

MATERNAL HEALTH LITERACY AND QUALITY OF CARE OFFERED TO PREGNANT WOMEN ATTENDING ANTENATAL CARE SERVICES IN LAGOS, NIGERIA

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Submission Date: 27th Oct., 2024

Date of Acceptance: 24th July, 2025

Publication Date: 31st Aug., 2025

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ABSTRACT

Background: Even though there has been significant success in reducing maternal mortality worldwide, Nigeria alone still accounted for about 28% of the global maternal deaths in the year 2020. Hence, we aim to assess the relationship between maternal health literacy and quality of care for pregnant women attending antenatal care (ANC) services in Primary Health Care (PHC) centres in Lagos state, Nigeria.

Methods: We conducted a cross-sectional study among 570 women attending ANCs in Primary Healthcare centers, Private hospitals and homes of Traditional Birth Attendants (TBA) in Ikorodu LGA of Lagos state. We included 8 PHCs, 2 private hospitals and 15 TBAs. We excluded facilities that did not offer both ANC and delivery services.

We described respondents' sociodemographic characteristics using summary statistics. The maternal literacy tool had 14 items with a 3 points likert scale and it was adapted from a past study on maternal literacy. We calculated the mean score as 37.0. Quality of care received was measured using 13 services to be provided during ANC visits based on guidelines from WHO and other literature. Using the raw scores, we conducted linear regression to check for association between maternal health literacy and ANC service quality.

Results: More than half (64.2%) of the respondents were aged 25 to 34 years, with a mean age of 27.9, and about three-quarter (76.7%) of them were Yorubas. Three hundred and fifty (61.4%) of the women scored equal or higher than the mean maternal literacy score (37.0) and 350 (61.4%) received at least 9 out of the 13 expected services. The mean ANC service score received by women was $9.8 \pm (3.6)$ and was higher in PHCs (10.5 ± 3.0) compared with private (9.7 ± 3.6) and TBA (7.3 ± 4.2) facilities ($p < 0.001$). Maternal literacy was positively associated with quality of care. Similarly, women residing in urban settlement had higher odds to receive higher quality of care compared to those residing in rural areas.

Conclusion: Our study shows that the type of healthcare facility a woman attended was a determining factor to the quality of ANC services received. The likelihood of receiving higher quality ANC service is greater in primary health centres than in private hospitals or homes managed by TBAs. The government, therefore, must adopt a multidimensional approach that includes interventions targeting individuals, households, communities, and other facility types in order to improve maternal and child health outcomes.

BACKGROUND

According to the World Health Organization (WHO), about 287,000 women died during and following pregnancy and childbirth in 2020.¹ Even though there has been significant success in reducing maternal mortality from 446,000 to 287,000 between the years 2000 and 2020,² many mothers still die from avoidable causes, particularly in sub-Saharan Africa which accounted for approximately 70% of global maternal deaths in 2020.¹ These differences between regions have

been linked to inequalities in health care services and access, and disparities in social determinants such as maternal health literacy (MHL).^{3,4} Given the importance of primary health care (PHC) in reducing this current trend, there is a need for an effective PHC system if Nigeria is to achieve the SDG 3.1.1 of reducing the global Maternal Mortality Ratio (MMR) to less than 70 per 100,000 live births.

Nigeria with a maternal mortality rate (MMR) of about 576 per 100,000 livebirths in year 2022,² ranks third among countries with the highest MMR point estimate, just behind South-Sudan (1223) and Chad (1063).¹ Additionally, Nigeria alone accounted for 28% of the global maternal deaths in the year 2020.¹ Similarly, Nigeria stands at the peak of countries with the highest number of under 5 deaths with about 110 under 5 deaths per 1000 live births as of 2021.⁵

The quality of care in ANC plays a crucial role in reducing avoidable maternal deaths by ensuring that pregnant women receive timely and comprehensive medical services, including regular checkups, screenings, and education about pregnancy-related issues.⁶ This helps identify and manage any potential complications early on, reducing the risk of complications that could lead to death of a mother or child during childbirth. Previous research aimed at assessing quality of antenatal care in Nigeria have been based on clients perception on care received at the facility, while some have measured quality of care in terms of number of visits and not based on actual service received, others have also made use of secondary data from the Nigeria Demographic Health Survey.⁷⁻⁹

In 2014 the WHO defined health literacy as *“the personal characteristics and social resources needed for individuals and communities to access, understand, appraise and use information and services to make decisions about health”*.¹⁰ The outcome of a pregnancy is significantly influenced by maternal health literacy. It gives women more knowledge about prenatal care, empowers pregnant women to make informed choices about nutrition, helps them recognize symptoms of complications, and improves their comprehension of prescription of drug medications.^{11,12} More importantly, it expands women's access to care, which improves pregnancy outcomes for women from all socioeconomic backgrounds. All of these significantly impact the well-being of both mother and child during pregnancy and beyond. Despite the importance of maternal health literacy on maternal health outcomes, there are limited studies that explore the effect of MHL on quality of care received by pregnant women, and none of these studies have checked if the care given by facilities is dependent on a woman's health literacy.¹¹⁻¹³

