



2023

Socio-Demographic Determinants of Non-Utilisation of Antenatal Care Services by Women in the Northern Region of Nigeria

Abubakar Yakubu Abbani

Ph.D. Program, Institute for Population and Social Research, Mahidol University, Thailand

Yothin Sawangdee

Institute for Population and Social Research, Mahidol University, Thailand

Olusola Akintoye Omisakin

Department of Demography and Social Statistics, Federal University Birnin Kebbi, Nigeria

Maretalinia Maretalinia

Ph.D. Program, Institute for Population and Social Research, Mahidol University, Thailand

Follow this and additional works at: <https://digital.car.chula.ac.th/jhr>



Part of the [Epidemiology Commons](#), [Psychiatric and Mental Health Commons](#), and the [Substance Abuse and Addiction Commons](#)

Socio-Demographic Determinants of Non-Utilisation of Antenatal Care Services by Women in the Northern Region of Nigeria

Abubakar Y. Abbani ^a, Yothin Sawangdee ^{a,*},
Olusola A. Omisakin ^b, Maretalinia Maretalinia ^a

^a Institute for Population and Social Research, Mahidol University, Thailand

^b Department of Demography and Social Statistics, Federal University Birnin Kebbi, Nigeria

Abstract

Background: A large proportion of women in the northern region of Nigeria do not utilise antenatal care (ANC) services. As a result, the region has the worst maternal and child health indicators. This study aims to identify the socio-demographic determinants of the non-utilisation of ANC services by pregnant women to provide evidence for policymakers to base decisions towards addressing the problem.

Methods: Data from the 2018 Nigeria Demographic and Health Survey was used with a sample of 14,421 women with a pregnancy history. Descriptive, bivariate, and hierarchical regression analyses were applied to the data using STATA software version 15.

Results: It was found that 32% of women in the northern region of Nigeria did not utilise ANC services during their most recent pregnancies. Factors at the individual (age, education, religion, ethnicity, parity, pregnancy intention, history of pregnancy termination, and media exposure), household (wealth index, husband's education, and autonomy in healthcare decision), and community (place and state of residence) levels were significant determinants of non-utilisation of ANC services by pregnant women in the region.

Conclusion: Policymakers should aim to develop programmes that target Muslim women, those from Hausa and Fulani ethnic groups, and those who reside in rural areas, to increase the uptake of ANC services.

Keywords: ANC services, Determinants, Non-utilisation, Northern region, Nigeria

1. Introduction

According to the World Health Organization (WHO) [1], Sub-Saharan African countries contribute the highest maternal deaths worldwide, with Nigeria accounting for about 23% in 2017 accounting for an estimated 67,000 women dying from pregnancy and childbirth-related causes. This high number of maternal deaths in Nigeria is due partly to low- or non-utilisation of maternal healthcare services (MHS) by women, especially antenatal care (ANC), which is a preventive measure against maternal and child deaths [2–7].

Antenatal care is among the more vital globally recommended interventions towards preventing

maternal and child mortality. The WHO [8] suggests a minimum of eight ANC contacts during a pregnancy with no complications; an increase from the previous recommendation of four visits. The frequency of ANC visits by a pregnant woman is essential in averting impediments and adverse pregnancy outcomes [8–12]. Fittingly, ANC visits enable healthcare providers to identify and manage obstetric complications and to provide educative messages and counselling to women for a healthy pregnancy and safe delivery [13–15]. A strong association has been established between ANC use and safe delivery services by women [16]. Despite the importance of ANC to the health of pregnant women, many Nigerian women, especially those from the northern region, either under-utilise or do not seek ANC services. The

Received 10 October 2022; revised 11 December 2022; accepted 13 December 2022.
Available online 20 January 2023

* Corresponding author.
E-mail address: yothin.saw@mahidol.ac.th (Y. Sawangdee).

<https://doi.org/10.56808/2586-940X.1043>

2586-940X/© 2023 The Authors. Published by College of Public Health Sciences, Chulalongkorn University. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

2018 Nigeria Demographic and Health Survey (NDHS) [14] reported that about a quarter of pregnant women in the country did not receive any ANC services, while only 67% had at least one ANC contact with a trained provider. The situation is worse in the northern region, with 32% of pregnant women not seeking ANC services, necessitating the need for this study.

Many studies have been conducted in Nigeria and other developing countries to identify the determinants of utilising ANC services by pregnant women [3,4,7,15,17–27]. However, most of the studies in Nigeria have mainly focused on the determinants of utilisation but not on the non-utilisation of ANC services despite the high rate of non-utilisation by pregnant women. Furthermore, very few studies have focused on the country's determinants of non-utilisation or under-utilisation [2,18,28,29]. None of these studies was specific to the northern region, which has the highest rates of non-utilisation of ANC services. Being a heterogeneous country with socio-demographic and cultural differences among the regions, some regional-specific determinants may be peculiar to specific areas and therefore promote a high rate of non-utilisation of ANC services in one region than in another. It is against this background that this study was designed.

