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Factors associated with non-utilization of maternal and child health services in Nigeria: results from the 2013 Nigeria demographic and health survey

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Abstract

Aim This study aims to examine factors associated with non-utilization of maternal and child health services in Nigeria.

Methods Secondary data from the 2013 Nigeria Demographic and Health Survey were utilized. A sample of 18,712 women aged 15–49 years who had had a child in the 5 years preceding the survey was selected. Variables on demographic and socio-economic characteristics of the study sample were analysed. Data analysis was carried out using STATA version 12 software. Univariate, bivariate and multivariate analyses were conducted.

Results We found that 48.83% of women had not made at least four antenatal care (ANC) visits, 62.34% delivered at home, while 71.43% had not received postnatal care (PNC). Multivariate analysis indicated that geo-political zone, location, women's education, religion, socio-economic status, marital status and husband's education were significantly associated with the non-utilization of ANC services, health facilities for delivery and PNC services.

Conclusion Our study concludes that maternal health-seeking behaviour is poor among women of reproductive age in Nigeria. In addition, demographic and socio-economic factors were significantly associated with the non-utilization of maternal and child health services. There is an urgent need for interventions to encourage the use of these services among women of reproductive age. Policy-makers need to design and implement policies targeted at women from the poorest households, who are less educated and living in rural areas or in the North West or South South region. This will assist in promoting change in maternal health-seeking behaviour.

Keywords Maternal health services · Antenatal care · Institutional delivery · Postnatal care · Population-based survey · Nigeria

Introduction

Maternal and child health is a global public health problem in low-resource countries. In 2015, it was estimated that about 303,000 women died during and following pregnancy and

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childbirth worldwide (WHO 2015). Up to 99% (302,000) of these deaths occurred in developing countries (WHO 2015). Sub-Saharan Africa (SSA) accounted for 66% (201,000) of all maternal deaths per year worldwide, yielding a maternal mortality ratio of 546 per 100,000 live births in 2015 (WHO 2015). Between 1990 and 2015, there was steady progress in the reduction of maternal mortality globally and in SSA, but the level of maternal mortality still remained unacceptably high in SSA (WHO 2015). The situation is critical in Nigeria, with a maternal mortality ratio of 814 per 100,000 live births at the end of 2017 (WHO 2015), an increase from 576 per 100,000 live births in 2013 (National Population Commission and Inner City Fund International 2014). Furthermore, Nigeria accounts for 19% of global maternal deaths (WHO 2015). Nigeria failed to meet the target of reducing the maternal mortality ratio by two thirds by 2015 as indicated in Millennium Development Goal 5 (WHO 2016). The World Health Organization (WHO) recommends four ANC visits during pregnancy, skilled assistance during

delivery, delivery at a health facility and PNC. These interventions are aimed at preventing maternal and child deaths. Nigeria as part of a global system has adopted these recommendations for the benefit of mothers and their newborn children. Despite strategies and policies to improve maternal and child health services, maternal and child mortality remains high in Nigeria with little progress made over decades. This implies that some women of reproductive age do not use maternal and child health services. In addition, there are inequities in the access to and quality of maternal and child health care services across Nigeria. Evidence suggests that the coverage of ANC, health facility delivery and PNC in Nigeria is low (National Population Commission and Inner City Fund International 2014). Hence, understanding of the factors associated with non-use of maternal and child health services are needed to inform policy decision-making aimed at improving poor maternal health-seeking behaviour and health outcomes, which are major public health challenges in Nigeria.