The federal government of Nigeria in 2012 launched the Saving One Million Lives Initiative Program-for-Results (PforR) Project for Nigeria in order to increase the utilization and quality of high-impact reproductive, child health, and nutrition interventions. While it is challenging to provide a definitive assessment, challenges have been reported, including infrastructural

gaps, funding issues and sociocultural factors, all of which impacts healthcare utilization.^{11,14,15} Therefore, it is important to know the current gaps in quality of care and maternal health literacy to inform the design of future initiatives and investments. Hence, we aim to assess the relationship between maternal health literacy and quality of care for pregnant women attending ANC services in PHCs in Lagos state, Nigeria.

METHODS

Study design

We conducted a cross-sectional study among pregnant women in Ikorodu, Lagos State from 11th of April 2023 to July 31st 2023.

Study settings

Lagos state is in the Southwest geopolitical zone and the State is predominantly inhabited by Yoruba ethnic groups while Islam and Christianity are the predominant religion. Lagos state has the second highest population in Nigeria, only behind Kano state, with a population of over 12 million, and it is regarded as the commercial capital of Nigeria.¹⁶ Ikorodu LGA where the study was conducted is a peri-urban setting, and was selected in view of concurrent research in this setting, which is unrelated to ANC.^{17,18} At the state level, Lagos state records MMR of 555 per 100,000 livebirths and 59 under-5 death per 1000 livebirths which is far from the SDG goal.¹⁹

Study population

Data was collected from pregnant women who attended ANC services on the day of visit to the facilities. Women were excluded if they were less than 15 years of age, critically ill, and unable to communicate in English language, Pidgin English or Yoruba languages.

Sample size

The sample size for the study was estimated using a single proportion formula for a finite population.²⁰

Sampling approach

A multi-stage sampling approach was used in selecting facilities for this study. The first stage was stratified sampling where we categorized all the PHC facilities into the Local council development areas (LCDA). Ikorodu LGA has 6 LCDAs, each with a different number of PHCs. In the second stage we purposively selected 4 LCDAs from the possible 6, while the third stage was also a purposive sampling approach where we purposively selected PHCs from the 4 selected LCDAs. In total, we selected 8 PHC facilities from the 4 LCDAs. In addition, we conveniently selected 2 private hospitals based on accessibility and proximity

to research data collectors and we visited TBAs based on availability and proximity. Altogether we included 10 private facilities and 15 TBAs. Facilities that did not offer both ANC and delivery services were excluded from the study. We employed a convenient sampling approach to select eligible pregnant women on the day of visit.

Data collection

Research assistants who had a minimum of a Nursing degree and had proficiency in the Yoruba language were employed. The research assistants were trained for 3 days and conducted a 2-week field pre-test at facilities that were not selected for the actual data collection. The research assistants carried out an interviewer-administered survey using a structured questionnaire, which included sections on respondents' socio-demographic characteristics, antenatal care services, past and current obstetrics history, and planned place of delivery for current pregnancy. The data for this study was collected on Android tablets using Open Data Kit (ODK).

Data Management and Analysis

We described respondents' sociodemographic characteristics using summary statistics. The maternal literacy tool was adapted from a past study on maternal literacy in Nigeria,¹³ with 14-items scored with a 3-point likert scale. All 14 items in the maternal health literacy tool were scored as (3= agree, 2= don't know, 1=disagree). 4 items were negatively worded with reverse scoring (3= disagree, 2= don't know, 1=agree) and they include I cannot look for health information in a library or on the internet, I cannot read, understand, and interpret medical prescription or instructions accurately, I cannot read and understand medical appointments such as dates for immunization screening, physical examination, and I cannot read and understand danger signs in pregnancy (such as anaemia, pallor, raised BP, swelling, bleeding, early labour etc.). We separated maternal literacy scores into two categories (low literacy and high literacy), using the mean maternal health literacy score as cut off. We calculated the mean maternal literacy score to be 37.0. Women with scores below 37.0 were classified as having low maternal health literacy, while those scoring 37.0 or higher were classified as having high maternal health literacy.¹³ We conducted a reliability test on the 14 items, and it showed Cronbach's alpha coefficient of 0.8428. To measure the quality of care received, we assessed 13 services to be provided during ANC visits based on guidelines from WHO and other literature.^{7,22,23} These included: health talk, blood pressure check, fetal heart monitoring, discussion on birth preparedness, blood group analysis, obstetrics ultrasound, PCV (Packed Cell Volume), blood sugar test, VDRL test,

