IJMA

Available online at www.mchandaids.org

INTERNATIONAL JOURNAL of MATERNAL and CHILD HEALTH and AIDS
ISSN: 2161-864X (Online)
ISSN: 2161-8674 (Print)
DOI: 10.21106/ijma.632

ORIGINAL ARTICLE | MATERNAL HEALTH

'We delivered at home out of fear': Maternity Care in Rural Nigeria During the COVID-19 Pandemic

Zubairu Iliyasu, MBBS, PhD, MPH[1]✉; **Amina A. Umar,** MBBS, MSc[1]; **Fatima S. Gaya,** MBBS[1]; **Nafisa S. Nass,** MBBS, MSc[1]; **Hadiza M. Abdullahi,** MBBS, MPH[1]; **Aminatu A. Kwaku,** MBBS, MSc[1]; **Taiwo G. Amole,** MBBS, MSc[1,2]; **Fatimah I. Tsiga-Ahmed,** MBBS, MSc[1]; **Hadiza S. Galadanci,** MBBS, MSc[2,3]; **Hamisu M. Salihu,** MD, PhD[4]; **Muktar H. Aliyu,** MD, DrPH, MPH[5]

[1]Department of Community Medicine, Bayero University, Kano, Nigeria; [2]African Center of Excellence for Population Health and Policy, Bayero University, Kano, Nigeria; [3]Department of Obstetrics and Gynaecology, Bayero University Kano, Nigeria; [4]Department of Family and Community Medicine, Baylor College of Medicine, Houston, Texas, USA; [5]Department of Health Policy & Vanderbilt Institute for Global Health, Vanderbilt University Medical Center, Tennessee, USA

✉**Corresponding author email:** ziliyasu@yahoo.com

ABSTRACT

Background and Objective: The COVID-19 pandemic response overwhelmed health systems, disrupting other services, including maternal health services. The disruptive effects on the utilization of maternal health services in low-resource settings, including Nigeria have not been well documented. We assessed maternal health service utilization, predictors, and childbirth experiences amidst COVID-19 restrictions in a rural community of Kumbotso, Kano State, in northern Nigeria.

Methods: Using an explanatory mixed methods design, 389 mothers were surveyed in January 2022 using validated interviewer-administered questionnaires, followed by in-depth interviews with a sub-sample (n=20). Data were analyzed using logistic regression models and the framework approach.

Results: Less than one-half (n=165, 42.4%) of women utilized maternal health services during the period of COVID-19 restrictions compared with nearly two-thirds (n=237, 65.8%) prior to the period ($p<0.05$). Non-utilization was mainly due to fear of contracting COVID-19 (n=122, 54.5%), clinic overcrowding (n=43, 19.2%), transportation challenges (n=34, 15.2%), and harassment by security personnel (n=24, 10.7%). The utilization of maternal health services was associated with participant's post-secondary education (aOR=2.06, 95% CI:1.14- 11.40) ($p=0.02$), and employment type (civil service, aOR=4.60, 95% CI: 1.17-19.74) ($p<0.001$), business aOR=1.94, 95% CI:1.19- 4.12) ($p=0.032$) and trading aOR=1.62, 95% CI:1.19-2.94) ($p=0.04$)). Women with higher household monthly income (≥ N30,000, equivalent to 60 US Dollars) (aOR=1.53, 95% CI:1.13-2.65) ($p=0.037$), who adhered to COVID-19 preventive measures and utilized maternal health services before the COVID-19 pandemic were more likely to utilize those services during the COVID-19 restrictions. In contrast, mothers of higher parity (≥5 births) were less likely to use maternal health services during the lockdown (aOR=0.30, 95% CI:0.10-0.86) ($p=0.03$). Utilization of maternal services was also associated with partner education and employment type.

Conclusion and Global Health Implications: The utilization of maternal health services declined during the COVID-19 restrictions. Utilization was hindered by fear of contracting COVID-19, transport challenges, and harassment by security personnel. Maternal and partner characteristics, adherence to COVID-19 preventive measures, and pre-COVID maternity service utilization influenced attendance. There

is a need to build resilient health systems and contingent alternative service delivery models for future pandemics.

Keywords: • Maternal Health • Maternal Health Services • Nigeria • Rural Nigeria • COVID-19 • Mixed Methods Study Design

1. Introduction

The COVID-19 pandemic stretched health systems to their limits.[1] In an effort to control the pandemic, health resources were re-focused on curbing the pandemic. Routine health services, including maternal healthcare, received less attention.[2] In low- and middle-income countries (LMICs), the movement restrictions, limited infection prevention supplies, unreliable infection control practices, and disrupted health workers' routines constrained access to maternal and newborn care, negatively impacting maternal and newborn health. The consequences of the COVID-19 control measures were even more severe in rural communities, where high-quality and timely maternity healthcare services were unavailable, inaccessible, or unaffordable even before the pandemic.[1]

Prior models have predicted a 17-43% rise in maternal deaths during the COVID-19 pandemic.[3] In the early phase of the pandemic, the population was advised not to attend hospitals unless strictly necessary; this advice applied to all persons, including pregnant women.[4] The imposed restrictions, transportation disruptions, and fear of SARS-CoV-2 exposure further hindered prenatal visits, health facility delivery, and access to emergency obstetric care.[5,6] Even women who made it to health facilities were not guaranteed quality care.[7] Further, clinic processes were modified in accordance with strict COVID-19 prevention and control guidelines, with the temporary closure of some clinics.[8] The effects of these changes could be magnified in rural communities, settings that already contribute disproportionately to maternal mortality and morbidity.[9]

In response to a recent World Health Organization (WHO) survey, 53% and 32% of participating countries reported disruptions in antenatal care and facility-based delivery services respectively, during the COVID-19 pandemic.[10] Similar reports from Africa indicated that maternal health services were significantly disrupted.[11] With a culture of preference for home deliveries predating the COVID-19 pandemic, the fear of getting infected with SARS-CoV-2 in health facilities discouraged the uptake of maternal health services.[12] In addition, the COVID-19 pandemic caused anxiety and psychological disorders in pregnant women, which are associated with poor delivery outcomes.[13,14]