Many studies have focused on the determinants of maternal and child health service utilization in Nigeria (Aremu et al. 2011; Adamu 2011; Babalola & Fatusi 2009; Dahiru et al. 2015; Ononokpono et al. 2013; Ononokpono et al. 2014a, b; Ononokpono 2015; Rai et al. 2012) and elsewhere (Khanal et al. 2014a; Kruk et al. 2010; Kitui et al. 2013; Karkee et al. 2014; Mehari et al. 2013; Joshi et al. 2014; Singh et al. 2013; Tsegay et al. 2013; Regassa 2011; Ochako et al. 2011; Gupta et al. 2014; Nketiah-Amponsah et al. 2013) to explain the high rate of mortality. Findings from these studies are mixed. However, there is limited evidence on the determinants of non-utilization of maternal and child health services in Nigeria focusing on all the health care dimensions of ANC, delivery and PNC, which are important to reproductive and women's health (Somefun and Ibisomi 2016; Titaley et al. 2009; Titaley et al. 2010; Khanal et al. 2014b; Khanal et al. 2015; Adewuyi et al. 2017; Takai et al. 2015; Agho et al. 2016; Kruk et al. 2015). This study seeks to fill the gap by using a nationally representative household survey as well as examining the influence of demographic and socio-economic characteristics to ultimately inform policy decision-making to improve health services delivery. Understanding the factors among women who do not use maternal and child health services is important. The purpose of this study is to understand how the non-use of maternal and child health services is influenced by demographic and socio-economic factors.

Methods

Data source

Secondary data from the 2013 Nigeria Demographic and Health Survey (NDHS) were used for the study. The NDHS is a nationally representative, cross-sectional study conducted by the National Population Commission (NPC) with funding from the United States Agency for International Development (USAID), the United Kingdom Department for International Development (DFID) through Partnership for Transforming Health Systems Phase II (PATHS2), and the United Nations Population Fund (UNFPA) with technical support from ICF International. The NDHS 2013 provides updated estimates of some of the basic demographic and health indicators covered in the earlier surveys, such as fertility levels, marriage, fertility preferences, awareness and use of family planning methods, child feeding practices, nutritional status of women and children, adult and childhood mortality and awareness and attitudes regarding HIV/AIDS in addition to information on violence against women.

Study design

This was a retrospective cross-sectional study that comprised 18,712 women aged 15–49 years who had had a child in the 5 years preceding the survey.

Data collection

Relevant data for the study were extracted from the 2013 NDHS data set using simple random sampling and stratification techniques. Of the numerous variables in the women's recode, 17 were selected for the purpose of this study. The data were then cleaned, re-categorized and recoded as necessary.

Measurement of variables

Dependent variables

The dependent and/or outcome variables in this study were non-use of ANC (coded as 1 if a woman made less than four ANC visits and 0 if a woman made at least four ANC visits), non-use of health facilities for delivery (coded as 1 if the child was delivered at home and 0 if the child was delivered at a health facility) and non-use of PNC (coded as 1 if the women did not receive a health check within 2 months after delivery and 0 if women received a health check within 2 months after delivery). In 2013, WHO updated its guidelines on PNC with the recommendation that women and newborns should receive PNC at a health facility for at least 24 h after birth, on day 3 (48–72 h), between days 7–14 after birth and 6 weeks after birth, regardless of the place of delivery (WHO 2014). The variable for PNC was derived from the question: How long and how often after delivery did the respondent receive health checks?

Independent variables

The independent and/or explanatory variables were guided by Andersen's Behavioural Model (Aday and Andersen 1974) and a literature review on the determinants of non-utilization of maternal and child health services (Somefun and Ibisomi 2016; Titaley et al. 2009; Titaley et al. 2010; Khanal et al. 2014b; Khanal et al. 2015; Adewuyi et al. 2017; Takai et al. 2015; Agho et al. 2016; Kruk et al. 2015). In Andersen's Behavioural Model, the variables that determine the demand for health care are categorized into: predisposing factors (age, gender, ethnicity and household head characteristics), enabling factors (location, geo-political zone, education, health insurance status and household income) and need factors (perceived severity of illness, self-reported health status, presence of physician diagnosing chronic diseases and overweight).

In our study, maternal age was categorized into seven groups. Maternal education was classified as no education, primary education, secondary education and higher education. Location was defined as urban or rural within one of Nigeria's six geo-political zones: North Central, North East, North West, South East, South West and South South. Socio-economic status (SES) was recorded as poorest, poorer, middle, richer and richest. Marital status was defined as never married, married, living with partner, widowed, divorced and separated. Women's occupations were recoded as not working outside the home, professional/clerical, sales/agriculture/self-employed and manual worker. Religion was listed as Catholic, other Christian, Islam, Traditionalist and other. Women's autonomy was codified as decisions made by the woman alone, woman and husband, husband alone or someone else. Parity was graded as < 3, 3–4 and ≥ 5. Husband's education was categorized into no education, primary education, secondary education and higher education and family size as less or more than five members. Gender of the household head was defined as male or female.

