

Distribution and Determinant of Caesarean Section Among Women of Reproductive Age

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<https://doi.org/10.56201/ijmepr.v10.no6.2026.pg54.69>

Abstract

Caesarean section (CS) delivery remains one of the most important lifesaving obstetric interventions for reducing maternal and neonatal morbidity and mortality when medically indicated. Irrespective of global efforts to improve access to emergency obstetric care, the utilization of caesarean section in Nigeria remains low and unevenly distributed across socioeconomic, residential, and regional populations. This study therefore examined the distribution and determinants of caesarean section among women of Reproductive Age. Data for the study were obtained from the Nigeria Demographic and Health Survey (NDHS 2023–24), a nationally representative survey involving 42,000 women aged 15–49 years. The survey adopted a stratified two-stage cluster sampling technique to ensure national representativeness. Descriptive statistics were used to examine the distribution of caesarean section delivery across selected socio-demographic characteristics, while multilevel logistic regression analysis was employed to identify individual-, household-, and community-level determinants of caesarean section delivery. Measures of inequality were used to assess rural–urban differentials in caesarean section utilization. The findings revealed that a majority of the respondents were aged 35–39 years (21.64%), 46.56% had no formal education, while 59.38% had five or more children. The prevalence of caesarean section delivery in Nigeria was 5.60% (95% CI: 5.25–5.96). Caesarean section delivery was significantly higher among urban women (10.02%; 95% CI: 9.29–10.79) compared to rural women (2.81%; 95% CI: 2.50–3.16). The inequality analysis further showed an absolute rural–urban difference of 6.97 percentage points (RD = 6.97; 95% CI: 5.48–8.45), while urban women were approximately four times more likely to undergo caesarean delivery than rural women (PR = 3.68; 95% CI: 2.88–4.70). At the multivariate level, women with higher education were significantly more likely to undergo caesarean section delivery (aIRR = 5.73; 95% CI: 4.56–7.19) compared with women with no formal education. Community-level media exposure also significantly increased the likelihood of caesarean section delivery, particularly among women residing in communities with medium media exposure (AOR = 1.60; 95% CI: 1.24–2.05; $p < 0.001$). Conversely, women who received skilled antenatal care had lower odds of caesarean section delivery (aIRR = 0.17; 95% CI: 0.04–0.86) compared with those who received unskilled care. The study concludes that caesarean section delivery in Nigeria is shaped by individual, household, and community-level factors, with pronounced rural–urban inequalities in utilization. The persistently low prevalence of caesarean section delivery, particularly in rural areas, reflects inequitable access to essential maternal healthcare services. Therefore, strengthening emergency obstetric care, improving women's education, expanding skilled maternal healthcare services, and addressing

socioeconomic and geographic disparities are critical to improving equitable access to caesarean section delivery and enhancing maternal and neonatal health outcomes in Nigeria.

Keywords: *Caesarean section delivery, Maternal healthcare utilization, Rural–urban inequalities, Emergency obstetric care,*

1.0 Introduction

Caesarean section (CS) is a surgical procedure involving the delivery of a baby through incisions in the mother's abdomen and uterus. It is a lifesaving obstetric intervention when complications such as obstructed labour, fetal distress, and hypertensive disorders make vaginal delivery unsafe (Betrán et al., 2016; WHO, 2018). Globally, caesarean section rates increased from approximately 7% in 1990 to over 21% in 2019, although access remains unequal across and within countries (WHO, 2021). In low- and middle-income countries, inadequate access to medically indicated caesarean delivery remains a concern, particularly among disadvantaged populations. In Nigeria, caesarean section utilisation remains low and varies across socioeconomic and geographical groups. The 2018 Nigeria Demographic and Health Survey (NDHS) reported a national prevalence of approximately 3%, with differences across geopolitical zones (NPC & ICF, 2019). Previous studies have associated utilisation with educational attainment, household wealth, place of residence, and access to maternal healthcare services, with higher utilisation generally reported among educated, wealthier, and urban women (Yaya et al., 2018; Adewuyi et al., 2019). Financial barriers, inadequate transportation, shortages of skilled personnel, and limited healthcare infrastructure may further restrict access, particularly in rural communities (Onwujekwe et al., 2019; Adde et al., 2020). Caesarean section utilisation is influenced by individual, household, and community-level factors. Maternal age, education, and parity may be associated with delivery patterns, while household wealth and health insurance can influence affordability. Antenatal care attendance may facilitate the identification of complications and referral for appropriate treatment. At the community level, healthcare infrastructure, availability of skilled personnel, transportation, and media exposure may influence access to obstetric services (Cavallaro et al., 2019; Okonofua et al., 2017). These factors may contribute to rural–urban and regional inequalities in the utilisation of caesarean section delivery.

