



ORIGINAL ARTICLE

Antenatal Care Services Utilization in Yobe State, Nigeria: Examining Predictors and Barriers

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ABSTRACT

Objective: In Nigeria, wide disparities exist between the different parts of the country, with the states in the North East zone having poor health resources. The objective of this study is to assess whether women's biological, sociocultural, and economic characteristics are associated with utilization of ante natal care services as measured by number of antenatal care (ANC) visits in Yobe State.

Methods: This is a secondary data analysis of the 2008 Nigeria Demographic and Health Survey with records from 33,385 women between 15-49 years who had given birth between January 2003 and December 2008 in Yobe State. Bivariate Pearson's Chi square test and two stages of Multivariate regression analysis were conducted.

Results: Women with at least primary level education (adjusted OR (AOR) = 2.40; CI 1.24 – 4.67), belonging to professional employment category (AOR = 12.07; CI 0.19 – 75.74) and those who had access to skilled health workers (AOR = 5.13; CI 2.50 – 10.52) are more likely to make the required number of ANC visits compared to those who are illiterates, unemployed and had no access to skilled health workers.

Conclusion and Global Health Implications: This study demonstrated that educational level, family wealth income, and availability of skilled health worker were consistently associated with the number of ANC visits even after controlling for covariates. These three covariates are in tandem with the Millenium Development Goals (MDG) 1 - eradication of extreme poverty and hunger; MDG 2 - universal basic education; MDG 3 - gender equality; and MDG 4 - maternal mortality. There is the need for inter-sectoral holistic intervention approach.

Key words: Antenatal Care Services • ANC Utilization • MDGs • Yobe State • Nigeria
• Skilled Health Workers

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Background and Objective

Nigeria has one of the highest maternal mortality ratios (MMR) in the world. Between 2010 - 2012, the World Health Organization (WHO) estimated that the country has an MMR of 630 per 100,000 live births.^[1] This figure indicates that the country only surpassed war torned and or politically unstable countries like Sierra Leone (890 per 100,000), Liberia (777 per 100,000) and Chad (1,100 per 100,000) live births respectively.^[1] The poor maternal outcome might not be unrelated to the low utilization rates of maternal health care services. For example, about half of the estimated eight million annual numbers of pregnancies have not had antenatal care (ANC) in 2010. Furthermore, among those that had ANC, 45% have made less than the minimum four ANC visits as recommended by the WHO.^[1] This national average does not reveal the disparities that exist within and between the six geopolitical zones of the country which are fairly heterogeneous in terms of religious and cultural affiliations. Women from the North East zone of Nigeria are more likely to die due to pregnancy related complications.^[2] It is important to note that disparities exist even within a given geopolitical zone. For instance, while the North East zonal average for the proportion of women who had ANC was 43%, Yobe state had the lowest with only 36% ANC utilization rate.^[3] These figures might even be lower since the state is largely rural, lowest number of skilled health workers, and poor records of vital events.^[4] Further, the sensitivity of the surveillance system is low based on recent reports that indicated the state has low ANC utilization and having MMR that is two fold higher than the reported national average of 630 per 100,000 live births.^[5,6] Although Yobe state has 528 public and private health facilities,^[3] however, these facilities lack both technical and institutional capacity,^[3,4] which invariability might have contributed to the low utilization of ANC services. With an estimated annual number of pregnancies of 600,000 and only 45 public employed midwives,^[7] a midwife is expected to attend to more than 50 pregnancies per day which could compromise the quality of services rendered.

Considering the Yobe State Strategic Health Development Plan 2010 – 2015 is in its final year,

there is the need to assess the the predictors of ANC utilization in the state in order to sustain the achievements recorded towards Millenium Development Goal number five (MDG 5) which is to reduce maternal deaths by two thirds compared to what was recorded in 1990. Unfortunately, there seems to be a dearth of local research studies on maternal mortality in Nigeria. For instance, despite Nigeria being among the areas with high MMR in the world,^[8-10] reports of systematic reviews of 2,500 and 5,575 showed that only 3 (1.2%) and 5 (0.5%) articles respectively were from Nigeria and non from Yobe state.^[8,11] One of the plausible reasons for such findings is that most published studies in Nigeria were hospital-based and focused more on medical causes of death such as hemorrhage, eclampsia, obstructed labor, ruptured uterus, sepsis, malaria and anemia in pregnancy, which does not provide information on antecedents before arrival to a health facility.^[11,12]

This paper is an effort to bridge this gap aimed to find out whether women's individual and community level factors influence the utilization of ANC services in Yobe state as measured by number of antenatal care visits.