In Nigeria, women of childbearing age constitute about 45% of the population.[15] Nigeria ranks third (1,047 per 100,000 live births) among sub-Saharan African countries with extremely high maternal mortality ratios after South Sudan (1,223 per 100,000 live births) and Chad (1,063 per 100,000 live births).[16] Maternal healthcare utilization is sub-optimal, especially in the northern parts of the country and rural communities.[17] The lockdown imposed in Nigeria following the first COVID-19 case in February 2020 further limited access to health services and discouraged the utilization of maternal and neonatal services. It is unclear what effect the pandemic had on maternal health-seeking behavior, especially in rural communities. In addition, the utilization of maternal health services in rural northern Nigeria and childbirth experiences under COVID-19 restrictions are yet to be well documented. We hypothesize that COVID-19 control measures restricted movements, thereby limiting access to maternal health services.

This study assessed maternal health service utilization, predictors, and childbirth experiences under COVID-19 restrictions in the rural Kumbotso community in northern Nigeria. Our findings can help generate contextualized pandemic preparedness

and response plans and inform strategies to sustain maternal healthcare access during future pandemics.

2. Methods

The study was conducted in the Kumbotso community in the first and second weeks of January 2022. Kumbotso is located 3 miles north of Kano City in Kano State, northern Nigeria, and has an estimated population of 374,200.[15] The predominant ethnic group is the Hausa-Fulani, however, other major Nigerian tribes such as Yoruba and Igbo are well represented. Women of reproductive age constitute approximately a quarter of the population.

The study population included women of reproductive age (15-49 years) who delivered during the COVID-19 restrictions (April 2020 to March 2021) and were residents of the Kumbotso community. We excluded mentally incompetent mothers and those who withheld consent.

The study design was cross-sectional and community-based and deployed explanatory mixed methods of data collection consisting of a questionnaire survey and in-depth interviews. The qualitative inquiry explored women's experiences of pregnancy care and childbirth during the COVID-19 restrictions. We employed a pragmatic epistemological stance combining a post-positivist paradigm for the questionnaire survey and an interpretivist paradigm for the qualitative component.[18,19] Sample size was determined using Fisher's formula,[20] and the following assumptions were: 1) maternal health services utilization of 65% during the COVID-19 pandemic reported in a previous study[21]; 2) 95% confidence level, and 3) 5% margin of error. The computation yielded a minimum sample size requirement of 389. The sample size was amplified by 10% to account for non-responses and rounded to 440.

A multistage sampling method was used. Half of the wards were sampled in the first stage using a simple ballot. In the second stage, one settlement was selected from each sampled ward using the same method. Numbers were then allocated to the selected settlements. After household enumeration, a sampling interval was determined. The systematic sampling method was used to select respondents in each settlement. The first household was selected by simple random sampling between 1 and the settlement's sampling interval. Subsequent households were obtained by adding the sampling interval to the preceding household's serial number. Finally, within each sampled household, eligible women consented after a detailed explanation of the study.

We adopted a validated structured questionnaire from a previous study for the survey.[21] Our adaptation had the following sections: Section A documented maternal and partner's socio-demographic characteristics; Section B determined obstetric history, COVID-19 risk perception, and adherence to COVID-19 measures during the lockdown; and Section C inquired about maternal health services (antenatal, delivery, and postnatal care) utilization before and during the COVID-19 lockdown, challenges, and reasons for non-use. Respondents were considered to have utilized maternal health services if they had at least four antenatal visits, were delivered in a health facility, and attended a postnatal clinic, as defined in a previous study.[21]

To elucidate survey findings, a purposive sub-sample of 20 survey respondents was interviewed in-depth in the fourth week of January 2022. Participants were purposively selected after stratification by ward of residence, settlement, parity, maternal health care utilization, complications, and mode of delivery and outcome. The qualitative interview guide was open-ended, with probes for detailed descriptions. The guide explored the experiences and challenges women and their partners faced regarding antenatal care, delivery, and postpartum care during the COVID-19 lockdown. Reasons for not utilizing maternal health services were elicited among non-attendees. All participants provided written or thumb-printed informed consent. Confidentiality in reporting qualitative findings was ensured by removing identifiers.

The Kano State Ministry of Health Research Ethics Committee reviewed and approved the study protocol. Using the local Hausa language, trained research assistants informed eligible women in

sampled households about the study objectives, eligibility criteria, sampling process, and procedure. Participants were also informed that involvement was voluntary and that withholding consent had no consequences. Literate women provided signed informed consent, while non-literate persons thumb-printed the consent form before the interviews. Interviews were conducted face-to-face, observing recommended COVID-19 precautions, in the respondents' homes, and away from family members. Completed questionnaires were checked and verified in the field by the supervisors. Questionnaires were double-entered independently by two data clerks into a password-protected database at Aminu Kano Teaching Hospital. Research staff were trained on establishing rapport, obtaining informed consent, protecting human research participants, and interview techniques.

2.1 Statistical Analysis

Data were analyzed using SPSS Version 22 (IBM Corp., Armonk, NY). Mean and standard deviation was used to summarize numeric data. Frequencies and percentages were obtained for categorical variables. Pearson's Chi-square or Fisher's exact test as appropriate was used to assess the association between respondents' and partners' sociodemographic characteristics, obstetric history, and the primary outcome (utilization of maternal health services during the COVID-19 restrictions).[22] Type I error was fixed at 5% for all tests. A binary logistic regression model was developed for the primary outcome. Independent variables with $p<0.10$ at the bivariate level were included in the logistic regression model.[23] Multicollinearity was assessed using variance inflation factors. Adjusted odds ratios (aORs) and their 95% confidence intervals (CIs) were used to measure the strength and direction of the effect of predictors. Hosmer-Lemeshow statistic and Omnibus tests were conducted to determine model fitness, with a Hosmer-Lemeshow Chi-square yielding a p-value of >0.05 considered a good fit.[24]

