary	1.72 (1.39, 2.15)	0.000	2.37 (1.86, 3.02)	0.000	1.97 (1.59, 2.45)	0.000	2.17 (1.64, 2.87)	0.000
No education	2.72 (1.95, 3.80)	0.000	2.52 (1.82, 3.49)	0.000	2.09 (1.55, 2.83)	0.000	2.70 (1.94, 3.77)	0.000
Husbands' education								
Higher	ref		ref		ref		ref	
Secondary	1.51 (1.28, 1.81)	0.000	1.53 (1.25, 1.87)	0.000	1.33 (1.12, 1.59)	0.001	1.59 (1.25, 2.03)	0.000
Primary	1.84 (1.50, 2.24)	0.000	1.91 (1.55, 2.36)	0.000	1.64 (1.36, 1.97)	0.000	1.91 (1.48, 2.44)	0.000
No education	1.64 (1.30, 2.07)	0.000	2.01 (1.58, 2.57)	0.000	1.86 (1.48, 2.32)	0.000	2.09 (1.59, 2.76)	0.000
Occupation								
Working	ref		ref		ref		ref	
Not working	1.16 (1.03, 1.31)	0.016	0.75 (0.66, 0.85)	0.000	0.84 (0.75, 0.96)	0.007	0.93 (0.81, 1.06)	0.299
Husbands' occupation								
Working	ref		ref		ref		ref	
Not working	1.35 (0.89, 2.06)	0.160	0.72 (0.41, 1.25)	0.241	1.54 (0.95, 2.51)	0.080	1.07 (0.60, 1.92)	0.810
Parity								
1	ref		ref		ref		ref	
2-3	1.17 (1.03, 1.33)	0.019	1.77 (1.54, 2.04)	0.000	1.44 (1.26, 1.65)	0.000	1.64 (1.40, 1.91)	0.000
>3	1.73 (1.35, 2.21)	0.000	2.80 (2.20, 3.56)	0.000	2.17 (1.71, 2.76)	0.000	2.73 (2.12, 3.50)	0.00
Terminated pregnancy								
No/never	ref		ref		ref		ref	
Yes/ever	0.73 (0.63, 0.83)	0.000	0.71 (0.61, 0.81)	0.000	0.76 (0.66, 0.87)	0.000	0.74 (0.63, 0.86)	0.000
Desired pregnancy								
Yes/then	ref		ref		ref		ref	
No	1.22 (1.07, 1.40)	0.004	1.20 (1.04, 1.39)	0.012	1.16 (1.01, 1.33)	0.036	1.27 (1.09, 1.48)	0.002
Wealth index								
Richest	ref		ref		ref		ref	
Poorest	2.56 (2.03, 3.22)	0.000	4.25 (3.31, 5.45)	0.000	3.20 (2.53, 4.03)	0.000	4.04 (3.02, 5.41)	0.000
Poorer	2.41 (1.96, 2.97)	0.000	3.26 (2.57, 4.14)	0.000	2.41 (1.95, 2.98)	0.000	3.32 (2.53, 4.35)	0.000
Middle	2.01 (1.65, 2.45)	0.000	2.36 (1.89, 2.96)	0.000	1.88 (1.53, 2.30)	0.000	2.34 (1.79, 3.06)	0.000
Richer	1.64 (1.37, 1.97)	0.000	1.84 (1.47, 2.29)	0.000	1.55 (1.28, 1.89)	0.000	2.05 (1.57, 2.67)	0.000
Media exposure^a								
Any exposure	ref		ref		ref		ref	
No exposure	1.46 (1.29, 1.65)	0.000	1.38 (1.21, 1.58)	0.000	1.24 (1.10, 1.41)	0.001	1.58 (1.38, 1.82)	0.000
Accessing healthcare^b								

