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Home childbirth among young mothers aged 15–24 years in Nigeria: a national population-based cross-sectional study

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ABSTRACT

Objective To estimate the prevalence and identify factors associated with home childbirth (delivery) among young mothers aged 15–24 years in Nigeria.

Design A secondary analysis of cross-sectional data from the 2013 Nigeria Demographic and Health Survey (NDHS).

Setting Nigeria.

Participants A total of 7543 young mothers aged 15–24 years.

Outcome measure Place of delivery.

Results The prevalence of home delivery among young mothers aged 15–24 years was 69.5% (95% CI 67.1% to 71.8%) in Nigeria—78.9% (95%CI 76.3% to 81.2%) in rural and 43.9% (95%CI 38.5% to 49.5%, p<0.001) in urban Nigeria. Using the Andersen's behavioural model, increased odds of home delivery were associated with the two environmental factors: rural residence (adjusted OR, AOR: 1.39, 95% CI 1.06 to 1.85) and regions of residence (North-East: AOR: 1.97, 95% CI 1.14 to 3.34; North-West: AOR: 2.94, 95% CI 1.80 to 4.83; and South-South: AOR: 3.81, 95% CI 2.38 to 6.06). Three of the enabling factors (lack of health insurance: AOR: 2.34, 95% CI 1.16 to 4.71; difficulty with distance to healthcare facilities: AOR: 1.48, 95% CI 1.15 to 1.88; and <4 times antenatal attendance: AOR: 3.80, 95% CI 3.00 to 4.85) similarly increased the odds of home delivery. Lastly, six predisposing factors—lack of maternal and husband's education, poor wealth index, Islamic religion, high parity and low frequency of listening to radio—were associated with increased odds of home delivery.

Conclusions Young mothers aged 15–24 years had a higher prevalence of home delivery than the national average for all women of reproductive age in Nigeria. Priority attention is required for young mothers in poor households, rural areas, North-East, North-West and South-South regions. Faith-based interventions, a youth-oriented antenatal care package, education of girls and access to health insurance coverage are recommended to speed up the reduction of home delivery among young mothers in Nigeria.

Strengths and limitations of this study

- National representativeness of the data analysed is the major strength of this study; therefore, findings are generalisable to the entire population of young mothers aged 15–24 years in Nigeria.
- Other notable strengths include large sample size, high response rates and low missing data coupled with the use of complex sample statistics in adjusting for the cluster design and the sampling weight of the data analysed.
- The survey being cross-sectional in design is limited in estimating the causal relationship between the outcome and explanatory variables.
- Also, given that the data analysed were self-reported and collected retrospectively, recall bias may be likely.

INTRODUCTION

Nigeria shares a disproportionately high global maternal mortality burden accounting for approximately 58 000 (about 19%) of the estimated 303 000 maternal deaths that occurred in the year 2015.[1] Although maternal mortality ratio declined from 1350 deaths per 100 000 live births in 1990 to 814 deaths per 100 000 live births in 2015 in Nigeria,[2] within the same period of time (1990 to 2015), the number of maternal deaths rose from 57 000 to 58 000 in the country.[2] Based on available data, Nigeria had the highest absolute number of maternal mortalities, worldwide, in the year 2015, with India coming in the second place.[1 3] Several factors may contribute to the occurrence of these mortalities, however, obstetric complications of pregnancy are known leading global causes.[4] While obstetric complications are not always predictable, they are treatable/preventable through timely provision and utilisation of skilled services accessible in healthcare facilities.[5] By using healthcare facility for childbirth (institutional, facility-based or health facility delivery) several needless maternal deaths may be prevented.[5 6]

Despite the consistent evidence demonstrating its benefits, institutional delivery remains poorly used in Nigeria.[7 8] Most pregnant women in the country often choose to deliver their babies at home with no access to skilled healthcare workers (doctors, nurses or

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midwives), and in many instances, with no one present.[8 9] In the year 2003, for instance, the prevalence of home childbirth in Nigeria stagnated at 67% but decreased marginally to 65% in 2008 and 63% in 2013.[8 10] This marginal decrease falls below expectation given the substantial investment and emphasis on using institutional delivery through the global momentum of the Millennium Development Goals (MDGs).[11 12] It is worth noting that many developing countries like Ghana, Kenya, Indonesia, Nepal, Niger Republic, have recorded considerable progress in the reduction of home delivery.[13–16] For example, the prevalence of home delivery decreased from 54% in 2003 to 27% in 2014 in Ghana;[15] and from 79.2% in 2006 to 46.5% in 2014 in Nepal.[16]

Several studies have examined the determinants of use/non-use of healthcare facility for childbirth in Nigeria,[10 17–21] and have reported a significant association between place of delivery and a range of sociodemographic factors including rural-urban residence, maternal/husbands education level, maternal religion, wealth index, region of residence, maternal age and birth order. However, to date, available studies have focused mainly on factors associated with institutional delivery among all mothers of reproductive age (aged 15–49 years). To the best of our knowledge, no study has explicitly assessed the determinants of home/institutional delivery among young mothers aged 15–24 years in Nigeria.

