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Utilization of antenatal, delivery and postnatal care services in primary healthcare centres in selected rural communities in Delta State, Southern Nigeria

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Abstract

Background: In Nigeria, there is a dearth of evidence on predictors of maternal care utilization in primary healthcare centres (PHCs).

Objective: In this study, we examined the predictors of antenatal care (ANC), delivery care, and postnatal care (PNC) utilization in PHCs in four rural communities in Ughelli North Local Government Area in Delta State, Southern Nigeria.

Methods: We performed a cross-sectional household survey which used a pretested structured questionnaire to elicit information from 380 women within the reproductive ages in their homes. Descriptive and predictive analyses were undertaken to assess the prevalence of ANC, delivery care, and PNC in PHCs. The odds for utilizing the three indicators were estimated using multivariate logistic regression.

Results: The data revealed that 72.96% (n = 224/380) of the women utilized ANC in PHCs. Among women who reported recent birth, 56.34% (n = 191/339) delivered in PHCs, 4.72% (n = 87/339) in other government hospitals, 13.27% (n = 445/339) in private hospitals and 25.66% (n =87/339) delivered either at home or in the homes of Traditional Birth Attendants. Also, 64.24% (n = 106/339) of women who reported recent birth use PHC for PNC. Women who required to walk for 30 - 59 min and ≥ 60 min to the nearest healthcare centre were, respectively, 56% [Odds ratio (OR) = 0.44; 95% confidence interval (CI): 0. 18 - 1.04] and (OR = 0.37, 95% CI: 0.19 - 0.72) significantly less likely to use PHC for ANC. Those who had primary educational qualification (OR = 0.36; 95% CI: 0.19 – 9.76) and at least secondary educational qualifications (OR = 0.43; 95% CI: 0.20 - 1.18) were respectively 64% and 57% significantly less likely to use PHC for delivery care. Attending ANC in PHCs significantly increases the chances of using PHC for both delivery care (OR = 10.52; 95% CI: 5.94 - 18.61), and PNC (OR = 2.11; 95% CI: 0.99 - 4.53). Also, using PHC for delivery care (OR = 11.72; 95% CI: 5.14 - 26.69) is associated with 1,072% increase in the odds to use PHCs for PNC.

Conclusion: The study concluded that the rate at which women in the study area deliver at home is high despite proximity to PHCs. Also, the use of PHCs for a lower level of care influences its usage for a higher level of care**.** The study among other things recommends that quality of care rendered in PHCs should be upgraded and more PHCs should be sited in the study area.

Keywords: *Antenatal care, delivery care, postnatal care, primary healthcare centre, Nigeria*

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INTRODUCTION

Current estimates put the global number of maternal deaths at between 500,000 and 536,000 per annum [1,2]. Over 90% of global maternal and perinatal mortality occur in Africa and South Asia [1]. Nigeria is a major contributor to sub-Saharan Africa's (SSA) rising maternal mortality burden and it is estimated that it respectively accounts for 68% and 19% of maternal mortality in SSA and the entire globe. High maternal mortality ratio in Nigeria is due to underutilization of maternal care services [3]. The trend in Nigeria revealed that while 43% of births in the five years preceding the most recent National Demographic and Health Survey [4] were delivered by skilled birth attendants, only 39% were conducted in health facilities. Also, only 57% of Nigerian women met the minimum recommended number of four ANC visits [4]. A continuum of care which involves antenatal care (ANC),

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institutional delivery, and postnatal care (PNC) has been advocated as necessary health interventions to achieve optimum maternal and child health. Cares provided in pregnancy, at the time of birth and in the postpartum period should be provided in a continuum and comprehensive manners to reap the full dividend of attaining optimal health for both mothers and their babies [5-11]. Primary healthcare (PHC), the key for achieving the target of good health for all, and a strategy for achieving universal health coverage was a key constituent of health sector reforms in the 20th century. PHC constitutes the first element of the continuing healthcare process and was founded on the principle that health is the fundamental right of all. The World Health Organization (WHO) [12] recommended PHC as the only health system strategy that can help achieve equity in health between rural and urban women [13]. Since 1986, Nigeria's health system has been reoriented towards a healthcare delivery system based on PHCs [11]. In light of the foregoing, reproductive health policy in Nigeria aims at ensuring the physical presence of PHCs in all communities. Current estimates put the number of PHCs in Nigeria at over 34,000 with one PHC per political ward [13]. Despite the spread and availability of PHCs in the rural part of Nigeria, evidence shows that rural Nigerian women are not optimizing the utilization of PHCs for skilled pregnancy care [8-10,14,15], hence resulting in disparity in health outcomes between rural and urban women [10]. In Nigeria, only a handful of studies examined predictors of maternal care utilization in PHCs. For instance, Alenoghena, Isah and Isara [11] investigated predictors of ANC, delivery and family planning utilization in PHCs among women in Edo North, Southern Nigeria. Okonofua et al. [9] examined predictors of skilled delivery and ANC in 20 communities in Edo State, Nigeria. Ahuru and Iseghohi [8] investigated predictors of early timing and an adequate number of ANC visits in PHCs among women in eight rural communities in Delta State, Nigeria. However, none of these studies included PNC utilization in PHCs. This present study filled this gap by investigating predictors of ANC, delivery care and PNC in PHCs in four randomly selected rural communities in Delta State, Southern Nigeria.