2.2 Qualitative Data Analysis

Qualitative interviews were recorded and transcribed verbatim. Thematic analysis was performed based on Framework Approach[25] and included familiarization through repeated reading, coding, theme generation, applying the codes to the transcripts, matrix formation, and interpretation. Findings from the two components of the mixed-methods study were integrated.[26]

3. Results

3.1 Quantitative Findings

Sociodemographic and obstetric characteristics

Of the 440 women approached, 389 (88.4%) completed the interviews. Respondents' mean age (±standard deviation) was 29.6±7.47. The majority were of Hausa ethnic group (91.3%) and all (100%) were Muslim. About one-third of the respondents were homemakers (33.9%) and traders/farmers (37.8%), and nearly 2-in-3 respondents (60.9%) had at least secondary education. The majority of women (92.6%) had at least two children and almost 1-in-5 (18.8%) had a history of adverse pregnancy events or outcomes. About one-third of the respondents reported a monthly household income of (<N30,000, equivalent to 60 US Dollars) (Table 1). More than half of the respondents self-perceived a moderate/high risk of COVID-19 and about two-thirds (64.6%) reported practicing the recommended COVID-19 preventive measures.

Maternal health service utilization

During their confinement under COVID-19 restrictions, 42.4% (n=165/389) of participating women utilized maternal health services (i.e., had at least four antenatal visits, delivered in a health facility, and attended a postnatal clinic). Excluding primipara, this contrasts with 65.8% (n=237/360 of women who utilized the same services before the COVID-19 outbreak ($p<0.05$) (Table 2).

Reasons for not utilizing maternal health services

As shown in Table 2, the main reasons for not using maternal health services during the COVID-19 lockdown included fear of contracting COVID-19 (n=122, 54.5%), clinic overcrowding (*n*=43, 19.2%), transportation challenges (n=34, 15.2%) and harassment by security personnel (*n*=24, 10.7%).

Table 1: Sociodemographic and obstetric characteristics of respondents, Kumbotso, Nigeria

Characteristics	Frequency No. (%) n=389
Age group	
<20	30 (7.7)
20-29	176 (45.2)
30-39	127 (32.7)
≥40	56 (14.4)
Ethnicity	
Hausa	355 (91.3)
Fulani	34 (8.7)
Religion	
Islam	389 (100.0)
Marital status	
Married	362 (93.1)
Single/Divorced/Widowed	27 (6.9)
Number of miscarriages	
0	275 (70.7)
1	59 (15.2)
≥2	55 (14.1)
Previous adverse pregnancy event/outcome	
Yes	73 (18.8)
No	316 (81.2)
Number of children	
1	29 (7.5)
2-4	187 (48.1)
≥5	173 (44.5)
Age of youngest child (months)	
12-23	389 (100.0)
Maternal education	
Non-Formal	65 (16.7)
Primary	87 (22.4)
Secondary	211 (54.2)
Post-Secondary	26 (6.7)
Husband's education	
Non-Formal	54 (13.9)
Primary	33 (8.5)
Secondary	161 (41.4)
Post-Secondary	141 (36.3)
Maternal occupation	
Homemakers	132 (33.9)
Student	21 (5.4)
Petty trading/Farming	147 (37.8)
Civil service	18 (4.6)
Business	62 (15.9)
Others	9 (2.3)
Husband's occupation	
Unemployed	14 (3.6)
Petty trading/Farming	88 (22.6)
Civil service	109 (28.0)
Business	135 (34.7)
Others	43 (11.1)
Household monthly income (Naira)	
<30,000	132 (33.9)
≥30,000	257 (66.1)
Travel time to the nearest health facility	
<30 minutes	292 (75.1)
30-60 minutes	97 (24.9)

(Contd...)

Table 1: (*Continued*)

Predictors of maternal health service utilization

At the multivariate level, parity, maternal education, husband's education, maternal occupation, partner's occupation, household income, adherence to COVID-19 preventive measures, and pre-COVID maternal health service utilization predicted maternal health service utilization during COVID-19 restrictions (Table 3). Specifically, mothers of higher parity (≥5 births) were 70% less likely to utilize maternal health services during the lockdown compared to a primipara (adjusted odds ratio, aOR) = 0.30, 95% Confidence Interval (CI):0.10-0.86) (p=0.03). Mothers with post-secondary education (aOR=2.06, 95% CI:1.14- 11.40) (p=0.02), and those whose partners had this same level of education (aOR=2.55, 95% CI:1.15- 5.64) (p=0.013) had an over two-fold increased likelihood of utilizing maternal health services during the COVID-19 restrictions compared to those without formal education. Compared to homemakers, women engaged in the civil service (aOR=4.60, 95%CI: 1.17-19.74) (p<0.001), business (aOR=1.94, 95%CI:1.19- 4.12) (p=0.032) and trading (aOR=1.62, 95%CI:1.19-2.94) (p=0.04) were over four-fold, 94% and 62%, more likely to utilize maternal health services during the COVID-19 lockdown, respectively. Similarly, women, whose partners were engaged in business (aOR=3.09, 95% CI:1.15-21.13) (p=0.028) and in