The United Nations (UN) defines 'youths' as persons aged 15–24 years;[22 23] and mothers in this age category represent a vulnerable group of women with peculiarity for socioeconomic disadvantages (being less educated, unemployed/underemployed) and high susceptibility to health/social challenges such as sexually transmitted diseases (including HIV), unwanted pregnancies and abortions.[24] Increasingly, studies have shown that mothers in this age bracket ('adolescent and young mothers')[25–27] are prone to higher risks of obstetric complications—known contributors to the burden of maternal and neonatal mortality.[8 26] Deliveries among adolescents and young mothers are characterised by prematurity, low birth weight, systemic infections, and maternal and perinatal mortality which are leading causes of neonatal mortality.[8 28 29]

Achieving universal health coverage and reducing the global burden of maternal as well as neonatal mortalities are major health-related targets of the recently launched Sustainable Development Goals (SDGs).[30] These targets are a high priority in Nigeria considering the poor indices of maternal and newborn health outcomes in the country.[8 19 29] From 2015 through to 2030, an estimated 1.6 million maternal lives are at stake and Nigeria alone is projected to account for about 33.3% of this estimate.[31] To be on track for SDGs, the annual rate of maternal mortality reduction in Nigeria needs to accelerate from 1.5% (2005–2015 rates) to 15.1% during 2015–2030.[31] Given its potential for preventing maternal and neonatal mortalities, improved utilisation of institutional delivery, particularly, among adolescents and young mothers is critical to the realisation of these targets in Nigeria.[5 32]

However, for effective intervention and programme design, evidence-informed knowledge on factors associated with home delivery among this category of vulnerable and often disadvantaged mothers is imperative. The present study, thus, aims to estimate the prevalence as well as assess factors associated with home delivery among young mothers aged 15–24 years in Nigeria. Using a well-regarded theoretical framework, a comprehensive and wide range of relevant explanatory variables were assessed. Findings provide further evidence which may inform policies and practices aimed at addressing the challenge of home delivery among young mothers towards reducing the burden of maternal and neonatal mortalities in Nigeria.

METHODS

Data source

We analysed data sets from the Cross-Sectional Nigeria Demographic and Health Survey 2013 (NDHS 2013), a nationally representative survey conducted by the Nigerian Population Commission with technical assistance from ICF International.[8] NDHS data are generally and freely available online (www.dhsprogram.com) on request from ICF International, USA. One of the key objectives of the 2013 survey was the provision of current and reliable data on maternal and child healthcare including fertility, mortality, nutritional status of mothers and children, and immunisation coverage in Nigeria.[8] A three-stage cluster sampling method was used in the design of the 2013 NDHS and validated interviewer-administered questionnaires were used in gathering data from a total of 38 948 eligible women aged 15–49 years.[8] A comprehensive description of sampling methods and the settings have previously been published for the 2013 NDHS.[8]

Sample size

A total of 38 948 eligible women, aged 15–49 years, was interviewed in the 2013 NDHS. The present study was, however, restricted to a total of 7543 young mothers aged 15–24 years—young mothers with complete information on the place of their most recent live delivery within 5 years leading to the 2013 NDHS. This information was extracted from the children's record file of the 2013 NDHS data. The designation of 'young mothers' as 'aged 15–24 years' was adapted from the definition of 'youths' by the UN,[22 23] and previously published studies on maternal healthcare services utilisation.[25–27 33] We used the checklist for the 'Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)' statement[34] while reporting this study. The STROBE statement provides a checklist to guide the appropriate report of cohort, case-control and cross-sectional studies thereby enhancing the transparency of observational studies.[34]

Study variables

Dependent variable

The outcome of interest for this study was home childbirths among young mothers aged 15–24 years in Nigeria.

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'Homebirth' was described as 'home delivery' or 'non-use of healthcare facility for childbirth' and its value was described by the variable 'place of delivery' in the 2013 NDHS data. This variable was dichotomised as 'institutional delivery' (delivery in government and private healthcare facilities, coded as '0') and 'home delivery' (delivery in respondents' home or 'other homes', coded as '1').[7 8 35]

Independent variables

Health services utilisation is a complex phenomenon, hence the need for a proven theoretical framework for a better assessment and clearer understanding of the health service in question in the context of its associated factors. Andersen's behavioural model[36] readily comes handy in this respect given its relevance and practicality in demonstrating associations between risk factors and maternal healthcare services utilisation, and institutional delivery in the present instance. Several studies have used this model in assessing maternal healthcare services utilisation including antenatal attendance and health facility delivery.[37–39]

The original version of the model developed in the 1960s by Ronald M Andersen focused mainly on the family as the unit of analysis and proposes that utilisation of health services depends on three factors—predisposing (whether people are inclined to use services, eg, demographics and social structure), enabling (factors which facilitate or impede use of services, eg, family support, health insurance) and need (whether care is required/desired, both perceived and actual needs). This initial version of the model has undergone several modifications in which the unit of measurement has changed from family to individuals, and the determining factors now include 'external environmental factors' in the phase IV version of the model. We adapted this phase IV version as a theoretical framework in this study.

We selected independent variables for the present study following an extensive literature review[7 10 25 26 40] with consideration for the available information in the 2013 NDHS.[8] The variables were classified into four categories using Andersen's model (figure 1) as follows:

1. External environmental factors: These consist of the 'region of residence' (categorised using the existing geopolitical zones in Nigeria: North-Central, North-East, North-West, South-East, South-South and South-West) and 'rural-urban residence' (categorised into rural and urban residences).
2. Predisposing factors: These include maternal and husband's education level (none, primary and secondary/higher), maternal age (15–19 years and 20–24 years),[26] and maternal occupation (unemployed (not working or engaged in domestic/housewives jobs), agriculture (self-employed and employee), employed (professional/tech/managerial, sales, services, clerical, skilled and unskilled manual)).[35] Other predisposing factors examined were maternal marital status (never married, currently married/living with a man, formerly married/lived with a man), parity (1, 2–3, ≥4), maternal religion (Christianity, Islam, traditional/other)[7] and wealth index. Wealth index is an aggregate function of socioeconomic status derived through the principal component analysis of respondents' households' assets (re-categorised as poor (lower 40%), middle (middle 40%) and rich (upper 20%)).[41] Factors related to media exposure—frequency of reading newspaper/magazine, frequency of listening to radio and frequency of watching television (all categorised as 'not at all','<once a week, ≥once a week)—were similarly assessed as predisposing factors.[38 42]
3. Enabling factors: These include 'health insurance coverage' (yes and no),[10] antenatal care (ANC) attendance (<4 times and ≥4 times),[35] companionship to health facility, distance to health facility and attitude of health workers[18] (all categorised as 'a big problem' and 'not a big problem'). Other enabling factors included permission to visit health facility and getting money to