blood test for hepB, urinalysis, haemoglobin genotype, and blood test for HIV. We gave each service a score of one making 13 the highest score. We calculated the mean service score to be 9.8. Women who scored less than the mean score were categorized to have received low-quality of ANC service while women who scored greater than or equal to the mean score were categorized to have received high-quality of ANC service.²⁴ Using the raw scores, we conducted linear regression to check for association between quality of ANC service received at the enrolled facility and participants' socio-demographic factors including maternal literacy. Variables that were not statistically significant in the univariate logistic regression analysis were excluded from the final adjusted logistic model. Additionally, all independent variables had variance

Table 1: Socio demographic characteristics of respondents

	Freq (%)
Age	
15-24	107 (18.8)
25-34	366 (64.2)
35-49	97 (17.0)
Marital status	
Never married	39 (6.8)
Ever married	531 (93.2)
Religion	
Christianity	366 (64.2)
Islam	203 (35.6)
Missing	1 (0.2)
Ethnicity	
Hausa	11 (1.9)
Igbo	82 (14.4)
Yoruba	437 (76.7)
Others	40 (7.0)
Woman Occupation	
Housewife	102 (17.9)
Self employed	349 (61.2)
Employed	115 (20.2)
Missing	4 (0.7)
Husband's occupation	
Self employed	363 (63.7)
Employed	198 (34.7)
Missing	9 (1.6)
Woman education	
Secondary and less	338 (59.3)
Tertiary	232 (40.7)
Husband's education	
Secondary and less	259 (45.4)
Tertiary	311 (54.6)
Place of residence	
Rural	223 (39.1)
Urban	347 (60.9)

inflation factor (VIF) scores below 2.0 and a mean VIF of 1.43, indicating acceptable levels of multicollinearity.

Ethical Considerations

The Helsinki Declaration and the Nigerian National Code of Health Research Ethics were followed in this investigation. Ethical approval was obtained from the relevant authorities, including the Lagos State Government (NHREC04/04/2008) and the UI/UCH ethics committee (NHREC/05/01/2008a). Verbal approval was taken from facility management before participants were approached. All participants gave verbal consent prior to taking part, and they were also given the opportunity to read the informed consent form. Participants were specifically informed that their participation was voluntary, and that the information collected would only be used for research purposes.

RESULTS

Socio-demographic characteristics of participants

We recruited 570 participants for this study. The mean age of the women was 27.9, and majority (64.2%) of them fell between ages 25-34 years, 93.2% were married, 64.2% Christians, and 60.9% resided in urban areas. In addition, about three-quarter (76.7%) of the participants were Yorubas. About 40% of the women and 54.6% of their husbands had a minimum of tertiary education. In addition, 61.2% of the women and 63.7% of their husbands were self-employed (Table 1).

Distribution of maternal literacy among participants

Overall, the mean maternal literacy score was 11.3 out of 14 and 350 (61.4%) of the women scored higher than the mean maternal literacy score (Table 2).

Table 2: Maternal health literacy among participants (N=570)

Variables	Agree	Disagree	Don't know	Mean	±SD
	Frequency (%)	Frequency (%)	Frequency (%)		
I cannot look for health information in a library or on the internet	133 (23.3)	420 (73.7)	17 (3.0)	2.5	0.8
I can understand and interpret basic health information accurately	454 (79.7)	108 (18.9)	8 (1.4)	2.6	0.8
I cannot read, understand, and interpret medical prescription or instructions accurately	148 (25.9)	408 (71.6)	14 (2.5)	2.5	0.9
I cannot read and understand medical appointments such as dates for immunization screening, physical examination	85 (14.9)	473 (83.0)	12 (2.1)	2.7	0.7
I have a basic understanding of medical terms	357 (62.6)	196 (34.4)	17 (3.0)	2.3	0.9
I can read and understand health pamphlets correctly	477 (83.7)	77 (13.5)	16 (2.8)	2.7	0.7
I have adequate knowledge on diets to take during pregnancy and after delivery	517 (90.7)	49 (8.6)	4 (0.7)	2.8	0.6
I cannot read and understand danger signs in pregnancy (such as Anaemia, pallor, raised BP, swelling, bleeding, early labour etc.)	132 (23.2)	409 (71.8)	29 (5.0)	2.5	0.8
I can read and write and do basic numeric skills	529 (92.8)	37 (6.5)	4 (0.7)	2.9	0.5
I understand the difference in delivery places with skilled and those without skilled birth attendants	329 (57.7)	129 (22.6)	112 (19.7)	2.4	0.8
I have ability to read, understand and act on the healthcare information positively	512 (89.8)	55 (9.7)	3 (0.5)	2.8	0.6
I have adequate knowledge and skills on how to care for my baby after delivery (breastfeeding, bathing)	511 (89.7)	47 (8.3)	13 (2.0)	2.8	0.6
I can read health pamphlets and acquire information and skills to maintain personal and food hygiene during pregnancy and after delivery	514 (90.2)	52 (9.1)	4 (0.7)	2.8	0.6
I have adequate skills to prepare a balanced diet	525 (92.1)	45 (7.9)	0 (0.0)	2.8	0.5
Maternal literacy score				37.0	6.0
Maternal literacy category					
Low literacy (score less than 37)	220 (38.6)				
High literacy (score ≥ 37)	350 (61.4)				