Despite previous research on maternal healthcare in Nigeria, further evidence is needed on the distribution of caesarean section delivery and the combined influence of individual, household, and community-level factors using recent nationally representative data. Limited understanding of these factors may hinder the identification of populations facing the greatest barriers to accessing essential obstetric care. The 2023–2024 NDHS provides an opportunity to examine these patterns and generate updated evidence on caesarean section utilisation in Nigeria. This study is significant because its findings may inform maternal healthcare planning, resource allocation, and interventions to improve equitable access to obstetric services. Identifying factors associated with caesarean section delivery can help policymakers and healthcare providers address barriers affecting disadvantaged populations and strengthen maternal healthcare delivery. The study covers women aged 15–49 years who had a live birth within the reference period specified by the 2023–2024 NDHS. It examines the distribution of caesarean section delivery across selected sociodemographic and geographical characteristics and assesses its individual-, household-, and community-level determinants across Nigeria. The analysis is limited to variables available in the survey, and its cross-sectional design permits the identification of associations rather than causal relationships.

Therefore, this study aimed to examine the distribution and determinants of caesarean section delivery among women of reproductive age in Nigeria. Specifically, it sought to examine the

distribution of caesarean section delivery in Nigeria and Identify the individual-, household-, and community-level factors associated with caesarean section delivery in Nigeria.

2.0 Methods and Materials

2.1 Study Area

The study was conducted in Nigeria, a country in West Africa comprising 36 states and the Federal Capital Territory (FCT), Abuja. The country is divided into six geopolitical zones: North Central, North East, North West, South East, South South, and South West. These zones reflect Nigeria's geographical, socioeconomic, and cultural diversity, providing the national context for examining the distribution of caesarean section (CS) delivery. Nigeria has a three-tier healthcare system comprising primary, secondary, and tertiary levels of care. The country's healthcare system faces challenges relating to infrastructure, the distribution of skilled health personnel, and access to quality services, particularly in rural and underserved communities. These contextual characteristics are relevant to understanding the distribution of CS delivery and the individual-, household-, and community-level factors associated with its utilization. The study covered Nigeria nationally and used secondary data from the 2023–2024 Nigeria Demographic and Health Survey (NDHS). Therefore, the study area represents the national survey coverage rather than a single state or community.

2.2 Study Design

This study employed a cross-sectional research design using secondary data from the 2023–2024 Nigeria Demographic and Health Survey (NDHS). The NDHS is a nationally representative household survey implemented by the National Population Commission (NPC) in collaboration with ICF, with technical and financial support from international partners. The survey provides information on key demographic and health indicators, including fertility, maternal and child health, and women's empowerment in Nigeria. The cross-sectional design enabled the examination of patterns in caesarean section (CS) delivery and associations between CS delivery and demographic, socioeconomic, cultural, and health service-related factors at a single point in time. However, the design does not establish causal relationships but identifies associations and patterns. The NDHS dataset contains standardized information on reproductive health, access to healthcare services, and women's characteristics, making it suitable for examining the distribution of CS delivery and its associated individual-, household-, and community-level factors in Nigeria.

2.3 Study Population

The study population comprised women of reproductive age (15–49 years) included in the 2023–2024 Nigeria Demographic and Health Survey (NDHS) who had at least one live birth within the five years preceding the survey. The NDHS covered women across Nigeria's 36 states and the Federal Capital Territory (FCT), including both urban and rural areas.

The study included women whose most recent births were delivered by caesarean section or vaginal delivery, allowing the examination of the distribution of caesarean section delivery and its associated factors. Relevant information included sociodemographic characteristics, reproductive history, antenatal care utilization, place of delivery, obstetric complications, household characteristics, and access to maternal healthcare services. The analytical population was restricted to eligible women with available information on mode of delivery and the explanatory variables required for the analysis.

2.4 Inclusion and Exclusion Criteria

This study included women aged 15–49 years from the NDHS 2023–24 dataset who meet the following criteria:

2.4.1 Inclusion Criteria

- i. Women who had at least one live birth within the five years preceding the survey.
- ii. Women with complete information on mode of delivery (Caesarean Section or vaginal delivery).
- iii. Women with complete information on relevant socio-demographic, obstetric, and healthcare-related variables included in the study.

2.4.2 Exclusion Criteria

- i. Women with no history of childbirth within the five years preceding the survey.
- ii. Women with incomplete or missing information on mode of delivery or other key study variables.

These criteria are necessary to ensure that the study population remains relevant to the objectives of the study and that the dataset used for analysis is sufficiently robust and reliable for statistical analysis.

2.5 Sample Size and Sampling Technique

The Nigeria Demographic and Health Survey (NDHS) 2023–24 employed a stratified two-stage cluster sampling design to obtain nationally representative data on population and health indicators in Nigeria. The sampling frame used for the survey was derived from the National Population Commission (NPC) master sampling frame based on the most recent national population and housing census.