Methodology

This is a cross-sectional study using data from the 2008 Nigeria Demographic and Health Survey (2008 NDHS) after receiving approval from ORC Macro and ICF International based in Calverton Maryland, USA. A total of 967 women between 15-49 years who had given birth between January 2003 and December 2008 participated in the study. Details on survey instruments and methodology are available in the NDHS report.^[2,25]

The data was analyzed using SPSS version 16. Bivariate Pearson's Chi square test statistic and two stages of Multivariate regression analysis were conducted in order to identify factors that predict the utilization of ANC in Yobe State. First, logistic regression of one variable at a time was conducted to get the unadjusted odds ratio and thereafter, a multivariate logistic regression was conducted to obtain adjusted odds ratios aimed at accounting for the effect of each of the study covariates.

We utilized the Anderson health behavior model as a framework for analyzing the determinants of utilization of health services.^[13] The model is composed of three sets of individual and community level factors that provide constructs to assess individuals' capacity to access and use health services. The three main set of factors are a) predisposing characteristics at individual level; b) enabling characteristics which focus on community level factors such as health care financing mechanism and health resources and c) need characteristics which is the perceived state of health by individual and health workers.^[14] This unique characteristic of the Anderson's Model was underscored by its application in a range of medical research such as the utilization of health care services^[15-17] and other social issues.^[18-24]

Results

Descriptive

Out of the 967 respondents, a total of 648 (67%) had at least one ANC visit during the last pregnancy before the 2008 NDHS survey. Among those that had ANC, only 328 had four or more recommended ANC visits constituting only 33.9% of the total study sample. Moreover, 319 (33%) and 320 (33.1%) of respondents had zero or less than four ANC visits respectively. About 26.4% of the respondents commenced their ANC visits in their third trimester (Table 1).

Biological characteristics of respondents

The age group 20 – 34 years old constituted the majority (44.9%) of the respondents with a mean age of 27.2 + 3.2 years. The age group 15 - 19 years old constituted 22.1% of the sample. The extreme of ages (<20 years and ≥35 years) had the lowest proportion of women who had four or more ANC visits. Majority of the women (87%) had at least two children (Table 1).

Cultural characteristics of respondents

Majority of the women were married (89.7%), belonging to Kanuri/Baribari ethnic group (42.2%), Muslims (98.7%), lack any form of autonomy (79.8%) and lived in rural areas (72.8%). Living in urban areas (27.2%), Yoruba ethnicity (60%), Christians (30%) and

having full autonomy (30%) had higher proportion of women that had four or more ANC visits (Table 1).

Economic characteristics of respondents

Majority of the respondents were illiterate (82%), unemployed (50%) and belonged to the poorest/poor wealth quintile (78.3%), and only 11.7%, 14% and 24.7%, respectively of these categories of women had met the recommended minimum of four ANC by the WHO (Table 1).

Respondents' health system characteristics

Distance to the nearest health facility and lacking health insurance policy (99.6%) showed lower proportion of women that had appropriate number of ANC visits. Majority of the respondents (91%) were not attended by skilled health care workers and fewer still (19.8%) had achieved the WHO recommendation of at least four ANC visits (Table 1).

Results of bivariate and logistic regression analysis

Age is significantly associated with the number of ANC visits ($\chi^2 = 43.11$; $df = 2$; $P < 0.00$). The age group 15 – 19 years were less likely to make four or more ANC visits compared to women who were aged 20 – 34 years even after controlling for the covariates (AOR = 1.72; CI 0.75 – 3.91) (Table 2).

Parity of ≥ 2 (AOR = 0.47; CI 0.20 – 1.11), religion (AOR = 0.99; CI 0.17 – 2.31), distance to the nearest health facility (AOR = 0.99; CI 0.22 – 4.50), availability of health insurance policy (AOR = 1.12; CI 0.99 – 1.71) and access to the media as a source of information on MHS (AOR = 0.99; CI 0.37 – 2.71) have no impact on the use of ANC services after controlling for education, family wealth index, and availability of skilled health workers (Table 2).