The objective of this study is to identify the socio-demographic determinants of non-utilisation of ANC services by pregnant women in the northern region of Nigeria to provide evidence that will guide policymakers towards designing appropriate region-specific programmes that will promote ANC uptake towards improving maternal health in that region of Nigeria.

2. Methods

2.1. Data and sample

This study utilised data from the 2018 Nigeria Demographic and Health Survey (NDHS), a nationally representative sample survey. The 2018 NDHS used a stratified two-stage cluster sampling design to collect data from rural and urban households across the country. Full details of the sampling design of the 2018 NDHS can be found in the full report [14]. The current study includes 14,421 (weighted = 14,244) women with a history of pregnancy in the five years prior to the 2018 NDHS across 744 cluster units in the northern region of Nigeria who had complete information concerning questions on ANC services use relating to their most recent pregnancy.

2.2. Variables

2.2.1. Outcome variable

The outcome variable measured in this study is the non-use of ANC services (categorised as a dummy variable with '1' for those who did not seek ANC services and '0' for those who attended at least one ANC visit). Only women who answered the question on the number of times they received ANC in respect of their most recent pregnancy before the 2018 NDHS were included in the analyses. However, women who indicated "don't know" were excluded.

2.2.2. Explanatory variables

The explanatory variables were selected based on a review of the literature on the determinants of utilisation and non-utilisation of ANC services in developing countries. The determinants were categorised into individual, household, and community factors to understand the influence of determinants at different levels. Individual factors included maternal age (15–19, 20–29, 30–39, 40–49), marital status (never married, currently married/living with a partner, others [widowed, divorced, or separated]), education (no education, primary, secondary or higher), religion (Islam, Christianity and others), ethnic group (Hausa, Fulani, and others), working status (not currently working, currently working), parity (one birth, two births, three or more births), pregnancy intention when respondent became pregnant with their last child (wanted, mistimed, and unwanted), history of pregnancy termination within the five years preceding the survey ('Yes' if women responded yes to 'Have you ever had a pregnancy that miscarried, was aborted, or ended in a stillbirth?' and the year that such pregnancy ended as 2013 to 2018; 'No' if otherwise), and media exposure, i.e., frequency of reading newspapers/magazines, listening to radio, and watching television ('No' for those with "not at all" response and 'Yes' for those with exposure at least once in a week). Household factors included household wealth index (poorest, poorer, middle, richer and richest), husband's education (no education, primary, secondary or higher), and women's autonomy in healthcare decision-making ('autonomous decision' if women participated in decision making; and 'no autonomy in decision' if otherwise). Community factors included the place of residence (urban, rural) and sub-region of residence (north–central, northeast, northwest).

2.2.3. Statistical analysis

Descriptive, bivariate and hierarchical regression analyses were performed to identify and understand

the socio-demographic determinants of non-utilisation of ANC services. The descriptive analysis presents the socio-demographic characteristics of sampled respondents showing frequency and percentage. The bivariate analysis estimated the association between the explanatory and outcome variables using chi-square tests for statistical significance. Due to the hierarchical structure of the NDHS data, a two-level multilevel regression was used to determine the fixed effects of factors associated with the non-utilisation of ANC services. Before estimating the hierarchical models that include the explanatory variables, a null model was estimated and used to calculate the intraclass correlation coefficient (i.e., $ICC = 0.453$). The ICC value indicated that 45% of the variations in the non-utilisation of ANC services in the region were due to cluster-to-cluster differences.

Three nested models were estimated to explain the influence of individual women, household, and community-level factors on the non-utilisation of ANC services in northern Nigeria. Model 1 estimated for characteristics of individual women, Model 2 included women's household factors in addition to their characteristics, while Model 3 incorporated community contextual factors together with individual and household factors. The goodness of the three models were compared using the log-likelihood statistics, and only the model with the best fit was interpreted, usually the model with lower log-likelihood statistics. The results of the three models were reported using adjusted odd ratios (AOR) with standard errors (SE) and p values at a 0.05 level of significance. The analyses applied sample weights to account for the complex designs of the NDHS data. All analyses were performed using STATA statistical software, version 15.0.

2.2.4. Ethical approval

Ethical approval for the NDHS was obtained by the National Population Commission of Nigeria from the National Health Research Ethics Committee of the Federal Ministry of Health, Nigeria and the ICF Institutional Review Board. To use the dataset, we registered and obtained approval from the DHS program (https://www.dhsprogram.com/data/dataset_admin/login_main.cfm), which is the custodian of the dataset.