Alpha coefficient=0.8428

Table 3: ANC services rendered by facility type

ANC services provided to pregnant women (N=570)	TBA (n=120)	Private (n=33)	PHC (n=417)	Total
Health talk	81 (67.5)	27 (81.8)	332 (79.6)	440 (77.2)
Blood pressure	102 (85.0)	32 (97.0)	402 (96.4)	536 (94.0)
Fetal heart monitoring	104 (86.7)	25 (75.8)	365 (87.5)	494 (86.7)
Discussion on birth preparedness	73 (60.8)	22 (66.7)	290 (69.5)	385 (67.5)
Investigations done since ANC registration* (N=525)	n=119	n=32	n=374	
Blood group	59 (49.6)	26 (81.3)	361 (96.5)	446 (85.0)
Obstetrics ultrasound	99 (83.2)	29 (90.6)	311 (83.2)	439 (83.6)
PCV	56 (47.1)	27 (84.4)	367 (98.1)	450 (85.7)
Blood sugar	51 (42.9)	26 (81.3)	350 (93.6)	427 (81.3)
Blood test for STI (VDRL test)	43 (36.1)	16 (50.0)	256 (68.5)	315 (60.0)
Blood test for hepatitis B	46 (38.7)	17 (53.1)	321 (85.8)	384 (73.1)
Urinalysis	51 (42.9)	26 (81.3)	368 (98.4)	445 (84.8)
Haemoglobin genotype	53 (44.5)	22 (68.8)	320 (85.6)	395 (75.2)
Blood test for HIV	60 (50.4)	25 (78.1)	348 (93.1)	433 (82.5)
ANC service score - mean (SD)**	7.3 (4.2)	9.7 (3.6)	10.5 (3.0)	9.8 (3.6)

*Missing investigations done since ANC registration = 45

** The one-way ANOVA revealed that there was a statistically significant difference between ANC service score and facility type (F-value 43.24, P-value <0.001)

Table 4: Adjusted linear regression analysis of quality of ANC service and participants' socio-demographic factors including maternal literacy

Quality of ANC services assessed		Unadjusted			p-value	Coeff	Adjusted		p-value
		Coeff	95% confidence interval				Coeff	95% confidence interval	
Variables									
Maternal health literacy	Raw score	0.27	(0.18	3.66)	<0.001	0.20	(0.11	0.30)	<0.001
Age	15-24 years	ref				ref			
	25-34 years	1.52	(0.76	2.28)	<0.001	0.70	(-0.02	1.43)	0.058
	35 years and above	1.29	(0.32	2.26)	0.009	0.38	(-0.54	1.29)	0.420
Religion	Christian	ref							
	Islam	-0.57	(-1.18	0.48)	0.071	*	*	*	*
Woman education	Secondary and less	ref							
	Tertiary	0.57	(-0.03	1.17)	0.062	*	*	*	*
Husband education	Secondary and less	ref				ref			
	Tertiary	0.88	(0.29	1.47)	0.003	-0.16	(-0.75	0.43)	0.592
Marital status	Never married	ref							
	Ever married	-0.26	(1.42	0.90)	0.657	*	*	*	*
Ethnicity	Others	ref				*	*	*	*
	Igbo	-0.22	(-2.29	2.25)	0.985	*	*	*	*
	Yoruba	-0.69	(-2.85	1.47)	0.532	*	*	*	*
Place of residence	Rural	ref				ref			
	Urban	1.60	(1.01	2.19)	<0.001	0.59	(-0.01	1.18)	0.053
Place of ANC enrolment	Non hospital	ref				Ref			
	Hospital	3.15	(2.48	3.83)	<0.001	2.63	(1.90	3.36)	<0.001

Respondents scored lowest in basic understanding of medical terms (62.6%) and ability to understand the difference in delivery places with skilled (hospital) and those without skilled (non-hospital) birth attendants (57.7%). Additionally, about a quarter (23.2%) could not read and understand danger signs in pregnancy

(such as Anemia, pallor, raised BP, swelling, bleeding, early labour e.t.c.