- i. In the first stage of sampling, Enumeration Areas (EAs), which served as Primary Sampling Units (PSUs), were selected from each stratum using probability proportional to size (PPS). Stratification was based on states and place of residence (urban and rural), ensuring adequate representation across all geopolitical zones of the country.
- ii. In the second stage, a systematic random sampling technique was used to select households from each selected enumeration area. Approximately 30 households were selected per cluster for participation in the survey. Eligible women aged 15–49 years residing in the selected households were then identified and interviewed using standardized NDHS questionnaires.
- iii. The NDHS 2023–24 selected approximately 1,400 clusters and over 42,000 households nationwide, resulting in a large and nationally representative sample. The survey achieved high response rates, thereby enhancing the reliability and validity of the dataset.

2.6 Data Collection Instrument

The NDHS 2023–24 utilized standardized survey instruments designed to obtain detailed demographic and health-related information from households and eligible respondents. For the purpose of this study, data will primarily be extracted from the Women's Questionnaire, which is administered to women aged 15–49 years.

The Women's Questionnaire contains several modules relevant to this study, including:

- i. Background characteristics (age, marital status, education, occupation, religion, and media exposure)
- ii. Reproductive history (parity, birth history, pregnancy outcomes, and previous obstetric experiences)
- iii. Maternal healthcare utilization (antenatal care attendance, place of delivery, skilled birth attendance, and postnatal care)
- iv. Caesarean section delivery history and related obstetric factors
- v. Household characteristics (wealth index, residence, household size, and environmental conditions)
- vi. Access to healthcare services and barriers to care

These modules provide the required variables necessary for assessing the prevalence and contextual determinants of caesarean section delivery in Nigeria.

2.7 Data Collection Procedure

This study adopted a quantitative cross-sectional analytical design using secondary data obtained from the Nigeria Demographic and Health Survey (NDHS) 2023–24. The NDHS is a nationally representative survey conducted by the National Population Commission (NPC) in collaboration with ICF International and supported by development partners such as the United States Agency for International Development (USAID), United Nations Population Fund (UNFPA), and the United Nations Children’s Fund (UNICEF). The survey forms part of the global Demographic and Health Survey (DHS) programme, which provides reliable and standardized demographic and health data across developing countries. The NDHS 2023–24 dataset is considered appropriate for this study because it contains comprehensive information on maternal and child health indicators, including mode of delivery, antenatal care utilization, place of delivery, reproductive history, socio-economic characteristics, and healthcare access. These variables are essential for examining the contextual determinants of caesarean section delivery among women of reproductive age in Nigeria. Data collection for the NDHS was conducted using structured and standardized questionnaires administered through face-to-face interviews by trained field personnel. The survey utilized Computer-Assisted Personal Interviewing (CAPI) techniques to improve data quality, minimize entry errors, and facilitate real-time consistency checks during fieldwork. Information was collected from eligible women aged 15–49 years across selected households nationwide. The NDHS dataset allows disaggregation of findings by region, place of residence (urban/rural), socio-economic status, educational attainment, and other demographic variables. This provides an opportunity to investigate regional and contextual disparities in caesarean section delivery in Nigeria. Furthermore, the nationally representative nature of the survey enhances the generalizability of findings and supports evidence-based recommendations for maternal health policy and obstetric care interventions.

2.8 Validity and Reliability of the Instrument

2.8.1 Validity of the Instrument

The validity of the NDHS 2023–24 instruments has been well established internationally through repeated application in several countries. The questionnaires are developed using globally accepted demographic and public health measurement standards and are regularly reviewed by experts in maternal and child health, epidemiology, demography, and survey methodology. Before implementation, the questionnaires underwent rigorous translation and back-translation into major local languages spoken in Nigeria to ensure clarity, consistency, and cultural appropriateness. The instruments were also pre-tested in selected communities prior to the main survey to identify ambiguities and improve comprehension among respondents. Content validity was ensured through expert reviews conducted by the National Population Commission (NPC), ICF International, and partner organizations. The survey instruments comprehensively capture key maternal health indicators, including caesarean section delivery, antenatal care utilization, obstetric history, and socio-demographic characteristics relevant to this study.

2.8.2 Reliability of the Instrument

The reliability of the NDHS data is ensured through strict quality assurance procedures implemented throughout the survey process. These procedures include intensive training and retraining of fieldworkers, field supervision, pilot testing, real-time monitoring of data collection activities, and built-in consistency checks within the CAPI system.

Standardized data collection procedures were applied uniformly across all regions of the country to minimize interviewer bias and ensure consistency in data recording. Supervisors conducted regular spot checks and validation exercises during fieldwork to enhance data accuracy and completeness.