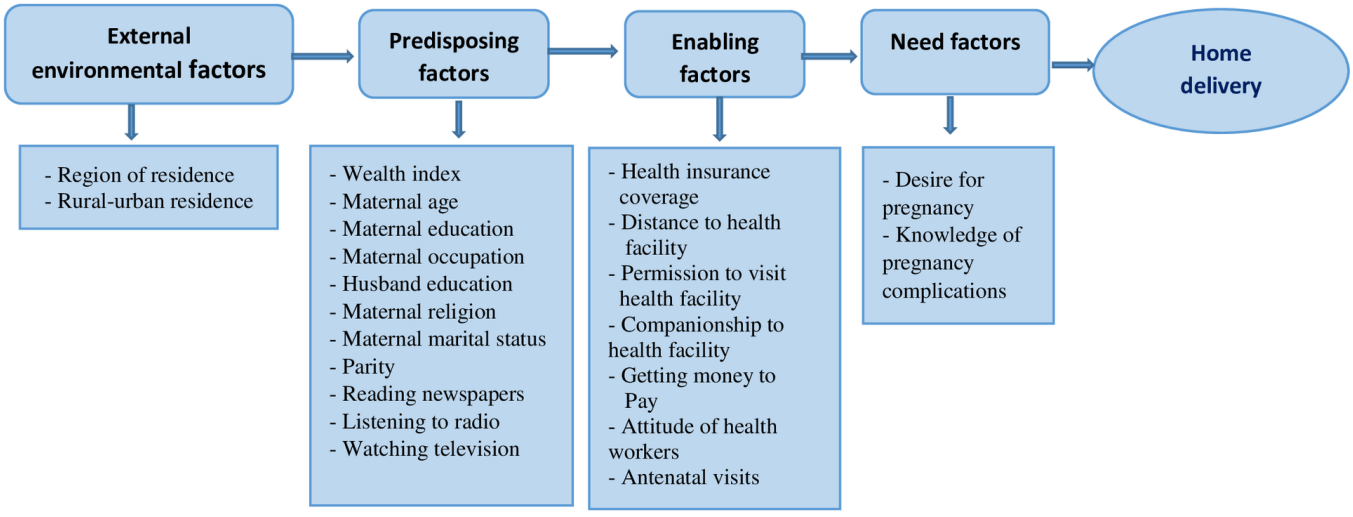


Figure 1 Theoretical framework for studying factors associated with home child delivery in Nigeria (adapted from Andersen[36])

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pay for health services (both were similarly categorised as 'a big problem' and 'not a big problem').[38 43]

4. Need factors: Desire for pregnancy (then (at the time of conception), later (sometimes after conception) and 'no more') and knowledge of pregnancy complication (yes and no) were assessed as need factor in this study.

Data analysis

We summarised the distribution of study participants (number and %) and estimated the prevalence of home delivery (in %). To test the association between the prevalence of home delivery and each independent variable, χ^2 tests were performed. We carried out simple logistic regression analyses and reported the 95% CI alongside p values to assess the unadjusted association between home delivery and the various independent variables included in this study. To assess the adjusted association between the outcome and the independent variables, we carried out multivariable binary logistic regression analyses.

In conducting multivariable logistic regression analyses, we built four parsimonious models hierarchically using the backward elimination method. First, we examined all 'external environmental factors' in Model I and retained those that were significant at p<0.05 (5% significance level). 'Predisposing factors' were then added to Model I with those 'external environmental factors' retained to establish Model II and significant factors with a p<0.05 were similarly retained for the next model. Model III comprised factors retained in Model II together with the 'enabling factors'. Model IV adjusted for factors retained in Model III in the presence of the 'need factor'.

We reported the adjusted OR (AOR), their corresponding 95% CIs and p values for each of Models I–IV. To minimise possible statistical errors, we double-checked our analysis and tested the final parsimonious model against factors previously reported to be associated with home delivery. All our analyses were conducted using the Statistical Package for Social Sciences (SPSS) V.21. In line with practice in previous studies,[35 37 43 44] we adjusted for the sample weight and the multistage cluster design of the NDHS data using the complex sample function in SPSS.[45] While analysing data with the cluster sampling design and stratifications, complex sample statistics account for the complex survey sample design and the unequal selection probability thus enhancing the statistical reliability of estimates.[45] To do this, we prepared a complex sample plan which specifies what SPSS needs to consider—sampling weights, strata and cluster—during data analysis.

Missing values were excluded in all analyses. In this paper, where appropriate, 'home delivery', 'home births', 'home childbirth' and 'non-use/utilisation of healthcare facility for childbirth' were used synonymously. Similarly, 'health facility delivery', 'facility-based delivery' and 'institutional delivery' were used interchangeably as appropriate. Where applicable, 'young mothers' was used generally for mothers aged 15–24 years while 'all women of reproductive age' (15–49 years) represents the national average.

Patient and public involvement statement

The present study was based on a secondary analysis of existing data, hence, there was no involvement of patients in the study. However, there was public involvement (relevant stakeholders including governmental, non-governmental and international organisations) in the design and execution of the survey (2013 NDHS) that produced the data on which the present study was based. Details of these have been published.[8]

RESULTS

Sample characteristics

A total of 7543 mothers, aged 15–24 years, was included in this study. Table 1 presents the descriptive characteristics of the study population. The highest proportion of participants was from the North-West region (41.8%) while the lowest was from the South-East (6.1%).