ANC service quality

Of the 570 women recruited in the study, only 179 (31.4%) of them received all 13 ANC services and

the mean number of services received was 9.8. Blood pressure (94.0%) and blood test for STI (VDRL test) (60.0%) were the highest and lowest ANC service received across all ANC provider types respectively. The TBAs recorded the lowest of several tests: blood group (49.6%), PCV (47.1%), Blood sugar (42.9%), blood test for hepatitis B (38.7%), hemoglobin genotype (44.5%) and blood test for HIV (50.4%), while the PHCs had the highest number for the same tests (Blood sugar 96.5%, blood test for hepatitis B 85.8%, hemoglobin genotype 85.6%, and blood test for HIV at 93.1). The mean ANC service score received by women was $9.8 \pm (3.6)$ and was higher in PHCs (10.5 ± 3.0) compared with private (9.7 ± 3.6) and TBA (7.3 ± 4.2) facilities ($p < 0.001$) (table 3).

Predictors of ANC service quality

We found that maternal literacy ($p < 0.001$) and place of enrollment ($p < 0.001$) were associated with the quality of care received by a woman. Women who had higher maternal literacy scores and those that enrolled at hospitals were more likely to receive better ANC services (table 4). Husband's education, woman age and place of residence were not significant in the adjusted logistic model.

DISCUSSION

The main purpose of conducting this study was to assess maternal health literacy and quality of care for pregnant women attending ANC in Lagos state. We found that while measurement of blood pressure, PCV and blood group were the most common ANC service rendered by facilities, TBAs conducted the least of the tests reported. Moreso, high quality of ANC service was linked with high maternal health literacy, residing in Urban settlement and enrollment of ANC at the hospital.

A lot of our respondents could not differentiate between delivery places with skilled birth attendants from those without skilled birth attendants, which probably explains why patronage of non-hospitals by pregnant women remains high.²⁵ Low patronage of skilled birth attendants poses significant public health risks. It increases the likelihood of complications during childbirth, leading to maternal and neonatal mortality and morbidity. Women who do not receive care from skilled attendants are at higher risk of childbirth-related infections, injuries, and other complications. This can also contribute to the perpetuation of intergenerational cycles of poor health outcomes. Moreover, low utilization of skilled birth attendants undermines efforts to achieve global health targets such as reducing maternal and infant mortality rates outlined in the Sustainable Development Goals. Therefore, it is crucial to sensitize community members through education

workshops and campaigns. This includes raising awareness about the qualifications and roles of skilled birth attendants, such as obstetricians or midwives, and ensuring access to quality healthcare services where skilled birth attendants are available. Additionally, it is important for the government to implement regulations and standards to help distinguish between skilled and unskilled birth attendants.

Furthermore, results from our analysis showed that having a higher maternal literacy score increases a woman's quality of care received. A significant number of respondents in our study could not understand and interpret basic health information accurately, while some could not search for health information in a library or on the internet, others could not read and understand danger signs in pregnancy (such as anemia, pallor, raised blood pressure, swelling, bleeding, early labour). A woman with a higher level of maternal literacy is better equipped to seek for, read, and comprehend health instructions and make informed decisions both during and after pregnancy. Findings from other studies have found that higher levels of education was associated with higher maternal health literacy.^{13,26,27} In a study conducted by Ademuyiwa *et al.*²⁸ among pregnant women in Lagos state, 20.6% of pregnant women had low or no awareness about the importance of carrying out blood test in pregnancy⁸, consequently, when education is lacking, pregnant women may also not see the need for some important medical tests. Hence, improved provision for formal education and adequate health talks before, during, and after pregnancy must be encouraged at all facility in order to increase caregivers' knowledge on how to care for themselves and their babies. This will be a step towards achieving SDG 4 which focuses on ensuring inclusive and equitable quality education for all, irrespective of age, gender or socioeconomic background. Kenward 2021 found an association between higher maternal health literacy and improved maternal health outcome.²⁹ This finding was in concordance with our finding on the positive association between maternal health literacy and quality of ANC service received. A woman who is well informed about caring for herself and her baby is more likely to ask questions, seek advice, and follow recommended ANC guidelines. Renkert and Nutbeam³⁰ mentioned that empowerment and increased confidence were two additional benefits of knowledge for women.³¹

We found that measurement of blood pressure was the most popular ANC component offered in Nigeria, which is in concordance with Fagbamigbe *et al.*, 2025.³² Generally, we found that laboratory tests such as Urinalysis test, HIV test, urinalysis and blood group

test was low as at the time of our visit. Not conducting these tests may serve as missed opportunity for early detection and treatment of some diseases such as urinary tract infections, gestational diabetes or preeclampsia, especially considering the fact that preeclampsia and eclampsia are some of the leading causes of maternal death and can be easily detected through urinalysis test.³²⁻³⁷