2.9 Data Analysis

Data from the 2023–2024 Nigeria Demographic and Health Survey (NDHS) were cleaned and analysed using Stata version 18 SE and R, with QGIS used for spatial mapping. Sampling weights and survey design features, including stratification and clustering, were accounted for in the analyses. Caesarean section delivery was coded as 1, while vaginal delivery was coded as 0.

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise respondents' characteristics and the distribution of caesarean section delivery. Chi-square tests and logistic regression were used to assess associations between caesarean section delivery and selected sociodemographic, obstetric, household, and community factors. Multivariable logistic regression was used to identify independently associated factors, with results presented as adjusted odds ratios (AORs) and 95% confidence intervals (CIs). Statistical significance was set at $p < 0.05$.

2.10 Ethical Considerations

This study utilized secondary data obtained from the Nigeria Demographic and Health Survey (NDHS) 2023–24, which is publicly available upon request from the DHS Program. Ethical approval for the original data collection was obtained by the National Population Commission (NPC) in collaboration with ICF International and relevant national ethical review bodies. Informed consent was obtained from all respondents prior to data collection, and strict confidentiality protocols were maintained throughout the survey process.

Permission to use the NDHS dataset for this study was obtained through formal application to the DHS Program. The data will be used strictly for academic purposes, and no attempt will be made to identify individual respondents. All analyses will adhere to ethical standards for secondary data use, ensuring privacy, confidentiality, and responsible reporting of findings.

3.0 Results/Findings

Socio-Demographic Characteristics of Respondents

Table 1 presents the respondents' sociodemographic and obstetric characteristics. Most respondents were aged 35–39 years (21.64%), had no formal education (46.56%), were currently married (88.42%), and had five or more children (59.38%). Most were Muslims (59.77%), resided in rural areas (59.75%), lacked health insurance (97.55%), and reported no media exposure (92.19%). The North-West accounted for the largest proportion of respondents (30.13%).

Table 1: Percentage and Distribution of Socio Demographic of the Respondents

Variables	Frequency (n)	Percentage (%)
Age group		
15–19	980	0.94
20–24	6,579	6.29
25–29	14,947	14.30
30–34	20,093	19.22
35–39	22,629	21.64
40–44	21,259	20.33

45–49	18,070	17.28
Education level		
No education	48,678	46.56
Primary	15,716	15.03
Secondary	30,333	29.01
Higher	9,830	9.40
Religion		
Catholic	8,761	8.38
Other Christian	32,564	31.14
Islam	62,491	59.77
Traditionalist	708	0.68
Other	33	0.03
Wealth index		
Poorest	26,000	24.87
Poorer	20,879	19.97
Middle	21,337	20.41
Richer	20,049	19.18
Richest	16,292	15.58
Marital status		
Currently unmarried	12,108	11.58
Currently married	92,449	88.42
CEB		
1–2	13,040	12.47
3–4	29,428	28.15
5+	62,089	59.38
Sex of household head		
Male	89,145	85.26
Female	15,412	14.74
Place of delivery		
Public facility	4,629	29.22
Private facility	2,616	16.51
Respondent's home	8,504	53.68
Others	92	0.58
media exposure		
No	90,234	92.19
Yes	7,644	7.81
Sex of child		
Male	53,642	51.30
Female	50,915	48.70
Birth order		
1	26,397	25.25
2–3	39,839	38.10
4–6	28,708	27.46
7+	9,613	9.19
Birth interval		
≤12 months	2,852	3.66
13–24 months	23,513	30.21
25–48 months	39,241	50.42
48+ months	12,222	15.70
Health insurance		

No	101,994	97.55
Yes	2,563	2.45
Residence		
Urban	42,082	40.25
Rural	62,475	59.75
Region		
North West	31,501	30.13
North East	21,217	20.29
North Central	18,668	17.85
South East	11,687	11.18
South South	11,297	10.80
South West	10,187	9.74

Prevalence of Caesarean Section (CS) by Background Characteristics

As shown in Table 2, the overall prevalence of caesarean section delivery was 5.60% (95% CI: 5.25–5.96). Prevalence increased with educational attainment, from 1.28% among women with no formal education to 19.37% among those with higher education, and with household wealth, from 0.92% among the poorest to 17.26% among the richest. Urban women had a higher prevalence (10.02%) than rural women (2.81%). The South-West recorded the highest prevalence (13.03%), while the North-East recorded the lowest (2.96%). Higher prevalence was also observed among insured women (22.05%) and those who attended eight or more antenatal care visits (13.97%).