More than two-thirds of study participants (73.2%) were from rural areas, more than half (53.2%) did not acquire formal education and only a small proportion (9.0%) were from rich households. One in five (20.5%) mothers were teenagers (15–19 years old) and approximately half (50.8%) of the study participants were in their first parity. Only a small proportion (3.6%) reported reading newspapers/magazines for ≥once a week. The proportion was higher for the frequency of watching television and listening to radio at 23.2% and 30.2%, respectively. Health insurance coverage was low (0.8%). Additionally, less than half of the mothers (45.5%) attended the recommended ≥four ANC visits even though most of them did not have a problem with distance to the health facility (65.1%) and getting permission to visit the health facility (85.2%). The majority (89.7%) of the mothers desired their pregnancy at the time they conceived.

Prevalence of home delivery

The prevalence of home delivery was 69.5% (95% CI 67.1% to 71.8%) among young mothers aged 15–24 years in Nigeria. Residence in rural areas was associated with a higher prevalence (78.9%) of home delivery than urban residence (43.9%, p<0.001). Regionally, the highest and the lowest prevalence of home delivery occurred in the North-West (86.3%) and the South-East (18.8%, p<0.001) regions, respectively (figure 2). Lack of maternal education was associated with a higher prevalence of home delivery (88.9%) compared with secondary/higher maternal education level (38.5%, p<0.001). Mothers in poor households had over threefold higher prevalence (87.4%) of home delivery than their counterparts in rich households (27.7%, p<0.001).

The prevalence of home delivery was higher among teenage mothers (75.9%) compared with mothers aged 20–24 years (67.8%, p<0.001). Married mothers had a higher prevalence of home delivery (70.8%) compared

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Table 1 Sample characteristics and prevalence of home delivery for mothers aged 15–24 years in Nigeria, 2013 NDHS

Factors	n* (%)†	Prevalence of home delivery %†	95% CI
External environmental factors			
Region of residence			
North-Central	1080 (13.8)	55.1	49.0 to 61.2
North-East	1870 (21.6)	79.2	74.6 to 83.1
North-West	2713 (41.8)	86.3	83.1 to 89.0
South-East	437 (6.1)	18.8	14.0 to 24.8
South-South	856 (8.1)	61.4	54.9 to 67.5
South-West	587 (8.6)	29.1	22.0 to 37.4
Rural-urban residence			
Rural	5618 (73.2)	78.9	76.3 to 81.2
Urban	1925 (26.8)	43.9	38.5 to 49.5
Predisposing factors			
Maternal education level			
Secondary/higher	2447 (30.5)	38.5	35.4 to 41.7
Primary	1310 (16.3)	64.1	59.7 to 68.3
None	3786 (53.2)	88.9	86.9 to 90.6
Maternal occupation			
Unemployed	3370 (45.2)	74.3	71.2 to 77.2
Agriculture	706 (9.0)	61.6	54.5 to 68.2
Employed	3420 (45.8)	66.2	63.0 to 69.2
Husband/partner's education level			
Secondary/higher	2803 (38.4)	49.3	45.8 to 52.8
Primary	1188 (16.8)	66.8	61.8 to 71.3
None	3011 (44.8)	89.8	87.9 to 91.5
Wealth index			
Poor	3933 (53.6)	87.4	85.1 to 89.3
Middle	2952 (37.4)	54.0	50.1 to 57.7
Rich	658 (9.0)	27.7	23.1 to 32.9
Maternal age (years)			
15–19 (teen)	1520 (20.5)	75.9	72.6 to 78.9
20–24 (non-teen)	6023 (79.5)	67.8	65.2 to 70.4
Maternal religion			
Islam	4946 (69.4)	80.2	77.8 to 82.4
Traditional/other	105 (1.5)	77.4	65.2 to 86.2
Christianity	2492 (29.1)	43.5	39.7 to 47.5
Maternal marital status			
Never married	448 (4.7)	48.8	41.3 to 56.4
Currently married/living with a man	6895 (92.8)	70.8	68.3 to 73.1
Formerly married/living with a man	200 (2.5)	60.6	49.5 to 70.7
Parity			
≥4	398 (5.1)	82.8	77.0 to 87.4
2–3	3283 (44.1)	75.4	72.7 to 77.8
1	3862 (50.8)	63.0	60.3 to 65.6
Frequency of reading newspaper/magazine			
Not at all	6707 (89.9)	73.6	71.1 to 75.9
<once a week	494 (6.4)	33.8	27.5 to 40.8
≥once a week	284 (3.6)	31.7	24.6 to 39.7
Frequency of listening to radio			
Not at all	3472 (45.0)	80.1	77.3 to 82.7
<once a week	1814 (24.8)	68.1	64.3 to 71.6
≥once a week	2232 (30.2)	54.6	50.9 to 58.2
Frequency of watching television			
Not at all	4492 (60.4)	84.0	81.8 to 86.0
<once a week	1241 (16.4)	52.8	47.7 to 57.9
≥once a week	1777 (23.2)	43.4	39.2 to 47.6
Enabling factors			
Health insurance cover			
No	7452 (99.2)	69.8	67.4 to 72.1
Yes	66 (0.8)	26.1	14.2 to 43.0
Antenatal attendance			
<4 times	2683 (54.5)	88.7	86.7 to 90.5
≥4 times	2371 (45.5)	45.4	42.2 to 48.6
Distance to health facility			
Big problem	2605 (34.9)	81.8	78.7 to 84.6
Not a big problem	4915 (65.1)	62.9	59.9 to 65.8
Permission to visit health facility			
Big problem	1088 (14.8)	86.8	83.4 to 89.6
Not a big problem	6428 (85.2)	66.4	63.8 to 68.9
Getting money for health services			
Big problem	3631 (47.0)	75.5	70.6 to 76.3
Not a big problem	3883 (53.0)	65.8	62.7 to 68.8
Companionship to health facility			
Big problem	1281 (17.3)	84.1	80.8 to 87.0
Not a big problem	6237 (82.7)	66.4	63.8 to 68.9
Attitude of health workers			
Big problem	1282 (17.6)	77.9	73.6 to 81.7
Not a big problem	6229 (82.4)	67.6	65.0 to 70.1
Need factor			
Desire for pregnancy			
Then	6623 (89.7)	71.6	69.2 to 73.9
Later	852 (10.0)	49.5	44.4 to 54.6
No more	25 (0.3)	64.8	36.8 to 85.3
Knowledge of pregnancy complications			
No	1199 (39.5)	64.7	60.6 to 68.5
Yes	1983 (60.5)	42.3	39.2 to 45.5