Table 2: Maternal healthcare before and during COVID-19 restrictions

	Frequency *n* (%)
Maternal healthcare utilization before COVID-19 (n=360)	
Attended antenatal care during last pregnancy	319 (88.6)
Last delivery in a health facility	237 (65.8)
Attended postnatal care after last delivery	283 (78.6)
Utilized MHS (i.e., had at least four antenatal visits, delivered in a health facility, and attended a postnatal clinic) before COVID-19	237 (65.8)
Maternal healthcare utilization during COVID-19 restrictions (n=389)	
Attended antenatal care (≥ 4 visits) during last pregnancy	281 (72.2)
Last delivery in a health facility	182 (46.8)
Attended postnatal care after last delivery	242 (62.2)
Utilized MHS (i.e., had at least four antenatal visits, delivered in a health facility, and attended a postnatal clinic) during the COVID-19 restrictions	165 (42.4)
Reasons for non-utilization of maternal health services during the COVID-19 restrictions	
Fear of contracting COVID-19	122 (54.5)
Overcrowding in clinics	43 (19.2)
Lack of transport	34 (15.2)
Harassment by security personnel	24 (10.7)
Unsure of availability of services	22 (9.8)
Health workers do not use COVID-19 protective equipment	9 (4.0)
The chairs and examination beds are not clean	6 (2.7)
Lack of water, soap, and sanitizer in the health facilities	3 (1.3)
Perceived high risk of contracting COVID-19	72 (18.5)
Adherence to COVID-19 preventive measures	
Regular hand washing and use of hand sanitizers	254 (65.3)
Facemask	362 (93.1)
Social distancing	177 (45.5)

civil service aOR=1.29, 95% CI:1.07- 8.22) (p=0.036) had a three-fold and 29% increased likelihood of utilizing maternal health services during the COVID-19 restrictions, respectively, compared to those that are unemployed. Further, women with a monthly household income of at least (N30,000, equivalent to 60 US Dollars) had a 53% increased probability of utilizing maternal health services during the COVID-19 lockdown (aOR=1.53, 95% CI:1.13-2.65) (p=0.037) relative to those with lower income. Similarly, women who practiced COVID-19 preventive measures had a three-fold increased likelihood of using maternal health services during the same period. Finally, the use of maternal health services before the COVID-19 pandemic increased the odds of maternal health service utilization during the COVID-19 lockdown.

3.2 Qualitative Findings

Twenty women completed the in-depth interviews. Four dominant themes reflective of women's views and experiences emerged from the in-depth interviews. These included perceptions of COVID-19, the influence of COVID-19 on health-seeking behavior for antenatal, delivery, and postnatal care, reasons for non-utilization of maternity care, challenges, and coping mechanisms.

Community perceptions of COVID-19

Participants indicated that some community members denied the existence of COVID-19. Some considered COVID-19 to be a man-made foreign disease, while others viewed it as a severe but self-limiting form of the common cold.

"Some people in our community still did not believe that COVID-19 was real and were of the view that it was a man-made, foreign, non-African disease. What I understand about it is that the cause is similar to the common cold or catarrh. Sometimes it can be severe but mostly heals by itself. It can be transmitted through contact, sneezing, and handshakes, and manifests as frequent cough, sneezing, and high fever." 34-year-old Mother

Perceived effects of the lockdown on households and healthcare-seeking behavior

Participants mentioned the effects of COVID-19 on households including food scarcity, decreased income due to limited economic activities, and difficulty in accessing health services, including maternity care.

"Really it affected the households and people's healthcare. No transport to go to the hospital, and you are harassed by security personnel when you leave home. Even when you finally arrive at the hospital you would

Table 3: Logistic regression model for predictors of maternal health services utilization during COVID-19 lockdown, Kumbotso, Nigeria (n=389)

Characteristics	N	Utilized maternal health services (≥ 4 ANC visits, facility delivery & PNC) during COVID-19 lockdown No. (%)	p-value	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Age group			0.90			
<20	30	12 (40)		Referent	Referent	
20-29	176	77 (43.8)		1.17 (0.53-2.57)	1.74 (0.49-6.11)	0.97
30-39	127	51 (40.2)		1.01 (0.45-2.27)	1.66 (0.42-6.51)	0.32
≥40	56	25 (44.6)		1.21 (0.49-2.98)	1.10 (0.23-5.14)	0.35
Ethnicity			0.83			
Hausa	355	150 (42.3)		--	--	
Fulani	34	15 (44.1)		--	--	
Marital status			0.15			
Married	362	150 (41.4)		--	--	
Single/divorced/widowed	27	15 (55.6)		--	--	
Previous adverse pregnancy outcome			0.44			
Yes	73	28 (38.4)		Referent	Referent	
No	316	137 (43.4)		1.23 (0.73-2.07)	0.72 (0.37-1.39)	0.31
Number of children			0.035*			
1	29	13 (44.8)		Referent	Referent	
2-4	187	91 (48.7)		1.17 (0.53-2.56)	0.40 (0.14-1.13)	0.21
≥5	173	61 (35.3)		0.67 (0.30-0.91)	0.30 (0.10-0.86)	0.03*
Maternal education			<0.001*			
Non-Formal	65	28 (32.2)		Referent	Referent	
Primary	87	97 (46.0)		1.24 (0.61-2.51)	0.91 (0.36-2.28)	0.34
Secondary	211	22 (84.6)		2.22 (1.21-4.08)	1.11 (0.46-2.67)	0.26
Post-secondary	26	22 (84.6)		14.36 (4.34-47.48)	2.06 (1.14-11.40)	0.02*
Husband's education			<0.001*			
Non-Formal	54	15 (27.8)		Referent	Referent	
Primary	33	6 (18.2)		0.58 (0.20-1.68)	0.54 (0.16-1.80)	0.17
Secondary	161	52 (32.3)		1.24 (0.63-2.45)	1.03 (0.48-2.20)	0.40
Post-secondary	141	92 (65.3)		4.88 (2.45-9.72)	2.55 (1.15-5.64)	0.013*
Maternal occupation			<0.001*			
Homemakers	132	37 (28.0)		Referent	Referent	
Petty trading/Farming	147	61 (41.5)		1.82 (1.10-3.00)	1.62 (1.19-2.94)	0.04*
Civil service	18	15 (83.3)		12.84 (3.51-46.94)	4.60 (1.17-19.74)	<0.001*
Business	62	39 (62.9)		4.35 (2.30-8.26)	1.94 (1.19-4.12)	0.032*
Others	30	13 (43.3)		1.96 (0.87-4.44)	0.73 (0.27-1.92)	0.19
Husband's occupation			<0.001*			
Unemployed	14	3 (21.4)		Referent	Referent	
Petty trading/Farming	88	16 (18.2)		1.16 (0.28-4.85)	1.27 (0.22-7.25)	0.46

(Contd...)

