Original Article

Assessment of Knowledge and Extent of Utilization of Antenatal Care Services among Pregnant Women in Rural Communities in Benue State

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ABSTRACT

In sub-Saharan Africa, maternal mortality is a major public health problem where more than half of the world's maternal deaths occur due to preventable causes. These causes of maternal deaths are diagnosed and treated when pregnant women have good antenatal care (ANC) knowledge and consistently attend ANC. This study aimed to assess the effect of health talk in promoting antenatal care attendance among pregnant women in rural communities. The study was a community based quasi-experimental study carried out in twelve rural communities in Benue state among pregnant women using multistage sampling technique. Participants who had ≥4 ANC contacts were 4.2 times more likely to have good knowledge of ANC than those with less visits in the study group (OR 4.2; CI 1.29-14.12). In the control group, women who had ≥4 ANC contacts were 15.8 times more likely to have good knowledge of ANC (OR 15.8; CI 1.14-181.13). Women who had formal education were 3.1 times more likely to utilize ANC than those without formal education (OR 3.12; CI 1.42-6.84). Also, women who were ≥25 years were 2.6 times more likely to utilize ANC than those <25 years (OR 2.65; CI 1.12-5.58). The study reveals that women who had four or more ANC attendance were 16 times more likely to have good knowledge of ANC (OR 15.5; CI 1.34-181.93).

Keywords: Antenatal care, Attendance, Education, Health, Knowledge, Promote, Rural communities

INTRODUCTION

Good care during pregnancy is important for the health of the mother and the development of the unborn baby.[1] Pregnancy is a crucial time to promote healthy behavior and parenting skills.[2] Good antenatal care (ANC) links the pregnant woman and her family with the formal health system, increases the chance of using a skilled attendant at birth, and contributes to good health through the life cycle.[3] In sub-Saharan Africa, maternal mortality is a major public health problem considering that half of the world's maternal deaths occur here[4]. One thousand women die per 100,000 live births in Sub-Saharan Africa and in Nigeria, it is 512/100,000 live births in rural communities[5,6,7]. Antenatal care (ANC) may assist in abating the severity of pregnancy-related complications through monitoring and prompt treatment of conditions aggravated during pregnancy.[8]

Nigeria's traditional ANC model required about 12 visits, but poor maternal outcomes led to adopting the focused antenatal care strategy (FANC).[9,10] WHO's 2016 approach replaced FANC, emphasizing eight quality contacts over visits to

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enhance pregnancy experience and reduce perinatal deaths.[9,11] When a woman attends ANC, she stands a higher chance of getting educated about these signs. Studies in Ethiopia and India reveal a low level of knowledge about ANC among pregnant women of 15.2% and 17% respectively[12,]. A study in Ogun State, Nigeria, revealed poor knowledge of ANC[13].

Studies have demonstrated that the higher the number of ANC visits, the lower the likelihood of maternal mortality[14]. The educational status of an individual is an indirect estimate of the knowledge level and utilization of health care [15]. The lower the educational status of pregnant women, the lower the utilization of skilled birth attendance at delivery (12.3%)[15]. Studies in Ethiopia have revealed a low level of good knowledge about ANC and hospital deliveries among pregnant women of 17% and 15.2% respectively?. This level of knowledge is unacceptably low[12,16]. A study in Nigeria, reveals a good ANC knowledge score of 46.1% which is still less than 50%[13]. National Demographic Health Survey (NDHS) 2018 reveals that women with good knowledge (35.6%) of ANC had eight or more ANC contacts during antenatal care[17].

Antenatal care (ANC) knowledge and utilization are shaped by sociodemographic, socioeconomic, cultural, and health system factors. [19] Maternal age, education, and marital status significantly affect awareness, with educated women more likely to appreciate ANC's benefits. [20,21] Financial barriers, cultural beliefs, and rural location limit access, with rural women facing long distances, poor transport, and weak infrastructure. [23,24] Service quality, staff availability, and equipment adequacy also influence uptake. [25,26]. Additionally, health worker attitudes, awareness campaigns, and previous pregnancy experiences shape women's perceptions and behaviors, underscoring the need for multifaceted interventions.[27,28].

The need for this study is highlighted by the dearth of publications from the study area on this topic[18]. Thus, the aim of this study is to evaluate the effect of health education on the knowledge and utilization of ANC as well as to determine the factors that influence knowledge and practice among pregnant women in rural communities in Benue State.