Statistical analysis

Data were analysed using STATA version 12 software. Descriptive statistics were used to analyse the demographic and socio-economic characteristics of the study sample in the form of frequency tables and simple percentages. Chi-square analysis was used to test for associations between demographic and socio-economic characteristics and health care dimensions of ANC, delivery and PNC. Thereafter, multivariate logistic regression was used to examine the relationships between dependent variables (non-use of ANC, non-use of health facilities for delivery and non-use of PNC) and independent variables (maternal age, maternal education, location, geo-political zone, SES, religion, marital status, woman's occupation, woman's autonomy, husband's education, parity,

family size and gender of household head) using the equation in the binary logistic regression model:

$$y = \beta o + \beta i X i + \beta 2 X 2 + \beta 3 X 3 \ldots \beta n X n + E i$$

where y is the outcome/dependent variable, βo is the constant/intercept, $\beta i \ldots \beta n$ are the regression coefficients, $X i \ldots X n$ are a collection of independent/explanatory variables and $E i$ is the error term. Tests were done at a 95% confidence level and at 5% significance level.

Results

Descriptive statistics

Table 1 shows that 48.83% of women had not made at least four ANC visits and that 62.34% delivered at home, while 71.43% had not received PNC. Table 2 presents the demographic and socio-economic characteristics of the study population. The majority of women were aged between 25 and 29 years (25.68%). Among the study population, 44.98% had no education, 20.64% had primary education, 27.59% had secondary education and 6.79% had higher education. The majority of women (66.11%) lived in rural areas while only 33.89% lived in urban areas. Respondents consisted of households and individuals from the six geo-political zones: North Central (15.63%), North East (19.44%), North West (30.42%), South East (8.57%), South West (13.33%) and South South (12.61%). The majority of women were Muslims (56.60%) while (41.91%) were Christians. Husbands alone made health care decisions regarding women's health in 57.65% of the cases, while only 30.17% of women made health care decisions together with their husband. A total of 72.7% had more than five members in their household while only 27.3% had less than five members.

Table 1 Distribution of study population by maternal and child health services indicators

Outcome variable	Respondents (%) (N = 18,712)
Antenatal care (ANC)	
Less than 4 ANC visits	9138 (48.83%)
4 ANC visits	9574 (51.17%)
Place of delivery	
At home	11,665 (62.34%)
At a health facility	7047 (37.66%)
Postnatal care (PNC)	
Not received	13,366 (71.43%)
Received	5346 (28.57%)

Table 2 Demographic and socio-economic characteristics of study population

Independent variable	Respondents (%) (N = 18,712)
Maternal age	
15–19	1084 (5.79%)
20–24	3467 (18.53%)
25–29	4806 (25.68%)
30–34	3874 (20.70%)
35–39	3049 (16.29%)
40–44	1689 (9.03%)
45–49	743 (3.97%)
Maternal education	
No education	8417 (44.98%)
Primary	3862 (20.64%)
Secondary	5162 (27.59%)
Higher	1271 (6.79%)
Location	
Urban	6341 (33.89%)
Rural	12,371 (66.11%)
Geo-political zone	
North Central	2924 (15.63%)
North East	3638 (19.44%)
North West	5692 (30.42%)
South East	1604 (8.57%)
South West	2495 (13.33%)
South South	2359 (12.61%)
Socio-economic status	
Poorest	4012 (21.44%)
Poorer	4206 (22.48%)
Middle	3785 (20.23%)
Richer	3556 (19.00%)
Richest	3153 (16.85%)
Marital status	
Never married	507 (2.71%)
Married	16,985 (90.77%)
Living with partner	548 (2.93%)
Widowed	276 (1.47%)
Divorced	216 (1.15%)
Separated	180 (0.96%)
Religion	
Catholic	1534 (8.20%)
Other Christian	6307 (33.71%)
Islam	10,591 (56.60%)
Traditionalist	191 (1.02%)
Other	89 (0.48%)
Woman's occupation	
Not working outside home	5260 (28.11%)
Professional/clerical	836 (4.47%)
Sales/agriculture/self-employed	10,416 (55.66%)
Manual work	2200 (11.76%)