The χ^2 tests conducted for the prevalence of home delivery yielded p values that were less than 0.001 on all variables.
*Unweighted sample sizes.
†Weighted percentage.
NDHS, Nigeria Demographic and Health Survey.

with their counterparts who were never married (48.8%, p<0.001). In addition, mothers in the Islamic religion had a higher prevalence of home delivery (80.2%) than their Christian counterparts (43.5%, p<0.001). The prevalence

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of home delivery was nearly threefold higher (69.8%) among mothers who lacked health insurance coverage compared with those that enjoyed the facility (26.1%, p<0.001). Lastly, mothers with <four times ANC visits had an approximately twofold increased prevalence of home delivery (88.7%) than those with ≥four times (focused ANC) attendance (45.4%, p<0.001).

Factors associated with home delivery among young mothers

The results of our bivariate analysis indicate that all the independent variables except 'desire for pregnancy' were statistically significant in their unadjusted association with home delivery among young mothers aged 15–24 years in Nigeria (table 2). Being classed in the poor wealth index, residence in the North-West region and lack of maternal education were the three leading factors associated with increased unadjusted odds of home delivery—increasing home delivery by 18-fold, 15.37-fold and nearly 13-fold, respectively— among young mothers in Nigeria (table 2). Other notable factors include low antenatal attendance (unadjusted OR, UOR: 9.36; 95% CI 7.57 to 11.55), residence in the North-East region (UOR: 9.24; 95% CI 5.87 to 14.59), lack of husband's education (UOR: 9.08; 95% CI 7.22 to 11.45), and lack of media exposure to television (UOR: 6.88; 95% CI 5.51 to 8.58) and newspaper (UOR: 6.00; 95% CI 4.17 to 8.63) as well as lack of health insurance coverage (UOR: 6.55; 95% CI 3.06 to 14.01).

Following multivariable logistic regression analysis, two external environmental factors, six of the predisposing factors and three of the enabling factors attained statistical significance in their association with home delivery (table 3, Model IV). Specifically, the odds of home delivery were higher among mothers residing in the North-East (AOR: 1.96; 95% CI 1.15 to 3.38), North-West (AOR: 2.95; 95% CI 1.78 to 4.90) and South-South (AOR: 3.72; 95% CI 2.34 to 5.90) regions compared with those living in the South-West region. Mothers in rural areas had 41% increased odds of home delivery compared with their urban counterparts (AOR: 1.41; 95% CI 1.06 to 1.85). Relative to those with at least a secondary level education, the odds of home delivery were 35% higher (AOR: 1.35; 95% CI 1.03 to 1.76) among young mothers with primary education

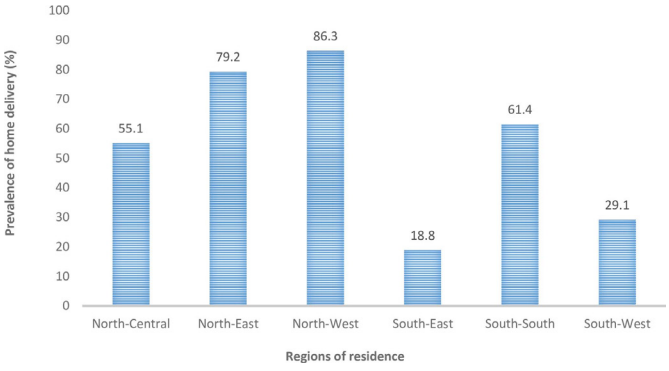


Figure 2 Prevalence of home delivery by regions of residence in Nigeria.

Table 2 Bivariate analysis of factors associated with home delivery among young mothers aged 15–24 years in Nigeria

Factors	UOR	95% CI	P values
External environmental factors			
Region of residence			
North-Central	2.98	1.91 to 4.70	<0.001
North-East	9.24	5.87 to 14.59	<0.001
North-West	15.37	9.80 to 24.15	<0.001
South-East	0.55	0.34 to 0.93	0.029
South-South	3.87	2.44 to 6.12	<0.001
South-West	1.00	(Reference)	–
Rural-urban residence			
Rural	4.76	3.65 to 6.24	<0.001
Urban	1.00	(Reference)	–
Predisposing factors			
Maternal education level			
None	12.75	10.17 to 15.98	<0.001
Primary	2.86	2.34 to 3.48	<0.001
Secondary/higher	1.00	(Reference)	–
Maternal occupation			
Unemployed	1.48	1.22 to 1.78	<0.001
Agriculture	0.82	0.60 to 1.13	0.220
Employed	1.00	(Reference)	–
Husband/partner's education level			
Secondary/higher	9.08	7.22 to 11.45	<0.001
Primary	2.05	1.65 to 2.57	<0.001
None	1.00	(Reference)	–
Wealth index			
Poor	18.01	13.16 to 24.60	<0.001
Middle	3.04	2.32 to 4.02	<0.001
Rich	1.00	(Reference)	–
Maternal age (years)			
15–19 (teen)	1.48	1.23 to 1.79	<0.001
20–24 (non-teen)	1.00	(Reference)	–
Maternal religion			
Islam	5.23	4.25 to 6.46	<0.001
Traditional/other	4.43	2.42 to 8.15	<0.001
Christianity	1.00	(Reference)	–
Maternal marital status			
Formerly married/ living with a man	1.60	0.95 to 2.70	0.051
Currently married/ living with a man	2.52	1.84 to 3.47	<0.001
Never married	1.00	(Reference)	–
Parity			
≥4	2.82	1.98 to 4.01	<0.001
2–3	1.78	1.60 to 2.01	<0.001
1	1.00	(Reference)	–
Frequency of reading newspaper/magazine			
Not at all	6.00	4.17 to 8.63	<0.001