3. Results

3.1. Descriptive and bivariate analyses

The distribution of the sample (Table 1) shows that about two-thirds of the respondents had

utilised ANC services at least once while about one-third did not utilise ANC services at all. The mean age of the respondents was 29 years ($SD = 7.36$). The age distribution shows that 7% of the women were adolescents (15–19 years), almost half were between ages 20–29, about one-third were between ages 30–39, and those within ages 40–49 years constituted one-tenth. The majority were married or living with a partner at the time of the survey. Almost one-third had no formal education, 14% had only primary education, and almost one-quarter were educated to secondary or higher education level. Christianity and other religions constituted one-fifth, while the majority were practicing Muslims. Respondents from the Fulani ethnic group constituted 13%, almost half were from the Hausa ethnic group, and 41% were from different ethnic groups combined. A substantial proportion of the respondents were not working, while the majority were working at the time of the survey.

Furthermore, 15% of the respondents had one birth, about 16% had two births, and the majority had three or more births. In terms of pregnancy intention, an overwhelming majority of the respondents wanted their last pregnancy, compared to 5% of those whose pregnancy was mistimed and 2% of those whose pregnancy was unwanted. Within the five years preceding the data collection, 9% of the respondents reported having a pregnancy termination. Respondents' exposure to media shows that the majority did not read newspapers or magazines, listen to a radio, or watch television in comparison to those who did so at least once a week. Respondents' household wealth index ranged from 32% for those who belong to the poorest household to 7% for those who belong to the richest household. About half of the respondents were married to husbands with no formal education, 12% were married to husbands with only primary education, and 39% to those with secondary or higher education. An approximate three-quarters of the respondents had no autonomy in decisions regarding their healthcare. About a quarter of the respondents resided in urban areas, while the majority were from rural areas. The sub-regional spread shows that about a quarter resided in the north–central zone, almost one-third were from the north-east zone, and almost half resided in the north-west zone.

The result of bivariate analysis from chi-square (Table 1) shows that all the individual, household, and community level factors were significantly associated with the non-utilisation of ANC services by women in the region ($p < .05$).

Table 1. Sample socio-demographic characteristics and Chi-square test of association.

Variable	Number of respondents (%)			p-value
	Users	Non-users	Total	
Mean age of respondents	9878 (68.5)	4543 (31.5)	14,421	
Age (years)	29 years (SD = 7.36)			0.000
15–19	603 (63.7)	343 (36.3)	946 (6.6)	
20–29	4746 (69.4)	2096 (30.6)	6842 (47.4)	
30–39	3489 (70.1)	1487 (29.9)	4976 (34.5)	
40–49	1040 (62.8)	617 (37.2)	1657 (11.5)	
Marital status				0.015
Never married	137 (74.1)	48 (25.9)	185 (1.3)	
Married/living with partner	9410 (68.3)	4376 (31.7)	13,786 (95.6)	
Others	331 (73.6)	119 (26.4)	450 (3.1)	
Education				0.000
No education	5032 (56.6)	3866 (43.5)	8898 (61.7)	
Primary	1657 (81.3)	382 (18.7)	2039 (14.1)	
Secondary or higher	3189 (91.5)	295 (8.5)	3484 (24.2)	
Religion				0.000
Christianity & others	2413 (81.1)	562 (18.9)	2975 (20.6)	
Islam	7465 (65.2)	3981 (34.8)	11,446 (79.4)	
Ethnicity				0.000
Fulani	1026 (53.2)	904 (46.8)	1930 (13.4)	
Hausa	4234 (64.9)	2288 (35.1)	6522 (45.2)	
Others	4618 (77.4)	1351 (22.6)	5969 (41.4)	
Employment				0.000
Not working	3483 (61.3)	2200 (38.7)	5683 (39.4)	
Working	6395 (73.2)	2343 (26.8)	8738 (60.6)	
Parity				0.000
One birth	1608 (73.5)	579 (26.5)	2187 (15.2)	
Two births	1596 (71.0)	653 (29.0)	2249 (15.6)	
Three or more births	6674 (66.8)	3311 (33.2)	9985 (69.2)	
Pregnancy intention				0.000
Wanted	9099 (68.1)	4257 (31.9)	13,356 (92.6)	
Mistimed	610 (77.1)	181 (22.9)	791 (5.5)	
Unwanted	169 (61.7)	105 (38.3)	274 (1.9)	
History of pregnancy termination				0.000
No	8937 (67.9)	4232 (32.1)	13,169 (91.3)	
Yes	941 (75.2)	311 (24.8)	1252 (8.7)	
Read newspaper/magazine				0.000
No	9101 (67.0)	4485 (33.0)	13,586 (94.2)	
Yes	777 (93.0)	58 (7.0)	835 (5.8)	
Listen to radio				0.000
No	5167 (60.9)	3324 (39.1)	8491 (58.9)	
Yes	4711 (79.4)	1219 (20.6)	5930 (41.1)	
Watch television				0.000
No	6306 (60.79)	4068 (39.21)	10,374 (71.9)	
Yes	3572 (88.26)	475 (11.74)	4047 (28.1)	
Wealth index				0.000
Poorest	2330 (50.35)	2298 (49.65)	4628 (32.1)	
Poorer	2624 (65.06)	1409 (34.94)	4033 (28.0)	
Middle	2273 (79.73)	578 (20.27)	2851 (19.8)	
Richer	1621 (87.53)	231 (12.47)	1852 (12.8)	
Richest	1030 (97.45)	27 (2.55)	1057 (7.3)	
Husband education*				0.000
No education	3487 (51.24)	3318 (48.76)	6805 (49.4)	
Primary	1287 (77.20)	380 (22.80)	1667 (12.1)	
Secondary or higher	4636 (87.24)	678 (12.76)	5314 (38.5)	
Autonomy in healthcare decision*				0.000
No autonomy in decision	6441 (63.91)	3638 (36.09)	10,079 (73.1)	
Autonomous decision	2969 (80.09)	738 (19.91)	3707 (26.9)	