Table 3: (*Continued*)

Characteristics	N	Utilized maternal health services (≥ 4 ANC visits, facility delivery & PNC) during COVID-19 lockdown No. (%)	p-value	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Civil service	109	71 (65.1)		3.11 (1.18-11.66)	1.29 (1.07-8.22)	0.036*
Business	135	62 (45.9)		6.85 (1.80-26.06)	3.09 (1.15-21.13)	0.028*
Others	43	13 (30.2)		1.59 (0.38-6.66)	1.17 (0.19-7.20)	0.71
Household monthly income (Naira)			<0.001*			
<30,000	132	30 (22.7)		Referent	Referent	
≥30,000	257	135 (52.5)		3.76 (2.34-6.05)	1.53 (1.13-2.65)	0.037*
Travel time to the nearest health facility			0.09			
<30 minutes	292	131 (44.9)		0.66 (0.41-1.07)	0.62 (0.33-1.16)	0.79
30-60 minutes	97	34 (35.1)		Referent	Referent	
Perceived risk of COVID-19			0.002*			
Low	317	123 (38.8)		Referent	Referent	
High	72	42 (58.3)		2.21 (1.31-3.71)	1.02 (0.52-2.00)	0.91
Adhered to COVID-19 protective measures			<0.001*			
Yes	164	106 (64.6)		5.14 (3.32-7.96)	3.19 (1.93-5.28)	0.001*
No	225	59 (26.2)		Referent	Referent	
Maternal health services utilization pre-COVID			<0.001*			
Yes	237	137 (57.8)		6.07 (3.74-9.85)	4.50 (2.57-7.90)	<0.001*
No	152	28 (18.4)		Referent	Referent	

*Significant at $P < 0.05$; OR: Odds Ratio, CI: confidence interval
Hosmer-Lemeshow Chi-square = 3.84, $P = 0.87$
The logistic model includes the following variables: Age group, previous adverse pregnancy outcome, number of children, maternal education, husband's education, maternal occupation, husband's occupation, household income, travel time, perceived COVID-19 risk, adherence to COVID-19 protective measures, and maternal health services utilization before COVID-19 pandemic.

not find a doctor to attend to you. It also brought about food scarcity because our men needed to go out daily to get food for us to eat, and there was no market. Honestly, the majority of the people suffered during the lockdown." 29-year-old Mother

This situation was made worse by the fear of contracting COVID-19 in health facilities and during transport. The result discouraged pregnant women from attending antenatal clinics, except for emergencies.

"Even the few women that were determined to go to the clinic, were afraid of getting infected with COVID-19 from other patients, and healthcare workers. They only braved the restriction to seek healthcare if their health condition was very serious, and people did not go to work, so there was a lot of hunger and poverty in the land." 30-year-old Mother

Maternal healthcare during the COVID-19 lockdown

Following the COVID-19 outbreak, health authorities imposed lockdowns and implemented protocols for infection prevention and control in hospitals and clinics. When asked about their experiences during clinic visits, some participants indicated that they took a risk by attending antenatal clinics, while others did not attend:

"Yes, I attended ANC, I couldn't see many people there, and the healthcare workers were very strict, but I didn't face any transportation problems as I walked to the nearby facility. I took preventive measures by wearing a face mask and on reaching the hospital we maintained social distancing.We also washed our hands on our arrival at the clinic. I did not have any fear because I know God will protect me and my baby." 32-year-old Mother

Some women did not attend, out of fear of contracting COVID-19 and the safety of their unborn babies:

I couldn't attend ANC initially because I was afraid of getting the disease and infecting my unborn baby and family members. But when the number of persons affected started going down, I was less scared and I had the courage to have an ANC visit towards the end of the pregnancy, as you know if you do not visit for antenatal at least once, the HCWs will harass you during labor." 27-year-old Mother

Challenges/reasons for non-utilization of maternity services

For some women transportation was the major challenge. Some pregnant women walked long distances for antenatal care. Security personnel enforced movement restrictions and there was the uncertainty of not meeting healthcare workers in the clinics:

"There was no movement, although law enforcement officers exempted visibly pregnant women, transportation was a major problem. You can imagine how difficult it is to trek late in pregnancy long distances to reach the hospital. You are also not sure if you will meet the healthcare workers as they also faced similar transport challenges." 28-year-old Mother

Other participants did not attend antenatal clinics during the lockdown, because they felt well and were confident of spiritual protection:

*"No, I didn't go for ANC during COVID-19 lockdown. Because I didn't have any problem that will necessitate ANC attendance at that time. I was not worried about my baby because God protects and whatever the Almighty says will happen, it will."*32-year-old Mother

Delivery was mostly at home. But some women were anxious about accessing emergency obstetric care when the need arose. Some participants attempted reaching health facilities during labor but were turned back and told that only emergencies were attended to. Private pharmacies and markets were closed, making shopping activities difficult.

"I was really disturbed. Because at that time there was no movement. So, I was very anxious as to what to do in case of emergency or when labor starts at night, as it often does. It was a very bad experience because our husbands were not allowed to go out to work and provide food for the family and there was no market to go and buy my needs, that of the baby, and the requirements for delivery. Some women on reaching the clinic, health workers said they were not conducting normal delivery, but handling only emergency cases. At that time the doctors and healthcare providers were very scarce because they have been drafted to attend to COVID-19 patients." 29-year-old Mother

Some women were delivered by traditional birth attendants, but complained that they did not get the same level of care that they had during their previous delivery:

"When labor started my husband was not at home, and it was unusually short labor compared to my previous experience. I also did not have a phone to call him. It was God who assisted me because nobody was around. I delivered the baby entirely on my own. It was scary because if I had bled a lot or lost consciousness as often happens during labor I could have died. When I previously delivered in the hospital I received much attention from the health workers, but when I delivered this time at home, I didn't receive that attention." 28-year-old Mother

Restrictions in movement and the lack of public transportation and ambulances made some mothers anxious about emergencies, while for others it was a convenient reason to deliver at home.