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Table 2 Continued

Factors	UOR	95% CI	P values
<once a week	1.09	0.68 to 1.78	0.695
≥once a week	1.00	(Reference)	–
Frequency of listening to radio			
Not at all	3.34	2.75 to 4.08	<0.001
<once a week	1.77	1.45 to 2.15	<0.001
≥once a week	1.00	(Reference)	–
Frequency of watching television			
Not at all	6.88	5.51 to 8.58	<0.001
<once a week	1.45	1.14 to 1.84	0.002
≥once a week	1.00	(Reference)	–
Enabling factors			
Health insurance cover			
No	6.55	3.06 to 14.01	<0.001
Yes	1.00	(Reference)	–
Antenatal attendance			
<4 times	9.36	7.57 to 11.55	<0.001
≥4 times	1.00	(Reference)	–
Distance to health facility			
Big problem	2.66	2.12 to 3.31	<0.001
Not a big problem	1.00	(Reference)	–
Permission to visit health facility			
Big problem	3.33	2.53 to 4.36	<0.001
Not a big problem	1.00	(Reference)	–
Getting money for health services			
Big problem	1.43	1.23 to 1.70	<0.001
Not a big problem	1.00	(Reference)	–
Companionship to health facility			
Big problem	2.67	2.10 to 3.41	<0.001
Not a big problem	1.00	(Reference)	–
Attitude of health workers			
Big problem	1.69	1.32 to 2.13	<0.001
Not a big problem	1.00	(Reference)	–
Need factor			
Desire for pregnancy			
Then	1.36	0.44 to 4.32	0.59
No more	0.52	0.17 to 1.70	0.29
Later	1.00	(Reference)	–
Knowledge of pregnancy complications			
No	2.48	2.04 to 3.01	<0.001
Yes	1.00	(Reference)	–

UOR, unadjusted OR.

and nearly twofold higher (AOR: 1.97; 95% CI 1.43 to 2.73) among those with no formal education. Lack of husband's education similarly increased the odds of home delivery by 46% (AOR: 1.46; 95% CI 1.06 to 2.05) compared with at least a secondary education level.

Poor wealth index category increased the odds of home delivery by 2.7-fold (AOR: 2.73; 95% CI 1.75 to 4.22) while middle wealth index increased it by 61% (AOR: 1.61; 95% CI 1.13 to 2.33) compared with the rich wealth index. In the same vein, parity ≥4 increased the odds of home delivery by 86% (AOR: 1.86; 95% CI 1.28 to 2.75) while parity of 2–3 increased it by 65% (AOR: 1.65; 95% CI 1.34 to 2.07). The odds of home delivery were 91% greater (AOR: 1.91; 95% CI 1.29 to 2.82) among young mothers in Islamic religion compared with those in Christianity. Young mothers who listened to radio services for less than once a week had 46% increased odds (AOR: 1.46; 95% CI 1.16 to 1.87) of home delivery compared with those who listened at least once in a week. Lack of health insurance coverage increased the odds of home delivery by more than twofold (AOR: 2.33; 95% CI 1.15 to 4.70). Also, fewer than four times ANC attendance increased the odds of home delivery by approximately fourfold (AOR: 3.81; 95% CI 2.99 to 4.84). Lastly, difficulty with distance to health facility increased the odds of home births by 47% (AOR: 1.47; 95% CI 1.13 to 1.89).

DISCUSSION

We assessed the prevalence and factors associated with home delivery among young mothers aged 15–24 years in Nigeria guided by Andersen's behavioural model of healthcare services utilisation. Our findings reveal that more than two-thirds (approximately 70%) of adolescents and young mothers delivered their babies at home in Nigeria. This prevalence is higher than the reported national average of 63% for all women of reproductive age (aged 15–49 years) in the country[8 10] and underscores the necessity to further prioritise the reproductive healthcare needs of adolescent and young women in Nigeria.

Some reasons may explain the high prevalence of home delivery found in this study. First is socioeconomic disadvantage occasioned commonly by low-level education and unemployment/underemployment that may characterise adolescents and young mothers.[8 46] Over 53% of young mothers in our study had no education at all and belonged to poor households, while about 45% were unemployed. Given the predominant 'out-of-pocket' payment system for healthcare services in Nigeria, affording healthcare facility delivery may be financially tasking for this category of women.[47] The overwhelmingly significant association between increased prevalence of home delivery and poor wealth index/lack of maternal education, in the present study, may be evidence in support of this position.

Second, considering that over 92% of respondents were married, and approximately 50% of them had at least one baby, early marriage (forced or child marriage in many instances[48]) could be contributing to the burden of home delivery in Nigeria. On average, 44% of girls marry before their eighteenth birthday (child marriage) in Nigeria, and the proportion could be as high as 68% in the northern parts of the country.[49 50] Early marriage means early initiation into family life and childbearing

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Table 3 Factors associated with home delivery among women aged 15–24 years in Nigeria