MATERIALS AND METHODS

Study Area

This study was conducted in twelve (12) rural communities in Benue State. Benue has a projected population figure of 6,888,980 persons in 2023 using an annual growth rate of 3%, with a landmass of 32,518 square kilometers[29]. Benue has three predominant ethnic groups namely; Tiv, Idoma, and Igede[30] however, English is the official language in the state of Benue. English is the official language in the state of Benue. Benue State has 20 predominant rural LGAs which were further clustered into three senatorial zones namely; A, B and C and selected

Study design

This study was a quasi-experimental study among pregnant women residing in rural communities of Benue State at the time of commencement of this study.

Sampling technique

A multistage sampling technique was employed for the study. From 20 predominantly rural LGAs, study and control LGAs were randomly selected in the first stage. In the second stage, communities with catchment PHCs within these LGAs were also randomly chosen. Probability proportionate sampling determined the number of participants per community, yielding a total sample size of 380 from 470 study and 445 control households. Systematic sampling with an interval of two guided household selection was undertaken. Household numbering began in the bottle's opening direction, proceeding clockwise. The first household was selected by ballot, and thereafter every alternate household until the required sample was achieved.

Inclusion criteria

Women of reproductive age whose pregnancy was ≤26 weeks and were residing in rural communities of Benue State were enrolled in the study

Exclusion criteria

Pregnant women who were temporary visitors and those who had already received structured antenatal care health education from another program or facility more than 6 months before commencement of were excluded.

Instrument of data collection

Data were collected using a semi-structured, interviewer-administered questionnaire with closed and open-ended questions, adapted from the validated 2018 NDHS tool. Translated into Tiv, Idoma, and Igede for cultural appropriateness, it captured socio-demographic characteristics, antenatal care (ANC) knowledge, and associated factors. Pretesting with 30 women in Tarhembe community, Tarka LGA, ensured clarity, timing, and reliability. Baseline data were obtained from both study and control groups. The intervention for the study group comprised six ANC-focused health talk sessions highlighting consistent attendance and maternal-infant benefits. Follow-up data were collected after delivery from both groups. Statistical significance was determined at $p \leq 0.05$.

Data Management

Data were analyzed using SPSS version 20. Chi-square, Fisher's exact, and logistic regression were used to compare proportions. The pretested tool assessed socio-demographics, obstetric history, and ANC knowledge/utilization, ensuring appropriateness and researcher familiarity.

Indices of assessment, scoring and grading

Participants were assessed based on twelve (12) components of antenatal care services. In the knowledge domain, each correct response was awarded one (1) mark while a wrong or don't know was awarded zero (0) mark[31]. Scores of 50% and above were classified as good while those below 50% were considered poor using the modified blooms criteria[31]

Ethical Consideration

Ethical clearance was sought from the ethical committee of Benue State Ministry of Health before the commencement of the study. Permission was obtained from the Primary Health Care Development Board and the local government chairmen of the selected LGAs. An advocacy visit was paid to village heads of selected communities to inform them about the study and solicit their support. Informed written consent was also obtained from the participants before the study.

RESULTS

All respondents were interviewed in the study and control groups giving a response rate of 100% at baseline. However, 177 responded in the study group after intervention with an attrition rate of 7% while 181 responded in the control group after follow-up with an attrition rate of 5%. The study and control groups had mean ages of 24.09±5.48 and 25.77±5.92 years, predominantly aged 15–24. Nearly all respondents were married, mostly Tiv, and overwhelmingly Christian. Secondary education was most common, followed by primary and tertiary levels, with slightly higher secondary and primary education rates in the study group compared to the control group (Table1). In both groups, most respondents were farmers (82.6% control; 76.8% study), followed by business and civil service. Majority earned less than ₦10,000 monthly. Parity was mostly 1–4 children in control (70.5%) and 1–3 in study (58.9%). Husbands' occupations mirrored respondents', with most being farmers, followed by business and civil service across both groups. (Table 2).