MATERIALS AND METHODS

Study design

This study was a community-based cross-sectional study that employed quantitative data collection method to investigate the predictors of ANC, delivery care and PNC in PHCs in four rural communities in Delta State, South-South Nigeria.

Study communities

The four study communities are in Ughelli North Local Government Area (LGA). Ughelli North is one of the twenty-five LGAs in Delta State. It lies between 9º 45 'N and 8º 43'E with a landmass of 818 square km. The National census of 2006 puts the population of the LGA at 821, 028 and women account for approximately 50% of the population. The primary source of maternal care in the LGA is PHCs, although several private hospitals exist in the LGA that renders various degrees of maternal health care services. There are 30 public PHCs with a PHC density ratio of 18 per 10,000 of the population [16]. There are few private hospitals and one general hospital located in the local government headquarters. Farming is the primary occupation of people in the study area, and it comprises crop plantation and fish farming.

Sample size

The data analyzed in this study was obtained from 380 women within the reproductive ages in four rural communities in Ughelli North LGA, Delta State. The sample size was obtained using the Cochrane's [17] sample size formula for single proportion and based on the assumption of an error margin of 5%, 1.96 critical values for 95% confidence level and 62.1% rate of ANC utilization in PHCs which was reported by Okonofua et al. [9] and a 5% non-response rate.

Sampling procedures

Multi-stage sampling method was used in selecting respondents for the study. In the first stage, a simple random sampling method was used to select four political wards out of the eleven political wards that make up the LGA. In the second stage, a simple random sampling technique was used to select one community in each of the four wards. The communities were numbered alphabetically in papers, which were folded and shoved in a balloon. A research assistant who was initially absent was asked to pick out one of the papers, and the community with the number on the paper was selected. In stage three, community household surveys were conducted. With the aid of lead contact persons, houses in the communities were numbered and households counted. Households with at least one qualified woman were enlisted in the survey. The eligibility criteria included being in reproductive age, either currently married or in consensual union, either pregnant or must have given birth in the last five years preceding the survey and were currently residing in the communities.

A non-proportional sampling method was employed in apportioning the 380 sample observations across the four rural communities, due to lack of accurate and reliable data to work out a proportional sampling. We assumed there was an equal number of qualified women in the four communities, and as a result, proposed to survey 95 women in each of the four communities. However, some communities have more qualified women while others fewer, hence larger number of observations was recruited from communities with more qualified women to make up the 380 observations. Nevertheless, the four communities were fairly represented in the sample observations. The communities were surveyed consecutively until the 380 observations were arrived at, then the research team stopped. The questionnaire used in collecting information from the women was adapted from Okonofua et al. [9], with slight modifications. It was pretested by administering it to

eight women in Gana, a neighbouring community which shared similar socioeconomic characteristics with the research participatory communities. Adjustments were made based on the results of the pilot test by rephrasing questions which were hazy to respondents and completely removing those that seemed irrelevant. The questionnaire was administered on a one-on-one basis with respondents and was fielded in either Pidgin English or English language. Trained field research assistants with qualifications in Management and Social Science disciplines were recruited for administering the questionnaire. Research assistants were given two days' training on the ethics of the survey, field conducts an in-depth review of the contents in the questionnaire. Data collection lasted for three months.

