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Skilled Birth Attendance in Nigeria: A Function of Frequency and Content of Antenatal Care

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Abstract

The utilization rate of maternal services remains low in sub-Saharan Africa and may be contributing to the region's high maternal mortality rate. This study examines the influence of antenatal care (ANC) on skilled birth attendance (SBA) in Nigeria. The data used were collected from a nationally representative sample of women (aged 15-49) in 2011. The sample is restricted to women who were within two years postpartum (weighted n=9879). Multivariate logistic regression was used to assess the association between ANC (number of visits attended and services received during last pregnancy) and SBA. Despite 70% of the women receiving any ANC, only 49% had SBA during their last childbirth. The number of ANC services received, rather than the number of ANC visits attended, was positively associated with having SBA during last childbirth after controlling for relevant covariates ($p<0.05$). The focus, therefore, should be on increasing the number of services received during ANC. *(Afr J Reprod Health 2015; 19[1]: 25-33).*

Keywords: Antenatal care, skilled birth attendance, pregnancy, Nigeria

Résumé

Le taux d'utilisation des services de santé maternelle reste faible en Afrique sub-saharienne et peut contribuer au taux élevé de mortalité maternelle de la région. Cette étude examine l'influence des soins prénatals (SPN) sur les accoucheuses qualifiées (AQ) au Nigeria. Les données utilisées ont été recueillies auprès d'un échantillon national représentatif de femmes (15-49 ans) en 2011. L'échantillon est limité aux femmes qui étaient dans les deux ans après l'accouchement (n = 9879 pondérée). La régression logistique multivariée a été utilisée pour évaluer l'association entre l'SPN (nombre de consultations et les services reçus pendant la dernière grossesse) et les AQ. Malgré le fait que 70% des femmes profitaient des SPN, seulement 49% avaient des AQ lors de leur dernier accouchement. Le nombre de services de soins prénatals reçu, plutôt que le nombre de visites prénatales assisté, était positivement associé au fait d'avoir une AQ lors du dernier accouchement après avoir contrôlé pour vérifier des variables pertinentes (p <0,05). L'accent doit donc être mis sur l'augmentation du nombre de services reçus pendant les SPN. *(Afr J Reprod Health 2015; 19[1]: 25-33).*

Mots clé : Soins prénatals, services des accoucheuses qualifiées, grossesse, Nigeria

Introduction

Antenatal care (ANC) is relevant to the prevention of maternal mortality especially in developing countries where the rates of maternal deaths continue to be high[1,2]. According to the World Health Organization (WHO), an estimated 289,000 women died during pregnancy/childbirth in 2013; a majority of these deaths were among women with limited access to skilled ANC and delivery[2]. ANC has both direct and indirect effects on maternal health. The direct effect includes early detection and treatment of conditions that lead to poor health outcomes during pregnancy such as hypertension and diabetes; while the indirect effects are through skilled birth attendance (SBA), which can prevent morbidity/mortality due to emergency conditions that arise during childbirth such as obstructed labor and bleeding[2-4].

Despite the progress made by many countries in the achievement of the Millennium Development Goals (MDGs), the progress of the fifth MDG, which is to improve maternal health, is lagging behind that of the other goals[1]. The United Nations monitor the progress of this MDG by measuring the proportion of births attended by a

skilled provider and the proportion of pregnant women who had any or at least four ANC visits during their last pregnancy[1,2]. The World Health Organization recommends at least four ANC visits during the course of a pregnancy[2]. This recommendation does not highlight the content or quality of the ANC received during those visits. While access to basic ANC improves pregnancy outcomes, it is probably not the frequency (number of ANC visits attended) that matter; it may be the content (number of ANC services received) that counts.