The overall knowledge of ANC services indicates that, in the study group, the majority (93.7%) of the respondents had good knowledge of ANC services at baseline. Similarly in the control group, the majority of the respondents (98.4%) had good knowledge of ANC services. The difference in knowledge of ANC between the study and control groups was not statistically significant (p=1.0). In the study group, almost all the respondents (99.4%) had good knowledge of antenatal care (ANC) post-intervention. Similarly, in the control group, majority of the respondents (98.3%) had good knowledge of antenatal care (ANC) post-intervention. The difference was not statistically significant p=0.623. In the study group, ANC knowledge significantly improved from 93.7% to 99.4% (p=0.003), while in the control group, knowledge remained stable (98.4% to 98.3%), showing no significant change (Table 3).

Regarding factors affecting the utilization of ANC, in the study group, respondents who were <25 years had the highest proportion (53.7%) with good knowledge of ANC. Indigenes had the highest

proportion (88.9%) with good knowledge. However, in the control group, respondents >25 years had the highest proportion (47.4%) with good knowledge of ANC. Indigenes had the highest proportion of respondents (98.4%) with good knowledge of ANC. The difference was not statistically significant inn both study and control groups p>0.05. In the study group, respondents who had good knowledge of antenatal care were those with formal education, farmers (71.1%) and those who had earning less than ₦10,000 monthly (56.3%). Similarly in the control group, respondents who had good knowledge were those with formal education (92.6%), those who were farmers (82.1%) and those earning less than ₦10,000 monthly (62.1%). In the study group, respondents who had good knowledge of antenatal care (ANC) were those with who had ≤4 children had the highest proportion (88.9%), those who had at least four (4) ANC contacts (70.5%) and those whose husbands were farmers (55.3%) . Similarly in the control group respondents who had good knowledge were those who had >4 children (70.0%), those who had at least four (4) ANC contacts (87.4%) and whose husbands were farmers (74.7%). The difference was statistically significant among farmers and those attending ANC (Table 4). In the study group, respondents who attended ANC at least four times were 4 times more likely to have good knowledge of ANC compared to those who had less than 3 ANC contacts p=0.018. However, in the control group, respondents who attended ANC at least four times were 4 times were 16 times more likely to have good knowledge of ANC compared to those who had less than 3 ANC contacts p=0.021. (Table 4)

On the utilization of ANC, in the study group, more than a third of respondents (37.4%) attended ANC at baseline. Similarly in the control group, more than 1/3rd of respondents (40.0%) attended ANC at baseline. The difference was not statistically significant p=0.081 (Figure 1). In the study group, almost all the respondents (95.5%) attended ANC post-intervention. However, in the control group, more than 2/3rds of respondents (79.0%) attended ANC post-intervention (Table 5). In the study group, more than one-third of respondents (37.4%) attended ANC at baseline, after the intervention, almost all the respondents (95.5%) attended ANC. The difference was statistically significant (p=0.027). Similarly in the control group, more than 1/3rd of the respondents (40.0%) attended ANC at the beginning of the study, at the end of the study, the Majority of the respondents (79%), attended ANC. The difference was statistically significant p=0.001(Table 6)

Findings about the factors affecting ANC utilizations showed that in both study and control groups, ANC attendance was highest among respondents aged ≥25 years and indigenes, highlighting age and indigene status as key determinants of baseline ANC utilization (Table 7). In the study group, ANC attendance was highest among women with formal education, farmers, and those earning less than ₦10,000 monthly. Formal education showed a statistically significant association (p=0.02), while farming and low income also influenced attendance, underscoring socioeconomic and educational factors shaping ANC utilization. (Table 7). In the study group, respondents who had ≤4 children had the highest proportion of respondents (74.2%) who attended ANC at baseline. The difference in proportion was statistically significant (p=0.001). Respondents whose husbands were farmers had the highest proportion of respondents (41.3%) who attended ANC at baseline. In the control group, respondents who had ≤4 children had the highest proportion of respondents (58.4%) who attended ANC at baseline. Respondents whose husbands were farmers had the highest proportion of respondents (47.4%) who attended ANC at baseline (Table 7). Age and income were significant predictors of ANC attendance only in the control group. Respondents who were <25 years were 2.6 times more likely to attend ANC compared to respondents who were ≥ 25 years, (p=0.01). Also, respondents who had formal education were 3.1 times more likely to attend ANC compared to respondents who did not have formal education, p=0.05 (Table 8).