"Yes, there were many women that delivered during the lockdown. We faced lots of issues, including transport problems, financial issues, and even the food to eat. For me, I was delivered to the hospital. I was so lonely that unlike in my previous births, the usually crowded labor rooms where some women even shared beds were deserted. I was the only woman who delivered at that

time. I missed the company of my relatives as there was no transport and restrictions were more stringent on visitors due to COVID-19." 27-year-old Mother

Participants indicated that COVID-19 served as an excuse for women who were not keen on delivering in health facilities to deliver at home without fuss from health workers. This was buttressed by fear of contracting COVID-19 in the hospital and bringing it home to family members:

"Culturally women prefer to deliver at home in this community. During the COVID lockdown, we delivered at home out of fear of COVID-19 and transmitting it to their babies and family members. The COVID-19 lockdown, therefore, served as a convenient excuse for those who did not like hospital delivery in the first place." 30-year-old Mother

Some participants missed the baby showers, gifts, and cultural ceremonies that usually accompanied childbirth, as gatherings and ceremonies were banned during the lockdown:

"I felt bad because women who delivered during the lockdown did not enjoy the usual goodies and gifts that are culturally provided by husbands and relatives during confinement, delivery, and naming ceremonies. We lost so many things we are supposed to get from our husbands." 26-year-old Mother

4. Discussion

This study assessed the effect of COVID-19 on maternity service utilization in rural northern Nigeria. Less than one-half of women utilized maternity services compared to two-thirds prior to COVID-19. Reasons for the non-use of maternity services during the COVID-19 lockdown include fear of contracting COVID-19, transportation difficulties, uncertainty about meeting HCWs, feeling well, and reliance on spiritual protection. Most women were delivered at home by unskilled traditional birth attendants. There were concerns about access to emergency obstetric care when needed, temporary closure of clinics, private pharmacies, and markets, and difficulty with purchasing needed maternity and baby supplies. For some women, the COVID-19 lockdown provided an excuse for delivering at home. Women also missed customary gifts and naming ceremonies. Maternal health service utilization during COVID-19 restrictions was predicted by parity, maternal and partner's education and occupation, household income, adherence to COVID-19 preventive measures, and pre-COVID maternity service utilization.

The proportion of women who utilized maternal health services during the COVID-19 lockdown (42.4%) was lower than before the pandemic (65.8%) among the respondents and previous surveys.[27,28] Similarly, utilization of maternal health services declined in Sierra Leone, Uganda, and Lesotho during the lockdown.[29,30] However, compared to our sample, utilization of maternal health services was higher in Ethiopia (64.8%)[21] and Malawi during the lockdown.[29] Elsewhere, RMNCH service utilization dipped below pre-COVID levels in India,[31] and in Pakistan, cesarean section rates (57%), hospital deliveries (37%), and postnatal visits (37%) declined.[32] Further, maternal health service utilization decreased in Haiti (18%) and Mexico during the COVID-19 pandemic.[29] The variation in the impact of the COVID-19 pandemic on the utilization of maternal health services could be related to differences in COVID-19 burden, risk perception, health system capacity, resilience, and transport infrastructure.

The reasons for non-utilization of maternal health services among our respondents (anxiety and fear of contracting COVID-19, lack of transportation, harassment by security personnel, and unavailability of health workers) are consistent with findings from southwest Nigeria,[33,34] Regarding client experiences, as mentioned in our interviews, some women in Ethiopia expressed dissatisfaction with the antenatal care (6%), delivery (18%) and postnatal services (46.7%) received,[21] as well as in India.[35] In Kenya, the fear of SARS-CoV-2 infection in health facilities increased traditional birth attendant-assisted home births.[1] As found among our respondents, adherence to COVID-19 preventive measures enabled the utilization of maternal health services in other parts of Nigeria, Ethiopia, and Indonesia, highlighting the importance of community sensitization.[21,36,37] Further, as stated by some of our participants, in India, fear of contracting COVID-19, poor quality of services, lack of transportation, and financial constraints were key issues faced by mothers in accessing healthcare.[36]

During the COVID lockdown, less experienced mothers of low parity were more likely to utilize maternal and health services. This finding could be related to the heightened concern about the safety of their unborn babies compared to the more experienced multigravida. The positive effect of maternal and partner education on health service uptake has been consistently reported.[21] Educated partners are more likely to understand health messages, and to correctly perceive the risk associated with non-adherence to COVID-19 measures and non-use of maternal health services.[21,37] Similarly, economically empowered mothers and partners are unlikely to be hindered from accessing services due to financial limitations.[21,37] The same goes for mothers from higher-income households, who are likely to afford transport and treatment costs.[38] Further, the correlation between maternal health service utilization before and during the COVID-19 lockdown is not surprising, as the same basic socioeconomic factors could be interacting with the COVID-19 pandemic response in shaping maternal health-seeking behavior.

The decline in maternal health service uptake during the COVID-19 pandemic relative to pre-COVID figures was influenced by sociodemographic, obstetric, and intrinsic factors (felt need, motivation, pre-COVID-19 maternal health-seeking behavior, transportation, fear of COVID and economic factors). Women who did not use maternal health services during the lockdown reverted to traditional birth attendants, despite expressing anxiety about obstetric emergencies. The development of resilient health systems, reliable patient transport services, exemption of pregnant women from movement restrictions, and prompt activation of contingency plans will help improve future epidemic response. Empowering mothers and creating awareness of COVID-19 prevention could improve maternal health service utilization during future epidemics. Unskilled traditional birth attendants should also be trained in basic infection prevention and control with referral linkages to health facilities.[39]

Our study was community-based, with explanatory mixed methods in design, and one of the first to document the utilization of maternal health services and childbirth experiences during the COVID-19 lockdown in rural northern Nigeria. The qualitative component provided an opportunity for participants to voice out the challenges encountered. However, the study had limitations. First, its cross-sectional nature hindered causal inferences. Second, the conduct of the study in one rural community calls for caution when extrapolating the findings to other settings. Finally, being a self-reported study, the risk of social desirability bias could not be excluded. Future studies should consider reviewing hospital records and assessing the views of healthcare workers to complement the mothers' perspectives. Finally, COVID-19 immunization access was delayed in this setting as was the case in most low-resource environments. This was compounded by vaccine hesitancy, especially, among pregnant women who were afraid of the unknown effects on the fetus.[40] Therefore, the findings of similar studies conducted during the later waves could show a higher utilization of maternal health services compared to this study.