Despite the inclusion of the HIV test into the ANC guideline to prevent HIV from being transmitted from mother to child (PMTCT)³⁸, a lot of women in our study were yet to have an HIV test. This missed opportunity can lead to increased HIV transmission to newborns, and a greater chance of HIV virus spread within communities, thus contributing to the overall burden of HIV/AIDS in the population. Furthermore, despite the importance of blood group antigen testing in saving the lives of patients who are likely to undergo blood transfusion, many hospitals and nonhospital facilities were yet to carry out this test. Where this test is lacking, patients in need of an emergency blood transfusion may lose their lives considering that it is essential to examine and evaluate the compatibility of donor and recipient blood groups prior to blood transfusion.³⁹ Studies have connected these poor practices to the health centers' inability to conduct these tests.^{40,41} Aside the lack of technical know-how, most hospitals and TBA centers lack the basic requirements such as adequate staffing, efficient power supply, availability of medical equipment e.t.c all of which are essential to deliver high quality services.^{33,40,41} Hence there is a need for the government to call for capacity support and infrastructural support at all hospitals, including the TBA centers.

Discussing birth preparedness during ANC is crucial for so many reasons. Surprisingly, many women who participated in our study were yet to receive this service, irrespective of the facility they enrolled. This is similar to the findings of a study conducted in Ethiopia in 2021.⁴² Discussing birth preparedness helps to ensure that expectant mothers and their families are equipped with the knowledge and can make necessary plans to ensure safe and healthy childbirth.^{42,43} This shows the need for more engagement with healthcare providers on the importance of discussing birth preparedness with pregnant mothers and those caring for them.

Limitation of the study

Our study is not without its own limitation. Firstly, the data was self-reported and thus may be prone to recall bias.

CONCLUSION

Generally, our study shows that the type of healthcare facility a woman enrolled was a determining factor to whether she receives desirable quality of ANC. This is not what your study found out. If you look at Table 3, all indices were better in the private hospital. Please review this statement. It is evident that improving maternal and child health outcome requires a multidimensional approach that includes interventions targeting individuals, households, communities, and the health system. Therefore, the government must adopt the ecological approach where multiple levels of influence are considered and as well ensure individual and major stakeholders are adequately carried along if Nigeria must achieve the SDG goal to improve maternal and child health outcomes. The results of this study will help to develop effective interventions and strategies to promote maternal health service utilization and quality of care among pregnant women nationwide.

REFERENCES

1. WHO. Maternal mortality [Internet]. 2023 [cited 2024 Feb 13]. Available from: <https://www.who.int/news-room/fact-sheets/detail/maternal-mortality>
2. WHO. Trends in maternal mortality 2000 to 2020: estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division [Internet]. 2023 [cited 2024 Feb 13]. Available from: <https://www.who.int/publications-detail-redirect/9789240068759>
3. **Elflein J**. Statista. 2023 [cited 2024 Apr 4]. Maternal mortality rate by country worldwide 2020. Available from: <https://www.statista.com/statistics/1240400/maternal-mortality-rates-worldwide-by-country/>
4. **Wagner T**, Stark M, Milenkov AR. What About Mom? Health Literacy and Maternal Mortality. *J Consum Health Internet*. 2020;24(1):50–61.
5. WHO. Child mortality (under 5 years) [Internet]. 2022 [cited 2024 Mar 8]. Available from: <https://www.who.int/news-room/fact-sheets/detail/levels-and-trends-in-child-under-5-mortality-in-2020>
6. **Kruk ME**, Pate M. The Lancet Global Health Commission on High Quality Health Systems 1 year on: progress on a global imperative. *The Lancet Global Health*. 2020 Jan 1;8(1):e30–32.
7. **Fagbamigbe AF**, Idemudia ES. Assessment of quality of antenatal care services in Nigeria: evidence from a population-based survey. *Reprod Health*. 2015 Sep 18;12:88.
8. **Ademuyiwa I**, Opeke R, Farotimi A, *et al*. Awareness and satisfaction with antenatal care