Table 1: Socio-demographic characteristics of respondents

VARIABLE	Study Group N=190 Frequency(%)	Control group N=190 Frequency(%)	Chi-Square test	p-value
Age group (years)			2.822	0.60
15 – 24	112(58.9)	91(47.9)		
25 – 34	65(34.2)	82(43.2)		
35 – 44	13(6.8)	17(8.9)		
Total	190(100)	190(100)		
Mean(±SD)	24.09±5.48	25.77±5.92		
Marital Status			1.218*	0.596
Married	190(100)	188(98.9)		
Single/Widowed	0(0.0)	2(1.1)		
Total	190(100)	190(100)		
Ethnicity			5.656*	0.463
Tiv	122(64.2)	118(62.1)		
Idoma	29(15.3)	35(18.4)		
Igede	37(19.5)	35(18.4)		
Others	2(1.1)	2(1.1)		
Total	190(100)	190(100)		
Religion			0.96*	1.00
Christian	188(98.9)	190(100)		
Muslim	2(1.1)	0(0.0)		
Total	190(100)	190(100)		
Educational Status			13.594	0.138
No Education	10(5.3)	49(25.8)		
Primary	59(31.1)	38(20)		
Secondary	110(57.9)	84(44.2)		
Tertiary	11(5.8)	19(10.0)		
Total	190(100)	190(100)		

**Others: Ethnic groups include: Igbo and Hausa
* Fisher's exact test

Table 2: Distribution of Occupation, Monthly income, Husband's occupation and Parity of Respondents

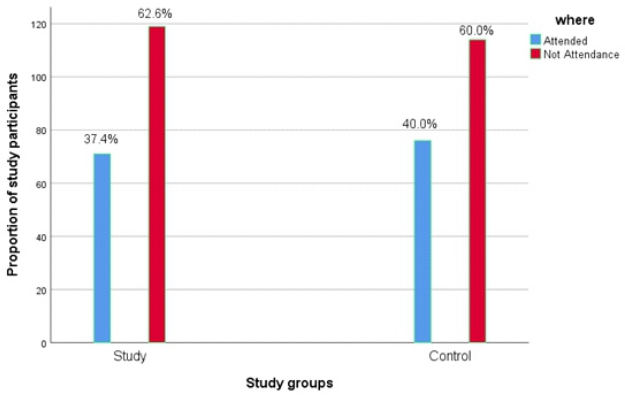
VARIABLE	Study Group N=190 Frequency (%)	Control Group N=190 Frequency (%)	Chi-Square test	p-value
Occupation			6.049*	0.304
Farming	146(76.8)	157(82.6)		
Business	32(16.8)	23(12.1)		
Civil servant	6(3.2)	8(4.2)		
Others	6(3.2)	2(1.1)		
Total	190(100)	190(100)		
Monthly Income (₦)			0.343	0.643
< ₦10,000	117(61.6)	120(63.2)		
≥ ₦10,000	73 (38.4)	70(36.8)		
Total	190(100)	190(100)		
Parity			0.003	1.0
Primigravida	40(21.1)	36(18.9)		
1–4	112(58.9)	134(70.5)		
≥ 5	38(20.0)	20(10.5)		
Total	190(100)	190(100)		
Husbands Occupation			12.371	0.185
Business	30(15.8)	23(12.1)		
Civil Servant	20(10.5)	19(10.0)		
Farming	115(60.5)	143(75.3)		
Others	25(13.2)	5(2.6)		
Total	190(100)	190(100)		

Table 3: Pre-post-intervention knowledge of Antenatal care (ANC) among study and control groups in Benue State

Variable	Study group		Control group	
	Before intervention n =(190) Frequency (%)	After intervention n =(177) Frequency (%)	Beginning of study n =(190) Frequency (%)	End of study n =(181) Frequency (%)
Good Knowledge	178(93.7)	176 (99.4)	187(98.4)	178(98.3)
Poor Knowledge	12(6.3)	1(0.6)	3(1.6)	3(1.7)
Total	190(100)	177(100)	190(100)	181(100)
	Fisher's exact test=8.870, p=0.003		Fisher's exact test=0.004, p=1.0	

