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ASSESSMENT OF THE EFFECT OF COVID-19 ON ANTENATAL CARE SERVICES UTILIZATION AND PROVISION IN CROSS RIVER STATE, NIGERIA

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Abstract

The effect of the COVID-19 pandemic has disrupted health services worldwide, with associated maternal health care, which includes antenatal care (ANC) services in sub-Saharan Africa. In Nigeria, the maternal mortality ratio has been estimated at 512/100,000 in Nigerian. This study assesses the impact of COVID-19 on the utilization and provision of ANC service in Cross River State, Nigeria. A cross-sectional design was used to collect data from health facilities, pregnant women and healthcare providers via questionnaires, surveys and interviews from one Local Government Area in each Senatorial District in the state. The major areas of interest include service availability, public perception safety during the pandemic, accessibility to the health facilities, patient attendance and healthcare workers preparedness, as well as Traditional Birth Attendants (TBAs). The results obtained in 2019 show that the total number of ANC visits was 26733 as compared to what was obtained in the survey results of 4777 in 2020. This simply indicates a 7.4% reduction in antenatal care attendance. Also institutional birth delivery in 2019 (4679) and 2022 (6015) shows an increase in the number of institutional births of about 1344. This study revealed discrepancies in healthcare service delivery and utilization across the districts as the proportion of births at health facilities were 51.4%, 30.7% and 17.9% in the south, central and north respectively. Conclusively, there was an increasing trend in home deliveries and TBAs due to the negative impact of the COVID-19 pandemic on antenatal services and utilization of healthcare facilities.

Keywords: Antenatal Care, COVID-19, Provision, Services, Utilization.

Introduction

Maternal mortality is a major public health challenge globally and sub-Saharan Africa in particular (Hogan *et al.,* 2020). Despite a considerable decline in the maternal mortality rate worldwide, Nigeria still ranks fourth amongst countries with the highest maternal mortality ratio (MMR) of 512/100,000 after South Sudan, Chad and Sierra Leone (National Population Commission and ICF, 2019; WHO, 2020). According to the International Classification of Diseases (ICD-10), "maternal death is the death of a woman while pregnant or within 42 days of the end of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes" (WHO, 2010).

Probable causes and contributory factors to this unacceptable high maternal mortality rate in Nigeria have become very disturbing as every birth becomes a potential incidence. The challenge may however not be unconnected to the nation's poor maternal healthcare system (Elem & Nyeche, 2016). However, the complex web of identified leading direct and indirect causes of maternal and newborn mortality, under which these deaths occur include; lack of knowledge among women on the importance of antenatal care (ANC), out-of-hospital deliveries by unskilled health workers, absence of certain essential services as well as a weak and unreliable referral system (Ahmed *et al.*, 2021; WHO, 2020). Other notable factors include haemorrhage, hypertensive disorders, sepsis, abortion, embolism, complications of anaesthesia, and peripartum cardiomyopathy (Akorede *et al*., 2022; Kabiru *et al.*, 2024; Say *et al.,* 2014; Tessema *et al.,* 2017).

With an estimated 58, 000 maternal deaths yearly and a maternal mortality ratio of about 512/100,000, a Nigerian woman has a 1 in 22 lifetime risk of dying during pregnancy, childbirth or postpartum/post-abortion as compared to women in the most developed countries where the lifetime risk is 1 in 4, 900 (WHO, 2018; WHO,2020). Sadly enough, available data puts the maternal mortality ratio in Cross River State at 831 per 100,000 live births (Agan *et al.,* 2010) The very poor maternal health indices in the Cross River State have been attributed to poor antenatal, intra-natal and postnatal practices, and to various socio-economic factors which place women at risk of adverse maternal health outcomes (Kingsley *et al.,* 2021).