Nigeria is one country where the progress of the fifth MDG is lagging[1,2]. With one of the highest maternal mortality ratios in the world (560 maternal deaths per 100,000 live births), only 38% of all births in Nigeria were attended by a skilled provider in 2013[2,4]. In addition, about 51% of women in 2013 met the recommended number of ANC visits during their last pregnancy[4]. These utilization rates are suboptimal and may be contributing to the high maternal mortality rate in Nigeria. Typically, the basic content of ANC in Nigeria includes: body weight measurement, blood pressure measurement, urine and blood testing, tetanus vaccination, HIV/AIDS counseling and testing, and malaria prophylaxis[5]. However, studies have shown low rates of receipt of these services[4,5]. In the bid to monitor efforts targeted at improving maternal health, it is imperative to ensure that the correct indicator of improved maternal health service utilization is being measured. Hence, the aims of this study are to determine: i) the predictors of use of ANC in Nigeria; ii) if ANC (operationalized as the number of ANC visits attended and/or services received during pregnancy) is associated with SBA among reproductive-aged women in Nigeria; and iii) the component of ANC (visits versus services) that is associated with SBA. The study results are expected to inform policies/programs targeted at

increasing the utilization of maternal health services and achievement of the fifth MDG in Nigeria.

Conceptual model

Thaddeus and Maine (1994) developed a conceptual framework explaining the factors that contribute to maternal mortality[6]. Their model focused on the interval between the start of an obstetric complication to the subsequent outcome, highlighting the three phases of delay in health care-seeking. These three phases of delay include: 1) delay in the decision to seek health care; 2) delay in arrival at a health facility; and 3) delay in the provision of adequate care at the health facility[6]. Gabrysch and Campbell (2009) adapted the delay framework to include preventive health care-seeking, specifically ANC[7]. This study uses the Gabrysch and Campbell adapted delay framework to conceptualize the associations between the factors that influence ANC and SBA. As shown in Figure 1, sociocultural factors (e.g. age, education, marital status), perceived benefit/need (pregnancy wanted, prior use of health services), economic accessibility (household wealth), physical accessibility (rural/urban residence), and quality of care (services provided, presence of skilled providers) affect the Phase 1 of the framework. Phase 2 is also affected by economic and physical accessibility while Phase 3 is affected by the quality of care provided. Controlling for these factors in the models that assess the association between ANC and SBA will contribute to accurate effect size estimation. Achieving the study objectives will provide tangible information for health providers on the benefits of the services they render and ways they can make their services more relevant to their clients.

Figure 1: Conceptual Framework of Factors that affect Utilization of Maternal Health Services
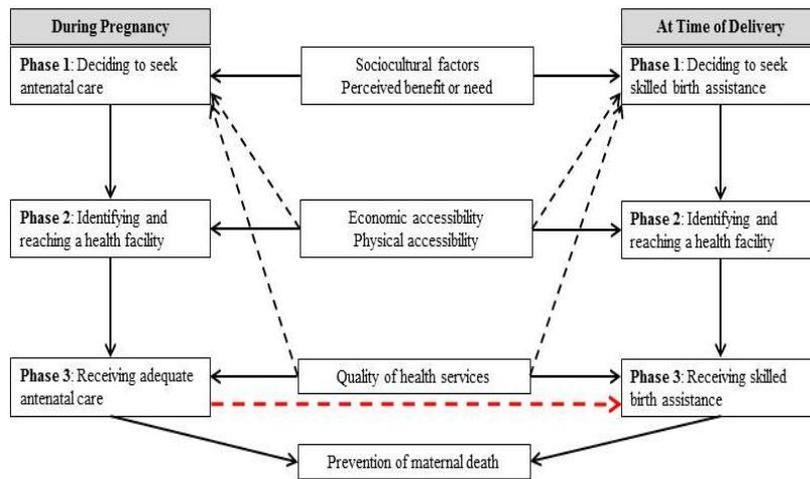

Methods

This study uses data from the fourth round of the Multiple Indicator Cluster Survey (MICS4) conducted in Nigeria in 2011. MICS is a cross-sectional household survey conducted every 3-5 years in several countries by UNICEF[8]. The survey uses a two-stage, probability-based, stratified cluster sampling design. A total of 24,565 reproductive-age women were interviewed in 2011. The present study focuses on women (ages 15 – 49) who had a live birth in the two years prior to survey, a sample size of 10,036 women (weighted sample size = 9879). The rationale for this restriction is that the survey collected maternal and newborn health information only from these women. Figure 2 shows the sample selection flowchart. Approval for data use was obtained from UNICEF.