Table 4: Factors associated with knowledge of ANC in Benue State

Variable	Study Group n=190 Frequency (%)		Control Group n=190 Frequency (%)	
	Good Knowledge	Poor Knowledge	Good Knowledge	Poor Knowledge
Age				
<25	102(53.7)	10(5.3)	89(46.8)	1(0.5)
≥25	76(40.0)	2(1.1)	98(51.6)	2(1.1)
Total	178(93.7)	12(6.3)	187(98.4)	3(1.6)
	Fishers exact= 3.148, p =.127		Fishers exact= 0.241, p = 1.0	
Ethnicity				
Indigene	176(92.6)	12(6.3)	185(98.4)	3(1.6)
Non indigene	2(1.1)	0(0.0)	2(1.1)	0(0.0)
Total	178(93.7)	12(6.3)		
	Fishers exact= 0.136, p = 1.0		Fishers exact= 0.32, p = 1.0	
Educational Status				
No Formal Education	9(4.7)	1(0.5)	49(25.8)	0(0.0)
Formal Education	169(88.9)	11(5.8)	138(72.6)	3(1.6)
Total	178(93.7)	12(6.3)	187(98.4)	3(1.6)
	Fisher's exact=0.242, p= 0.488		Fisher's exact=1.059,p = 0.570	
Occupation				
Farming	135(71.1)	11(5.8)	156(82.1)	1(0.5)
Business	31(16.3)	1(0.5)	21(11.1)	2(1.1)
Civil servant	6(3.2)	0(0.0)	8(4.2)	0(0.0)
Others	6(3.2)	0(0.0)	2(1.1)	0(0.0)
Total	178(93.7)	12(6.3)	187(98.4)	3(1.6)
	Fisher's exact =0.634, p = 0.865		Fisher's exact =7.950, p = 0.100	
Monthly Income (₦)				
< ₦10,000	107(56.3)	10(5.3)	118(62.1)	2(1.1)
≥ ₦10,000	71(37.4)	2(1.1)	69(36.3)	1(0.5)
Total	178(93.7)	12(6.3)	187(98.4)	3(1.6)



Chi Square= 3.313, p = 0.081

Figure 1. Utilization of ANC

Table 5: Post-intervention proportion of study subjects who Assessed ANC services in a health facility

Variable	Study Group n =177 Frequency (%)	Control Group n =181 Frequency (%)
Attend ANC	169(95.5)	143(79.0)
Not attend ANC	8(4.5)	38(21.0)
Total	*177(100)	*181(100)
	Chi-Square =21.690, p = 0.001	

**7% drop our rate in the study group and 5% drop out rate in the control group*

Table 6: Pre-Post-Intervention proportion of study subjects who accessed ANC services

Variable	Study group		Control group	
	Before intervention n =(190) Frequency (%)	After intervention n =(177) Frequency (%)	Beginning of study n =(190) Frequency (%)	End of study n =(181) Frequency (%)
Attended ANC	71(37.4)	169 (95.5)	76(40.0)	143(79)
Not Attended ANC	119(62.6)	8	114(60.0)	38(21)
Total	190(100)	177(100)	190(100)	181(100)
	Chi-Square = 136.744, p = 0.001		Chi-Square =58.314, p =0.001	

Table 7: Factors associated with baseline utilization of antenatal care (ANC) services

Variable	Study Group n=190 Frequency (%)		Control Group n=190 Frequency (%)	
	Attended ANC	Did Not Attend ANC	Attended ANC	Did Not Attend ANC
Age				
< 25	55(36.7)	19(12.7)	35(22.7)	25(16.25)
≥ 25	59(39.3)	17(11.3)	70(45.5)	24(15.6)
Total	114(76.0)	36(24.0)	105(68.2)	49(31.8)
	Chi-Square = 0.225, p = 0.704		Chi-Square = 4.395, p = 0.051	
Ethnicity				
Indigene	113(75.3)	35(23.3)	103(66.9)	49(31.8)
Non-Indigene	1(0.7)	1(0.7)	2(1.3)	0(0.0)
Total	114(76.0)	24.(0)	105(68.2%)	49(31.8)
	Fisher's exact = 0.751,p = 0.424		Fisher's exact=0.946,p= 0.563	
Educational Status				
StatuSSstatus No Formal Education	8(5.3)	1(0.7)	23(14.9)	20(13.0)
Formal Education	106(70.7)	35(23.3)	82(53.2)	29(18.8)
Total	114(76.0)	36(24.0)	105(68.2)	49(31.8)
	Fisher's exact= 0.873,p= 0.687		Chi-Square = 5.937, p = 0.020	
Occupation				
Farming	86(57.3)	29(19.3)	85(55.2)	44(28.6)
Business	23(15.3)	6(4.0)	14(9.1)	3(1.9)
Civil servant	3(2.0)	0(0.0)	6(3.9)	1(0.6)
Others	2(1.3)	1(0.7)	0(0.0)	1(0.6)
Total	114(76.0)	36(24.0)	105(68.2)	49(31.8)
	Fisher's exact= 1.162, p = 0.828		Fisher's exact= 4.471, p= 0.190	
Monthly Income (₦)				
< ₦10,000	64(42.7)	23(15.3)	63(40.9)	34(22.1)
≥ ₦10,000	50(33.3)	13(8.7)	42(27.3)	15(9.7)
Total	114(76.0)	36(24.0)	105(68.2)	49(31.8)
	Chi-Square = 0.674, p = 0.445		Chi-Square = 1.263, p = 0.287	
Parity				
≤4	141(74.2)	40(21.1)	90(58.4)	44(28.6)

