

CLINICAL ARTICLE

Obstetrics

Utilization cost of maternity services for childbirth among pregnant women with coronavirus disease 2019 in Nigeria's epicenter

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Abstract

Objective: To estimate utilization costs of spontaneous vaginal delivery (SVD) and cesarean delivery (CD) for pregnant women with coronavirus disease 2019 (COVID-19) at the largest teaching hospital in Lagos, the pandemic's epicenter in Nigeria.

Methods: We collected facility-based and household costs of all nine pregnant women with COVID-19 managed at the hospital. We compared their mean facility-based costs with those paid by pregnant women pre-COVID-19, identifying cost-drivers. We also estimated what would have been paid without subsidies, testing assumptions with a sensitivity analysis.

Results: Total utilization costs ranged from US \$494 for SVD with mild COVID-19 to US \$4553 for emergency CD with severe COVID-19. Though 32%–66% of facility-based cost were subsidized, costs of SVD and CD during the pandemic have doubled and tripled, respectively, compared with those paid pre-COVID-19. Of the facility-based costs, cost of personal protective equipment was the major cost-driver (50%). Oxygen was the major driver for women with severe COVID-19 (48%). Excluding treatment costs for COVID-19, mean facility-based costs were US \$228 (SVD) and US \$948 (CD).

Conclusion: Despite cost exemptions and donations, utilization costs remain prohibitive. Regulation of personal protective equipment and medical oxygen supply chains and expansion of advocacy for health insurance enrollments are needed in order to minimize catastrophic health expenditure.

KEYWORDS

Coronavirus disease 2019, cost, economic evaluation, maternal health, Nigeria, out-of-pocket expenditure, skilled birth attendance

1 | INTRODUCTION

Since its emergence in December 2019, coronavirus disease 2019 (COVID-19) has been a major disruptor to humanity.¹ By mid-October 2020, there had been over 38 million confirmed cases, including over a million deaths globally.¹ This has come on the heels of significant gains in global maternal mortality reduction over the past two decades. In 2017, it was estimated that there were 295 000 maternal deaths worldwide.² However, modeled estimates published early in the COVID-19 pandemic predicted that an 8.3%–38.6% increase in maternal deaths could be expected per month.³ Such increments do not bring countries any closer to achieving the global target of reducing the maternal mortality ratio to 70 per 100 000 live births.⁴ Nigeria alone accounts for 25% of global maternal deaths.²

Access to skilled health personnel is critical for reducing these deaths.⁵ However, one key barrier that limits access to skilled health personnel is service cost.² In Africa, 97% of mothers are delivered by spontaneous vaginal delivery (SVD) or cesarean delivery (CD).⁶ Guidelines have been published on how both SVD and CD should be provided to pregnant women with COVID-19 in Nigeria in line with global guidance.⁷ However, do the revamped services resulting from the guideline come at an additional cost to women?

The many indirect effects of COVID-19 and the consequences of the lockdown measures implemented by many countries,³ including Nigeria, highlight a need to focus on the cost of utilizing maternity services during the pandemic. Lagos is the epicenter of the COVID-19 pandemic in Nigeria with 20 370 cases and 204 deaths, compared with the national average of 1644 cases and 30 deaths in total, as of 16 October 2020.⁸ The objective of this study was to assess the utilization costs of maternity services for childbirth among pregnant women with COVID-19 in Lagos, Nigeria.

2 | MATERIALS AND METHODS

This was a hospital-based cost analysis from the user's (women's) perspective. Women were only approached after their discharge from the Lagos University Teaching Hospital (LUTH), Lagos, Nigeria. The inclusion and exclusion criteria used for recruitment are described in Table 1. From the included women, we collected data on direct cost components spent within the facility, outside the facility (household), opportunity (loss of productivity) costs, and any other relevant costs that women claimed to have expended for their care. All of these made up total utilization cost. We noted any exemptions and donations that reduced the cost paid by women. A detailed review of patient financial account records in the hospital was used to capture all facility-based costs. In capturing facility-based costs, we separated those related to obstetric care from those for COVID-19 care. For comparison, we collected data on the standard SVD and CD facility-based cost for booked and unbooked pregnant women pre-COVID-19. A pre-tested online tool was administered to women to collect household and opportunity costs. We collected data on the monthly income of self-employed women and their caregivers.

TABLE 1 Inclusion and exclusion criteria.

Inclusion criteria

- Pregnant women with COVID-19 who delivered at Lagos University Teaching Hospital, either by spontaneous vaginal delivery or cesarean delivery at term or near term

Exclusion criteria

- Pregnant women who delivered outside the hospital and were subsequently admitted for management of complications after delivery
- Pregnant women admitted into private wards and those exempted from paying user fees

We only included a pro-rata cost of the typical monthly cost related to the number of days that the women spent in hospital.