Figure 2: Sample selection flowchart of women surveyed during the fourth round of the Multiple Indicator Cluster Survey (MICS4), Nigeria 2011
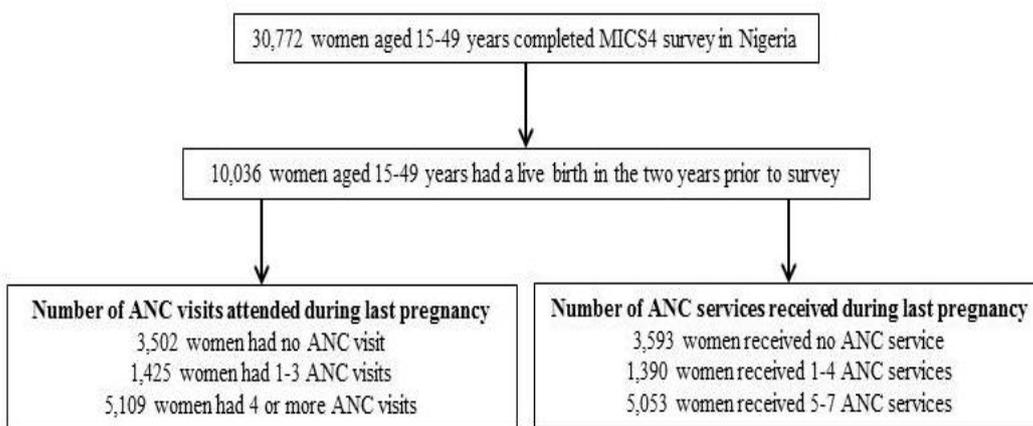
For the first study aim, which is to determine the predictors of ANC in Nigeria, the outcome variables are '*any ANC visit*' and '*any ANC service*' during last pregnancy. The women were asked the number of times they went to a health facility for ANC; this variable was coded as having any ANC visit during last pregnancy (i.e. one or more visits) versus no ANC visit at all. In

addition, the women were asked to report the ANC services they received during their last pregnancy. The services included: body weight measurement, blood pressure measurement, urine test, blood test, tetanus vaccination, malaria prophylaxis, and HIV counseling and testing. Data on all these services were collected as binary variables (yes/no). A composite variable was created reflecting the sum of the ANC services received. The value of the composite variable ranged from zero to seven, with a score of zero meaning none of the services was received while a score of seven means all the services were received. A dependent variable of '*any ANC service*' was then created with response categories of 'none' versus 'at least one ANC service'. The predictor variables for this model are the woman's: age (grouped as 15-24, 25-29, 30-34, and 35 or more years); educational attainment (none, primary, and secondary/higher education); marital/union status (married/has partner vs. single/divorced/separated); religion (Christianity, Islam, or other/no religion); residence (urban vs. rural); region of country (northern vs. southern geopolitical zones), household wealth index, and reproductive health factors such as parity prior to last pregnancy (1-2, 3-4, or 5+ children) and intention of last pregnancy (wanted at the time vs. not wanted at the time). Logistic regression models were used to assess the association between these variables and the two independent variables – ANC visits attended and services received.

The second study aim, which is to assess the effect of ANC on SBA, has SBA as the outcome variable of interest. This outcome is coded as '*yes*' if the woman had SBA at last childbirth and '*no*' otherwise. SBA was defined as having a childbirth assisted by a skilled health professional such as medical doctor, nurse, or midwife. Women who reported that their births were assisted by a friend, family member, traditional birth attendant, or by no one were classified as not having SBA. The key independent variables are ANC visits attended during pregnancy (categorized as 'no visit', '1-3 visits', and '4 or more visits') and ANC services received during pregnancy (categorized as 'no service', '1-4 services', and '5 or more services'). The covariates included in the regression models include the woman's age, education, marital/union

status, residence, region of country, religion, household wealth index, parity, intention of last pregnancy, type of ANC provider (none, not medically-trained, or medically-trained) and prior health service utilization (yes/no). These variables were selected from the literature and are reflected in the conceptual model guiding the analysis. These factors have been found to influence the utilization of maternal health services in other countries in the developing world including Nigeria[3,5-7,9-11]. All analyses were performed using Stata statistical software version 13[12], controlling for clustering of women within sampling units and using the survey weights.