Measures

Three outcome indicators were utilized in this study. They were ANC, Delivery and PNC. The ANC was defined as the place of ANC and coded as 1 for ANC in PHCs and 0 for otherwise. Delivery care was defined as the place of delivery and coded as 1 for delivery supervised in PHCs and 0 for otherwise. The PNC was defined as the place of PNC and coded 1 for a PNC checkup in PHCs and 0 for otherwise. These variables were examined against all cofounding covariates which included the socio-demographic characteristics of respondents. Drawing from past studies on maternal and child care utilization and models of maternal care utilization, the following independent variables were examined as predictors of the three outcome indicators: maternal age, maternal education, employment status, monthly income, marital status, time involved in travelling to the nearest healthcare centre, perception of the quality of care rendered in the nearest healthcare centre, birth preparedness, responsible partner for health bills, exposure to media, woman's level of autonomy and religion.

Statistical analysis

The distribution of the respondents' socioeconomic characteristics together with their attitude towards maternal care (ANC, delivery care and PNC) was expressed as a simple frequency and proportions. Bivariate analysis was conducted to examine the association between the three outcome indicators and the various socio-economic factors using the Pearson's Chi square (χ^2) test. The multivariate logistic regression was utilized to examine the predictors of the three outcome indicators. Variables included in the multiple logistic regression were those variables that were significant at 0.2 significance level. The results of the binary logistic regression were presented as odds ratios (OR) and 95% confidence interval (CI). Statistical significance was set at 10% significant level. Analysis for ANC was bounded for the 380 women surveyed across the four rural communities while that for delivery and PNC was bounded for 339 women who reported recent birth in the last five years preceding the survey. It is only these sets of women that could provide information on place of delivery and PNC.

RESULTS

In Table 1, the characteristics of women participants are presented. The average age [± standard deviation (SD)] of the women was 36.31 ± 6.54 yr. The highest proportion of the women were within the group 35 – 39 yr., while the least proportion of women were within the age group 16 - 19 yr. Analysis of educational attainment showed that majority of the women had primary educational

Table 1: Socio-demographic characteristics of the women

Characteristics	Frequency (n = 380)	Percentage
Maternal age in yr.		
Mean (SD)	36.3 (6.5)	
16 - 19	9	2.36
20 - 24	35	9.21
25 - 29	47	12.36
30 - 34	57	15
35 - 39	126	33.16
40 - 49	106	27.89
Maternal education		
No formal education	91	23.94
Primary	212	55.79
Secondary	72	18.95
Tertiary	5	1.32
Employment status		
Not working	20	5.26
Working	360	94.74
Monthly income (₦)		
< 5,000 [a]	183	48.16
5,000 - 9,999	105	27.63
10,000 - 14,999	63	16.58
15,000 - 99,999	9	2.37
Woman's level of autonomy		
None	33	8.68
Low	208	54.74
Moderate	84	22.11
High	38	10
Very high	17	4.47
Media exposure		
None	62	16.32
Low	78	20.53
Moderate	82	21.58
High	140	36.84
Very high	18	4.74
Marital status		
Married	202	53.16
Living together	166	43.68
Widowed	12	3.16
Time (in minutes) walking to nearest health centre		
< 30	134	35.26
30 - 59	36	9.47
≥ 60	210	55.26
Perception of quality of care		
Poor	215	56.58
Good	35	9.21
Excellent	130	34.21
Who pays for health bill		
Respondent alone	50	13.16
Husband alone	210	55.26
Respondent and husband	120	31.58

*SD, standard deviation; [a] deducted unemployed women without monthly income

qualifications (55.79%, n = 212/380), while an insignificant number of them reported tertiary educational qualification (1.32%, n = 5/380). Approximately 95% (n = 360/380) of the women were employed. The highest proportion (48.16%, n = 183/380) of working women earned less than ₦ 5, 000 per mo. Majority of the women were married with a low level of autonomy. Approximately 81% (n = 307/380) of the women utilized ANC services during their most recent pregnancy, and 72.96% (n = 224) of them utilized care in PHCs. Out of the women surveyed, 339 reported recent birth in the last five years preceding the survey. About 80% (n = 272/380) of women with recent birth reported that they went for ANC checkups and 73.89% (n = 201) utilized ANC in PHCs. Analysis of the place of delivery for women with recent birth showed that 4.72% (n = 16/339) delivered in other government hospitals, 56.34% (n = 191) in PHCs, 13.27% (n = 45) in private hospitals and 25.66% (n = 87) delivered either at home or in the homes of traditional birth attendants (TBAs). Approximately 49% (n = 165/339) of women with recent birth went for PNC checkup three weeks after delivery. Analysis of the place of PNC revealed that 10.30% (n = 17/165) utilize PNC in other government hospitals, 64.24% (n = 106) in PHCs, 16.36% (n = 27) in private hospitals and 9.09% (n = 15) either at home or in the homes of TBAs (Table 2).