	Model I†		Model II‡		Model III§/		Model IV¶	
Factors	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
External environmental factors								
Region of residence								
North-Central	1.86**	1.16 to 3.03	1.63*	1.02 to 2.55	1.23	0.76 to 2.00	1.25	0.76 to 2.02
North-East	6.89***	4.18 to 11.35	2.59***	1.52 to 4.37	1.97*	1.14 to 3.34	1.96*	1.15 to 3.38
North-West	10.70***	6.65 to 17.17	4.18***	2.53 to 6.85	2.94***	1.80 to 4.83	2.95***	1.78 to 4.90
South-East	0.59	0.34 to 1.02	0.72	0.40 to 1.31	0.65	0.37 to 1.14	0.63	1.78 to 4.90
South-South	2.84***	1.76 to 4.62	5.63***	3.48 to 9.15	3.81***	2.38 to 6.06	3.72***	2.34 to 5.90
South-West	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Rural-urban residence								
Rural	3.53***	2.67 to 4.65	1.61**	1.22 to 2.12	1.39*	1.06 to 1.85	1.41*	1.06 to 1.85
Urban	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Predisposing factors								
Maternal education level								
None			2.53***	1.86 to 3.48	2.00***	1.44 to 2.73	1.97***	1.43 to 2.73
Primary			1.43**	1.13 to 1.85	1.36*	1.05 to 1.80	1.35*	1.03 to 1.76
Secondary/higher			1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Husband/partner's education level								
None			1.75***	1.30 to 2.36	1.44*	1.05 to 2.01	1.46*	1.06 to 2.05
Primary			1.20	0.92 to 1.52	1.12	0.86 to 1.45	1.11	0.86 to 1.47
Secondary/higher			1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Wealth index								
Poor			3.04***	2.05 to 4.56	2.70***	1.75 to 4.16	2.73***	1.75 to 4.22
Middle			1.45*	1.05 to 1.97	1.59*	1.12 to 2.28	1.61*	1.13 to 2.33
Rich			1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Maternal religion								
Islam			1.71**	1.16 to 2.51	1.88**	1.26 to 2.76	1.91**	1.29 to 2.82
Traditional/other			1.47	0.79 to 2.71	1.79	0.86 to 3.66	1.80	0.89 to 3.70
Christianity			1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Parity								
≥4			1.74*	1.13 to 2.68	1.87**	1.29 to 2.75	1.86**	1.28 to 2.75
2–3			1.56***		1.65***		1.65***	
1			1.00	1.34 to 1.81 (Reference)	1.00	1.34 to 2.07 (Reference)	1.00	1.34 to 2.07 (Reference)
Frequency of listening to radio								
Not at all			1.33*	1.04 to 1.66	1.06	0.83 to 1.33	1.07	0.85 to 1.34
<once a week			1.46***	1.17 to 1.79	1.46**	1.15 to 1.86	1.46**	1.16 to 1.87
≥once a week			1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Enabling factors								
Health insurance cover								
No					2.34**	1.16 to 4.71	2.33**	1.15 to 4.70
Yes					1.00	(Reference)	1.00	(Reference)
Antenatal attendance								
<4 times					3.80***	3.00 to 4.85	3.81	2.99 to 4.84
≥4 times					1.00	(Reference)	1.00	(Reference)

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Table 3 Continued

Factors	Model I† AOR	Model I† 95% CI	Model II‡ AOR	Model II‡ 95% CI	Model III§/ AOR	Model III§/ 95% CI	Model IV¶ AOR	Model IV¶ 95% CI
Distance to health facility								
Big problem					1.48**	1.15 to 1.88	1.47**	1.13 to 1.89
Not a big problem					1.00	(Reference)	1.00	(Reference)
Need factor								
Desire for pregnancy								
Later							1.11	0.81 to 1.56
No more							4.20	0.95 to 18.77
Then							1.00	(Reference)

*p<0.05, **p<0.01, ***p<0.0001.

Factors included in modelling: region of residence, rural-urban residence, wealth index, maternal age, maternal education level, maternal occupation, husband education level, maternal religion, maternal marital status, parity, frequency of reading newspapers, frequency of listening to radio, frequency of watching television, health insurance coverage, distance to health facility, permission to visit health facility, companionship to health facility, getting money to pay, attitude of health workers, antenatal visits, desire for pregnancy. 'Knowledge of pregnancy complications' was not included in the multivariable analysis as about 58% of its information was missing.

†Model 1: External environmental factors only.
‡Model II: Predisposing factors added to Model I.
§Model III: Enabling factors added to Model I.
¶Model IV: Need factor added to Model III.
AOR, adjusted OR.

with consequences for a wide range of health-related, social as well as economic challenges—gender inequality, financial dependency, increased risk of obstetric complications and so on.[49 51] These factors may contribute to low educational attainments, lack of maternal autonomy, poverty[25 49 51] and subsequently to low/non-utilisation of maternal healthcare services. Disrespect and abuse of clients by healthcare workers,[52] and certain sociocultural practices/beliefs may equally play a role in the high prevalence of home delivery found in our study. For instance, giving birth to one's first baby without any assistance has been reported as a thing of pride for young married women in the Hausa community in Nigeria.[53]

We conducted multivariable logistic regression analyses and our results implicate a range of factors broadly discussed under the three significant variable categories below, according to Andersen's model.

External environmental factors

The two external environmental factors—rural-urban residence and region of residence—assessed in this study were significantly associated with the odds of home delivery in the adjusted analyses. The finding that young mothers in rural areas had increased odds of home delivery than their urban counterparts is comparable to those of previous studies for all women of reproductive age in Nigeria and other developing countries.[7 10 41 54] Similar finding was reported for adolescent and young Nepalese mothers.[26] Such rural-urban differences may be explained by the urban advantage both in terms of better access to healthcare facilities and services in urban compared with rural residence.[8 53] Owing to socioeconomic and geographical disadvantages, healthcare services and facilities are often in short supply in rural areas. Poorly staffed/equipped healthcare facilities, traditional/cultural practices/beliefs and low socioeconomic circumstances are other relevant factors which may explain the increased odds of home delivery found in rural residence in the present study.