Table 2: Prevalence of Caesarean Section (CS) by All Background Characteristics

Characteristic	No CS n (%)	CS n (%)	95% CI (CS Prevalence)
Overall	15,098 (94.40)	895 (5.60)	5.25–5.96
Age group			
15–19	806 (98.05)	16 (1.95)	1.20–3.15
20–24	3,318 (95.95)	140 (4.05)	3.44–4.76
25–29	4,137 (94.15)	257 (5.85)	5.19–6.58
30–34	3,439 (94.19)	212 (5.81)	5.09–6.61
35–39	2,171 (92.54)	175 (7.46)	6.46–8.59
40–44	978 (92.44)	80 (7.56)	6.11–9.32
45–49	249 (94.32)	15 (5.68)	3.45–9.21
Education level			
No education	6,783 (98.72)	88 (1.28)	1.04–1.58
Primary	1,731 (97.03)	53 (2.97)	2.28–3.87
Secondary	5,140 (92.66)	407 (7.34)	6.68–8.05
Higher	1,444 (80.63)	347 (19.37)	17.61–21.27
Religion			
Catholic	1,200 (91.53)	111 (8.47)	7.08–10.10
Other Christian	4,285 (90.12)	470 (9.88)	9.07–10.77
Islam	9,528 (96.82)	313 (3.18)	2.85–3.55
Traditional	81 (100.00)	0 (0.00)	-
Others religion	4 (80.00)	1 (20.00)	-
Wealth Index			
Poorest	4,092 (99.08)	38 (0.92)	0.67–1.26
Poorer	3,139 (98.09)	61 (1.91)	1.49–2.44
Middle	2,966 (96.33)	113 (3.67)	3.06–4.40

Richer	2,768 (92.08)	238 (7.92)	7.00–8.94
Richest	2,133 (82.74)	445 (17.26)	15.85–18.77
Marital status			
Currently unmarried	1,446 (94.63)	82 (5.37)	4.34 – 6.62
Currently married	13,652 (94.38)	813 (5.62)	5.26 – 6.01
CEB			
1–2	5,352 (91.85)	475 (8.15)	7.48–8.88
3–4	4,742 (94.73)	264 (5.27)	4.69–5.93
5+	5,004 (96.98)	156 (3.02)	2.59–3.53
Sex of household head			
Male	13,383 (94.68)	752 (5.32)	4.96 – 5.70
Female	1,715 (92.30)	143 (7.70)	6.57 – 9.00
Place of Delivery			
Public facility	4,181 (90.32)	448 (9.68)	8.86–10.56
Private facility	2,187 (83.60)	429 (16.40)	15.03–17.87
Home/Others	8,596 (100.00)	0 (0.00)	-
Media Exposure			
No	12,887 (95.16)	656 (4.84)	4.49–5.22
Yes	1,128 (83.87)	217 (16.13)	14.26–18.20
Sex of child			
Male	7,602 (93.94)	490 (6.06)	5.56 – 6.60
Female	7,496 (94.87)	405 (5.13)	4.66 – 5.63
Birth Order			
1	2,990 (91.16)	290 (8.84)	7.92–9.86
2–3	5,181 (93.39)	367 (6.61)	5.99–7.30
4–6	4,855 (96.56)	173 (3.44)	2.97–3.98
7+	2,072 (96.96)	65 (3.04)	2.39–3.86
Birth interval			
≤12 months	245 (96.84)	8 (3.16)	1.59–6.19
13–24	2,495 (96.18)	99 (3.82)	3.14–4.63
25–48	6,778 (96.07)	277 (3.93)	3.50–4.41
48+	2,559 (92.68)	202 (7.32)	6.40–8.35
Ethnicity			
Hausa/Fulani	4,883 (32.34)	126 (14.08)	2.12 – 2.99
Yoruba	8,368 (55.42)	577 (64.47)	5.96 – 6.98
Igbo	1,825 (12.09)	192 (21.45)	8.31 – 10.88
Others	22 (0.15)	0 (0.00)	—
Health Insurance			
No	14,840 (94.75)	822 (5.25)	4.91–5.61
Yes	258 (77.95)	73 (22.05)	17.91–26.84
ANC Visits			
1–3	6,204 (98.46)	97 (1.54)	1.26–1.87
4–7	4,638 (94.04)	294 (5.96)	5.33–6.66
8+	2,415 (86.03)	392 (13.97)	12.73–15.30
Provider of ANC assistance			
Skilled ANC	9,101 (92.41)	748 (7.59)	7.09–8.12
Unskilled ANC	379 (96.68)	13 (3.32)	1.94–5.63
Wanted Last child			

Wanted then	12,728 (94.64)	721 (5.36)	4.99–5.75
Wanted later	1,706 (92.92)	130 (7.08)	5.99–8.35
Wanted no more	664 (93.79)	44 (6.21)	4.66–8.25
Residence			
Urban	5,561 (89.98)	619 (10.02)	9.29 – 10.79
Rural	9,537 (97.19)	276 (2.81)	2.50 – 3.16
Region			
North East	3,315 (97.04)	101 (2.96)	2.44–3.58
North Central	2,701 (93.27)	195 (6.73)	5.88–7.71
South East	1,592 (92.13)	136 (7.87)	6.69–9.24
South South	1,430 (90.39)	152 (9.61)	8.25–11.16
South West	1,301 (86.97)	195 (13.03)	11.42–14.84