Table 2: Reproductive Characteristics of the women

Variable	Frequency (n = 380)	Percentage
Birth preparedness		
No	259	68.16
Yes	121	31.84
Number of children		
0-2	91	23.95
3-4	131	34.47
≥5	158	41.58
ANC use		
Yes	307	80.79
No	75	19.74
Place of ANC		
Other govt hospitals	25	8.79
PHCs	224	72.96
Private hospital	29	9.45
At home/other homes/TBAs	27	8.79
Recent birth (n = 339)		
No	67	19.78
Yes	272	80.24
Place of ANC		
Other govt hospitals	21	7.72
PHCs	201	73.89
Private hospitals	24	8.82
At home/other homes/TBAs	26	9.56
Place of delivery		
Other govt hospitals	16	4.72
PHCs	191	56.34
Private hospitals	45	13.27
At home/other homes/TBAs	87	25.66
Postnatal care use		
No	174	51.33
Yes	165	48.67
Place of postnatal care		
Other govt hospitals	17	10.30
PHCs	106	64.24
Private hospitals	27	16.36
At home/other homes/TBAs	15	9.09

*ANC, antenatal care; PHC, primary healthcare; TBA, traditional birth attendant; govt, government

Bivariate analysis

Approximately 73% (n = 224/307) of the women attended ANC in PHCs during their last pregnancies. Compared to those who did not utilize ANC in PHCs, those who did report primary educational qualifications were unemployed and required < 30 min walk to the nearest healthcare centre. Also, approximately 56% (n = 191/339) of the women delivered their last child in PHCs. The majority of those who delivered in PHCs were within the age-group 40 - 49 yr., reported no formal educational qualification, earned < ₦ 5,000 per mo, had no media exposure and utilized ANC in PHCs in the course of their last pregnancies. Also, approximately 64% (n = 106/165) of the women utilized PNC in PHCs. Compared to those who did not utilize PNC in PHCs, those who did were within the age-group 16 – 19 yr., reported primary educational qualifications, earned between ₦ 10,000 and ₦ 14,999 per mo, had low media exposure, were prepared for delivery and had their last deliveries in PHCs (Table 3).

Predictors of ANC utilization in PHCs

Results of the logistic regression model predicting the factors associated with the utilization of a PHC for ANC are presented in Table 4. Women who required 30 - 59 min walk [adjusted odds ratio (aOR), 0.44; 95% CI: 0.18 - 1.04] and ≥ 60 min walk (aOR, 0.37; CI: 0.19 - 0.72) to the nearest healthcare centre were, respectively, 56% and 63% significantly less likely to use PHC facility for ANC compared to those who required < 30 min walk to the nearest healthcare centre.

Predictors of delivery care utilization in PHCs

The results of the logistic regression model predicting the factors associated with delivery care utilization in PHCs are presented in Table 4. Women who had primary education (aOR, 0.36; 95% CI: 0.19 - 9.76) and those who had at least secondary education (aOR, 0.43; 95% CI: 0.20 - 1.18) were respectively 64% and 57% significantly less likely to use PHC facility for delivery care compared to women without formal education. Women who had low exposure (aOR, 0.42; 95% CI: 0.17 - 1.05) and moderate exposure (aOR, 0.43; 95% CI: 0.11 - 0.73) were respectively 58% and 57% significantly less likely to utilize delivery care in PHCs compared to women who had no exposure. Women who share healthcare responsibility with husbands (aOR, 2.28, 95% CI: 0.94 - 5.54) were approximately two times as

likely to utilize delivery care in PHCs compared to women who pay healthcare bills alone. Women who use the PHC facility for ANC (aOR, 10.52; 95% CI: 5.94 - 18.61) were 95.20% significantly more likely to use PHC for delivery compared to women who did not utilize ANC in PHCs.