The advent of the Corona Virus Disease 2019 (COVID-19) on the healthcare system may have further exacerbated the problem of maternal mortality (Akorede et al., 2021). This is relative to the fact that the global pandemic has led to disruption and adjustment in maternity service provision, diversion of resources away from essential pregnancy care due to prioritized

COVID-19 response and a potential risk of vertical transmission becoming a major concern (Kingsley *et al.,* 2021). Its epidemiology and clinical characteristics suggest that the disease pathogen primarily targets the human respiratory system with accumulated evidence of person-to-person transmission both in hospital and family settings. Findings from this study will provide several layers of baseline data that cover critical areas of public health, such as infectious disease prevention and surveillance, maternal and child health including psychosocial strategies to addressing contemporary global issues, specifically because this study has the potential to help in estimating the magnitude and patterns of the effect of COVID-19 on antenatal care (ANC) services utilization and provision which stands as the major entry point to neonatal disease prevention and highly pivotal to the survival of children (Cross River State Ministry of Information Report, 2015). This study is justifiable in that it may invariably yield benefits that transcend this generation.

Materials and Methods

Study Area: Cross River State is one of the 36 states in the Federal Republic of Nigeria in the South-South geopolitical zone. It is located between latitude 4o 24', and 6o 53' North and longitude 7o 50' and 9o 28' East. It is bounded in the North by Benue State, South by the Atlantic Ocean, southwest – Akwa Ibom State, West by Ebonyi and Abia State, and East by the Republic of Cameroon Cross River State Ministry of Information Report, 2015). It has a total land mass of 23,000sq km. It has three major languages namely Efik, Bekwarra and Ejagam, and the projected population of the State is estimated to be 3.738 million (2016) (Cross River State Ministry of Information Report, 2015). The state headquarters is in Calabar and has three senatorial districts with 18 Local government areas in total. Cross River State is an agricultural state, its vegetation is made of mangrove and tropical rain forest in the south and central zones, and savannah woodlands in the north and about 75% of the people are engaged in subsistence farming. Health system positioning and ownership of facilities in the state showed that there are about 932 health facilities, classified based on tiered of government levels viz local, state and federal including private facilities and faith-based or profit-oriented. The majority (over 90%) of facilities in Cross River State are publicly owned and most of these are managed by the primary healthcare department of the ministry of the local government. Conversely, most private health facilities are predominantly secondary health services, with the presence of only two tertiary health care facilities in the state (Cross River State Ministry of Information Report, 2015).

Study Design: This study is a multi-centre health facility-based cross-sectional study design, employing both quantitative methods of data collection in assessing the effect of COVID-19 on antenatal care services utilization and provision in Cross River State, Nigeria.

Study Population: Using a random sampling method, one Local Government Area (LGA) was selected in each senatorial district in the state and then simple random sampling was used to select five (5) communities in the selected LGAs, thus making a total of 3 LGAs and 15 communities in the state. The target population included pregnant women, health workers as well as Traditional Birth Attendants (TBAs) in our sample as local auxiliary healthcare providers supporting mainstream healthcare delivery.

Sample Size Determination: The sample size was determined using the snowball formula below as cited in (Ejenot-Nwadiaro, *et al.,* 2020).

n = N

1 + (N) (e) 2

Where; n = sample size desired, N = population size; and

e = desired margin of sampling error Substituting for the above formula:

$$n = \frac{3{,}738{,}000}{1+(3{,}738{,}000)(.03)^2}$$

$$n = \frac{3{,}738{,}000}{3365.2}$$

n = 1111

One thousand one hundred and ten respondents were used to estimate the effect of COVID-19 on Antenatal Care attendees and service provision in the study area, and the study population is 3,738,000 (NPC, 2010) and the margin of error is pegged at 3%. To account for attrition bias, the sample size was increased by 10% to a desired sample size of 1222. Hence 407 respondents were selected in each senatorial district across the state to give a total of 1222 as the desired sample size.

Sampling Procedure: A multi-stage random sampling technique was employed in the selection of study participants and the procedure is described as follows.

Stage 1: Selection of wards: In each of the LGA selected, a simple random sampling technique was used to select 10 wards each making a total of 30 wards that were sampled in the study area

Stage 2: Selection of communities: In each of the selected wards, a simple random sampling technique was used in the selection of one community making a total of 10 communities that were sampled.