(continued on next page)

Table 1. (continued)

Variable	Number of respondents (%)			p-value
	Users	Non-users	Total	
Place of residence				0.000
Urban	2998 (83.98)	572 (16.02)	3570 (24.8)	
Rural	6880 (63.40)	3971 (36.60)	10,851 (75.2)	
Sub-region				0.000
North–Central	2805 (73.99)	986 (26.01)	3791 (26.3)	
North–East	3179 (71.45)	1270 (28.55)	4449 (30.8)	
North–West	3894 (63.00)	2287 (37.00)	6181 (42.9)	

Note: sample is unweighted; * $n = 13,786$.

3.2. Determinants of non-utilisation of ANC services

Table 2 shows the results of the two-level hierarchical regression models for determinants of non-utilisation of ANC services by women in northern Nigeria. Focusing on the third model, which is the best fit, the result shows that age (except for 40–49 years), religion, and exposure to reading newspapers/magazines were not statistically significant determinants of the non-utilisation of ANC services. All the other confounders reveal positive and statistically significant associations ($p < .05$).

The result shows that as age increases, the likelihood of not utilising ANC services increases, with those in the oldest age group (40–49 years) being 1.47 times more likely to not utilise ANC services than those in the youngest age group (15–19 years). However, education reduces the likelihood of non-utilisation of ANC services such that women with primary education and those with secondary or higher education were 44% and 68% less likely to not utilise ANC services than those without formal education in the region. Women from the Fulani ethnic group were 1.74 times more likely to report non-utilisation of ANC services than those from other ethnic groups. Being a working woman reduces the likelihood of not utilising ANC services by 30%. Multiparous women were 1.46 times (two births) and 1.38 times (three or more births) more likely to not utilise ANC services while pregnant than those with only one birth history. Women who had an unwanted pregnancy, compared to those who had intention to become pregnant, were 1.64 times more likely to not utilise ANC services. Women who had a history of pregnancy termination were 29% less likely to not utilise ANC services than their peers with no prior experience of pregnancy termination. Listening to the radio and watching television at least once a week reduced the likelihood of not utilising ANC services by 30% and 25% - than not doing so.

Household factors were also found to influence the non-utilisation of ANC services. Household wealth

index reduced the likelihood of not utilising ANC services consistently from 22% among women in poorer households to 87% among women in the richest households, as compared to those in the poorest households. Women whose husbands had a primary education and those with secondary or higher education were 44% and 48%, respectively, less likely to not utilise ANC services than those whose husbands had no formal education. Similarly, women who had autonomous decisions regarding their healthcare were 22% less likely to not utilise ANC services relative to those who had no autonomy in decision regarding their own health care.

Community-level factors were found to determine the non-utilisation of ANC services by women in northern Nigeria. Women residing in rural areas were found to be 1.61 more likely to not utilise ANC services than those residing in urban areas, and those residing in the north-east and north-west zones were 64% and 44%, more likely to not utilise ANC services when compared with those residing in the north–central zone of the region.

4. Discussion

This study aimed to identify and understand the determinants of the non-utilisation of ANC services by women in the northern region of Nigeria. About one-third of women who had given birth in the region within the five years prior to the 2018 Nigeria Demographic and Health Survey did not seek ANC services while pregnant. This high prevalence of non-utilisation of ANC services can lead to adverse maternal health outcomes. The result shows that all the individual, household, and community level factors were significantly associated ($p < .05$) with the non-utilisation of ANC services by women in the region. Except for ages below 40–49, religion, and exposure to reading newspapers/magazines, all other determinants were statistically significant in the multilevel regression models estimated.

This study found that as age increases, the odds to not utilise ANC services also increases, with the

Table 2. Hierarchical regression models to identify determinants of non-utilisation of ANC services in the northern region of Nigeria.