Table 2 (continued)

Independent variable	Respondents (%) (N = 18,712)
Woman's autonomy	
Woman alone	1019 (5.45%)
Woman and husband	5646 (30.17%)
Husband alone	10,787 (57.65%)
Someone else	1260 (6.73%)
Parity	
Less than 3 children	7368 (39.38%)
Between 3 and 4 children	5923 (31.65%)
5 or more children	5421 (28.97%)
Husband's education	
No education	7401 (39.55%)
Primary	3452 (18.45%)
Secondary	5334 (28.51%)
Higher	2525 (13.49%)
Family size	
Less than 5 members	5109 (27.30%)
More than 5 members	13,603 (72.70%)
Gender of household head	
Male	16,498 (88.17%)
Female	2214 (11.83%)

Predictors of non-utilization of maternal and child health services

Table 3 shows the determinants of non-utilization of maternal and child health services using chi-square analysis. Factors significantly associated with non-utilization of ANC services, health facilities for delivery and PNC services were maternal age, maternal education, location, geo-political zone, socio-economic status, marital status, religion, women's occupation, women's autonomy, parity, husband's education, family size and gender of household head.

Table 4 present results of the predictors of non-utilization of maternal and child health services using a logistic regression model. With respect to ANC visits, women aged 30–34 years were 0.81 times less likely to report non-use of ANC services (OR: 0.81; 95% CI: 0.68–0.97) compared with women aged 15–19 years, 20–24 years, 25–29 years, 35–39 years, 40–44 years and 45–49 years. Women aged 25–29 years were 1.21 times more likely to report non-use of health facilities for delivery (OR: 1.21; 95% CI: 1.00–1.47) compared with women aged 15–19 years, 20–24 years, 30–34 years, 35–39 years, 40–44 years and 45–49 years. It can be seen that women and husbands/partners with primary, secondary and higher education displayed lower odds of not utilizing ANC services, health facilities for delivery and PNC services compared with women and husbands/partners with no

Table 3 Factors associated with non-utilization of maternal and child health services using chi-square analysis

Demographic and socio-economic characteristics	Non-use of ANC		Non-use of health facilities for delivery		Non-use of PNC	
	X^2	p value	X^2	p value	X^2	p value
Maternal age	174.37	0.000*	166.32	0.000*	90.17	0.000*
Maternal education	3571.20	0.000*	5163.85	0.000*	2193.71	0.000*
Location	1867.48	0.000*	2776.09	0.000*	1062.43	0.000*
Geo-political zone	3108.74	0.000*	4806.43	0.000*	1710.73	0.000*
Socio-economic status	3905.97	0.000*	5220.15	0.000*	2345.16	0.000*
Marital status	61.88	0.000*	59.33	0.000*	72.54	0.000*
Religion	1439.74	0.000*	2530.83	0.000*	811.97	0.000*
Woman's occupation	592.65	0.000*	967.88	0.000*	382.99	0.000*
Woman's autonomy	1138.63	0.000*	1678.43	0.000*	757.14	0.000*
Parity	124.45	0.000*	273.19	0.000*	99.84	0.000*
Husband's education	3007.22	0.000*	3545.38	0.000*	1578.83	0.000*
Family size	166.41	0.000*	286.63	0.000*	83.36	0.000*
Gender of household head	193.49	0.000*	239.36	0.000*	77.28	0.000*