Place of domicile ($\chi^2 = 90.36$; $df = 1$; $P < 0.00$), ethnicity ($\chi^2 = 46.94$; $df = 5$; $P < 0.00$), level of education ($\chi^2 = 73.03$; $df = 3$; $P < 0.00$), occupation ($\chi^2 = 39.21$; $df = 3$; $P < 0.00$), family wealth index ($\chi^2 = 139.35$; $df = 4$; $P < 0.00$) and availability of skilled health workers ($\chi^2 = 78.86$; $df = 1$; $P < 0.00$) are associated with the number of ANC visits (Table 2).

After adjusting for covariates, women of Yoruba and Igbo ethnic groups were 44 and 94 times respectively

Table 1. Bio-socio-demographic Characteristics of Study Respondents

Independent variable	Proportion of sample (%)	Number of ANC visits (N=967) (%)	
		<4 visits	≥4 visits
Age in years			
<20	22.1	90.7	9.3
20 – 34	44.9	74.9	25.1
35 – 49	33.0	90.6	9.4
Parity			
1	13.0	73.3	26.7
2 – 4	36.4	76.1	23.9
5+	50.6	85.0	15.0
Birth order			
First	13.0	73.3	26.7
Second	13.5	73.4	26.6
Third	12.8	74.8	25.2
Fourth or higher	60.6	84.4	15.6
Birth interval between the last two deliveries			
Less 24 months	25.3	80.8	19.2
24-48 month	55.4	79.9	20.1
49+ months	19.3	85.9	14.1
When first ANC visit was made			
First trimester	19.4	11.4	88.6
Second trimester	54.2	27.6	72.4
Third trimester	26.4	48.3	51.7
Place of domicile			
Rural	72.8	90.5	9.5
Urban	27.2	65.0	35.0
Marital status			
Never married	6.6	100.0	0.0
Married	89.7	82.1	17.9
Living together	0.1	100.0	0.0
Divorced/separated	2.0	89.5	10.5
Widowed	1.7	87.5	12.5
Ethnicity			
Hausa	21.5	81.2	18.8
Yoruba	0.5	40.0	60.0
Igbo	0.1	0.0	100.0
Fulani	17.4	91.7	8.3
Kanuri/Baribari	42.2	77.5	22.5
Others	18.3	94.3	5.7
Religion			
Islam	98.7	83.6	16.4
Christianity	1.0	70.0	30.0
Tradition	0.3	100.0	0.0

Cond...

Table 1. (Continued...)

Independent variable	Proportion of sample (%)	Number of ANC visits (N=967) (%)	
		<4 visits	≥4 visits
Level of autonomy			
None	79.8	83.7	16.3
Some	16.7	77.1	22.9
Full	3.5	70.0	30.0
Family wealth index			
Poorest	53.7	95.0	5.0
Poorer	24.6	80.3	19.7
Middle	12.6	63.1	36.9
Rich	7.4	52.8	47.2
Richest	1.7	56.2	43.8
Respondent highest education level			
No formal education	82.0	88.3	11.7
Primary	9.1	60.2	39.8
Secondary	8.1	65.4	34.6
Higher	0.8	50.0	50.0
Total years of schooling			
Zero	82.0	88.3	11.7
Less than 6 years	9.1	60.2	39.8
6-12 years	8.4	64.4	34.6
13+ years	0.5	40.0	50.0
Respondent occupation			
Not working	50.6	86.0	14.0
Unskilled worker	39.6	85.6	14.4
Skilled worker non professional	9.0	67.8	32.2
Professional	0.8	25.0	75.0
Distance			
No	82.6	77.8	22.2
Yes	17.4	88.6	14.4
Have health insurance			
No	99.6	83.6	16.4
Yes	0.4	75.0	25.0
Attended by skilled health worker during ANC visits			
No	91.0	80.2	19.8
Yes	9.0	27.6	72.4
Received health talks during ANC			
No	8.8	9.1	90.9
Yes	91.2	30.7	69.3
Access to the media			
Never/rarely	80.0	86.7	13.3
Almost always	20.0	71.0	29.0

more likely to achieve the recommended four or more ANC visits compared to women belonging to Hausa ethnic group (Table 2). Women living in urban areas (AOR = 2.14; CI 1.23 – 3.73), having some form of autonomy (AOR = 8.74; CI 0.62 – 12.45) and those in the highest wealth quintile (AOR = 4.44; CI 0.64 – 30.64) had four or more number of ANC visits compared to their rural colleagues, those without any form of autonomy and belonging the poorest wealth quintile respectively (Table 2).