Fixed effects	Model 1	Model 2	Model 3
	AOR (SE)	AOR (SE)	AOR (SE)
<i>Intercept</i>	0.52 (0.08) ***	0.99 (0.16)	0.98 (0.22)
Age (years) [15–19 ^{ref}]			
20–29	1.05 (0.11)	1.03 (0.11)	1.02 (0.11)
30–39	1.10 (0.13)	1.08 (0.13)	1.08 (0.13)
40–49	1.56 (0.21) **	1.47 (0.20) **	1.47 (0.20) **
Education [None ^{ref}]			
Primary	0.47 (0.04) ***	0.58 (0.05) ***	0.56 (0.05) ***
Secondary or higher	0.21 (0.02) ***	0.32 (0.03) ***	0.32 (0.03) ***
Religion [Others ^{ref}]			
Islam	0.91 (0.12)	0.86 (0.11)	1.07 (0.14)
Ethnicity [Others ^{ref}]			
Fulani	1.73 (0.20) ***	1.62 (0.19) ***	1.74 (0.21) ***
Hausa	1.24 (0.12) *	1.15 (0.11)	1.19 (0.13)
Employment [Not working ^{ref}]			
Working	0.69 (0.04) ***	0.70 (0.04) ***	0.70 (0.04) ***
Parity [One birth ^{ref}]			
Two births	1.43 (0.13) ***	1.46 (0.14) ***	1.46 (0.14) ***
Three or more births	1.33 (0.12) **	1.37 (0.13) **	1.38 (0.13) **
Pregnancy intention [Wanted ^{ref}]			
Mistimed	1.32 (0.15) *	1.15 (0.15)	1.15 (0.15)
Unwanted	1.49 (0.26) *	1.68 (0.31) **	1.64 (0.30) **
History of pregnancy termination [No ^{ref}]			
Yes	0.79 (0.07) **	0.80 (0.07) *	0.81 (0.07) *
Read newspaper/magazine [No ^{ref}]			
Yes	0.90 (0.15)	0.93 (0.17)	0.95 (0.17)
Listen to radio [No ^{ref}]			
Yes	0.67 (0.04) ***	0.70 (0.04) ***	0.70 (0.04) ***
Watch television [No ^{ref}]			
Yes	0.61 (0.05) ***	0.76 (0.06) **	0.75 (0.06) **
Wealth index [Poorest ^{ref}]			
Poorer		0.79 (0.05) ***	0.78 (0.05) ***
Middle		0.58 (0.05) ***	0.59 (0.05) ***
Richer		0.39 (0.05) ***	0.41 (0.05) ***
Richest		0.12 (0.03) ***	0.13 (0.03) ***
Husband's education [None ^{ref}]			
Primary		0.56 (0.04) ***	0.56 (0.04) ***
Secondary or higher		0.52 (0.04) ***	0.52 (0.04) ***
Autonomy in healthcare decision [No autonomy ^{ref}]			
Autonomous decision		0.77 (0.05) ***	0.78 (0.05) ***
Place of Residence [Urban ^{ref}]			
Rural			1.61 (0.22) **
Sub-region [North–Central ^{ref}]			
North-East			0.36 (0.06) ***
North-West			0.56 (0.09) ***
Random Effect			
Intercept variance	1.80 (0.14)	1.52 (0.12)	1.38 (0.11)
Model Fit			
–2 log-likelihood	13,435.98	12,540.50	12,487.42

Note: AOR = Adjusted odds ratio; SE = Standard error; * $p < .05$, ** $p < .01$, *** $p < .001$.

oldest women (40–49 years) being more likely to not seek ANC services. Similarly, women with two or more births were more likely to not utilise ANC services. These situations may be due to a feeling of being experienced in pregnancy care by the older women and those with two or more children to warrant them to not attend ANC. Other reasons

may be due to unfavourable experiences with healthcare service providers during their previous pregnancies.

The findings indicate that education, both as individual and household level determinant, tends to reduce the likelihood of non-utilisation of ANC services by women while pregnant, as women who

were educated and/or whose husbands were educated, especially with secondary and higher education, were more likely to utilise ANC services than those who had and/or their husbands had no formal education. This finding is consistent with other studies in Nigeria and elsewhere [2,21,28,30]. The finding is not surprising because education has been shown to promote health services utilisation by women; education reduces the likelihood of non-utilisation of services because educated women can read, understand, and possess a higher level of awareness of the dangers of not utilising ANC services while pregnant. It enhances decision-making to utilise health services [30–33]. This result, therefore, reinforces the need for governments in the states of the northern region of Nigeria to enhance education, especially for women. In particular, girl-child education should be promoted and prioritised. The benefits of girl-child education are numerous. It will reduce early marriage and early childbearing and promote healthcare services utilisation by women, especially ANC, while pregnant, thereby enhancing maternal and child health.

This study found that Hausa and Fulani women have higher odds of non-utilisation of ANC services than their counterparts from other ethnic groups in the region. This could be due to the predominance of traditional practices around pregnancy and childbirth among the Fulani and Hausa ethnic groups who share a long history of coexistence and inter-marriage, hence the commonality in traditional practices. Being predominantly Muslim and in line with their religious beliefs, the Hausa and Fulani ethnic groups frown at healthcare providers who are not females to attend to women during ANC, thereby increasing the likelihood of not utilising services where health facilities do not have female doctors, nurses, and midwives. Although it is scarce to have health facilities with no female workers in the northern region, especially nurses and midwives, the presence of other male workers still discourages some women from seeking care. Fagbamigbe and Idemudia [29] found that about one-fifth of women did not utilise ANC services because of the opposite sex of the care providers.