Results

The characteristics of women in this study are shown in Table 1. Approximately half of the women (49%) had SBA during their last childbirth. Compared to women who did not have SBA during their last childbirth, women who did were older (25 – 39 years), had more education (secondary and higher), lived in rural areas, are Christians, are richer, had lower parity, had prior health service utilization, had a medically-trained ANC provider, attended at least four ANC visits, and received a majority (≥ 5 services) of the ANC services. These differences were statistically significant at *p* value <0.05. Approximately 70% of the women received any ANC (visit and/or service) during their last pregnancy (data not shown).

Table 2 shows the odds ratios estimated from the multivariate analyses of factors associated with ANC visits and services in Nigeria. The statistically significant results are reported below. Women who had at least primary education were more than twice as likely to have attended at least one ANC visit and to have received at least one ANC service during their last pregnancy compared to women with no education (OR: 2.2 for primary education and 3.2 for secondary or more education; *p*<0.05). Rural women were approximately 50 percent more likely to have had at least one ANC visit and service compared to urban women while women who live in the North-West region of the country were approximately 50% less likely to have at least one ANC visit and

service compared to those who live in any of the southern regions (*p*<0.05). Household wealth was positively associated with having at least one ANC visit and service (p<0.05). In addition, women who reported that their last pregnancy was wanted at the time were twice as likely to have attended at least one ANC visit and received at least one ANC service during that pregnancy compared to those who did not want the pregnancy at the time (OR: 2.27 and 2.16 respectively; *p*<0.05). Women who are aged 30-34 years are 30% more likely to have had at least one ANC visit and service (*p*<0.05). The woman's marital status, religion, and prior parity were not found to be significantly associated with attending any ANC visit or receiving any ANC service during their last pregnancy.

Table 1: Characteristics of women, ages 15 – 49, who had a live birth in the two years prior to survey, Nigeria 2011

Characteristics, Column (%)	Total Sample N = 9879	Skilled Birth Attendance	
		Yes n = 4814	No n = 5065
Age in years*			
15 – 19	6.0	3.5	8.4
20 – 24	20.4	17.3	23.4
25 – 29	28.9	31.5	26.4
30 – 34	22.9	26.2	19.9
35 – 39	14.2	15.8	12.6
40+	7.6	5.7	9.3
Education completed*			
None	40.0	12.3	66.3
Primary	18.7	19.7	17.8
Secondary and higher	41.3	68.0	15.9
Union Status			
In-Union	95.4	94.8	95.9
Not in-union	4.6	5.2	4.1
Residence*			
Rural	31.6	47.9	16.1
Urban	68.4	52.1	83.9
Region of residence			
North Central	13.2	15.7	10.7
North East	14.8	5.7	23.4
North West	28.3	10.1	45.6
South South	14.3	17.8	11.1
South East	9.7	17.6	2.2
South West	19.7	33.1	7.0
Religion*			
Christianity	45.9	66.4	26.3
Islam	52.7	32.4	72.0
Other/No Religion	1.4	1.1	1.7
Household wealth index *			
Poorest	21.9	5.0	38.1
Poor	20.3	10.7	29.3
Middle	18.5	18.9	18.1
Rich	19.9	29.6	10.6
Richest	19.4	35.8	3.9
Number of children ever born (Parity)*			
1 – 2 children	35.7	44.3	27.5
3 – 4 children	30.2	30.7	29.7
5+ children	34.1	25.0	42.8
Prior health service utilization (proxy: has immunization card)*			
Yes	52.6	77.1	29.2
No	47.4	22.9	70.8
Intention of last pregnancy			
Wanted at the time	82.5	81.1	83.8
Not wanted at the time	17.5	18.9	16.2
Number of ANC visit(s) during last pregnancy*			
No visit	30.9	4.6	55.9
1 – 3 visits	12.5	11.8	13.1
4 + visits	56.6	83.6	31.0
Number of ANC service(s) during last pregnancy*			
No service [a]	31.9	4.9	57.5
1 – 4 services	13.1	11.0	15.1
5 – 7 services	55.0	84.1	27.4
Type of ANC provider*			
None	30.9	4.6	55.9
Not trained medically (TBA/CHW/Other)	4.8	3.0	6.6
Trained medically (Doctor/Nurse/Midwife)	64.3	92.4	37.5