All cost data were collected in local currency (Naira [N]). Analysis was conducted in Microsoft EXCEL (Microsoft Corporation, Redmond, WA, USA) following conversion of cost data to US \$ as per the mean exchange rate for the year.⁹ All costs were presented in US \$. To synthesize findings, we identified the obstetric (pregnancy complications)¹⁰ and COVID-19 (mild or severe)¹¹ features that may influence utilization costs for each woman. Individual utilization costs were summed, and key cost drivers were identified for each case. We estimated the mean and median cost of the component and total costs per service (SVD, elective CD, and emergency CD). We also estimated how much more women would have paid if there were no exemptions or donations. We then conducted a sensitivity analysis to test their influence on subsidy valuation. In addition, we compared mean facility-based costs for pregnant women with COVID-19 with standard facility-based costs pre-COVID-19.

Ethical approval was obtained from the Health Research and Ethics Committee at LUTH (no. LUTHHREC/EREV/0520/24). Written informed consent was obtained from all participants.

3 | RESULTS

All nine pregnant women who had laboratory-confirmed COVID-19 and were managed in LUTH between April 1, 2020 and August 31, 2020 were recruited for this study. Their ages ranged from 22 to 40 years (median 33 years). All nine women were married and had attained tertiary education. Six of the women were employed, one was self-employed, and two were unemployed. The spouses of all nine women were employed.

Of the nine women, two remained symptomatic during admission, presenting with acute respiratory distress syndrome, the other seven were asymptomatic until discharge. Seven presented with no obstetric complications during the index pregnancy. For mode of delivery, there were eight CDs (Cases 1–8); five were elective (Cases 1–5) and the other three were emergency CDs (Cases 6–8). All CDs were performed under spinal anesthesia. Case 9 was the only patient who gave birth by SVD. The women spent between 4 and 22 days in the hospital (median 15 days) (Table 2). Except for one macerated stillbirth, all mothers and their babies were discharged alive.

TABLE 2 Description of care and utilization costs of spontaneous vaginal and caesarean delivery for pregnant women with COVID-19 in US \$.

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
Relevant details of care									
COVID-19 symptom state	Mild	Mild	Mild	Mild	Mild	Severe	Mild	Severe	Mild
Obstetric complication(s) in index pregnancy	None	None	None	None	None	None	Preeclampsia	None	Placental abruption
Mode of delivery	ELCD	ELCD	ELCD	ELCD	ELCD	EMCD	EMCD	EMCD	SVD
Length of hospital stay (days)	11	21	20	13	5	22	21	15	4
Cost of service utilization in US \$									
Facility-based costs									
Service fee ^a	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Ward admission ^a	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Feeding ^a	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Medicines	202 (24%)	331 (30%)	248 (27%)	246 (25%)	244 (33%)	594 (20%)	210 (28%)	235 (30%)	22 (10%)
Diagnostics (obstetric)	59 (7%)	96 (9%)	75 (8%)	99 (10%)	63 (8%)	248 (8%)	199(26%)	105 (14%)	38 (17%)
Diagnostics (COVID-19)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	74 (3%)	0 (0%)	0 (0%)	0 (0%)
Extra oxygen consumption	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1422 (48%)	0 (0%)	55 (7%)	0 (0%)
Supplies/consumables	101 (12%)	79 (7%)	134 (15%)	173 (18%)	132 (18%)	132 (4%)	119 (16%)	99 (13%)	45 (20%)
Personal protective equipment	478 (56%)	597 (54%)	446 (49%)	445 (46%)	303 (40%)	463 (16%)	229 (30%)	274 (35%)	116 (51%)
Discharge fee	7 (1%)	7 (1%)	0 (0%)	12 (1%)	7 (1%)	7 (<1%)	7 (1%)	7 (1%)	7 (3%)
Total facility-based costs	847 (59%)	1109 (99%)	903 (99%)	975 (93%)	749 (60%)	2939 (65%)	764 (58%)	773 (47%)	228 (46%)
Household costs									
Transport (to and from)	21 (100%)	8 (100%)	10 (100%)	7 (9%)	16 (100%)	10 (11%)	5 (100%)	13 (100%)	13 (57%)
Childcare	0 (0%)	0 (0%)	0 (0%)	68 (91%)	0 (0%)	78 (89%)	0 (0%)	0 (0%)	10 (43%)
Total household costs	21 (1%)	8 (1%)	10 (1%)	75 (7%)	16 (1%)	88 (2%)	5 (<1%)	13 (1%)	23 (5%)
Other costs									
Sundry items	0 (0%)	0 (0%)	0 (0%)	0 (0%)	52 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Gifts/Tips to hospital staff	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total other costs	0 (0%)	0 (0%)	0 (0%)	0 (0%)	52 (4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Opportunity costs									
Loss of productivity cost	572 (100%)	0 (0%)	0 (0%)	0 (0%)	433 (100%)	1525 (100%)	546 (100%)	845 (100%)	243 (100%)
Total opportunity costs	572 (40%)	0 (0%)	0 (0%)	0 (0%)	433 (35%)	1525 (33%)	546 (42%)	845 (52%)	243 (49%)
Total cost	1439 (100%)	1117 (100%)	914 (100%)	1049 (100%)	1250 (100%)	4553 (100%)	1315 (100%)	1631 (100%)	494 (100%)

Abbreviations: COVID-19, coronavirus disease 2019; ELCD, elective caesarean delivery; EMCD, emergency caesarean delivery; SVD, spontaneous vaginal delivery. ^aPatients with COVID-19 are exempted from paying service fees, ward admission and feeding.