The findings revealed that having no autonomous decision regarding one's healthcare increased the likelihood of non-utilisation of ANC services by women in northern Nigeria. Through our supplementary analysis of bivariate association between women's autonomy in deciding on their health and religious affiliation, we discovered that a greater proportion of women who practice Islam lack autonomy in decisions about their healthcare, whereas a greater proportion of women who practice

Christianity and other religions did have autonomy in decisions about their healthcare. Evidence from the literature [2,28,34] have also shown that Muslim women were less likely to utilise ANC services than their counterparts from Christian or other religious groups in Nigeria. Both the traditional and religious customs of the Hausa and Fulani Muslims require women to obtain the permission of their husbands or a male gatekeeper before going out of their homes, including accessing healthcare services. This requirement has been shown to affect service utilisation primarily when women cannot obtain such permission [29].

Furthermore, household wealth is another significant determinant of ANC non-utilisation by women in northern Nigeria. Women from households classified as middle or rich wealth quintile have lower odds of non-utilisation of ANC services than those from poor households. This finding is consistent with previous studies from Nigeria and elsewhere [23,25,30,35–37], which shows that household wealth can significantly influence the use of ANC services. By implication, ANC services should be offered free to remove financial barriers and enable women from poor households to access and utilise ANC services. A study in Indonesia [38] has recommended the inclusion of free ANC services into health insurance policy that could also be applicable to Nigeria. When pregnant women are included in the national health insurance programme in Nigeria, it will encourage them to utilise not only ANC but also other maternal healthcare services thereby preventing maternal mortality and morbidity.

The place of residence of women is another significant determinant of the non-utilisation of ANC services in northern Nigeria. Just as previous studies have reported from Nigeria and elsewhere [2,19,26,36], it was found that women from rural areas have a higher likelihood of not utilising ANC services while pregnant. This reluctance may be due to many reasons, such as the problem of access to health facilities because many rural areas do not have health facilities nearby. This limited access makes women travel long distances, incurring additional costs, or travel on foot or on the back of animals such as camels and donkeys, which could serve as a barrier to utilising ANC services. A study in Pakistan [24] reported that women living within a short distance of a health facility were more likely to utilise ANC services.

Conversely, those living farther away from services are less likely to utilise services, which is the case in many rural areas that lack access to health facilities nearby. To mitigate this problem, the

government of the northern states should provide health facilities in the rural areas or within a short distance of the rural areas. In addition, the governments can initiate community outreaches by healthcare providers in communities without health facilities for regular ANC contacts for pregnant women in order to mitigate the influence of lack of access and long distance to health facilities.

4.1. Strength and limitation

Focusing on non-users of ANC services and understanding the determinants of non-utilisation in the region with the poorest maternal health indicators in Nigeria, which researchers have often neglected, is a key strength of this study. It has provided some empirical evidence for policymakers to initiate specific and targeted interventions towards improving service uptake for a safe pregnancy outcome. The limitation of this study lies in the fact that it cannot establish a causal relationship between the outcome and explanatory variables because it is a cross-sectional survey using secondary data. It is recommended that further studies should be carried out to understand how cultural (ethnicity) and religious norms influence the non-utilisation of ANC services in the region through qualitative methodology. This is because a lot can be remedied through understanding beliefs and practices that could be detrimental to pregnant women's health. Another limitation is that, although the NDHS is a larger and very reliable survey with representative sample for the whole country, the 2018 dataset is now more than four years after the data collection and it is likely that the prevalence and determinants of non-utilisation of ANC services may have changed. Hence, studies with more recent data may reveal otherwise.

5. Conclusion

The high prevalence of non-utilisation of ANC services by pregnant women in the northern region of Nigeria is an issue of concern because ANC is an important preventive measure against maternal mortality and morbidity. This study found that socio-demographic factors at the individual, household, and community levels influenced the non-utilisation of ANC services by pregnant women in the northern region of Nigeria. Therefore, policies that will lead to an increase in service utilisation should be formulated to reduce the high maternal mortality in Nigeria. Government and other stakeholders need to directly address the factors that are influencing non-utilisation of ANC services by

women, especially the lack of education among women, by promoting girl-child education and targeting Muslim women from Hausa and Fulani ethnic groups.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgement

The authors would like to thank the DHS program for granting permission to use the DHS2018 dataset of Nigeria for this study.