Stage 3: Selection of respondents: In each community selected, only consenting pregnant women and health workers were incorporated into the study. Pregnant women resident in the selected communities were selected with the assistance of healthcare workers at the health facility where they attend ANC. This initial step was followed by a snowball sampling approach (thus, pregnant women/ANC attendees referred the researchers to other pregnant women who are friends or relatives residents in the community). However, for healthcare providers, 9 Primary Healthcare Coordinators (3 representing each senatorial district), 20 healthcare providers (2 per community) and 6 TBAs (2 in each senatorial district) were interviewed by the D. Betta Edu.

Instruments for data collection: The study employed three (3) major instruments of data collection viz;

1. ANC utilization/visit questionnaires for the pregnant women
2. ANC services provision questionnaires for healthcare workers
3. Data extraction form to establish baseline and variable trends in the past five years

Pre-testing: The pre-test was carried out with 10 per cent of the total sample size (i.e. 111 respondents). In the pretest, out of the 18 LGAs, 3 were randomly selected from each senatorial district i.e. Southern, Central and Northern senatorial districts of Cross River State to be included in the study. Pre-testing is intended to determine the relevance of questions to variables under measurements, remove ambiguity, improve the sequencing of questions and give an estimate of the maximum time burden for the completion of questions. In testing the reliability of the instrument, it was given to another set of respondents on two separate occasions after a week interval, content relation validity of the instrument was assessed based on the consistent nature of the instrument with the variables defined and measured.

Data Collection Procedure: Five (5) field research assistants with tertiary level of education were trained by the principal researcher a week before the pre-test on research ethics, questionnaires administration and data collection procedures to ensure completion, consistency and accuracy. The questionnaire was interviewer-administered to ANC attendees and health workers after seeking consent. All questionnaires were filled thus representing 100% of the desired sample size.

Method of Data Analysis: All collected data were checked for completeness and reliability before entry into the software. Data entry and cleaning were done using Epi Info version 3.5.3 computer software. Descriptive statistics of SPSS version 20 were used to summarize all the values of the variables. Results were expressed as percentages and presented in tables, charts and graphs. Student's t-test and chi-square were used to test for the hypothesis stated at a 5% level of significance. Pearson's X2 test and binary logistic regression with 95% CI will be used to measure associations. Further tests of statistics using a binary logistic regression model to test relationships between each independent variable and outcomes were investigated using a binary logistic regression model. All variables with a p-value less than 0.2 were included in the multiple logistic regression models, and a p-value of less than 0.05 will be considered statistically significant.

Expected Outcome: Findings from this proposed study will provide several layers of baseline data that cover critical areas of public health, such as infectious disease prevention and surveillance, maternal and child health including psychosocial strategies to address contemporary global issues. Specifically, this study has the potential to help in estimating the magnitude and patterns of the effect of COVID-19 on antenatal care (ANC) services utilization and provision which stands as the major entry point to neonatal disease prevention and is highly Pivotal to the survival of children. This invariably may yield benefits that transcend this generation.

Ethical consideration: Ethical approval was obtained from the Cross River State Research Ethics Committee, Ministry of Health, Calabar. The ethical approval was then used to make entry into the communities in Cross River state. Verbal or written informed consent was obtained from community gatekeepers, heads of households, market leaders and respondents who took part in the study. The objectives, significance and benefits of the study were explained to the respondents and participants. The study was strictly voluntary as the research participants were assured of anonymity and confidentiality of the information that they provided.

Results

All 1222 questionnaires were distributed, filled and retrieved for analysis giving a response rate of 100%. Thus, a total number of 407 respondents represent each Senatorial District in this study.