5. Conclusion and Global Health Implications

Maternal health service utilization declined during the COVID-19 lockdown relative to pre-COVID-19 figures. Utilization was hindered by fear of contracting COVID-19 in health facilities, transportation challenges, harassment by security agents, and overcrowding in the clinics. Attendance was influenced by parity, maternal and husband's education/occupation, household income, adherence to COVID-19 preventive measures, and pre-COVID maternity service utilization. There is a need to build resilient health systems, contingency plans, and alternative service delivery models to ensure unhindered access to maternal and child health services during future pandemics.

Compliance with Ethical Standards

Conflicts of Interest: *The authors declare no competing interests.* ***Financial Disclosure:*** *Nothing to declare.* ***Funding/Support:*** *There was no funding for this study.* ***Ethics Approval:*** *The study protocol was reviewed and approved by the Kano State Ministry of Health Research Ethics Committee.* ***Acknowledgments:*** *None* ***Disclaimer:*** *None.* Findings from this study were presented at the 2023 Consortium of Universities in Global Health (CUGH) Annual Conference in Washington, D.C.

Key Messages

- Sociodemographic, obstetric, and intrinsic factors influenced the decline in the use of maternal health services during the COVID-19 pandemic.
- The use of maternal health services before the COVID-19 pandemic increased the odds of maternal health service utilization during the COVID-19 lockdown.
- Mothers of lower parity were more likely to utilize maternal and health services during the COVID-19 lockdown.
- These are vital lessons for building resilient health systems and epidemic preparedness in similar settings.

References

1. Pant S, Koirala S, Subedi M. Access to maternal health services during COVID-19. *Europasian J Med Sci.* 2020;20:46-0. doi: 10.46405/ejms.v2i2.110
2. Ameyaw EK, Ahinkorah BO, Seidu AA, Njue C. Impact of COVID-19 on maternal healthcare in Africa and the way forward. *Arch Public Health.* 2021;79(1):223. doi: 10.1186/s13690-021-00746-6
3. Hantoushzadeh S, Shamshirsaz AA, Aleyasin A, et al. Maternal death due to COVID-19. *Am J Obstet Gynecol.* 2020;223(1):109.e1-109.e16. doi: 10.1016/j.ajog.2020.04.030
4. Rocca-Ihenacho L,Alonso C.Where do women birth during a pandemic? Changing perspectives on safe motherhood during the COVID-19 pandemic. *J Glob Health Sci.* 2020;2. doi:10.35500/jghs.2020.2.e4
5. Sacks E, Brizuela V, Perrotta C. It's the destination *and* the journey-a mapping of the challenges in transport and referral for maternal and newborn health in pandemics and beyond. *Front Public Health.* 2021;9:612409. doi: 10.3389/fpubh.2021.612409
6. Palo SK, Dubey S, Negi S, et al. Effective interventions to ensure MCH (Maternal and Child Health) services during pandemic related health emergencies (Zika, Ebola, and COVID-19): a systematic review. *PLoS One.* 2022;17(5):e0268106. doi: 10.1371/journal.pone.0268106
7. Sahoo KC, Negi S, Patel K, Mishra BK, Palo SK, Pati S. Challenges in Maternal and Child Health Services Delivery and Access during Pandemics or Public Health Disasters in Low-and Middle-Income Countries: A Systematic Review. *Healthcare* 2021;9(7):828. doi: 10.3390/healthcare9070828
8. Yan YY, Fan TY, Zheng YL, et al. Prevention and control of COVID-19 by primary health care facilities in China: a field-survey-based qualitative study in three typical cities. *BMC Health Serv Res.* 2022;22(1):399. doi: 10.1186/s12913-022-07770-4
9. Fantaye AW, Okonofua F, Ntoimo L, Yaya S. A qualitative study of community elders' perceptions about the underutilization of formal maternal care and maternal death in rural Nigeria. *Reprod Health.* 2019;16(1):164. doi: 10.1186/s12978-019-0831-5
10. World Health Organization. Third Round of the Global Pulse Survey on Continuity of Essential Health Services During the COVID-19 Pandemic November-December 2021. Interim report. Geneva; 2022. Accessed July 3, 2022. https://www.who.int/teams/integrated-health-services/monitoring-health-services/global-pulse-survey-on-continuity-of-essential-health-services-during-the-covid-19-pandemic
11. Quaglio G, Cavallin F, Nsubuga JB, et al. The impact of the COVID-19 pandemic on health service use in sub-Saharan Africa. *Public Health Action.* 2022;12(1):34-39. doi: 10.5588/pha.21.0073
12. Onchonga D, Alfatafta H, Ngetich E, Makunda W. Health-seeking behaviour among pregnant women during the COVID-19 pandemic: a qualitative study. *Heliyon.* 2021;7(9):e07972. doi: 10.1016/j.heliyon.2021.e07972
13. Fan S, Guan J, Cao L, et al. Psychological effects caused by COVID-19 pandemic on pregnant women: a systematic review with meta-analysis. *Asian J Psychiatr.* 2021;56:102533. doi: 10.1016/j.ajp.2020.102533
14. Calvert C, John J, Nzvere FP, et al. Maternal mortality in the COVID-19 pandemic: findings from a rapid systematic review. *Glob Health Action.* 2021;14(sup1):1974677. doi:10.1080/16549716.2021.1974677.
15. National Population Commission. *Report of Nigeria's National Population Commission on the 2006 Census*. Population and Development Review. 2006; 33 (1): 206-210.
16. *Trends in Maternal Mortality 2000 To 2020: Estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division*. World Health Organization; 2023. Published February 23, 2023. Accessed April 11, 2023.https://www.who.int/publications/i/item/9789240068759
17. Ononokpono DN, Odimegwu CO. Determinants of maternal health care utilization in Nigeria: a multilevel approach. *Pan Afr Med J.* 2014;17 Suppl 1(Suppl 1):2. doi: 10.11694/pamj.supp.2014.17.1.3596
18. Kaushik V, Walsh CA. Pragmatism as a research paradigm and its implications for social work research. *Soc Sci.* 2019;8(9):255. doi:10.3390/socsci8090255
19. Creswell JW, Plano Clark VL. *Designing and Conducting Mixed Methods Research*. 2nd ed. Thousand Oaks: Sage; 2011:43-51.
20. Lwanga SK, Lemeshow S. *Sample Size Determination*