Predictors of PNC utilization in PHCs

The logistic regression results for the factors associated with PNC utilization in PHCs are presented in Table 4. Women within the age grade 20 - 24 yr. (aOR, 0.07; 95% CI: 0.00 - 1.39); 25 – 29 yr. (aOR, 0.01; 95% CI: 0.00 - 0.24); 30 - 34 yr. (aOR, 0.02; 95% CI: 0.00 - 0.42); 35 - 39 yr. (aOR, 0.04; 95% CI: 0.00 - 0.57); and 40 - 49 yr. (aOR, 0.02; 95% CI: 0.00 - 0.37) were respectively 93%, 99%, 98%, 96%, and 98% significantly less likely to utilize PNC

Table 3a: Association between maternal care usage in PHCs and socio-demographic characteristics

Background characteristics	ANC in PHCs (%)	Delivery care in PHCs (%)	PNC in PHCs (%)
Total	224 (72.96)	191 (56.34)	106(64.24)
Maternal age yr.			
16 - 19	5 (55.55)	2 (40)	3 (60)
20 - 24	22 (62.86)	7 (58.33)	5 (41.67)
25 - 29	24 (51.06)	16 (38.09)	7 (16.67)
30 - 34	39 (69.64)	29 (54.72)	19 (35.85)
35 - 39	70 (55.56)	69 (55.65)	33 (26.61)
40 - 49	64 (59.4)	68 (66.7)	39 (38.2)
p value	0.45	0.06*	0.06*
Chi square	4.722	10.754	10.744
Maternal education			
No formal education	56 (61.54)	59 (68.60)	21 (24.42)
Primary	132 (62.26)	102 (54.55)	73 (39.04)
Secondary	35 (48.61)	26 (46.62)	10 (16.39)
Tertiary	1 (20)	04 (80)	2 (40)
p value	0.06*	0.01*	<0.001*
Chi square	7.529	13.312	13.591
Employment status			
Not employed	13 (65)	9 (52.94)	6 (35.29)
Employed	211 (58.61)	182 (56.52)	100(31.06)
p value	0.57	0.77	0.71
Chi square	0.319	0.08	0.135
Monthly income (₦)			
0+	13 (65.0)	9 (52.94)	6 (35.29)
< 5,000	117 (63.93)	106 (61.63)	41 (23.84)
5,000 - 9,999	60 (57.14)	54 (56.23)	37 (38.54)
10,000 - 14,999	31 (49.21)	21 (46.67)	22 (48.89)
15,000 - 99,999	3 (33.33)	1 (11.11)	0 (0)
p value	0.02*	0.02*	<0.001*
Chi square	11.232	11.232	17.506
Woman's level of autonomy			
None	20 (62.50)	16 (53.33)	10 (33.33)
Low	129 (62.0)	118 (59.9)	66 (33.5)
Moderate	42 (50.0)	35 (53.5)	19 (29.2)
High	23 (60.5)	15 (46.9)	5 (15.6)
Very high	10 (58.8)	7 (46.7)	6 (40.0)
p value	0.39	0.55	0.13
Chi square	5.232	3.025	4.146

*ANC, antenatal care; PNC, Postnatal care; PHC, primary healthcare

Table 3b: Association between maternal care usage in PHCs and socio-demographic characteristics

Background characteristics	ANC in PHCs (%)	Delivery care in PHCs (%)	PNC in PHCs (%)
Total	224(72.96)	191 (56.34)	106(64.24)
Media exposure			
None	42 (67.74)	42 (73.68)	6 (10.53)
Low	48 (61.54)	38 (55.88)	34 (50)
Moderate	42 (51.22)	30 (42.85)	20 (28.57)
High	82 (58.6)	76 (58.9)	43 (33.3)
Very high	10 (55.55)	5 (33.33)	3 (20)
p value	0.37	< 0.001*	< 0.001*
Chi square	4.315	15.73	23.89
Marital status			
Married	122(60.39)	112 (59.57)	65 (34.57)
Living together	95 (57.23)	72 (51.43)	34 (24.29)
Widowed	7 (58.33)	7 (63.64)	7 (63.44)
p value	0.83	0.30	0.01*
Chi square	0.379	2.411	9.495
Birth preparedness			
No	142(54.83)	126 (55.51)	64 (28.19)
Yes	82 (67.77)	65 (58.04)	42 (37.50)
p value	0.83	0.66	0.08*
Chi square	5.709	0.195	3.022
Number of children ever given birth to			
0 - 2	57 (62.64)	24 (48)	14 (28)
3 - 4	71 (54.19)	70 (53.44)	34 (25.95)
≥ 5	96 (60.76)	97 (61.39)	58 (36.71)
p value	0.22	0.17	0.13
Chi square	4.433	3.503	4.146
Time (min) involved in walking to nearest health centre			
< 30	94 (70.15)	69 (55.09)	42 (31.15)
30 - 59	20 (55.56)	22 (68.75)	11 (34.38)
≥ 60	110(52.38)	100 (54.24)	53 (28.80)
p value	< 0.001*	0.42	0.29
Chi square	10.861	1.733	2.473
Perception of quality of care in nearest health centre			
Poor	117(54.42)	108 (55.96)	54 (27.97)
Good	23 (65.71)	19 (67.86)	11 (39.28)
Excellent	84 (64.62)	64 (54.24)	41(34.75)
p value	0.12	0.42	0.43
Chi square	4.21	1.733	2.473
Who pays for health bill			
Respondent alone	31 (62)	22 (46.81)	12 (25.53)
Husband alone	131(62.38)	115 (60.21)	58 (30.37)
Respondent and husband	62 (51.67)	54 (53.47)	36 (35.64)
p value	0.15	0.19	0.43
Chi square	3.844	3.238	1.692
Place of ANC			
PHC	-	153 (75.74)	84 (41.58)
Others	-	38 (27.74)	22 (16.06)
p value	-	< 0.001*	<0.001*
Chi square		76.481	24.749
Place of delivery			
PHC	-	-	89 (46.6)
Others	-	-	17 (11.5)
p value	-	-	< 0.001*
Chi square		-	47.83