Socio-Demographic Characteristics of Respondents

The majority of ANC attendees who took part in the study were aged 35-39 years and were residing mostly in the Southern Senatorial District 105(36.8%) of the state. Primary education was attained by most persons in the central senatorial district

154 (35.5%). Further findings indicated that participants who took part in the study were single and from the central senatorial district 168 35.8%). Meanwhile, ANC attendees in the north 214 (34.8%), had a household size of about 4-6 members, as of the period preceding the study. Trading, which was the commonest type of occupation among participants, was majorly among participants in the central senatorial district 135 (36.4%) (Table 1).

Table 1: Socio-demographic characteristics of participants

Characteristics	Senatorial districts (n = 1221)			Total
Age	South (%)	Central (%)	North (%)	
15-24	66 (29.6)	74 (33.2)	83 (37.2)	223 (100.0)
25-34	130 (30.4)	161 (37.7)	136 (31.9)	427 (100.0)
35-44	181 (36.2)	153 (30.6)	166 (33.2)	500 (100.0)
45-49	30 (42.3)	19 (26.8)	22 (30.9)	71 (100.0)
Educational level				
Non-formal	89 (28.6)	98 (31.5)	124 (39.9)	311 (100.0)
Primary	147 (33.9)	154 (35.5)	133 (30.6)	434 (100.0)
Secondary	102 (37.5)	91 (33.5)	79 (29.0)	272 (100.0)
Tertiary	69 (33.8)	64 (31.4)	71 (34.8)	204 (100.0)
Marital status				
Single	159 (33.8)	168 (35.8)	143 (30.4)	470 (100.0)
Married	112 (35.7)	99 (31.5)	103 (32.8)	314 (100.0)
Divorced/separated	29 (47.5)	12 (19.7)	20 (32.8)	61 (100.0)
Widowed	2 (16.7)	4 (33.3)	6 (50.0)	12 (100.0)
Co-habiting	105 (28.9)	124 (34.1)	135 (37.0)	364 (100.0)
Household size				
1-3	128 (37.1)	111 (32.2)	106 (30.7)	345 (100.0)
4-6	195 (31.8)	205 (33.4)	214 (34.8)	614 (100.0)
7-10	80 (37.4)	79 (36.9)	55 (25.7)	214 (100.0)
> 10	4 (8.3)	12 (25.0)	32 (66.7)	48 (100.0)
Occupation				
Trader	114 (30.7)	135 (36.4)	122 (32.9)	371 (100.0)
Farmer	54 (17.4)	149 (47.9)	108 (34.7)	311 (100.0)
Civil/Public servant	161 (63.1)	30 (11.8)	64 (25.1)	255 (100.0)
Unemployed	63 (26.1)	85 (35.3)	93 (38.6)	241 (100.0)
Self-employed	15 (34.9)	8 (18.6)	20 (46.5)	43 (100.0)

**Figures in parenthesis are percentage*

Reproductive Characteristics of Respondents

Over a third of the respondents 247 (37.4%) majorly from the central senatorial district, were accessing ANC for the first time. On the other hand, most ANC attendees who had visited the healthcare centre during periods preceding the study survey were majorly from the southern senatorial district 196 (35.0%). ANC attendees with one or two children were mostly from northern Senatorial District 221 (36.6%). ANC attendees in the northern senatorial district had their last delivery mostly at home 105 (42.7%) and through a TBA 208 (46.4%), while ANC attendees that had their last delivery at the healthcare facility 208 (46.4%) were mostly from the southern senatorial district. The majority of participants did not attend ANC during their last pregnancy and those that attended were mostly from the northern senatorial district 199 (36.4%). Most participants were in the second trimester and mostly of the central senatorial district 220 (44.6%) at the time of this study. Households of these participants had mostly three children and these occurred majorly in the 172 (49.0%) northern senatorial district (Table 2).