In Health Studies: A Practical Manual. World Health Organization;1991: 29-32.

21. Temesgen K, Wakgari N, Debelo BT, et al. Maternal health care services utilization amidstCOVID-19 pandemic in West Shoa zone, central Ethiopia. *PLoS One.* 2021;16(3): e0249214. doi: 10.1371/journal.pone.0249214

22. Kim H. Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test. *Resor Dent Endod.* 2017;42 (2):152-55. doi: 10.5395/rde.2017.42.2.152

23. Katz MH. *Multivariable Analysis-A Practical Guide for Clinicians and Public Health Researchers*. Cambridge, U.K.: Cambridge University Press; 2011.

24. Hosmer DW, Lemeshow S. *Applied Logistic Regression*. New York: Wiley; 2013.

25. Pope C, Ziebland S, Mays N. Qualitative research in health care. Analyzing qualitative data. *BMJ.* 2000;320(7227):114–6. doi: 10.1136/bmj.320.7227.114

26. Farmer T, Robinson K, Elliott SJ, John ED. Developing and implementing a triangulation protocol for qualitative health research. *Qual Health Res.* 2006; 16:377-94. doi: 10.1177/1049732305285708

27. National Population Commission (NPC)/Nigeria and ICF. *Nigeria Demographic and Health Survey 2018*. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF; 2019.

28. National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF). *Multiple Indicator Cluster Survey 2021, Survey Findings Report*. Abuja, Nigeria: National Bureau of Statistics and United Nations Children's Fund;2022

29. Aranda Z, Binde T, Tashman K, et al; Cross-site COVID-19 Syndromic Surveillance Working Group. Disruptions in maternal health service use during the COVID-19 pandemic in 2020: experiences from 37 health facilities in low-income and middle-income countries. *BMJ Glob Health.* 2022;7(1):e007247. doi: 10.1136/bmjgh-2021-007247

30. Burt JF, Ouma J, Lubyayi L, Amone A, et al. Indirect effects of COVID-19 on maternal, neonatal, child, sexual and reproductive health services in Kampala, Uganda. *BMJ Glob Health.* 2021;6(8):e006102. doi: 10.1136/bmjgh-2021-006102

31. Bankar S, Ghosh D. Accessing Antenatal Care (ANC) services during the COVID-19 first wave: insights into decision-making in rural India. *Reprod Health.* 2022;19(1):158. doi: 10.1186/s12978-022-01446-2

32. Emmanuel F, Ahmad A, Reza T, et al. Indirect effects of COVID-19 pandemic on reproductive, maternal, newborn and child health services in Pakistan. *East Mediterr Health J.* 2022;28(4):258-265. doi: 10.26719/emhj.22.011

33. Balogun M, Banke-Thomas A, Sekoni A, et al. Challenges in access and satisfaction with reproductive, maternal, newborn and child health services in Nigeria during the COVID-19 pandemic: A cross-sectional survey. *PLoS One.* 2021;16(5):e0251382. doi: 10.1371/journal.pone.0251382

34. Adelekan B, Goldson E, Abubakar Z, et al. Effect of COVID-19 pandemic on provision of sexual and reproductive health services in primary health facilities in Nigeria: a cross-sectional study. *Reprod Health.* 2021;18(1):166. doi: 10.1186/s12978-021-01217-5

35. Sinha B, Dudeja N, Mazumder S, et al. Estimating the impact of COVID-19 pandemic related lockdown on utilization of maternal and perinatal health services in an urban neighborhood in Delhi, India. *Front Glob Womens Health.* 2022;3:816969. doi: 10.3389/fgwh.2022.816969

36. Akaba GO, Dirisu O, Okunade KS, et al. Barriers and facilitators of access to maternal, newborn and child health services during the first wave of COVID-19 pandemic in Nigeria: findings from a qualitative study. *BMC Health Serv Res.* 2022;22(1):611. doi: 10.1186/s12913-022-07996-2

37. Ariani N. Antenatal care services utilization during COVID-19 second wave attack in Pasuruan, Indonesia. *J Med Life.* 2022;15(1):7-14. doi: 10.25122/jml-2021-0238

38. Sui Y, Ahuru RR, Huang K, Anser MK, Osabohien R. Household socioeconomic status and antenatal care utilization among women in the reproductive-age. *Front Public Health.* 2021;9:724337. doi: 10.3389/fpubh.2021.724337

39. Hernandez S, Oliveira JB, Mendoza Sosof C, Lawrence E, Shirazian T. Adapting antenatal care in a rural LMIC during COVID-19: A low literacy checklist to mitigate risk for community health workers. *Int J Gynaecol Obstet.* 2020;151(2):289-291. doi: 10.1002/ijgo.13332

40. Iliyasu Z, Perkins JM, Tsiga-Ahmed FI, et al. COVID-19 vaccine acceptability among pregnant women in northern Nigeria. *J Obstet Gynaecol Can.* 2022 Apr;44(4):349-350.e1. doi: 10.1016/j.jogc.2022.01.002