ANC: Antenatal Care; TBA: Traditional Birth Attendant; CHW: Community Health Worker; N: Weighted Sample
[a]includes women who had no ANC visit and those who had at least one ANC visit but did not receive any ANC service
*Distributional difference between the groups (had skilled birth attendance or not) is statistically significant at p<0.05

Table 2: Multivariate analysis of factors associated with antenatal care visits and services in Nigeria, 2011

Variables	Antenatal Care (Weighted N=9879)	
	At least one ANC visit OR (95% CI)	At least one ANC service OR (95% CI)
Age in years		
15 – 24	1.00	1.00
25 – 29	1.22 (0.99 – 1.50)	1.15 (0.93 – 1.43)
30 – 34*	1.33 (1.03 – 1.71)	1.34 (1.05 – 1.76)
35+	1.25 (0.96 – 1.62)	1.25 (0.95 – 1.64)
Education*		
No formal education	1.00	1.00
Primary education	2.17 (1.80 – 2.63)	2.13 (1.77 – 2.57)
Secondary and higher education	3.18 (2.48 – 4.07)	3.21 (2.50 – 4.12)
Union Status		
Not in-union	1.00	1.00

In-union	1.20 (0.84 – 1.71)	1.39 (0.89 – 2.19)
Residence*		
Urban	1.00	1.00
Rural	1.55 (1.13 – 2.13)	1.45 (1.04 – 2.02)
Region		
Southern regions	1.00	1.00
North Central	1.20 (0.91 – 1.59)	1.29 (0.97 – 1.70)
North East	0.78 (0.57 – 1.07)	0.90 (0.65 – 1.25)
North West*	0.43 (0.32 – 0.58)	0.49 (0.36 – 0.67)
Religion		
Christianity	1.00	1.00
Islam	0.83 (0.66 – 1.05)	0.79 (0.62 – 1.02)
Others	1.15 (0.64 – 2.05)	1.09 (0.63 – 1.88)
Household wealth index*		
Poorest	1.00	1.00
Poor	2.09 (1.70 – 2.57)	2.13 (1.74 – 2.61)
Middle	3.69 (2.79 – 4.88)	3.80 (2.87 – 5.03)
Rich	6.87 (4.73 – 9.98)	7.03 (4.85 – 10.18)
Richest	16.40 (10.11 – 26.60)	17.49 (10.82 – 28.26)
Parity		
No child	1.00	1.00
1 – 2 children	0.83 (0.67 – 1.03)	0.78 (0.62 – 0.99)
3 – 4 children	0.77 (0.60 – 0.99)	0.78 (0.59 – 1.02)
5+ children	0.77 (0.58 – 1.03)	0.74 (0.54 – 1.01)
Intention of last pregnancy*		
Not wanted at the time	1.00	1.00
Wanted at the time	2.27 (1.80 – 2.87)	2.16 (1.71 – 2.72)

OR: Odds Ratio; CI: Confidence Interval
* Statistically significant for both outcomes

The results shown in Table 3 include the logistic regression estimations of the association between ANC and SBA. Model 1 includes the number of ANC visits attended as the key independent variable; Model 2 includes the number of ANC services received as the key independent variable; while Model 3 includes both ANC variables as the independent variables controlling for each other and other relevant covariates. As shown in Model 1, the number of ANC visits attended is not significantly associated with SBA while controlling for relevant covariates ($p>0.05$). In Model 2, women who received a majority of the ANC services (≥5 services) are approximately 90% more likely to have had SBA compared to those who did not receive any service controlling for relevant covariates ($p<0.05$). There was no statistically significant difference between those who received 1-4 ANC services and those who did not receive any ANC service at all (OR: 1.16; 95% CI: 0.79-1.71). In Model 3, which includes both the ANC visits and services, it can be seen that those who attended any ANC visit were less likely to have had SBA compared to those who did not attend any visit (OR: 0.22 for 1-3 visits and 0.34 for 4+ visits; $p<0.05$). On the contrary, women who received any ANC service were more than three times as likely to have had SBA compared to those who did not receive any ANC service (OR: 3.11 for 1-4 services and 4.85 for 5-7 services; $p<0.05$). Older age (35+ years), having any formal education, living in southern geopolitical zones, having higher household wealth, lower parity, prior health service utilization, and having a trained ANC provider were positively associated with SBA across all three models ($p<0.05$).