*$p < 0.05$

education. We found that women living in rural areas displayed higher odds of not utilizing ANC services (OR: 1.27; 95% CI: 1.16–1.40), health facilities for delivery (OR: 1.60; 95% CI: 1.46–1.76) and PNC services (OR: 1.20; 95% CI: 1.09–1.31) compared with women living in urban areas. Higher odds of not utilizing ANC services were found among women from the North West (OR: 1.73; 95% CI: 1.54–1.95) and South South (OR: 1.92; 95% CI: 1.68–2.20) regions of Nigeria, while lower odds of not utilizing ANC services were seen among women from the South East (OR: 0.49; 95% CI: 0.41–0.58) and South West (OR: 0.54; 95% CI: 0.46–0.62) regions. The likelihood of not utilizing health facilities for delivery was higher for women from the North East (OR: 1.79; 95% CI: 1.57–2.05), North West (OR: 3.64; 95% CI: 3.18–4.16) and South South (OR: 2.30; 95% CI: 2.00–2.65) regions, while the probability of not utilizing health facilities for delivery was lower for women from the South East (OR: 0.56; 95% CI: 0.47–0.66) and South West (OR: 0.81; 95% CI: 0.71–0.94) regions. Regarding PNC, women in the North West, South East and South South regions of Nigeria were 1.38, 1.71 and 1.52 times respectively more likely to report non-use of PNC services, while women in the North East and South West regions were 0.74 and 0.65 times respectively less likely to not do so. The odds of not utilizing ANC services, health facilities for delivery and PNC services were lower for women from the poorer, middle income, richer and richest households compared with women from the poorest households. Women who were widowed, divorced or separated were 1.62, 1.48 and 2.27 times respectively more likely to report non-use of ANC services compared with women who were not married, married or living with a partner. The odds of non-use of health facilities for delivery were 0.63 times lower

for women who were widowed (OR: 0.63; 95% CI: 0.43–0.91) compared with women who were not married, married, living with a partner, divorced or separated. There was an increased likelihood of not utilizing PNC services among married women (OR: 2.04; 95% CI: 1.13–3.68) and women who were divorced (OR: 1.55; 95% CI: 1.04–2.32) compared with women who were not married, living with partner, widowed or separated. Muslim women were 0.80 times less likely to not use ANC services than women who were Catholic, other Christian, Traditionalist or of another unclassified religious group. Women from other Christian faiths, Islam, and Traditionalist and other unclassified religions were 1.32, 1.50, 1.92 and 1.27 times respectively more likely to report non-use of health facilities for delivery than Catholic women. Those women who were Traditionalist were 1.60 times more likely to report non-use of PNC services (OR: 1.60; 95% CI: 1.03–2.50) compared with women who were Catholic, other Christian, Muslim or belonged to other unclassified religious group. Women who worked in sales or agriculture, were self-employed or did manual work were less likely to report non-use of ANC services and PNC services compared with women not working outside the home and women who were professionals or in clerical occupations. Women who jointly made health care decisions with their husbands and women whose husbands made health care decisions alone were less likely to report non-use of PNC services compared with women who made health care decisions alone and women who had someone else make them. Increased odds of non-use of health facilities for delivery were found in women with parity between three and four children (OR: 1.37; 95% CI: 1.21–1.54) and women with parity five or more children (OR: 1.42; 95% CI: 1.23–1.64). Women with more than five household members

Table 4 Factors associated with non-utilization of maternal and child health services using logistic regression model