>4	7(3.7)	2(1.1)	15(9.7)	5(3.2)
Total	148(77.9)	42(22.1)	105(68.2)	49(31.8)
	Fisher's exact= 0.001, p = 1.000		Chi-Square = 0.493, p = 0.610	
Husbands Occupation				
Business	20(13.3)	4(2.7)	15(9.7)	4(2.6)
Civil Servant	14(9.3)	3(2.0)	10(6.5)	5(3.2)
Farming	62(41.3)	26(17.3)	76(49.4)	39(25.3)
Others	18(12.0)	3(2.0)	4(2.6)	1(0.6)
Total	114(76.0)	36(24.0)	105(68.2)	49(31.8)
	Fisher's exact= 3.196, p = 0.361		Fisher's exact=1.430, p = 0.725	

Table 8: Binary Logistic regression for significant factors affecting ANC attendance

Variable	Study Group			Control Group		
	Odds Ratio	95% Confidence interval	p-value	Odds Ratio	95% Confidence interval	p-value
Age						
< 25 years	1.190	0.560 – 2.525	0.651	2.655	1.262 – 5.582	0.010
≥ 25 years	1			1		
Educational status						
Formal Education	2.629	0.316 –21.716	0.372	3.119	1.423 – 6.836	0.005
No Formal Educated	1			1		

DISCUSSION

Findings revealed that baseline knowledge of ANC was generally good in both study and control groups, though utilization of services was low. Adequate ANC attendance was identified as the most significant predictor of knowledge in both groups.

At baseline, utilization of ANC was low in both groups, with formal education and age ≥25 years as significant predictors in the control group. Health facility utilization was associated with income in both groups and formal education in the control group. Post-intervention analysis showed statistically significant improvements in ANC knowledge and access in the study group, while improvements in the control group were not statistically significant.

Demographic characteristics revealed that most respondents were aged 15–24 years and had attained secondary education, reflecting early marriage patterns similar to findings in Cross River and Bauchi. Early marriage has been linked with poor birth preparedness, which increases risks of maternal morbidity and mortality. Ethnically, most respondents were Tiv, the predominant tribe in Benue, and nearly all were Christians, consistent with previous regional studies.[35,36].

Occupationally, most respondents were farmers, reflecting Benue's agrarian economy. This contrasts with findings from Kwara and Edo, where women were predominantly traders, though studies in Ethiopia and Edo reported similar patterns of subsistence farming. Subsistence agriculture often results in poor income, and given Nigeria's reliance on out-of-pocket health financing, low income limits women's ability to access maternal services. Indeed, most respondents earned less than ₦10,000 monthly, similar to findings in Edo, Kaduna, and Kenya, where women lived on less than $2/day. Low income is strongly associated with poor ANC

utilization and restricted access to skilled delivery, thereby heightening risks of maternal morbidity and mortality.[41,42,37]

In terms of parity, most respondents had 1–4 children, unlike studies in Kwara where high parity was more common. Younger women of lower parity often have limited exposure to maternal health information, leading to poor ANC knowledge and utilization. By contrast, multiparous women with secondary education in this study demonstrated better knowledge of ANC, possibly due to prior exposure during previous pregnancies. These findings are consistent with studies in India and Tanzania, but differ from those in South Africa and Ogun State, where knowledge was poor.[34,37]

ANC attendance was the only consistent predictor of ANC knowledge across both groups. Women with ≥4 ANC contacts were significantly more likely to demonstrate good knowledge, aligning with studies in Pakistan, India, and Nigeria. [13,43,44,45] Increased ANC visits enhance opportunities for maternal health education, skilled birth preparedness, and ultimately better outcomes for mothers and infants. Income and education further strengthened knowledge of facility delivery, highlighting the role of socioeconomic status in maternal health service uptake.