Table 2: Reproductive Characteristics of Respondents

Characteristics	Senatorial districts (%), n = 1221			Total (%)
First-time pregnancy	***South (%)***	***Central (%)***	***North (%)***	
Yes	211 (31.9)	247 (37.4)	203 (30.7)	661 (100.0)
No	196 (35.0)	160 (28.6)	204 (36.4)	560 (100.0)
Gravidity				
1-2	289 (34.0)	275 (32.4)	285 (33.6)	849 (100.0)
3-4	86 (29.3)	111(37.9)	96 (32.8)	293 (100.0)
5-6	30 (41.7)	21 (34.7)	25 (23.6)	76 (100.0)
≥ 7	2 (66.7)	0 (00.0)	1 (33.3)	3 (100.0)
Birth parity				
1-2	189 (31.3)	194 (32.1)	221 (36.6)	604 (100.0)
3-4	103 (33.0)	122 (39.1)	87 (27.9)	312 (100.0)
5-6	90 (41.7)	75 (34.7)	51 (23.6)	216 (100.0)
≥ 7	25 (28.1)	16 (18.0)	48 (53.9)	89 (100.0)
Attended ANC during the last delivery				
Yes	190 (34.7)	158 (28.9)	199 (36.4)	547 (100.0)
No	217 (32.2)	249 (36.9)	208 (30.9)	674 (100.0)
Gestational age				
1st trimester	141 (43.4)	85 (26.2)	99 (30.5)	325 (100.0)
2nd trimester	117 (23.7)	220 (44.6)	156 (31.7)	493 (100.0)
3rd trimester	149 (37.0)	102 (25.3)	152 (37.7)	403 (100.0)
Children (U-5 years) in household				
One	105 (44.1)	74 (31.1)	59 (24.8)	238 (100.0)
Two	135 (38.9)	124 (35.7)	88 (25.4)	347 (100.0)
Three	78 (22.2)	101 (28.8)	172 (49.0)	351 (100.0)
Four	89 (31.2)	108 (37.9)	88 (30.9)	285 (100.0)

**Figures in parenthesis are percentage*

Rate of antenatal care attendance in the study area

Results presented in Table 3 show a five-year trend of health indices in the study area from 2016-2020. In this study, the rate of antenatal care attendance indicates an increase in trend from 2016 to 2020 when the disease first entered Africa In 2018 for instance, a total of 21662 women attended ANC as compared to 13788 women who did in 2016, thus translating to about 36.5% increase in ANC service utilization in the study area. The same trend repeated itself in 2018 (26194) as compared to 2019 (21662) and 2019 (26733) to 2020 (26194) showing a 17.3% and 11.9% increase in ANC service utilization respectively. However, trends in this study show a decrease in ANC attendance from the onset of COVID-19 in 2019 (26733) as compared to the survey results in 2020 (24777) which indicate a 7.4% reduction in ANC attendance.

In comparison with the yearly number of institutional births between 2016 (2437), 2017 (4015) and 2018 (4923), a substantial increase of about 39% and 18.4% respectively were recorded following the trend as observed in this study. Although, there was a 5% decrease in institutional birth in 2019(4679) as compared to 2018(4923), however, we observed an exponential increase of about 22.2% of institutional births in the survey results in 2020 (6015) in comparison to when the COVID-19 lockdown was announced in 2019 (4679). We observed in this study a matching decrease in the trend for neonatal mortality in 2016 (Kingley, 2021), 2017 (WHO, 2018) and 2018 (WHO, 2020). However, there was an increase in neonatal mortality in 2019 (Kingley, 2021) during the start of the pandemic as compared to 2018 (6). Results presented in this study show an unacceptably high rate of maternal and neonatal mortality in 2016 (Say, *et al.,* 2014; Kingley, 2021) and nearly the same trend repeated itself in 2019 (WHO, 2018; Kingley, 2021) respectively.