Demographic and socio-economic characteristics	Non-use of ANC			Non-use of health facilities for delivery			Non-use of PNC		
	Odds ratio	95% CI	p value	Odds ratio	95% CI	p value	Odds ratio	95% CI	p value
Maternal age									
15–19	1	1	1	1	1	1	1	1	1
20–24	0.89	(0.76–1.05)	0.156	1.16	(0.97–1.40)	0.109	1.00	(0.83–1.19)	0.968
25–29	0.90	(0.76–1.06)	0.209	1.21	(1.00–1.47)	0.050*	1.05	(0.87–1.26)	0.617
30–34	0.81	(0.68–0.97)	0.023*	1.11	(0.90–1.36)	0.338	1.02	(0.84–1.25)	0.813
35–39	0.85	(0.70–1.03)	0.098	1.03	(0.83–1.29)	0.774	1.03	(0.83–1.26)	0.811
40–44	0.89	(0.72–1.10)	0.287	0.97	(0.76–1.24)	0.831	1.14	(0.91–1.44)	0.240
45–49	0.99	(0.77–1.27)	0.929	1.12	(0.84–1.50)	0.431	1.17	(0.89–1.54)	0.257
Maternal education									
No education	1	1	1	1	1	1	1	1	1
Primary	0.67	(0.61–0.75)	0.000*	0.66	(0.58–0.74)	0.000*	0.67	(0.61–0.75)	0.000*
Secondary	0.49	(0.43–0.55)	0.000*	0.44	(0.39–0.50)	0.000*	0.49	(0.43–0.55)	0.000*
Higher	0.33	(0.26–0.42)	0.000*	0.19	(0.15–0.25)	0.000*	0.33	(0.26–0.42)	0.000*
Location									
Urban	1	1	1	1	1	1	1	1	1
Rural	1.27	(1.16–1.40)	0.000*	1.60	(1.46–1.76)	0.000*	1.20	(1.09–1.31)	0.000*
Geo-political zone									
North Central	1	1	1	1	1	1	1	1	1
North East	0.94	(0.84–1.07)	0.350	1.79	(1.57–2.05)	0.000*	0.74	(0.66–0.84)	0.000*
North West	1.73	(1.54–1.95)	0.000*	3.64	(3.18–4.16)	0.000*	1.38	(1.21–1.57)	0.000*
South East	0.49	(0.41–0.58)	0.000*	0.56	(0.47–0.66)	0.000*	1.71	(1.47–1.99)	0.000*
South West	0.54	(0.46–0.62)	0.000*	0.81	(0.71–0.94)	0.004*	0.65	(0.57–0.74)	0.000*
South South	1.92	(1.68–2.20)	0.000*	2.30	(2.00–2.65)	0.000*	1.52	(1.33–1.74)	0.000*
Socio-economic status									
Poorest	1	1	1	1	1	1	1	1	1
Poorer	0.56	(0.50–0.62)	0.000*	0.49	(0.42–0.58)	0.000*	0.63	(0.55–0.73)	0.000*
Middle	0.35	(0.31–0.39)	0.000*	0.32	(0.27–0.37)	0.000*	0.43	(0.37–0.49)	0.000*
Richer	0.29	(0.25–0.33)	0.000*	0.23	(0.19–0.27)	0.000*	0.35	(0.29–0.41)	0.000*
Richest	0.24	(0.20–0.28)	0.000*	0.14	(0.12–0.18)	0.000*	0.27	(0.22–0.32)	0.000*
Marital status									
Never married	1	1	1	1	1	1	1	1	1
Married	1.24	(0.71–2.19)	0.449	0.60	(0.33–1.09)	0.094	2.04	(1.13–3.68)	0.018*
Living with partner	1.35	(0.75–2.41)	0.320	0.97	(0.52–1.79)	0.916	1.74	(0.95–3.20)	0.073
Widowed	1.62	(1.14–2.31)	0.007*	0.63	(0.43–0.91)	0.015*	1.40	(0.97–2.01)	0.068
Divorced	1.48	(1.01–2.15)	0.043*	1.00	(0.65–1.54)	0.986	1.55	(1.04–2.32)	0.031*
Separated	2.27	(0.54–3.36)	0.000*	0.90	(0.60–1.36)	0.618	1.04	(0.71–1.53)	0.832
Religion									
Catholic	1	1	1	1	1	1	1	1	1
Other Christian	0.95	(0.82–1.09)	0.467	1.32	(1.14–1.53)	0.000*	1.00	(0.88–1.15)	0.917
Islam	0.80	(0.68–0.93)	0.005*	1.50	(1.27–1.76)	0.000*	1.13	(0.98–1.32)	0.103
Traditionalist	1.35	(0.94–1.95)	0.104	1.92	(1.28–2.88)	0.002*	1.60	(1.03–2.50)	0.037*
Other	0.93	(0.55–1.57)	0.785	1.27	(1.24–4.15)	0.008*	0.78	(0.47–1.30)	0.339
Woman's occupation									
Not working outside home	1	1	1	1	1	1	1	1	1
Professional/clerical	0.88	(0.70–1.11)	0.281	0.87	(0.69–1.11)	0.268	0.93	(0.77–1.11)	0.418
Sales/agriculture/self-employed	0.83	(0.76–0.91)	0.000*	0.92	(0.83–1.01)	0.092	0.81	(0.74–0.89)	0.000*
Manual worker	0.69	(0.61–0.78)	0.000*	0.92	(0.80–1.06)	0.260	0.81	(0.71–0.92)	0.001*

Table 4 (continued)