Similar to the findings for all mothers in the reproductive age bracket,[7 10] young mothers residing in the North-East, North-West and the South-South regions of Nigeria had increased odds of home childbirth compared with those in the South-West region. Disparities in socioeconomic and educational development, as well as the distribution of healthcare services/facilities and the impacts of culture/religion in the various regions in Nigeria, may explain this finding. The South-West region of Nigeria, for example, has a higher concentration of healthcare facilities/services, especially, with the presence of a megacity like Lagos where most of the healthcare professionals in Nigeria are located. This comparative advantage may provide greater access to healthcare facilities/services, and subsequently, better use of institutional delivery in the region. Conversely, the North-East and the North-West regions of the country are among the least developed socioeconomically and educationally.[8 55] The South-South region equally suffers low socioeconomic development due to a shortfall in infrastructure, environmental degradation and high rates of

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unemployment.[8] These factors are likely to contribute to the comparatively lower utilisation of healthcare facility delivery in the regions.

Predisposing factors

Six predisposing factors—lack of mother's and father's education, poor wealth index, birth order of 2–3, Islamic religion and listening to radio programmes for less than once a week—were significantly associated with increased odds of home delivery among young mothers in Nigeria. The findings in respect of maternal and husbands' education level, as well as wealth index, agree with those of previous studies for all women of reproductive age in Nigeria[7 10 17] and other developing countries.[26 41] Education and wealth empower women both socioeconomically and in terms of autonomy and confidence in making healthy choices including better use of maternal healthcare services/facilities.[35 37 56] Using institutional delivery, however, goes with financial responsibility which may constitute a major constraint for young mothers in poor households.

Consistent with previous reports for all reproductive-aged women in respect of other maternal healthcare services utilisation,[7 10 37 44] we found increased odds of home delivery among young mothers with Islamic affiliation compared with their counterparts in the Christian religion. This finding is commonly explained using the observation that, on religious grounds, Muslim women often have a preference for female healthcare providers.[37 57 58] Therefore, concern about a male healthcare worker being present during childbirth could discourage young Muslim mothers from patronising healthcare facility delivery. Lastly, we found decreased odds of home delivery among young mothers who frequently listen to radio broadcast. A similar result has been reported for all women of reproductive age with regards to ANC utilisation in rural Nigeria.[37] Like rural women, most respondents in the present study are of low socioeconomic status and a greater proportion of them frequently (≥once a week) listen to radio (30.2%) compared with other traditional media—television (23.2%) and newspaper/magazines (3.6%). Our findings, thus, bring to fore the popularity of radio services among young mothers in Nigeria which probably explains why 'frequency of listening to radio', retained its statistical significance in our adjusted analysis. The benefits of this finding need to be well explored by appropriately using radio services in behaviour change communication/health promotion targeted at adolescents and young mothers in Nigeria. Also, given that youths are more likely to be easily engaged through social media, it may be appropriate to further investigate the impacts of such media in enlightening adolescents and young mothers in Nigeria on the importance of using healthcare facilities for childbirth.

Enabling factors

Three enabling factors—lack of health insurance coverage, lack of/low antenatal attendance and distance barrier to healthcare facilities—were equally significant in their association with increased odds of home delivery in the present study. These findings compare well with those for all women of reproductive age,[7 10 37 59] highlighting the necessity of revisiting healthcare facilities and services coverage in Nigeria. Proximity and accessible motorable road network are critical to enhancing physical access to healthcare facilities, especially, in rural areas. Also, while our study underscores the crucial roles of access to health insurance in promoting institutional delivery, the coverage of the insurance is rather low at approximately 2% (national average),[8] and, 0.8% for young mothers aged 15–24 years. In other words, 99.2% of young mothers required 'out-of-pocket' payment to enjoy health facility delivery in Nigeria. Universal access to health insurance, thus, clearly comes across as one important entry point to addressing the challenge of home delivery among young mothers in Nigeria.

Lastly, nearly fourfold increased odds of home delivery were associated with underuse of focused ANC, identifying the variable as the most significant predictor of home delivery in this study. Being the first element in the continuum of maternal healthcare, ANC provides a unique opportunity for awareness creation on the importance of institutional delivery.[10] However, with only 45.5% attendance (present study), focused ANC was much more underused among young mothers compared with all women of reproductive age (53.5%) in Nigeria.[7 8 37] Youth-oriented ANC package, which considers the peculiarities of young mothers, may, thus, be warranted for a speedy reduction in the prevalence of home delivery among young mothers in Nigeria.

National representativeness of the data analysed is the major strength of this study. Other notable strengths include large sample size, high response rates, low missing data and the use of a well-regarded conceptual framework of Andersen's behavioural model. Hence, relevant independent variables were comprehensively examined, and findings are generalisable to the entire population of young mothers aged 15–24 years in Nigeria. Nonetheless, the survey being cross-sectional in design is limited in estimating causal relationships, and this needs to be taken into consideration in the interpretation of the findings of this study. Also, recall bias may be likely given that the data used were self-reported and collected retrospectively. However, restricting our samples to the most recent live births in the 5 years preceding the 2013 NDHS reduces chances of recall bias.

CONCLUSIONS

Young mothers aged 15–24 years had a higher prevalence of home delivery than the national average reported for all women of reproductive age in Nigeria. Our findings reveal that young mothers in rural residence, those of Islamic faith, as well as those in the North-East, North-West and South-South regions had a comparatively higher prevalence and increased odds of home delivery. Efforts aimed at improving healthcare facility delivery among young mothers in Nigeria need to focus more on bridging regional, geographical as well as socioeconomic disparities in access to healthcare facilities and services. Free maternal healthcare services, access to health insurance coverage, socioeconomic

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empowerment, as well as youth-oriented ANC package are practical and implementable interventions clearly recommended by our findings. Also, target-specific interventions such as faith-based health promotion, and availability of female service providers may improve institutional delivery among young Muslim mothers.

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Data availability statement The data analysed in this study are available online in the Demographic and Health Survey repository at www.dhsprogram.com. Permission to use the data is freely granted upon request from ICF International, USA.

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