Despite relatively good baseline knowledge, utilization remained low (37.4% and 40% in study and control groups, respectively), much lower than figures from Vietnam, Lagos, and Ghana but comparable to rural Vietnam. Low utilization in this study may reflect its community-based design, which included un-booked pregnancies.[46,47,48]. Given ANC's role in screening for infections, managing complications, and improving outcomes, the findings underscore the importance of promoting ANC attendance and addressing socioeconomic barriers. Gestational age misreporting was minimized through ultrasound confirmation, strengthening the study's reliability.[49,50,51,52]

In exploring the factors associated with baseline knowledge of antenatal care (ANC), only ANC attendance was a predictor of the knowledge of ANC in both study and control groups. In the study group, pregnant women who had ≥4 ANC contacts were four times more likely to have good knowledge of ANC as compared to those who had less than 3 ANC contacts while in the control group pregnant women who had ≥4 ANC contacts were 15.8 times more likely to have good knowledge of ANC as compared to those who had ≤3 ANC contacts. This finding was similar to findings in Pakistan and India where the majority of the respondents who had at least four ANC contacts had good knowledge of ANC. A similar study in Nigeria reveals a good mean knowledge of ANC of 2.39 ±0.54 among the majority of the respondents (87.2%) who agreed that ANC attendance was very important in counseling about major complications of pregnancy such as malaria and anemia in pregnancy and other new-born deformities. A pregnant woman who has adequate ANC contacts as found in this study has higher chances of making contacts with a skilled birth attendant. Each contact a pregnant woman makes with a health system leads to higher chances of having maternal health education which would lead to good knowledge of ANC and improved utilization of maternal health services which would lead to reduced maternal morbidity and mortality.

Since majority of health care financing in Nigeria is out of pocket, women in this study who earned more than ₦10,000 would have more ANC attendance resulting in good knowledge of hospital deliveries. Also, women who have formal education have higher chances of seeking for skilled care at delivery resulting in good knowledge of health facility deliveries.

In this study, more than one third of the respondent's utilized antenatal care (ANC) in both study (37.4%) and control (40.0%) groups at baseline. This finding was in contrast to a facility-based study in Vietnam where 78.3% of respondents utilized ANC in urban facilities. Other studies with contrasting findings are hospital-based studies in Lagos, Nigeria, NDHS, 2018, and a study in Ghana where health facility utilization was greater than 65% as compared to the finding in this study. A similar finding was a study in Vietnam where the rural health facilities had utilization of 15.2%. The low utilization of ANC in this study may be because this study was a community-based study that captures women that have never utilized ANC before and those that have

been utilizing ANC but have not booked for the index pregnancy. ANC attendance offers pregnant women the opportunity to screen for diseases such as Malaria, HIV, Syphilis, Packed Cell Volume (PCV), and Urine for proteins. It also identifies potential complications that may arise during pregnancy and treat them accordingly. Studies have proven that pregnant women who have more ANC contact have improved maternal and fetal outcomes

CONCLUSION

The study found women demonstrated good baseline knowledge of ANC. Adequate ANC attendance was a strong predictor of ANC knowledge. Despite generally low ANC utilization, increasing age and formal education significantly predicted utilization among women in the control group.

Recommendations

Improving community education is essential, as it predicts knowledge. Periodic health talks and awareness campaigns on antenatal care and facility delivery, targeting women, should be implemented through government and non-governmental organizations, ensuring active community involvement for sustainable outcomes. In addition, job creation through formal and informal sectors as well, and skill acquisition programs should be enhanced to improve the earnings of women and girls in particular to improve access to ANC.

Limitations

Some participants who traveled to deliver outside the study communities during the study period could not be accounted for and were lost to follow-up. Gestational age estimation using the last menstrual period (LMP) may have been inaccurate because some women may not have remembered the dates correctly.

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Conflict of Interests

We declare that we have no competing interests as researchers.

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