Demographic and socio-economic characteristics	Non-use of ANC			Non-use of health facilities for delivery			Non-use of PNC		
	Odds ratio	95% CI	*p* value	Odds ratio	95% CI	*p* value	Odds ratio	95% CI	*p* value
Woman's autonomy									
Woman alone	1	1	1	1	1	1	1	1	1
Woman and husband	0.91	(0.77–1.07)	0.251	0.86	(0.73–1.01)	0.066	0.66	(0.57–0.77)	0.000*
Husband alone	1.08	(0.91–1.27)	0.379	1.11	(0.94–1.31)	0.203	0.85	(0.73–1.00)	0.044*
Someone else	0.88	(0.51–1.52)	0.647	0.87	(0.49–1.54)	0.622	1.21	(0.69–2.14)	0.494
Parity									
Less than 3 children	1	1	1	1	1	1	1	1	1
Between 3 and 4 children	1.09	(0.98–1.21)	0.124	1.37	(1.21–1.54)	0.000*	1.09	(0.98–1.22)	0.106
5 or more children	1.07	(0.92–1.21)	0.322	1.42	(1.23–1.64)	0.000*	1.04	(0.91–1.19)	0.532
Husband's education									
No education	1	1	1	1	1	1	1	1	1
Primary	0.56	(0.51–0.63)	0.000*	0.76	(0.67–0.87)	0.000*	0.80	(0.71–0.91)	0.001*
Secondary	0.52	(0.47–0.58)	0.000*	0.65	(0.57–0.74)	0.000*	0.74	(0.65–0.84)	0.000*
Higher	0.49	(0.42–0.56)	0.000*	0.57	(0.49–0.67)	0.000*	0.68	(0.59–0.78)	0.000*
Family size									
Less than 5 members	1	1	1	1	1	1	1	1	1
More than 5 members	1.04	(0.95–1.14)	0.412	0.96	(0.87–1.07)	0.472	0.90	(0.82–0.99)	0.028*
Gender of household head									
Male	1	1	1	1	1	1	1	1	1
Female	0.84	(0.75–0.95)	0.006*	0.91	(0.80–1.02)	0.111	0.90	(0.8–1.01)	0.070

*$p < 0.05$

were less likely to report non-use of PNC services (OR: 0.90; 95% CI: 0.82–0.99) compared with women with less than five household members. Female-headed households were associated with a decreased likelihood of not utilizing ANC services (OR: 0.84; 95% CI: 0.75–0.95) compared with male-headed households.

Discussion

Our study examined the factors associated with non-utilization of maternal and child health services in Nigeria. Results from the study showed that maternal health-seeking behaviour is poor among women of reproductive age. Similar studies in Nigeria support this finding (Adamu 2011; Babalola & Fatusi 2009; Dahiru et al. 2015; Ononokpono et al. 2013; Ononokpono et al. 2014a, b; Ononokpono 2015; Somefun & Ibisomi 2016; Takai et al. 2015). Furthermore, the utilization of maternal and child health care services in Nigeria was also low compared with other countries in Africa. In this study, maternal age was significantly associated with non-utilization of at least four ANC visits and health facility delivery. This result is consistent with a study conducted in Nigeria (Adewuyi et al. 2017). Findings from our study revealed that maternal education was significantly associated with non-

utilization of at least four ANC visits, health facilities for delivery and PNC. This result is consistent with studies conducted in Nigeria (Takai et al. 2015; Somefun & Ibisomi 2016; Agho et al. 2016; Adewuyi et al. 2017) and elsewhere (Khanal et al. 2014b, 2015; Titaley et al. 2010; Titaley et al. 2009). Education determines the level of economic empowerment, ability to make decisions regarding health care and knowledge of pregnancy and pregnancy care. Living in rural areas was significantly associated with non-utilization of at least four ANC visits, health facilities for delivery and PNC. This result is consistent with studies conducted in Nigeria (Agho et al. 2016; Adewuyi et al. 2017) and elsewhere (Khanal et al. 2014b; Titaley et al. 2010). Rural-urban differences in health service delivery could explain the reason why rural residents do not utilize maternal health services. Our results showed that geopolitical zone was significantly associated with non-utilization of at least four ANC visits, health facilities for delivery and PNC. This finding is consistent with similar studies from Nigeria (Somefun & Ibisomi 2016; Adewuyi et al. 2017) and elsewhere (Titaley et al. 2010) and could be due to the fact that southern Nigeria is more developed than northern Nigeria. Socio-economic status was significantly associated with non-utilization of at least four ANC visits, health facilities for delivery and PNC. This result is also consistent with studies conducted in Nigeria (Somefun &