* Significant at 20 %; ANC, antenatal care; PNC, Postnatal care; PHC, primary healthcare

Table 4: Logistic Regression Model Predicting the Likelihood of Utilizing ANC, Delivery and PNC in PHCs

Variables	ANC utilization in PHCs		Delivery care utilization in PHCs		Postnatal care utilization in PHCs	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Maternal age in years						
16 - 19 (ref)	-	-	1		1	
20 - 24	-	-	1.71	0.13 - 21.89	0.07***	0.00 - 1.39
25 - 29	-	-	0.79	0.08 - 7.95	0.01*	0.00 - 0.24
30 - 34	-	-	1.47	0.15 - *14*.29	0.02*	0.00 - 0.42
35 - 39	-	-	1.80	0.19 - 17.41	0.04**	0.00 - 0.57
40 - 49	-	-	3.57	0.36 - 35.57	0.02*	0.00 - 0.37
Maternal Education						
Non formal (ref)	1		1		1	
Primary	0.92	0.54 - 1.56	0.36*	0.19 - 9.76	2.99*	1.33 - 6.76
≥ Secondary		0.31 - 1.17	0.43**	0.20 - 1.18	0.44	0.15 - 1.30
Monthly income	0.59					
0+ (ref)	1		1		1	
< 5,000	0.89	0.33 - 2.43	2.15	0.65 - 7.07	0.25	0.05 - 1.36
5,00-9,999	0.73	0.26 - 2.06	1.68	0.35 - 6.04	0.77	0.14 - 4.26
10,000 - 14,999	1.45	0.15 - 1.34	1.65	0.43 - 6.38	2.92	0.47 - 17.95
15,000 - 99,999	0.23	0.04 - 1.33	0.18	0.01 - 2.53		
Media exposure						
None (ref)	-	-	1		1	
Low	-	-	0.42***	0.17 - 1.05	22.86*	6.46 - 80.82
Moderate	-	-	0.43*	0.11 - 0.73	9.41*	2.69 - 32.92
High	-	-	0.60	0.25 - 1.29	9.61*	3.05 - 30.21
Very high	-	-	0.19	0.01 - 2.57	18.95*	1.83 - 195.96
Woman's level of autonomy						
None (ref)	-	-	1		1	
Low	-	-	1.21	0.47 - 3.14	0.91	0.30 - 2.69
Moderate	-	-	1.40	0.47 - 4.19	0.76	0.21 - 2.68
High	-	-	0.74	0.20 - 2.68	0.28	0.06 - 1.31
Very high	-	-	1.11	0.21 - 6.03	2.59	0.33 - 20.49
Marital status						
Married (ref)	-	-	-	-	1	
Living together	-	-	-	-	0.47**	0.24 - 0.93
Others	-	-	-	-	1.96	0.29 - 12.86
Birth preparedness						
No (ref)	-	-	-	-	1	
Yes	-	-	-	-	1.42	0.72 - 2.81
Number of children ever given birth to						
0 - 2 (ref)			1		1	
3 - 4.	-	-	1.69	0.70 - 4.08	2.09	0.73 - 5.98
≥ 5	-	-	1.64	0.63 - 4.27	2.74*	0.89 - 8.49
Time involved in walking to the nearest health centre (in minutes)						
< 30 (ref)			-	-	-	-
30 - 59	0.44***	0.18 - 1.04	-	-	-	-
≥ 60	0.37**	0.19-0.72	-	-	-	-
Perception of quality of care						
Poor (ref)	1		-	-	-	-
Good	1.57	0.71 - 3.49	-	-	-	-
Excellent			-	-	-	-
Who pays for health bill	0.97	0.49 - 1.92				
Respondent alone (ref)	1		1			
Husband alone	0.96	0.49 - 1.89	1.86	0.83 - 4.17	-	-
Respondent and husband	0.73	0.36 - 1.48	2.28***	0.94 - 5.54	-	-
Place of ANC						
Other (ref)	-	-	1		1	
PHCs	-	-	10.52*	5.94 - 18.61	2.11**	0.99 - 4.53
Place of delivery		-				
Others (ref)	-	-	-	-	1	
PHCs	_	-	-	-	11.72*	5.14 - 26.69