Similarly, women with at least primary level education (AOR = 2.40; CI 1.24 – 4.67), belonging to professional employment category such as lawyers, health workers, teachers etc (AOR = 12.07; CI 0.19 – 75.74) and those who have access to skilled health workers (AOR = 5.13; CI 2.50 – 10.52) are more likely to make the required number of ANC visits compared to those who are illiterates, unemployed and had no access to skilled health workers respectively (Table 2).

Predictive model on the utilization of ANC services

The model contained six predictive variables (age, family wealth quintile, religious affiliation, highest educational attainment, parity, and distance to health facility). These variables were selected based on the result of the bivariate Pearson Chi square test, binary logistic regression and or known theoretical facts. These variables were found to be statistically significant χ^2 (28, N=967) 53.10; $P < 0.00$, indicating that, the model was able to distinguish between participants who have had less than four ANC visits and those who had four or more ANC visits. The variables accounted for 39.1% (Cox & Snell R Square) and 54.4% (Nagelkerke R Square) of variability among participants, correctly classified 80.4% of cases and together with Hosmer and Lemeshow goodness of fit test indicated the model being useful ($p = 0.77$) since the p-value is larger than the alpha level^[26] (table not shown).

Discussions

Maternal and Child Health Services (MCHS) is among the top priority of Yobe State government as enshrined in the state health strategic plan for

2010 - 2015. Despite significant progress in MCHS, the state has not met the MDG five.^[3] In 2008, the MMR in the state was reported to be 1,549 per 100,000 live births which is about three times higher than the national average of 545 per 100,000 live births.^[2,3] Furthermore, the ANC utilization rate was 36% and of these only 9.8% had access to appropriate skilled health workers.^[2,3] In general, wide disparities exist between the different parts of the country with the states in the North East zone which includes Yobe State having the worst maternal health indicators. In order to identify the root issues for the abysmal performance of the state, this study disaggregated data in line with the social determinants of health as advanced by the WHO.^[27]

The low ANC utilization rates in the North Eastern states of Nigeria which include Yobe State is consistent with areas with the high levels of poverty, low female literacy and empowerment.^[4,28] This is a reflection of the socioeconomic development, access and utilization MCHS rendered in the state. While it might have cultural connotations, however, MCHS will only be used when geographical and economic access is guaranteed. For instance, the Yobe State health strategic plan for 2010 – 2015 clearly indicated the lack of technical and institutional capacity which could have contributed to the low utilization of ANC services.^[3] The worsening of the current Boko Haram Islamist extremist insurgency particularly from 2011 to date, could have further decimated the availability of skilled health workers based on recent report that the doctor population ratio is 1 for every 54,000 people.^[7] Similarly, the estimated workload for a midwife is 257 pregnant women per week. Furthermore, a study on the state of health system following the Boko Haram insurgency has indicated that health workers have been abducted and/or killed and many health facilities were closed.^[28]

The findings of this study showed that few respondent have access to skilled health workers (9%), very high proportion of illiterates (82%), families living in poverty (78.3%), high risk pregnancies among teenagers (22.1%) and women more than 34 years (33%) and lack of female autonomy (79.8%) in terms of decision making, economic independence and freedom of going out of their matrimonial home

Table 2. Factors Associated with the Number of Antenatal Care Visits Attended.