Table 3: Summary Of Trends Of ANC Attendees, Birth Delivery, Maternal Mortality and Neonatal Mortality
**Figures in parenthesis are percentage*

Characteristics	Senatorial districts			Total
ANC Attendance	***South***	***Central***	***North***	
2016	4531	4690	4567	13788
2017	7629	6528	7505	21662
2018	9393	7960	8841	26194
2019	8917	9202	8614	26733
2020	8563	8024	8190	24777
Birth Delivery				
2016	889	753	795	2437
2017	1542	1126	1347	4015
2018	1990	1226	1707	4923
2019	1766	1341	1572	4679
2020	2388	133	2296	6015
Maternal Mortality				
2016	4	1	5	10
2017	2	2	2	6
2018	1	4	1	6
2019	5	3	1	9
2020	1	1	3	5
Neonatal Mortality				
2016	1	5	5	11
2017	4	1	4	9
2018	1	2	3	6
2019	1	9	1	11
2020	0	0	3	3

Compare the Baseline Data of Antenatal Care Attendance with the Survey Results

Comparatively, baseline results obtained in 2019 show that the total number of ANC visits was 26733 as compared to what was obtained in the survey results of 4777 in 2020. This simply indicates a 7.4% drop in antenatal care attendance. Also, baseline data for institutional birth delivery in 2019 (4679) and 2022 (6015) shows an increase in the number of institutional births of about 1344, with institutional maternal and neonatal mortality showing a decrease in their numbers (Table 3).

Determine the Effect of COVID-19 on Antenatal Care Utilization/Visits in the Study Area

In this study, we found out that the majority of the women did their antenatal care follow-up in a healthcare facility. Out of the 1221 respondents, 661(54.1%) said it was their first pregnancy/time to utilize antenatal care services in a healthcare facility, while some 560 (45.9) said it wasn't their first pregnancy/time to utilise the antenatal care services of the health facilities. Data obtained from the demographic characteristics of respondents (Table 2) indicated that, of the 560 mothers who are not first-time mothers, 547 (giving a 98% rate) attended ANC during their last delivery with about 325 (26%) seeking care during their first trimester. This may be due to the importance of ANC and satisfactory service delivery in the study area.

Table 4: Effect on the provision of ANC services

Effect	Senatorial district (%), n=1221			Total (%)
Changes in ANC services	*South*	*Central*	*North*	
Yes	22 (34.9)	20 (31.8)	21 (33.3)	63 (100.0)
No	3 (25.0)	5 (41.7)	4 (33.3)	12 (100.0)
Type of changes				
Decrease in attendees	16 (34.0)	15 (31.9)	16 (34.0)	47 (100.0)
Increase in attendees	4 (57.1)	1 (14.3)	2 (28.6)	7 (100.0)
Unavailability of services	2 (22.2)	4 (44.4)	3 (33.3)	9 (100.0)

**Figures in parenthesis are percentage*

Discussion

This study provides a snapshot of the effect of COVID-19 on antenatal care services utilization and provision in Cross River State, Nigeria. The participants of this study covered three senatorial districts of the state where the majority were women of childbearing age, with primary education being the major educational qualification attained across the districts (33.9%, 35.5%, 30.6%) respectively. Although the majority of the respondents in this study were married, with a moderate household size of about 4-6 persons per household. However, many of them were traders and only about a few of the respondents had tertiary education. These results are similar to the findings of United Kingdom (UK) maternal mortality reports which suggest that women at particular risk of dying during pregnancy are Black, Asian, ethnic minority women, immigrants, victims of domestic violence and women of lower socioeconomic status (Akorede, 2021; Knight, 2019, Olubiyi et al., 2019).

Relative percentage differences of a five-year trend of ANC attendees, birth delivery, maternal mortality and neonatal mortality comparing figures from 2016 to 2020 indicate a clear disruption in ANC services, specifically at the onset of COVID-19 and the lockdown. ANC visits were 7.4% lower in 2020 compared to 2019. The reason for this reduction may be indicative of heightened fear of disease transmission, which might have stopped women from seeking care at health facilities, and some restriction measures set up by the government to curb the spread of the virus. Therefore, the provision of improved ANC service is less likely to bring about better health outcomes if uptake is low as observed in this study during the period of COVID-19. Findings from this study which is similar to those obtained which concluded that accessing healthcare for non-COVID-19 related health issues, including antenatal care services, has been grossly impacted. Again, coupled with the need to ensure global containment measures; health centres are being overstretched with response efforts, limited supply of equipment due to the disrupted supply chain, and shortage of skilled birth attendants as health workers need to respond to COVID-19.