Table 3: Logistic estimation of the association between antenatal care and skilled birth attendance in Nigeria, 2011

	Skilled birth attendance (Weighted n=9879)		
Variables	**Model 1** OR (95% CI)	**Model 2** OR (95% CI)	**Model 3** OR (95% CI)
Number of ANC visits			
No visit	1.00	---	1.00
1 – 3 visits	0.72 (0.47 – 1.12)	---	0.22 (0.10 – 0.46)
4 + visits	1.21 (0.80 – 1.85)	---	0.34 (0.16 – 0.72)
Number of ANC services			
No Service	---	1.00	1.00
1 – 4 services	---	1.16 (0.79 – 1.71)	3.11 (1.56 – 6.18)
5 – 7 services	---	1.90 (1.29 – 2.81)	4.85 (2.39 – 9.86)
Age in years			
15 – 24	1.00	1.00	1.00
25 – 29	1.02 (0.82 – 1.27)	1.01 (0.82 – 1.26)	1.02 (0.82 – 1.26)
30 – 34	1.26 (0.95 – 1.68)	1.26 (0.95 – 1.69)	1.24 (0.93 – 1.65)

35+	1.40 (1.06 – 1.85)	1.41 (1.07 -1.86)	1.37 (1.04 – 1.80)
Education			
No formal education	1.00	1.00	1.00
Primary education	1.88 (1.45 – 2.42)	1.80 (1.39 – 2.33)	1.82 (1.40 – 2.35)
Secondary and higher education	3.34 (2.56 – 4.34)	3.20 (2.45 – 4.17)	3.17 (2.42 – 4.14)
Union Status			
Not in-union	1.00	1.00	1.00
In-union	1.01 (0.71 – 1.45)	0.99 (0.70 – 1.40)	0.98 (0.70 – 1.37)
Residence			
Urban	1.00	1.00	1.00
Rural	1.05 (0.83 – 1.33)	1.05 (0.83 – 1.34)	1.05 (0.82 – 1.33)
Region			
Southern regions	1.00	1.00	1.00
North Central	1.13 (0.87 – 1.48)	1.09 (0.84 – 1.42)	1.12 (0.85 – 1.46)
North East	0.36 (0.27 – 0.47)	0.34 (0.26 – 0.46)	0.35 (0.27 – 0.47)
North West	0.26 (0.19 – 0.37)	0.26 (0.18 – 0.37)	0.26 (0.18 – 0.36)
Religion			
Christianity	1.00	1.00	1.00
Islam	0.82 (0.67 – 1.01)	0.83 (0.68 – 1.02)	0.84 (0.68 – 1.03)
Others	0.66 (0.36 – 1.21)	0.71 (0.40 – 1.29)	0.68 (0.37 – 1.23)
Household wealth index			
Poorest	1.00	1.00	1.00
Poor	1.51 (1.18 – 1.91)	1.48 (1.16 – 1.89)	1.50 (1.17 – 1.92)
Middle	2.34 (1.80 – 3.04)	2.36 (1.74 – 2.95)	2.23 (1.71 – 2.91)
Rich	3.58 (2.66 – 4.82)	3.40 (2.51 – 4.61)	3.36 (2.48 – 4.56)
Richest	8.32 (5.24 – 13.19)	7.84 (4.92 – 12.52)	7.69 (4.81 – 12.28)
Parity			
1 – 2 children	1.00	1.00	1.00
3 – 4 children	0.66 (0.52 – 0.83)	0.67 (0.53 – 0.85)	0.66 (0.52 – 0.84)
5+ children	0.74 (0.57 – 0.97)	0.75 (0.57 – 0.98)	0.74 (0.57 - 0.97)
Prior health service utilization			
No	1.00	1.00	1.00
Yes	1.38 (1.13 – 1.67)	1.26 (1.05 – 1.53)	1.25 (1.04 – 1.52)
Intention of last pregnancy			
Not wanted at the time	1.00	1.00	1.00
Wanted at the time	1.19 (0.98 – 1.44)	1.17 (0.96 – 1.42)	1.16 (0.96 – 1.41)
ANC provider			
None/Not trained	1.00	1.00	1.00
Trained medically	7.77 (5.25 – 11.51)	5.81 (4.06 – 8.14)	6.77 (4.58 – 10.00)