Covariates	Model 1: Dropout from ANC		Model 2: Dropout from SBA delivery		Model 3: Dropout from PNC		Model 4: Dropout from all CoC components	
	AOR (95% CI)	P value	AOR (95% CI)	P value	AOR (95% CI)	P value	AOR (95% CI)	p value
Big problem	ref		ref		ref		ref	
Not a big problem	0.81 (0.72, 0.91)	0.000	0.94 (0.83, 1.05)	0.283	0.93 (0.83, 1.04)	0.218	0.87 (0.76, 0.99)	0.039
Religion								
Others	ref		ref					
Muslim	1.40 (1.09, 1.80)	0.008	1.72 (1.33, 2.24)	0.000	1.57 (1.25, 1.98)	0.000	1.78 (1.33, 2.38)	0.000
Residence								
Urban	ref		ref		ref		ref	
Rural	1.46 (1.26, 1.70)	0.000	1.40 (1.19, 1.64)	0.000	1.23 (1.06, 1.43)	0.008	1.40 (1.18, 1.67)	0.000
Division								
Dhaka	ref		ref		ref		ref	
Barisal	1.20 (0.92, 1.55)	0.173	0.96 (0.74, 1.24)	0.737	0.96 (0.75, 1.23)	0.757	1.11(0.83, 1.48)	0.488
Chattogram	1.20 (0.97, 1.48)	0.096	1.13 (0.89, 1.43)	0.310	1.00 (0.81, 1.25)	0.976	1.23 (0.96, 1.57)	0.107
Khulna	0.84 (0.66, 1.062)	0.146	0.53 (0.41, .69)	0.000	0.55 (0.44, 0.70)	0.000	0.46 (0.34, 0.620)	0.000
Mymensingh	0.68 (0.52, 0.89)	0.005	1.19 (0.94, 1.52)	0.154	1.10 (0.86, 1.40)	0.436	0.84 (0.63, 0.11)	0.225
Rajshahi	1.04 (0.81, 1.34)	0.750	0.81 (0.63, 1.03)	0.094	0.77 (0.62, 0.97)	0.026	0.79 (0.61, 1.02)	0.076
Rangpur	0.64 (0.50, 0.83)	0.001	0.84 (0.64, 1.10)	0.199	0.88 (0.69, 1.13)	0.320	0.59 (0.44, 0.80)	0.001
Sylhet	1.17 (1.90, 1.51)	0.234	1.27 (0.98, 1.63)	0.067	1.18 (0.93, 1.50)	0.178	1.31 (0.98, 1.74)	0.067
Survey round								
BDHS 2017-18	ref		ref		ref		ref	
BDHS 2022	1.36 (1.19, 1.56)	0.000	0.45 (0.39, 0.52)	0.000	1.01 (0.88, 1.15)	0.929	0.59 (0.51, 0.69)	0.000

^aMedia exposure: newspaper or television or radio; ^bProblem to access healthcare: permission to go or monetary constraints or distance to health facilities

In all the regression models, standard errors of the odds ratio for all covariates were <2 , indicating an acceptable level of multicollinearity among the independent variables. Furthermore, the Variance Inflation Factor (VIF) of the covariates was less than 3 for both the adjusted and unadjusted models (Supplementary file; Table 2).

Discussion

Using the Andersen's health care utilization model, we found that predisposing factors (age, respondent's and husband's education level, parity, desired pregnancy, religion, survey round), enabling factors (respondent's and husband's occupation, wealth index, media exposure), and need factors (desired pregnancy) are contributing to the increment of the odds of maternal dropout from CoC.

The findings indicate a significant relationship between maternal age and dropout across receiving ANC, delivery assisted by SBA, PNC, and the overall CoC. Women aged 31–49 years exhibited significantly lower dropout than adolescent mothers, especially in securing delivery assisted by SBA and overall CoC. Younger mothers, particularly those under 19, often face socio-cultural challenges

and limited access to maternal services (WHO, 2016b), which may result in lower utilization of ANC visits, SBA at delivery, and PNC visits in Bangladesh. Alternatively, older mothers are more likely to possess social and financial advantages that could enhance their decision-making capacity and ability to navigate healthcare systems, thus more likely to complete the recommended package of maternal health services (Rahut et al., 2024).

Maternal education is often associated with yielding greater financial independence and decision-making capacity, which in turn tends to have positive effects on healthcare services for both the mother and her children (Kc & Neupane, 2016). Similarly, educated husbands were found to exhibit supportive attitudes due to increased awareness, which enabled mothers to access maternal healthcare services (Wai et al., 2015; Yadav et al., 2021). The analysis also demonstrated that having more children led to an increased likelihood of dropout from CoC, which could be due to additional responsibilities for mothers, perceived reduced risk of having maternal complications, and financial constraints linked with an extended family (Kumar et al., 2019; Vora et al., 2009).

In addition, the number of children as well as birth order influence healthcare-seeking behaviors for children under five years of age. Research suggested that mothers are more likely to seek healthcare for their first child than their subsequent children because they started relying on their accumulated experiences (Dureja & Negi, 2024). Our findings identified that Muslim women have a higher likelihood of dropout from CoC, which could be because they were less likely to use skilled maternal health services than women of other religions, mainly due to cultural norms and religious practices that emphasize female modesty and gender-concordant care (Shahabuddin et al., 2017), but the lack of female doctors is a major barrier regarding this issue (Tappis et al., 2016).

We find that in BDHS 2022, the likelihood of ANC dropout increased, whereas the likelihood of dropping out from SBA delivery and all CoC components decreased. A potential reason could be the COVID-19 pandemic, which led to a reduction in household income and disrupted access to maternal healthcare by 19-20% (Hamadani et al., 2020; Hossain et al., 2024). Another potential reason is the increasing cost of living, as attending the recommended number of ANC visits necessitates multiple trips to healthcare facilities. This requirement competes with time for domestic responsibilities and incurs associated indirect medical costs, such as transportation and medications (Gandhi et al., 2022).