- services among pregnant women in Lagos state, Nigeria. *Calabar Journal of Health Sciences*. 2021 Jun 30;5:21–27.
9. **Nwaeze IL**, Enabor OO, Oluwasola TAO, Aimakhu CO. Perception and satisfaction with quality of antenatal care services among pregnant women at the University College Hospital, Ibadan, Nigeria. *Ann Ib Postgrad Med*. 2013 Jun;11(1):22–28.
 10. WHO. Health literacy toolkit for low- and middle-income countries [Internet]. 2014 [cited 2024 Mar 8]. Available from: <https://www.who.int/publications-detail-redirect/9789290224754>
 11. **Phommachanh S**, Essink DR, Wright PE, *et al*. Maternal health literacy on mother and child health care: A community cluster survey in two southern provinces in Laos. *PLoS One*. 2021 Mar 29;16(3):e0244181.
 12. **Nawabi F**, Krebs F, Vennedey V, *et al*. Health literacy in pregnant women: A systematic review. *Int J Environ Res Public Health*. 2021 Apr 6;18(7):3847.
 13. **Bello CB**, Esan DT, Akerele SA, Fadare RI. Maternal health literacy, utilisation of maternal healthcare services and pregnancy outcomes among newly delivered mothers: A cross-sectional study in Nigeria. *Public Health in Practice*. 2022 Jun 1;3:100266.
 14. **Mojinyinola J**. Influence of maternal health literacy on healthy pregnancy and pregnancy outcomes of women attending public hospitals in Ibadan, Oyo State, Nigeria. *African Research Review*. 2011 Jun 22;5.
 15. **Chou VB**, Walker N, Kanyangarara M. Estimating the global impact of poor quality of care on maternal and neonatal outcomes in 81 low- and middle-income countries: A modeling study. *PLoS Med*. 2019 Dec;16(12):e1002990.
 16. National Population Commission (NPC) [Nigeria], ICF. Nigeria demographic health survey 2018. The DHS Program ICF Rockville, Maryland, USA. 2019;748.
 17. **King C**, Burgess RA, Bakare AA, *et al*. Integrated sustainable childhood pneumonia and infectious disease reduction in Nigeria (INSPIRING) through whole system strengthening in Jigawa, Nigeria: study protocol for a cluster randomised controlled trial. *Trials*. 2022 Jun 24;23(1):95.
 18. **Graham HR**, Olojede OE, Bakare AAA, *et al*. Pulse oximetry and oxygen services for the care of children with pneumonia attending frontline health facilities in Lagos, Nigeria (INSPIRING-Lagos): Study protocol for a mixed-methods evaluation. *BMJ Open* [Internet]. 2022 May 2 [cited 2022 Sep 2];12(5). Available from: <https://pubmed.ncbi.nlm.nih.gov/35501079/>
 19. **Matsuoka S**, Kawakatsu Y, Koga S, *et al*. Underlying causes of underutilization of maternal, neonatal and child health (MNCH) services in Africa: A survey from Lagos State, Nigeria. *Glob Health Med*. 2020 Jun 30;2(3):184–189.
 20. **Charan J**, Biswas T. How to calculate sample size for different study designs in medical research? *Indian J Psychol Med*. 2013;35(2):121–126.
 21. Nigeria. Nigeria Equity Tool [Internet]. Equity Tool. 2015 [cited 2025 May 8]. Available from: <https://equitytool.org/nigeria/>
 22. **Azodoh V**, Ijadunola M, Bamidele M. Quality of antenatal care services in primary healthcare centers in the Federal Capital Territory. 2021 Jan 1;
 23. WHO. WHO recommendations on antenatal care for a positive pregnancy experience [Internet]. 2016 [cited 2024 Apr 8]. Available from: <https://www.who.int/publications-detail-redirect/9789241549912>
 24. **Ilo C**. Extent of utilization of antenatal care services among childbearing mothers in Anambra State of Nigeria. 2015 Jan 1 [cited 2025 May 8]; Available from: https://www.academia.edu/76854958/extent_of_utilization_of_antenatal_care_services_among_childbearing_mothers_in_Anambra_state_of_Nigeria
 25. **Okala U**. Factors Associated with the utilization of traditional birth attendants (TBAS) among pregnant women in Nigerian rural communities [Internet]. 2023 [cited 2024 Apr 8]. Available from: https://www.researchgate.net/publication/371761247_factors_associated_with_the_utilization_of_traditional_birth_attendants_TBAS_among_pregnant_women_in_Nigerian_rural_communities
 26. **Safaie SZ**, Rahebi SM, Haghjou SNM, Leili EK. The relationship between maternal health literacy and pregnancy outcome in postnatal wards. *Journal of Biochemical Technology*. 2018;9(2–2018):120–127.
 27. **Ikwunne T**, Wall PJ, Hederman L. Understanding and designing tools for engaging low health literacy in Nigeria [Internet]. 2020 [cited 2024 Mar 24]. Available from: https://www.researchgate.net/publication/343391558_Understanding_and_designing_tools_for_engaging_low_health_literacy_in_Nigeria
 28. **Ademuyiwa IY**, Opeke RO, Farotimi AA, *et al*. Awareness and satisfaction with antenatal care services among pregnant women in Lagos state, Nigeria. *Calabar J Health Sci* [Internet]. 2021 Jun 30 [cited 2025 May 10];5(1):21–27. Available from: <https://c-jhs.com/awareness-and-satisfaction-with-antenatal-care-services-among-pregnant-women-in-lagos-state-nigeria/>
 29. **Kenward S**. Maternal Health Literacy: Educating Mothers to Keep Them Safe - SWHR [Internet].