[a] ref, reference category; CI, confidence interval; aOR,: adjusted odds ratio; *Significant at 1% significance level; ** Significant at 5% significance level; ***Significant at 10% significance level; + represent unemployed women without monthly income.

in PHCs compared to women within the age-group 16 – 19 yr. Women who had primary education (aOR, 2.99; 95% CI: 1.33 - 6.76) were approximately three times as likely to use PHC facility for PNC compared to those without formal education. Women who had low media exposure (aOR, 22.86; 95% CI: 6.46 - 80.82), moderate media exposure (aOR, 9.41; 95% CI: 2.69 - 32.92), high media exposure (aOR, 9.61; 95% CI: 3.05 -30.21) and very high media exposure (aOR, 18.95; 95% CI: 1.83 - 195.96) were respectively 2,186%, 841%, 861% and 1,795% significantly more likely to use PHC facility for PNC compared to women with no media exposure. Women who were in a consensual union (aOR, 0.47; 95% CI: 0.24 -0.93) were 53% significantly less likely to utilize delivery care in PHCs compared to women who were married and living with their husbands. Women who had ≥ 5 children (aOR, 2.74; 95% CI: 0.89 - 8.49) were 174% significantly more likely to use PHC facility for PNC compared to those who had 0 - 2 children. Women who attended ANC in PHCs (aOR, 1.11; 95% CI: 0.99 - 4.53) and those who delivered in PHCs (aOR, 11.72; 95% CI: 5.14 - 26.69) were respectively 111% and 1,072% significantly more likely to use PHC for PNC.

DISCUSSION

This study investigated the determinants of ANC, delivery and PNC bounded within PHCs among 380 women selected in four rural communities in Ughelli North LGA, Delta State Southern Nigeria. Attending ANC, having delivery and going for PNC checkups are some of the recommended strategies in reducing maternal morbidity and mortality [5]. Nigeria continues to be a major contributor to maternal mortality globally. The Nigerian government has implemented several interventions to upgrade the PHC system and as such increased access and utilization of care bounded within PHCs. Despite these interventions, evidence has shown that PHCs are underutilized for skilled pregnancy care [8-10, 14, 15]. The results from the study showed that 80.79% (n = 307/380) of the women attended ANC while pregnant. Although the ANC coverage rate recorded in this study falls below the targeted coverage rate of 90%, it is impressive and commendable. The coverage rate recorded in this study is higher than the 76.1% recorded by the most recent National Demographic and Health Survey [3]. Concerning ANC utilization in PHCs, the study showed that 72.96% (n = 224/307) of women while pregnant utilized ANC in PHCs. The coverage rate of ANC in PHCs recorded in this study is higher than the 62.09% reported by Okonofua et al. [9], 25.90% recoded by Ejembi et al. [15], but less than the 79% recorded by Alenoghena, Issah and Isara [11]. It is no surprise that PHCs is widely used by the women for ANC given the widespread nature of PHCs in most rural parts of Nigeria. The result showed that among women who delivered in the last five years preceding this study, 4.72% (n = 16/339) delivered in other government hospitals, 56.34% (n = 191) delivered in PHCs, 13.27% (n = 45) in private hospitals and 25.66% (n = 87) delivered either at home or in the homes of TBAs. Put together, 74.33% (n = 252/339) delivered in health facilities. While delivery coverage rate in a health facility is high, it falls below the target rate of 100% [5]. The proportion of the women whose delivery was not supervised by skilled birth attendants was too high to guarantee the achievement of SDGs goal 3.1. Intervention programme should be initiated in the study area that will link up pregnant women to a health facility at the time of delivery [18, 19].