Factors associated with Caesarean section in Nigeria

Table 3 presents the associations between selected individual, household, and community-level characteristics and caesarean section delivery. In the analysis, media exposure was positively associated with caesarean section delivery (aIRR = 2.62; 95% CI: 1.20–5.72; $p = 0.02$), while skilled antenatal care was negatively associated with the outcome (aIRR = 0.17; 95% CI: 0.04–0.86; $p = 0.03$). Community-level illiteracy and geopolitical region also showed significant adjusted associations in selected categories. Other variables did not demonstrate statistically significant adjusted associations at the 5% level.

Table 3: Individual, household and community factors associated with caesarean section in Nigeria.

Characteristic	IRR	(95% CI)	p-value	aIRR(95% CI)	(95% CI)	p-value
Age group						
15–19 (Ref)	1.00			1.00		
20–24	2.08	1.25–3.47	0.01	1.07	0.40 – 4.80	0.87
25–29	3.00	1.82–4.95	0.00	5.03	3.25 – 6.04	0.66
30–34	2.98	1.80–4.93	0.00	2.03	1.70 – 7.22	0.84
35–39	3.83	2.31–6.35	0.00	1.45	1.53 – 2.38	0.80
40–44	3.88	2.29–6.59	0.00	3.77	1.73 – 4.01	0.88
45–49	2.92	1.46–5.82	0.02	0.15	—	—
Educational Level						
No education (Ref)	1.00			1.00		
Primary	2.32	1.66–3.25	0.00	0.45	0.04 – 5.57	0.532
Secondary	5.73	4.56–7.19	0.00	0.51	0.09 – 2.76	0.432
Higher	15.13	12.04–19.00	0.00	2.98	0.55 – 16.10	0.205
Religion						
Catholic (Ref)	1.00			1.00		
Other Christian	1.17	0.96–1.42	0.125	1.40	0.41 – 4.84	0.592
Islam	0.38	0.30–0.46	0.00	0.99	0.11 – 8.81	0.991
Wealth Index						
Poorest (Ref)	1.00			1.00		
Poorer	2.07	1.39–3.10	0.00	0.16	0.00 – 5.86	0.32
Middle	3.99	2.77–5.74	0.00	0.37	0.02 – 7.36	0.51
Richer	8.61	6.13–12.08	0.00	0.93	0.05 –	0.96

					17.05	
Richest	18.76	13.52–26.03	0.00	3.45	0.14 – 7.89	0.453
Marital Status						
Current	1.00			1.00		
Unmarried (Ref)						
Currently Married	1.05	(0.84–1.31	0.68	-	—	—
CEB						
1–2 (Ref)	1.00			1.00		
3–4	0.65	0.56–0.75	0.00	1.31	0.35 – 4.97	0.69
5+	0.37	0.31–0.44	0.00	9.78	0.72 –	0.09
					13.63	
Sex of Household Head						
Male (Ref)	1.00			1.00		
Female	1.45	1.22–1.72	0.00	0.431	0.16 – 1.16	0.10
Place of Delivery						
Public facility (Ref)	1.00			1.00		
Private facility	1.69	1.50–1.92	0.00	1.73	0.50 – 5.96	0.38
Respondent's home	9.26	(8.46–11.01	0.00	5.90	1.51 – 7.30	0.00
Birth Order						
1(Ref)	1.00			1.00		
2–3	0.75	0.65–0.87	0.00			
4–6	0.39	0.32–0.47	0.00	0.57	0.12 – 2.73	0.49
7+	0.34	0.26–0.45	0.00	1.06	0.12 – 9.62	0.96
Birth interval						
≤12 months (Ref)	1.00			1.00		
13–24	1.21	0.59–2.45	0.603	0.48	0.04 – 5.32	0.55
25–48	1.24	0.62–2.48	0.540	0.47	0.04 – 5.67	0.55
48+	2.31	1.16–4.63	0.018	0.98	0.09 –	0.99
					11.02	
ANC Visits						
1–3 (Ref)	1.00			1.00		
4–7	3.87	3.09–4.86	0.00	1.25	0.28 – 5.52	0.77
8+	9.07	7.30–11.28	0.00	3.35	0.46 –	0.23
					24.22	
Provider of ANC assistance						
Unskilled ANC (Ref)	1.00			1.00		
Skilled ANC	2.29	1.34–3.93	0.00	0.17	0.04 – 0.86	0.03
Have health Insurance						
No (Ref)	1.00			1.00		
Yes	3.33	2.89–3.84	<0.00	0.53	0.16 – 1.81	0.31
Sex of Child						