References

- [1] World Health Organization [WHO]. Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Geneva: WHO; 2019.
- [2] Adewuyi EO, Auta A, Khanal V, Bamidele OD, Akuoko CP, Adefemi K, et al. Prevalence and factors associated with underutilization of antenatal care services in Nigeria: a comparative study of rural and urban residences based on the 2013 Nigeria demographic and health survey. *PLoS One* 2018;13(5):e0197324. <https://doi.org/10.1371/journal.pone.0197324>.
- [3] Ajayi IO, Osakinle DC. Socio-demographic factors determining the adequacy of antenatal care among pregnant women visiting Ekiti State primary health centers. *Online J Health Allied Sci* 2013;12.
- [4] Ashir GM, Doctor HV, Afenyadu GY. Performance based financing and uptake of maternal and child health services in yobe sate, northern Nigeria. *Global J Health Sci* 2013;5(3): 34–41. <https://doi.org/10.5539/gjhs.v5n3p34>.
- [5] Kazanga I, Munthali AC, McVeigh J, Mannan H, MacLachlan M. Predictors of utilisation of skilled maternal healthcare in Lilongwe District, Malawi. *Int J Health Pol Manag* 2019;8(12):700–10. <https://doi.org/10.15171/ijhpm.2019.67>.
- [6] Madaj B, Smith H, Mathai M, Roos N, van den Broek N. Developing global indicators for quality of maternal and newborn care: a feasibility assessment. *Bull World Health Organ* 2017;95(6):445–521. <https://doi.org/10.2471/blt.16.179531>.
- [7] Okedo-Alex IN, Akamike IC, Ezeanosike OB, Uneke CJ. Determinants of antenatal care utilisation in sub-Saharan Africa: a systematic review. *BMJ Open* 2019;9(10):e031890. <https://doi.org/10.1136/bmjopen-2019-031890>.
- [8] World Health Organization [WHO]. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: WHO; 2016.
- [9] Babalola S, Fatusi A. Determinants of use of maternal health services in Nigeria—looking beyond individual and household factors. *BMC Pregnancy Childbirth* 2009;9:43. <https://doi.org/10.1186/1471-2393-9-43>.
- [10] Gabrysch S, Campbell OM. Still too far to walk: literature review of the determinants of delivery service use. *BMC Pregnancy Childbirth* 2009;9:34. <https://doi.org/10.1186/1471-2393-9-34>.
- [11] Ikamari LD. Maternal health care utilisation in Teso District. *Afr J Health Sci* 2004;11(1–2):21–32.
- [12] Titaley CR, Hunter CL, Heywood P, Dibley MJ. Why don't some women attend antenatal and postnatal care services?: a qualitative study of community members' perspectives in Garut, Sukabumi and Ciamis districts of West Java Province,