The result showed that 48.67% (n = 165/339) of the women went for PNC checkup within 3 wk after delivery. While the PNC coverage is higher than the 42% rate recorded by the most recent National Demographic and Health Survey [4], it falls short of the 90% targeted rate [5]. The result shows that time involved in walking to the nearest health centre is the only significant predictor of ANC utilization in PHCs in the study area. Specifically, women who lived farther than 30 min walk to the nearest health centre were significantly less likely to use PHCs for ANC. It shows that long-distance to health centre can discourage ANC utilization in rural parts of Nigeria [6, 8]. A Nigerian study reported that distance affects both the quality and quantity of ANC utilization [6]. The study, therefore, recommends that more PHCs should be sited in the study communities. The logistic regression revealed that women who reported primary and at least secondary educational qualifications were significantly less likely to deliver in PHCs when compared to those who had no formal education. While this result in parts contradicts what has been reported by previous Nigerian studies [2, 7], it corroborates finding by Okonofua et al. [9], reflecting that better-educated women are more prone to utilize delivery care in tertiary and private health facilities. The study justified that this could be due to poor perception of the quality of care rendered in PHCs in Nigeria. Hence, PHCs in Nigeria should be overhauled and the entire system should be upgraded. We noted that attending ANC in PHCs increases the chances of using PHCs for delivery. Though this finding contradicts previous Nigerian study that did not focus on maternal care utilization in PHCs [20]. The study could not trace a significant effect from ANC to health facility delivery. Hence, there is a need to simultaneously reinforce the use of both ANC and delivery care in PHCs as strategies for reducing maternal mortality in rural parts of Delta State [20]. The results revealed that women who were above 19 yr. were significantly less likely to utilize PNC in PHCs. However, those who reported at least five children are more likely to utilize PNC in PHCs. Therefore, intervention programmes should target women with few children regardless of age. While the finding contradicts the reports by Dahiru and Oche [5], who studied maternal care in general, it shows that experience associated with pregnancies positively influence attitude towards PNC utilization in PHCs in the study area.

Primary educational attainment is significantly associated with PNC utilization in PHCs; hence women in the study

area should be encouraged to have a minimum of primary educational qualifications. Also, media exposure significantly influences PNC utilization in PHCs suggesting the need to use various media channels to educate women in the study area on the benefits of PNC attendance within a few days after delivery. Interestingly, both the use of PHCs for ANC and delivery significantly improves the chances of using PHCs for PNC, hence there is need to simultaneously reinforce the three of them as potential strategies that can drive down maternal mortality in rural Nigeria. Despite the utility from the study, it has some noteworthy limitations. First, the data analyzed were obtained through verbal reporting and they were not validated with any objective source such as health facility card. Second, the non-proportional sampling method was used in allocating sample across the four rural communities. Sampling weights for adjusting non-proportional sampling could not be estimated due to lack of accurate and reliable data on the number of women within the reproductive ages in each of the communities.

Conclusion

The rate of ANC, delivery, and PNC utilization in PHCs is impressive; however, several women in the study area delivered either at home or in the homes of TBAs. More educated women were less likely to utilize delivery care in PHCs apparently due to perception of the quality of care. Intervention programmes should be implemented in rural parts of Delta State to improve the quality of care rendered in PHCs.

DECLARATIONS

Ethical considerations

Approval to conduct the study was obtained from the University of Benin Ethics Review Committee with protocol number-ADM/E22/A/VOL.VII/14689. Permission to undertake the survey was sought from the leaders of the various communities where the survey was conducted. Finally, informed consent was obtained from participants. The purpose of the research was explained to participants and they were made to sign a form which showed that they understood what was explained to them and that they gave their consents by participating willingly. Finally, participants' privacy and confidentiality were ensured throughout the time of data collection.

Consent to publish

All authors consented to the publication of the manuscript.

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Competing Interests

No conflict of interest was reported by the authors.

Author contributions

RRA conceived the study, undertook the analysis while AMA and CIN undertook the write up of part of the manuscript and estimated the models. All authors read and approved the final manuscript.

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Availability of data

The dataset used and analyzed during the current study is available from the corresponding author on a reasonable request.

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