Male (Ref)	1.00			1.00		
Female	0.85	0.74–0.96	0.01	0.45	0.17 – 1.20	0.11
Media Exposure						
No (Ref)	1.00			1.00		
Yes	4.20	3.40–5.20	0.00	2.62	1.20 – 5.72	0.02
Wanted Last child						
Wanted then	1.00			1.00		
(Ref)						
Wanted later	1.32	1.10–1.58	0.00	0.48	0.04 – 5.13	0.54
Wanted no more	1.16	0.86–1.56	0.33	1.17	0.13 – 10.37	0.89
Ethnicity						
Hausa/Fulani	1.00			1.00		
(Ref)						
Yoruba	3.78	3.04–4.71	0.00	2.56	0.21 – 31.30	0.46
Igbo	2.56	2.12–3.10	0.00	3.57	0.47 – 26.89	0.22
Place of Residence						
Urban (Ref)	1.00			1.00		
Rural	0.28	0.24–0.32	0.00	1.878	0.66 – 5.32	0.24
Zone						
North West	1.00			1.00		
(Ref)						
North East	1.24	0.96–1.62	0.11	0.47	0.050 – 4.5	0.51
North Central	2.83	2.26–3.54	0.00	0.05	0.01 – 0.33	0.00
South East	3.31	2.60–4.21	0.00	0.05	0.01 – 0.35	0.00
South South	4.04	3.19–5.11	0.00	0.04	0.01 – 0.26	0.00
South West	5.48	4.39–6.84	0.00	0.06	0.01 – 0.39	0.00
Community Poverty Level						
Low (Ref)	1.00			1.00		
Medium	0.32	0.27–0.37	0.00	1.12	0.33 – 3.78	0.85
High	0.10	0.08–0.13	0.00	0.31	0.04 – 2.55	0.28
Community Illiteracy						
Low (Ref)	1.00			1.00		
Medium	0.39	0.34 0.45	0.00	0.19	0.04 – 0.87	0.03
High	0.08	0.06 0.10	0.00	0.25	0.00 – 22.53	0.54
Community Media Exposure						
Low (Ref)	1.00			1.00		
Medium	0.72	0.63–0.83	0.00	1.98	0.62 – 6.28	0.247
High	0.42	0.35–0.50	0.00	3.89	0.81 – 18.58	0.09

4.0 Discussions

4.1 Sociodemographic Characteristics of Respondents

The sociodemographic characteristics provide context for understanding caesarean section (CS) utilisation in Nigeria. The substantial proportion of respondents aged 30 years and above and those with no formal education reflects important reproductive and educational characteristics that may influence maternal healthcare utilisation (Betrán et al., 2016; Adedini et al., 2018; Babalola et al., 2019). The concentration of respondents in poorer households also highlights potential financial barriers to transportation, facility-based delivery, and surgical obstetric care (Singh et al., 2021).

The predominance of married women and those with five or more children is consistent with Nigeria's high fertility patterns (Owoo et al., 2021). Furthermore, the substantial proportion of home deliveries, limited health insurance coverage, and low media exposure point to potential barriers to accessing maternal health information and appropriate obstetric services (Doctor et al., 2018; Gage, 2021; Wegbom et al., 2023). The predominance of rural respondents and the concentration in northern geopolitical regions also provide important context for interpreting geographical differences in CS utilisation. Collectively, these characteristics underscore the relevance of socioeconomic, reproductive, and geographical factors in understanding access to obstetric care.

4.2 Distribution of Caesarean Section in Nigeria

The study recorded an overall CS prevalence of 5.6%, indicating relatively low utilisation nationally. This finding is consistent with evidence of low CS rates in Nigeria and parts of sub-Saharan Africa (Betrán et al., 2016; NDHS, 2018). The prevalence is below the historically cited population-level range of 10–15%; however, this benchmark should not be interpreted as a target for individual facilities or women, since CS should be performed according to clinical need (WHO, 2022). CS prevalence increased with maternal education and household wealth, suggesting socioeconomic inequalities in access to surgical delivery (Boerma et al., 2018; Cavallaro et al., 2017). Women with fewer previous births also had higher prevalence than those with higher parity, potentially reflecting differences in obstetric history and patterns of healthcare utilisation (Kozhimannil et al., 2019). Religious differences were observed, but these should be interpreted alongside regional, economic, and healthcare-access inequalities rather than attributed to religion alone (Babalola et al., 2019; Doctor et al., 2018). Higher CS prevalence was also observed among women with health insurance, media exposure, and more antenatal care visits, as well as those delivering in private facilities. These differences may reflect variations in financial protection, health information, clinical monitoring, and access to facilities with surgical capacity (Gage, 2021; Wegbom et al., 2023; WHO, 2016). Geographically, prevalence was highest in the South West and lowest in the North East, while urban women had higher prevalence than rural women. These patterns highlight substantial socioeconomic and geographical inequalities in CS utilisation. However, the descriptive findings alone cannot establish independent relationships or explain the underlying causes.