Seemingly, the level of parental employment can facilitate utilization of maternal care through better

economic resources as well as greater rationalization in making decisions and residing in proximity to urban areas where healthcare is more readily available (Shanto et al., 2023). Although maternal healthcare services are freely accessible under universal healthcare coverage in Bangladesh, publicly funded facilities often suffer from overcrowding and limited resources; therefore, a significant proportion of mothers rely on private services, especially for having delivery assisted by SBA. In that aspect, wealth plays a crucial role in accessing healthcare services and potentially leading to a more seamless completion of the CoC (Asnake et al., 2024; Ghimire et al., 2021; Myint & Mya, 2022).

We find that women with limited access to media have a higher dropout rate from the CoC. Media serves as an essential channel for disseminating information about the importance, timing, and benefits of maternal health services. Media exposure increases awareness, shapes positive attitudes toward healthcare utilization, and encourages recommended health-seeking behaviors by providing practical knowledge and reducing misconceptions. Multiple studies have reported that women exposed to mass media are significantly more likely to initiate and complete the recommended continuum of maternal health services, while lack of media exposure is a consistent predictor of higher dropout rates, underscoring the vital role of information access in supporting maternal health outcomes (Alem et al., 2022; Rammohan et al., 2021).

A higher dropout rate from the CoC among mothers with undesired pregnancies can be explained by several interrelated factors. Women experiencing unintended pregnancies often show less motivation and emotional investment toward ensuring comprehensive maternal care, which can manifest in reduced attendance at antenatal, delivery, and postnatal services (Asnake et al., 2024; Muluneh et al., 2020). This lack of proactive care-seeking may stem from psychological distress, limited partner or familial support, and insufficient preparation for the pregnancy, such as inadequate financial or logistical arrangements. Conversely, mothers who desire their pregnancies are typically more engaged, motivated by positive emotions, and likely to plan for and prioritize maternal health services, resulting in a lower dropout rate from the CoC. Multiple studies have confirmed that pregnancy intention is a significant predictor of care-seeking behavior and that undesired pregnancies are associated with both lower service uptake and greater discontinuity in maternal healthcare service utilization, whereas desired pregnancies facilitate more consistent completion of the CoC (Khan et al., 2020).

Strengths, limitations, and policy implications

The study utilized the latest two consecutive nationally representative surveys, with high response rates. Therefore, these datasets allow for reliable conclusions about maternal healthcare utilization patterns across the country within the defined time. In addition, the selection of factors is guided by Andersen's Behavioral Model of Healthcare Services, providing a more precise estimate. The evaluation of outcomes and factors followed validated measurements, minimizing the risk of assessment bias.

In contrast to the strengths of the study, there remain some challenges to interpreting the findings. Firstly, the cross-sectional design of the study limits establishing a causal nature of the association found between identified factors and CoC components. Secondly, the possibility of recall bias may affect the accuracy of findings, as the recall period spanned up to three years in the datasets. Finally, the study did not explore healthcare system-related factors, such as healthcare providers' attitudes, patient-provider relationships, availability of workforce, quality of care, and factors underlying the decision-making dynamics of women to uptake CoC services. These contextual elements are critical to fully understanding healthcare utilization.

This study offers crucial insights into the utilization of CoC in maternal healthcare, emphasizing the importance of policy support to improve the maternal utilization of CoC and the development of relevant interventions and the provision of services.

Conclusion

In this study of 8,424 mothers, more than one in four failed to complete the continuum of maternal care, with dropout most pronounced at the antenatal care stage. Dropout was strongly associated with lower education, higher parity, lower wealth, rural residence, younger maternal age and was also influenced by media exposure, pregnancy intention, and religious affiliation, underscoring the complex interplay of sociodemographic and experiential factors in maternal health service utilization.

Competing interest

No competing interest is declared.

Authors' contributions

SSA: PS: MAR: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing- Original draft, Writing- Review and editing, Visualization, Supervision, Project administration; **SJ:** Software, Validation, Investigation, Data

curation, Writing Original draft, Writing- Review and editing, Visualization ; **RI**: Software, Validation, Investigation, Data curation, Writing Original draft, Writing- Review and editing, Visualization ; **IJ**: Software, Validation, Investigation, Data curation, Writing Original draft, Writing- Review and editing, Visualization ; **MRA**: Writing- Review and editing, Supervision, Visualization; **SS**: Writing- Review and editing, Supervision, Visualization

Data availability statement

Publicly accessible Bangladesh Demographic and Health (BDHS) data was used in this study. The data can be accessed either at <https://dhsprogram.com/> or upon reasonable request to the corresponding author. The full statistical models are presented as supplementary file ([Supplementary file](#)).

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Supplementary Files

Multimedia Appendixes

Factors associated with dropout from maternal continuum of care.

URL: <http://asset.jmir.pub/assets/f3cca8660efaa229aa18b2658d7c8704.docx>