- 2021 [cited 2024 Mar 22]. Available from: <https://swahr.org/maternal-health-literacy-educating-mothers-to-keep-them-safe/>, <https://swahr.org/maternal-health-literacy-educating-mothers-to-keep-them-safe/>
30. Opportunities to improve maternal health literacy through antenatal education: an exploratory study - PubMed [Internet]. [cited 2025 May 10]. Available from: <https://pubmed.ncbi.nlm.nih.gov/11733456/>
 31. **Renkert S**, Nutbeam D. Opportunities to improve maternal health literacy through antenatal education: an exploratory study. *Health Promot Int*. 2001 Dec;16(4):381–388.
 32. **Fagbamigbe AF**, Idemudia ES. Assessment of quality of antenatal care services in Nigeria: evidence from a population-based survey. *Reproductive Health* [Internet]. 2015 Sep 18 [cited 2025 May 10];12(1):88.
 33. **Sageer R**, Kongnyuy E, Adebimpe WO, *et al*. Causes and contributory factors of maternal mortality: evidence from maternal and perinatal death surveillance and response in Ogun state, Southwest Nigeria. *BMC Pregnancy Childbirth*. 2019 Feb 11;19:63.
 34. **Tasneem S**, Nnaji A, Artac M. Causes of maternal mortality in Nigeria; A systematic review. *International Journal of Health Management and Tourism*. 2019 Dec 29;200–210.
 35. **Ansari N**, Manalai P, Maruf F, *et al*. Quality of care in early detection and management of pre-eclampsia/eclampsia in health facilities in Afghanistan. *BMC Pregnancy and Childbirth*. 2019 Jan 18;19.
 36. **Ajayi A**, Awopegba O, Owolabi E, Ajala A. Coverage of HIV testing among pregnant women in Nigeria: progress, challenges and opportunities. *Journal of Public Health*. 2021 Mar 1;43(1):e77–84.
 37. UNAIDS. 90–90–90: good progress, but the world is off-track for hitting the 2020 targets [Internet]. 2014 [cited 2024 Apr 29]. Available from: https://www.unaids.org/en/resources/presscentre/featurestories/2020/september/20200921_90-90-90
 38. **Okusanya B**, Nweke C, Gerald LB, *et al*. Are prevention of mother-to-child HIV transmission service providers acquainted with national guideline recommendations? A cross-sectional study of primary health care centers in Lagos, Nigeria. *BMC Health Services Research*. 2022 Jun 11;22(1):769.
 39. **Li HY**, Guo K. Blood Group Testing. *Front Med (Lausanne)*. 2022 Feb 11;9:827619.
 40. **Osungbade K**, Oginni S, Olumide A. Content of antenatal care services in secondary health care facilities in Nigeria: implication for quality of maternal health care. *Int J Qual Health Care*. 2008 Oct;20(5):346–351.
 41. **Alhassan RK**, Duku SO, Janssens W, *et al*. Comparison of perceived and technical healthcare quality in primary health facilities: Implications for a sustainable national health insurance scheme in Ghana. *PLoS One*. 2015 Oct 14;10(10):e0140109.
 42. **Girma D**, Walelign A, Dejene H. Birth preparedness and complication readiness practice and associated factors among pregnant women in Central Ethiopia, 2021: A cross-sectional study. *PLoS One*. 2022 Oct 27;17(10):e0276496.
 43. **August F**, Pembe AB, Kayombo E, *et al*. Birth preparedness and complication readiness – a qualitative study among community members in rural Tanzania. *Global Health Action*. 2015 Dec 1;8(1):26922

Appendix 1: Other investigations done since ANC registration

ANC services provided to pregnant women (N=570)	TBA (n=120)	Private (n=33)	PHC (n=417)	Total
Weight measurement	57 (47.5)	26 (78.8)	395 (94.7)	478 (83.9)
Prayers were done for me today	68 (56.7)	23 (69.7)	263 (63.1)	354 (62.1)
Other activities/assessments	6 (5.0)	0 (0.0)	17 (4.1)	23 (4.0)
Other Investigations done since ANC registration* (N=525)	n=119	n=32	n=374	
Urine microscopy	22 (18.5)	12 (37.5)	126 (33.7)	160 (30.5)
High vaginal swap	15 (12.6)	0 (0.0)	40 (10.7)	55 (10.9)
Blood test for Hep C	33 (27.7)	14 (43.8)	232 (62.0)	279 (53.1)