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

Emmanuel O Adewuyi, ∗1,2 Vishnu Khanal,3 Yun Zhao,4 Lungcit David,5 Olasunkanmi David Bamidele,6 Asa Auta7

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 43.3% (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.

INTRODUCTION

Nigeria shares a disproportionately high global maternal mortality burden accounting for approximately 58000 (about 19%) of the estimated 303000 maternal deaths that occurred in the year 2015.1 Although maternal mortality ratio declined from 1350 deaths per 100000 live births in 1990 to 814 deaths per 100000 live births in 2015 in Nigeria,2 within the same period of time (1990 to 2015), the number of maternal deaths rose from 57000 to 58000 in the country.3 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.4 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.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...
midwives), and in many instances, with no one present.\(^8\) 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.\(^5\)\(^6\)\(^7\) 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).\(^1\)\(^2\)\(^3\) 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.\(^13\)\(^14\)\(^15\) For example, the prevalence of home delivery decreased from 54% in 2003 to 27% in 2014 in Ghana;\(^16\) and from 79.2% in 2006 to 46.5% in 2014 in Nepal.\(^17\)

Several studies have examined the determinants of use/non-use of healthcare facility for childbirth in Nigeria,\(^10\)\(^17\)\(^18\)\(^19\)\(^20\)\(^21\) 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’)\(^25\)\(^26\) 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.\(^4\)\(^19\)\(^29\) 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.\(^3\)\(^2\)

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 75 43 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.\(^25\)\(^26\)\(^27\)\(^33\) 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.
‘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’).78

**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 model36 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 review710252640 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),35 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.3842

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 workers18 (all categorised as ‘a big problem’ and ‘not a big problem’). Other enabling factors included permission to visit health facility and getting money to

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![Figure 1](image-url)  
**Figure 1** Theoretical framework for studying factors associated with home child delivery in Nigeria (adapted from Andersen36)
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, χ² 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 our analysis and tested the final parsimonious model to minimise possible statistical errors, we double-checked our analysis and tested the final parsimonious model.

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

### Table 1 Continued

| Factors | n* (%)† | Prevalence of home delivery | %† | 95% CI |
|---------|---------|----------------------------|-----|--------|
| 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 (34.5) | 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) | 59.9 | 56.5 to 63.5 |
| Permission to visit health facility | Big problem | 1088 (14.8) | 86.8 | 83.4 to 89.6 |
| Not a big problem | 6428 (85.2) | 63.8 | 69.6 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) | 62.7 | 68.8 to 68.8 |
| Companionship to health facility | 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 χ² 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
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](image)

**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)  | –        |
| **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   |
Table 2  Continued

| Factors                              | UOR     | 95% CI          | P values |
|--------------------------------------|---------|-----------------|----------|
| 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.

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 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. 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. 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) 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. Early marriage means early initiation into family life and childbearing
Table 3  Factors associated with home delivery among women aged 15–24 years in Nigeria

| Factors | Model I† | Model II‡ | Model III§ | Model IV¶ |
|---------|----------|----------|------------|-----------|
|         | 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*** 1.34 to 1.81 | 1.65*** 1.34 to 2.07 | 1.65*** 1.34 to 2.07 |
| 1                                    | 1.00 (Reference) | 1.00 (Reference) | 1.00 (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) |            |
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.

Table 3  Continued

| Factors                     | Model I† AOR 95% CI | Model II‡ AOR 95% CI | Model III§/ AOR 95% CI | Model IV¶ AOR 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.

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, poverty25 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.5 33 Owing to socio-economic 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 35 The South-South region equally suffers low socioeconomic development due to a shortfall in infrastructure, environmental degradation and high rates of
unemployment. 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, accord with those of previous studies for all women of reproductive age in Nigeria and other developing countries. 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. 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, 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. 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. 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 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, 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), 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. 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. 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
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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