Although in this study, there was a 5% decrease in institutional births between 2018 and 2019, we also observed an exponential increase of about 22.2% of institutional births in the survey results. Institutional delivery service utilization is one of the key and proven interventions to improve maternal health and well-being and to reduce maternal mortality through providing safe delivery and reducing complications that are related to and occur during birth. To reduce the level of maternal mortality, the World Health Organization (WHO) envisions a world where "every pregnant woman and newborn receive quality care throughout pregnancy, childbirth and postnatal period" (Tuncalp, *et al.*, 2015). The Safe Motherhood initiative also highly emphasizes institutional delivery as one element of emergency obstetric care where complicated cases can be safely handled.

More so, the high number of women who did not attend ANC as suggested in this study, may have translated to their choice of place of delivery. This study found that the proportion of mothers who gave birth at a health facility was 51.4%, 30.7% and 17.9% in the South, central and north respectively. Although the findings from the south are similar to the NHIS report of 2018, which pecked health facility delivery to 50.2%, there is still cause for concern across other districts as observed. This proportion is much higher in the urban area (south) and slightly lower in the central than that in the North. The reason for these discrepancies in the proportion of facility delivery could be due to the level of awareness of the population across the district in the study area. Again, the rate of facility delivery in this study was generally lower when compared to study findings from other similar settings, like local studies from Ethiopia (73.2%) and Nigeria (65%) (Woiynshet, *et al.*, 2016; Shehu, *et al.,* 2022). This could be due to the inherent difference socio socio-demographic characteristics, access to health facilities and sociocultural structure. The study agrees that there is a negative increasing trend of home deliveries and the use of TBAs. For instance, as much as 42.7% and 46.4% in the Northern senatorial district still gave birth at home and patronised the services of TBAs respectively.

Findings from this study suggest no infant mortality was recorded in the selected facilities within the period under review. However, in-line graphs which show the trend of health indices in the study area from 2016-2020 are suggestive of an increase in ANC attendees and birth delivery in 2019 and 2020. The clinical implications of potential increases in these years are unclear but with almost a corresponding neonatal mortality at its peak in 2017, 2019 and 2020 across districts could pose challenges for maternal and newborn health. More research is needed to address the impact of COVID-19 on routine pregnancy and delivery care. This finding is not in agreement with a cross-sectional survey conducted in seven countries, which found a

decrease in planned antenatal and delivery care use due to COVID-19 concerns. The discrepancies in the average practices may be due to the period, and countries where studies were conducted.

Conclusion

There are wide varieties of factors that influence the quality of ANC services provision and utilization ranging from age, educational level and socio-economic factors. This study concluded that there is a 7.4% clear disruption of ANC services following the five-year trend compared with the survey results. Although in this study, there was a 5% decrease in institutional births between 2018 and 2019, we also observed an exponential increase of about 22.2% of institutional births in the survey results in 2020. Even though the majority of the women did their antenatal care follow-up in the healthcare facility, we observed in this study an increase in neonatal mortality in 2019 (Kingsley *et al.,* 2021) during the start of the pandemic as compared to 2018(6) with a matching unacceptably high rate of maternal and neonatal mortality in 2019 (WHO, 2018; Kingsley *et al.,* 2021) respectively. This study also found that there are still discrepancies in service delivery and utilization across districts as the proportion of mothers who gave birth at a health facility was 51.4%, 30.7% and 17.9% in the south, central and north respectively. However, the study agrees that there is a negative increasing trend of home deliveries and the use of TBAs. The study indicated that the COVID-19 pandemic imparted ANC services and utilization and identified government restrictions, peer pressure, myths and misconceptions, cost and attitudes of healthcare workers as the five most common reasons for the cancellation of ANC schedules.

Conflict of Interest

The authors have declared that no competing interest exists.

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