Ibisomi 2016; Agho et al. 2016; Adewuyi et al. 2017) and elsewhere (Khanal et al. 2014b; Khanal et al. 2015; Titaley et al. 2010; Titaley et al. 2009). Poor women are often not economically empowered to utilize health care services. Marital status was significantly associated with non-utilization of at least four ANC visits, health facility delivery and PNC. This result is consistent with another study conducted in Nigeria (Takai et al. 2015). Religion was significantly associated with non-utilization of at least four ANC visits, health facilities for delivery and PNC, consistent with a study conducted in Nigeria (Adewuyi et al. 2017). Women's occupation was also significantly associated with non-utilization of at least four ANC visits and PNC. In contrast, a study in Timor-Leste found women's occupation to be significantly associated only with non-use of health facilities for delivery (Khanal et al. 2014b). Women who were not working outside the home and those with poorly paid jobs may not be able to afford maternal health services. Women's autonomy was also significantly associated with non-utilization of at least four ANC visits and PNC. In contrast, a study in Indonesia found that women's autonomy was significantly associated with non-utilization of ANC services (Titaley et al. 2010). A man's right to make decisions regarding women's health care could affect maternal health care-seeking behaviour. Parity was significantly associated with non-utilization of health facilities for delivery. This result is consistent with a study conducted in Timor-Leste (Khanal et al. 2014b). In contrast, another study in Indonesia found that parity was significantly associated with non-utilization of ANC services (Titaley et al. 2010). Generally speaking, women who have had previous experiences of childbirth with no complications tend to deliver at home. Husbands' educational level was significantly associated with non-utilization of at least four ANC visits, health facilities for delivery and PNC. This result is consistent with studies conducted in Nigeria (Takai et al. 2015; Adewuyi et al. 2017) and elsewhere (Khanal et al. 2014b; Khanal et al. 2015). Education determines the level of economic empowerment, ability to make decisions regarding health care and knowledge of pregnancy and pregnancy care. Family size was significantly associated with non-utilization of PNC. At least one previous study in Nigeria has shown that family size influences PNC utilization (Ononokpono et al. 2014a). Gender of the household head was significantly associated with non-utilization of at least four ANC visits.

Limitations of the study

Our study has some limitations that nevertheless do not invalidate our work. The study used cross-sectional secondary data; hence, causality for the factors associated with non-use of maternal and child health services could not be established. Findings from our study were also affected by the structure of the questionnaire, mode of data collection and recall bias due to self-reported information. Although it was published in 2013, the NDHS is still the most recent NDHS data set publicly available before the release of the 2018 NDHS.

Conclusions

Our study concludes that maternal health-seeking behaviour is poor among women of reproductive age. In addition, demographic and socio-economic factors are associated with the non-utilization of maternal and child health services. Hence, there is a need for policy-makers to target these factors in the design and implementation of policies to improve utilization of maternal and child health services among women of reproductive age. Our study has implications for poor maternal health-seeking behaviour in Nigeria. Policy-makers need to develop interventions to promote education and awareness among women, address inadequate cultural practices that prevent the utilization of maternal and child health services, increase women's autonomy and strengthen poverty alleviation and women's empowerment, particularly in rural areas. Further research should adopt a qualitative approach for better understanding and insights into the factors associated with the non-utilization of maternal and child health services in Nigeria.

Compliance with ethical standards

The authors declare that they have no conflict of interest.

Ethical approval A request was made for microdata from the NDHS website on September 8, 2017, and approval granted for downloading on the same day. Hence, there were no ethical issues of concern as this is publicly available information.

Statement regarding informed consent Issues of informed consent were addressed by the Institutional Review Board (IRB) of ICF Macro International in the United States and the National Health Research Ethics Committee (NHREC) of the Federal Ministry of Health (FMOH) of Nigeria.

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