4.3 Factors Associated with Caesarean Section in Nigeria

The adjusted analysis indicated that some factors associated with CS in the crude analysis did not remain statistically significant after controlling for other variables. Maternal age and education, for example, lost statistical significance after adjustment, suggesting that their crude relationships may partly reflect differences in socioeconomic circumstances and healthcare access. Previous studies have similarly highlighted the relevance of maternal characteristics and socioeconomic conditions to obstetric care utilisation (Cavallaro et al., 2017; Adedini et al., 2018).

Parity was inversely associated with CS in the crude analysis, although its independent contribution should be interpreted according to the adjusted results. Place of delivery and antenatal care also require careful interpretation because CS depends on access to facilities with surgical capacity, while antenatal care may facilitate the identification and referral of pregnancy complications (Kozhimannil et al., 2019; WHO, 2016).

Media exposure remained significantly associated with CS after adjustment, with exposed women having higher adjusted likelihoods of surgical delivery. Access to health information may contribute to awareness of obstetric services and healthcare-seeking behaviour, although this relationship may also reflect wider socioeconomic differences (Wegbom et al., 2023). Geopolitical region also remained associated with CS relative to the North West reference category, indicating geographical variation that may relate to differences in healthcare infrastructure, transportation, household resources, and sociocultural conditions (Doctor et al., 2018). In addition, medium community-level illiteracy was associated with lower CS utilisation than the reference category, suggesting that community educational context may be relevant beyond individual educational attainment.

Overall, the findings indicate that CS utilisation in Nigeria varies across socioeconomic and geographical groups, with media exposure, selected regional categories, community-level illiteracy, and other model-specific factors contributing to the adjusted results. These findings support the importance of addressing inequalities in access to appropriate obstetric care. Nevertheless, the cross-sectional design limits causal interpretation, and the observed associations should not be taken as proof that the identified factors directly cause or prevent CS delivery.

5.0 Conclusion

This study examined the distribution of caesarean section (CS) delivery in Nigeria and the individual-, household-, and community-level factors associated with its utilisation. The overall prevalence of CS was 5.6%, with notable variations across socioeconomic and geographical groups. Higher CS prevalence was observed among women with higher educational attainment and household wealth, while utilisation also varied by parity, antenatal care attendance, media exposure, and region of residence. These patterns suggest that access to CS is unevenly distributed across the population. The findings highlight the importance of socioeconomic circumstances and healthcare access in understanding CS utilisation in Nigeria. The concentration of CS among more advantaged women, alongside the low national prevalence, raises concerns about inequities in access to medically indicated obstetric surgery. However, given the cross-sectional design, the observed associations should not be interpreted as causal relationships. Efforts to improve equitable access to CS should prioritise strengthening emergency obstetric services in underserved areas, improving referral systems, expanding financial protection through health insurance, and promoting timely antenatal care and appropriate facility-based delivery. Addressing educational and socioeconomic barriers may also improve access to essential maternal healthcare. These measures should aim to ensure that every woman who requires a caesarean section can obtain timely, safe, and appropriate care, regardless of socioeconomic status or place of residence.

6.0 Contribution to Knowledge

This study contributes to knowledge in two principal ways:

i. **National evidence on the distribution of caesarean section in Nigeria:** The study provides an assessment of CS prevalence at the national level, documenting an overall prevalence of 5.60% and substantial variation across socioeconomic and geographical groups. The findings highlight the uneven distribution of CS utilisation, particularly the differences between the South West and North East geopolitical zones.

ii. **Evidence on the multilevel factors associated with caesarean section:** By examining individual-, household-, and community-level characteristics, the study provides evidence on how maternal sociodemographic characteristics, household economic position, healthcare utilisation, and community context relate to CS delivery in Nigeria. This multilevel perspective supports a broader understanding of variations in utilisation beyond individual maternal characteristics alone.

7.0 Recommendation

i. **Equitable Access to Caesarean Section:** Given the overall CS prevalence of 5.60% and the observed differences across socioeconomic groups, maternal healthcare policies should prioritise equitable access to medically indicated caesarean section, particularly among women from disadvantaged households.

ii. **Reduction of Socioeconomic Inequalities:** The higher prevalence of CS among women with higher educational attainment and household wealth highlights the need to address financial and informational barriers that may limit access among women with lower levels of education and those from poorer households.

iii. **Context-Specific Regional Planning:** The substantial geographical variation in CS prevalence, including the higher prevalence in the South West (13.03%) and lower prevalence in the North East (2.96%), supports region-specific assessment of obstetric service availability and access. Resource allocation should reflect local maternal healthcare needs and service capacity.

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