Independent variable	Bivariate analysis		Multivariate logistic regression analysis							
	n	Chi-Square (χ^2) test	Unadjusted OR	95% CI for unadjusted OR		P-value (unadjusted OR)	Adjusted OR	95% CI for adjusted OR		P-value for adjusted OR
				Lower	Upper			Lower	Upper	
Age in years										
<20	194	20	χ^2 (2, N=967)=43.11, p=0.00	1.00			1.00			
20 – 34	325	109		3.25	1.96	5.41	0.00	1.72	0.75	3.91
35 – 49	289	30		1.01	0.56	1.82	0.98	0.87	0.30	2.48
Parity										
1	77	28	χ^2 (2, N=967)=12.16, p=0.00	1.00			1.00			
2 – 4	223	70		0.86	0.52	1.44	0.57	0.47	0.20	1.11
5+	346	61		0.44	0.29	0.81	0.01	0.46	0.18	1.2
Birth order										
First	77	28	χ^2 (3, N=967)=13.73, p=0.00	1.00			1.00			
Second	80	29		1.00	0.54	1.83	0.99	8.93	0.38	208.05
Third	77	26		0.93	0.50	1.73	0.82	0.12	0.01	3.09
Fourth or higher	412	76		0.51	0.31	0.83	0.01			
Birth interval between the last two deliveries										
Less 24 months	143	34	χ^2 (2, N=967)=2.43, p=0.30	1.00			1.00			
24-48 months	310	78		1.06	0.68	1.66	0.81	1.19	0.17	8.49
49+ months	116	19		0.69	0.37	1.27	0.23	195.78	2.35	16.28
Place of domicile										
Rural	637	67	χ^2 (1, N=967)=90.36, p=0.00	1.000			1.00			
Urban	171	92		5.12	3.58	7.31	0.00	2.14	1.23	3.73
Ethnicity										
Hausa	169	39	χ^2 (5, N=967)=46.94, p=0.00	1.00			1.00			
Yoruba	2	3		6.50	1.05	40.23	0.04	44.78	0.00	1.00
Igbo	0	1		7.00	0.00		1.00	94.28	0.00	1.00
Fulani	154	14		0.39	0.21	0.75	0.01	0.054	0.00	0.65
Kanuri/Baribari	316	92		0.26	0.13	0.54	0.00			
Others	167	10		0.00	0.00		1.00			

Contd...

Table 2. (Continued...)

Independent variable	Bivariate analysis		Multivariate logistic regression analysis							
	n	Chi-Square (χ^2) test	Unadjusted OR	95% CI for unadjusted OR		P-value (unadjusted OR)	Adjusted OR	95% CI for adjusted OR		P-value for adjusted OR
				Lower	Upper			Lower	Upper	
<4 visits ≥4 visits										
Religion										
Islam	797	157	χ^2 (2, N=967)=1.93, p=0.38	1.00			1.00			
Christianity	7	3		2.12	0.56	8.55	0.26	0.99	0.17	2.31
Tradition	3	0		0.00	0.00		1.00			0.99
Level of autonomy										
None	577	112	χ^2 (2, N=967)=6.74, p=0.03	1.00			1.00			
Some	111	33		1.53	0.99	2.37	0.06	8.74	0.62	12.45
Full	21	9		2.21	0.99	4.95	0.05	33.35	7.13	41.33
Family wealth index										
Poorest	493	26	χ^2 (4, N=967)=139.35, p=0.00	1.00			1.00			
Poorer	191	47		4.67	2.81	7.75	0.00	3.24	1.83	5.74
Middle	77	45		11.08	6.46	19.00	0.00	6.00	2.94	12.25
Rich	38	34		16.97	9.24	31.16	0.00	6.16	2.38	15.94
Richest	9	7		14.75	5.09	42.72	0.00	4.44	0.64	30.64
Respondent highest educ level										
No formal education	700	93	χ^2 (3, N=967)=73.03, p=0.00	1.00			1.00			
Primary	53	35		4.97	3.08	8.02	0.00	2.40	1.24	4.67
Secondary	51	27		3.99	2.38	6.66	0.00	5.08	2.08	12.39
Higher	4	4		7.53	1.85	30.61	0.00	10.21	3.15	14.77
Respondent occupation										
Not working	419	68	χ^2 (3, N=967)=39.21, p=0.00	1.00			1.00			
Unskilled worker	326	55		1.04	0.71	1.53	0.84	1.00		
Skilled worker non-professional	59	28		2.92	1.74	4.91	0.00	1.23	0.10	15.31
Professional	2	6		18.49	3.66	93.47	0.00	12.07	0.19	75.74
Distance										
No	389	111	χ^2 (1, N=967)=179.79, p=0.00	1.00			1.00			
Yes	93	12		0.45	0.24	0.86	0.02	0.99	0.22	4.50

Contd...

Table 2. (Continued...)