Model 1 includes ANC visits as the key independent variable; Model 2 includes ANC services received as the key independent variable; Model 3 includes both key independent variables (visits and services received)
OR: Odds Ratio; CI: Confidence Interval --- not included in the model

Discussion

This study aimed to assess the association between ANC and SBA among reproductive aged women in Nigeria. The finding that the number of ANC services received is positively associated with having SBA is consistent with the findings from other studies in similar African settings[3,7,9]. Our finding that the number of ANC visits attended is negatively associated with having SBA is supported by the results from a qualitative study in Uganda that reported that some women attend ANC to verify that their pregnancy is progressing well and once reassured do not seek SBA[10]. This could be as a result of cultural norms that promote delivery at home. This finding implies that the message about the benefits of ANC may be widespread, however that of SBA is probably lagging. There may be some underlying cultural/societal norms around seeking ANC from health facilities and choosing to deliver outside the facility. It is important to reinforce the need for both ANC and SBA as effective ways of reducing the high rates of maternal deaths in Nigeria. Our finding that, compared to women in the southern region of the country, women in the north-west regions were less likely to have attended any ANC visit, received any ANC service, or received SBA

at delivery suggest that there may be contextual factors that are affecting utilization of maternal health services in northern Nigeria. These contextual factors such as restrictive religious and gender norms together with geographical inaccessibility to health facilities need to be addressed. Maternal and child health programs need to target women and men in these regions of the country to increase their knowledge of the importance of receiving maternal services and possibly improve their attitudes towards maternal health care utilization. We also found that rural women were more likely to have had SBA compared to urban women; this result suggests that efforts may have been focused disproportionately on rural areas at the expense of urban areas. Some African researchers have suggested the disappearance of the so-called 'urban advantage' in light of the high levels of urban poverty[13]. The high urbanization rate in Nigeria (>3% per annum) has led to higher levels of poverty in urban areas that are becoming closer to that of rural areas[14]. According to a 2003 study that used Demographic and Health Surveys from 23 countries in sub-Saharan Africa, poverty has created an intra-urban disparity in access to maternal health care as urban poor women had limited access to antenatal and delivery care compared to their wealthier counterparts[15]. Hence, there is a need to ensure that the reproductive health needs of women in the urban areas including that of the new internal migrants are being met.

Despite the utility of the results of this study, there are a few limitations. The decision to seek ANC and to have SBA is probably interrelated – hence endogeneity may be a problem. It is possible that women who wish to have SBA utilize the available ANC services leading to more visits attended and services received. To control for this probable endogeneity, a proxy variable for propensity to use health services (having an immunization card) was included in the models. Hence, the effect of endogeneity on our results may have been reduced. However, it is possible that the added variable did not control for all of the endogeneity present. In addition, the data for this study was collected via a cross-sectional survey; therefore, the direction of causality cannot be inferred. Although the potential for recall bias was minimized by restricting to women with a live birth in the two years prior to the survey, it is expected that the recall of the number of visits and services received may still be biased. However, the study findings are important and relevant as they inform the need to reassess the indicators used in assessing the coverage of ANC as a measure of maternal health service utilization. No study, to our knowledge, has evaluated the component of ANC that predicts SBA. The finding that the number of ANC services received positively predicts the odds of having SBA while controlling for the number of ANC visits attended is innovative. It suggests that there is a need to focus on improving the content of ANC in Nigeria.

Conclusion

The results of this study indicate that there is room for improvement in the evaluation and research of maternal health utilization in Nigeria. Future studies should focus on studying innovative ways to improve both the frequency and content of ANC in Nigeria. Although there is evidence that male involvement has the potential to improve women's use of health services especially in patriarchal societies such as Nigeria, future research need to study the best way to involve men and to evaluate the impact of such male involvement on maternal health utilization. Additionally, there may be a need for comparative qualitative research in both the southern and northern regions of Nigeria to understand the contextual factors that affect maternal health service utilization.

Acknowledgement

Conflict of Interest

The authors declare no conflict of interest.

Contribution of Authors

The first author (CCO) conceived and designed the study and also analyzed the data. Both authors prepared the manuscript and approved of this final version.

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