- Indonesia. *BMC Pregnancy Childbirth* 2010;10:61. <https://doi.org/10.1186/1471-2393-10-61>.
- [13] Bustreo F, Say L, Koblinsky M, Pullum TW, Temmerman M, Pablos-Méndez A. Ending preventable maternal deaths: the time is now. *Lancet Global Health* 2013;1(4):e176–7. [https://doi.org/10.1016/s2214-109x\(13\)70059-7](https://doi.org/10.1016/s2214-109x(13)70059-7).
- [14] National Population Commission [NPC]. Nigeria; ICF. Nigeria demographic and health Survey 2018. Abuja, Nigeria. Rockville, Maryland, USA: NPC and ICF; 2019.
- [15] Osungbade KO, Shaahu VN, Uchendu OC. Clinical audit of antenatal service provision in Nigeria. *Health Care Women Int* 2011;32(5):441–52. <https://doi.org/10.1080/07399332.2010.517878>.
- [16] Bayou NB, Gacho YH. Utilization of clean and safe delivery service package of health services extension program and associated factors in rural kebeles of Kafa Zone, Southwest Ethiopia. *Ethiop J Health Sci* 2013;23(2):79–89.
- [17] Laksono AD, Rukmini R, Wulandari RD. Regional disparities in antenatal care utilization in Indonesia. *PLoS One* 2020; 15(2):e0224006. <https://doi.org/10.1371/journal.pone.0224006>.
- [18] Nwosu CO, Ataguba JE. Socioeconomic inequalities in maternal health service utilisation: a case of antenatal care in Nigeria using a decomposition approach. *BMC Publ Health* 2019;19(1):1493. <https://doi.org/10.1186/s12889-019-7840-8>.
- [19] Okoli C, Hajizadeh M, Rahman MM, Khanam R. Geographical and socioeconomic inequalities in the utilization of maternal healthcare services in Nigeria: 2003–2017. *BMC Health Serv Res* 2020;20(1):849. <https://doi.org/10.1186/s12913-020-05700-w>.
- [20] Saad-Haddad G, DeJong J, Terreri N, Restrepo-Méndez MC, Perin J, Vaz L, et al. Patterns and determinants of antenatal care utilization: analysis of national survey data in seven countdown countries. *J Glob Health* 2016;6(1):010404. <https://doi.org/10.7189/jogh.06.010404>.
- [21] Abubakari A, Agbozo F, Abihiro GA. Factors associated with optimal antenatal care use in Northern region, Ghana. *Women Health* 2018;58(8):942–54. <https://doi.org/10.1080/03630242.2017.1372842>.
- [22] Adebowale SA, Akinyemi JO. Determinants of maternal utilization of health services and nutritional status in a rural community in South-West Nigeria. *Afr J Reprod Health* 2016; 20(2):72–85. <https://doi.org/10.29063/ajrh2016/v20i2.8>.
- [23] Arthur E. Wealth and antenatal care use: implications for maternal health care utilisation in Ghana. *Health Econ Rev* 2012;2(1):14. <https://doi.org/10.1186/2191-1991-2-14>.
- [24] Aziz Ali S, Aziz Ali S, Feroz A, Saleem S, Fatmai Z, Kadir MM. Factors affecting the utilization of antenatal care among married women of reproductive age in the rural Thatta, Pakistan: findings from a community-based case-control study. *BMC Pregnancy Childbirth* 2020;20(1):355. <https://doi.org/10.1186/s12884-020-03009-4>.
- [25] Fagbamigbe AF, Idemudia ES. Wealth and antenatal care utilization in Nigeria: policy implications. *Health Care Women Int* 2017;38(1):17–37. <https://doi.org/10.1080/07399332.2016.1225743>.
- [26] Haruna-Ogun OA. Geographical differentials in uptake of antenatal care services in Nigeria. *Health Care Women Int* 2018;39(1):34–49. <https://doi.org/10.1080/07399332.2017.1388804>.
- [27] Joshi C, Torvaldsen S, Hodgson R, Hayen A. Factors associated with the use and quality of antenatal care in Nepal: a population-based study using the demographic and health survey data. *BMC Pregnancy Childbirth* 2014;14:94. <https://doi.org/10.1186/1471-2393-14-94>.
- [28] Aregbeshola BS, Khan SM. Factors associated with non-utilization of maternal and child health services in Nigeria: results from the 2013 Nigeria demographic and health survey. *J Public Health* 2019;27(3):357–65. <https://doi.org/10.1007/s10389-018-0950-4>.
- [29] Fagbamigbe AF, Idemudia ES. Barriers to antenatal care use in Nigeria: evidences from non-users and implications for maternal health programming. *BMC Pregnancy Childbirth* 2015;15:95. <https://doi.org/10.1186/s12884-015-0527-y>.
- [30] Ahinkorah BO, Seidu AA, Agbaglo E, Adu C, Budu E, Hagan Jr JE, et al. Determinants of antenatal care and skilled birth attendance services utilization among childbearing women in Guinea: evidence from the 2018 Guinea Demographic and Health Survey data. *BMC Pregnancy Childbirth* 2021;21(1):2. <https://doi.org/10.1186/s12884-020-03489-4>.
- [31] Ahmed S, Creanga AA, Gillespie DG, Tsui AO. Economic status, education and empowerment: implications for maternal health service utilization in developing countries. *PLoS One* 2010;5(6):e11190. <https://doi.org/10.1371/journal.pone.0011190>.
- [32] Tsala Dimbuene Z, Amo-Adjei J, Amugsi D, Mumah J, Izugbara CO, Beguy D. Women's education and utilization of maternal health services in Africa: a multi-country and socioeconomic status analysis. *J Biosoc Sci* 2018;50(6):725–48. <https://doi.org/10.1017/s0021932017000505>.
- [33] Sado L, Spaho A, Hotchkiss DR. The influence of women's empowerment on maternal health care utilization: evidence from Albania. *Soc Sci Med* 2014;114:169–77. <https://doi.org/10.1016/j.socscimed.2014.05.047>.
- [34] Solanke BL, Oladosu OA, Akinlo A, Olanisebe SO. Religion as a social determinant of maternal health care service utilisation in Nigeria. *Afr Popul Stud* 2015;29(2):1868–81.
- [35] Alex-Ojei CA, Odimegwu CO. Correlates of antenatal care usage among adolescent mothers in Nigeria: a pooled data analysis. *Women Health* 2021;61(1):38–49. <https://doi.org/10.1080/03630242.2020.1844359>.
- [36] Dahiru T, Oche OM. Determinants of antenatal care, institutional delivery and postnatal care services utilization in Nigeria. *Pan Afr Med J* 2015;21:321. <https://doi.org/10.11604/pamj.2015.21.321.6527>.
- [37] Wilunda C, Quaglio G, Putoto G, Takahashi R, Calia F, Abebe D, et al. Determinants of utilisation of antenatal care and skilled birth attendant at delivery in South West Shoa Zone, Ethiopia: a cross sectional study. *Reprod Health* 2015; 12:74. <https://doi.org/10.1186/s12978-015-0067-y>.
- [38] Fauzi R, Kyi YP, Mon MM, Munira L, Herman B, Hounnaklang N, et al. Factors affecting optimal antenatal care utilization in Indonesia: implications for policies and practices. *J Publ Health Pol* 2021;42(4):559–73. <https://doi.org/10.1057/s41271-021-00307-9>.