Independent variable	Bivariate analysis		Multivariate logistic regression analysis								
	n	Chi-Square (χ^2) test	Unadjusted OR	95% CI for unadjusted OR	P-value (unadjusted OR)	Adjusted OR	95% CI for adjusted OR	P-value for adjusted OR			
	<4 visits	≥ 4 visits		Lower	Upper		Lower	Upper			
Has health insurance policy											
No	805	158	$\chi^2 (1, N=967)=0.21, p=0.66$	1.00							
Yes	3	1		1.70	0.18	16.41	0.65	1.12	0.99	1.71	0.15
Attended by skilled health worker*											
No	473	117	$\chi^2 (1, N=967)=78.86, p=0.00$	1.00							
Yes	16	42		10.61	5.76	19.54	0.00	5.13	2.50	10.52	0.00
Access to the media as source of health information											
Never/rarely	670	103	$\chi^2 (1, N=967)=27.65, p=0.00$	1.00							
Almost always	137	56		2.66	1.83	3.86	0.00	0.99	0.37	2.71	0.99

Notes: OR=Odds ratio; CI=Confidence intervals; *Attended at least one ANC visit=648

on health grounds. These findings suggest that these women are likely to have high proportion of complicated pregnancies, poor access and utilization of MCHS, which might have contributed to the high MMR as was similarly observed in other studies.^[29-33] Furthermore, these high risk pregnancies coupled with short interval between births (25.3%) and grand multipara (50.6%) as observed in this study, could be the underlying root causes for most of the high proportion of preventable maternal deaths.^[9,10] ANC is an objective strategy to effectively identify high risk pregnancies. However, the low proportion of women who had four or more number of ANC visits means that, many high risk pregnant women may not be detected and may result in life threatening condition and in extreme cases could lead to the death of a woman and or her baby. The lack of autonomy further compound the scenario, since it may lead to delays to decide to seek modern medical care when early signs of danger are noticed.

Although, the low ANC utilization rate could be influenced by place of domicile, ethnicity, religion and female autonomy, however, these factors were not found to be consistently statistically significant after controlling for covariates such as education and income levels. The low utilization of ANC services as observed in this study is not in keeping with the findings of another study in Nigeria that reported Muslim women are less likely to have four or more number of ANC visits compared to their Christian counterparts.^[29] This assertion is not consistent when confounders such as tribe, income and level of education were controlled as was the case in this study. Moreover, after controlling for age, wealth index, education and distance, parity and religion have no significant impact on the number of ANC visits and its main effect associations shifted from been statistically significant to not significant (Table 2). Hence, the role of ethnicity and religion needs to be studied as both shape the attitude and behaviors of the populace. The reason been that, each of the major ethnic group particularly Hausa, Igbo, Fulani and Kanuris are predominantly (>90%) adherents of either Christianity or Islam and each has different ethnically driven norms on pregnancy and childbirth.

It is important to underscore that the study being cross sectional design has only demonstrated the strength of associations rather than causal factors. Moreover, DHS data is individual based and therefore might not fully represent community level factors and hence the need for studies with robust designs.

Conclusions and Global Health Implications

This study demonstrated that, educational level, family wealth income, and availability of skilled health worker are consistently associated with the number of ANC even after controlling for covariates. These three predictor variables are in tandem with MDG 1 (eradication of extreme poverty and hunger), MDG 2 (universal basic education), MDG 3 (gender equality) and MDG 4 (maternal mortality). These three variables have significant impact on population health outcome and need for intersectoral collaboration with ministries of education, agricultural and other social services using primary health care as the springboard. A sustainable approach is to provide compulsory free universal basic education for girls (MDG 2) to enhance uptake and retention of girl's up to secondary level of education. This will have a multiplier effect towards reduction in poverty (MDG 1), improve female autonomy and equality (MDG 3) and improve health cultural capital that will ultimately reduce maternal deaths (MDG 5). Hence, the provision of health care services should be driven by results based management approach in order to enhance realistic multipronged planning, ownership, commitment, accountability and transparency among various stakeholders. There is therefore, the need for an independent periodic program reviews to guide timely and appropriate interventions.

Ethical Approval: *The 2008 Nigeria Demographic and Health Survey (2008 NDHS) was approved by ORC Macro and ICF International, Calverton, Maryland, USA.*

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Key Messages

- More than 67% of pregnant women in Yobe State, Nigeria did not receive the recommended four antenatal care visits.
- Lack of education is the most consistent variable associated with antenatal care utilization in Yobe state, Nigeria.
- Educating all girls beyond primary school level could enhance improvement in female empowerment and ability to make the most appropriate healthcare related choices.
- Girl-child education is among the most promising interventions to address global issues like extreme poverty and hunger (MDG 1), low female literacy rate (MDG 2), gender inequality (MDG 3), high maternal and infant morbidity and mortality (MDG 4 & 5) in Yobe state, Nigeria.

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