TABLE 3 Facility-based cost of using spontaneous vaginal and cesarean delivery pre-COVID-19 in US\$(%)

	SVD, booked	SVD, unbooked	CD (spinal anesthesia), booked	CD (general anesthesia), booked	CD (spinal anesthesia), unbooked	CD (general anesthesia), unbooked
Facility-based costs in US \$						
Service fee ^a	28 (24%)	55 (31%)	82 (21%)	82 (20%)	82 (19%)	82 (18%)
Ward admission	0 (0%)	0 (0%)	74 (19%)	74 (18%)	74 (17%)	74 (16%)
Feeding	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Medicines	42 (37%)	42 (23%)	148 (38%)	175 (43%)	148 (34%)	175 (38%)
Diagnostics (obstetric)	10 (9%)	75 (42%)	74 (19%)	74 (18%)	126 (29%)	126 (27%)
Prenatal fees	28 (24%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Supplies/consumables	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Discharge fee	7 (6%)	7 (4%)	7 (2%)	7 (2%)	7 (1%)	7 (1%)
Total facility-based costs	113 (100%)	179 (100%)	384 (100%)	411 (100%)	436 (100%)	464 (100%)

Abbreviations: CD, cesarean delivery; COVID-19, coronavirus disease 2019; SVD, spontaneous vaginal delivery.

^aService fees paid for vaginal delivery include ward admission and feeding.

The total utilization (facility-based and household) cost was US \$494 for the sole pregnant woman who had SVD and mild COVID-19. Total utilization cost for those who underwent CD ranged from US \$914 for a pregnant woman who had an uncomplicated elective CD to US \$4553 for one who had an emergency CD and severe COVID-19. Mean total utilization cost across the entire population was US \$1529 (standard deviation US \$1112). When disaggregated, facility-based costs made up the highest proportion (67% of the mean total utilization cost) whereas opportunity cost due to loss of productivity of the caregiver made up 30%. Transport, childcare, and purchase of other sundry items constituted the remaining 3% (Table 2).

For facility-based costs, the hospital management exempted all COVID-19 patients from paying the service fee, ward admission, and feeding, in line with the Federal Government's directive. In addition, laboratory confirmation for COVID-19 by reverse transcription polymerase chain reaction test was free. With support from government, international agencies, some charities and philanthropists, some personal protective equipment (PPE) was made available to skilled health personnel at no cost to the women.

For the costs still required, the woman who had SVD paid a total of US \$228. The cost of additional PPE required for their care was the major cost driver (50%), followed by supplies (20%) and obstetric diagnostics (17%). For elective CD, facility-based cost ranged from US \$749 to US \$1109, with a median cost of US \$903. Major cost drivers for elective CD were PPE (50%), medicines (28%), and medical supplies (14%). Excluding the cost of additional supplemental oxygen required by women who had severe COVID-19 symptoms, emergency CD cost ranged from US \$719 to US \$1517. The major cost drivers were medicines (35%), PPE (32%), and diagnostics (18%). Based on severity of COVID-19 symptoms, cost ranged from

US \$228 for a woman with mild disease who gave birth by SVD, to US \$2939 paid by a woman who had severe COVID-19 symptoms requiring additional supplemental oxygen extra-operatively during admission. For this latter case (Case 7), the medical oxygen required to manage severe COVID-19 symptoms was the major cost driver (48%), followed by medicines (20%) and supplies (14%) (Table 2).

The cost of SVD for pregnant women with COVID-19 is more than double the cost paid by a booked pregnant woman pre-COVID-19 (US \$113). For CD, excluding medical oxygen, the average facility-based cost of all eight CD patients (US \$984) was about 2.5 times more than what women paid pre-COVID-19 (US \$384) (Tables 2 and 3).

Without the exemptions and donations, the pregnant woman with mild COVID-19 who gave birth via SVD (Case 9) would have paid US \$526 in facility-based costs, meaning she received 57% of the facility-based cost as subsidies and donations. Pregnant women with mild COVID-19 requiring CD (Cases 1–5 and 7) would have paid US \$1767–US \$1960, but their costs were subsidized by 43%–66%. Those with severe COVID-19 symptoms requiring CD would have paid US \$2181–US \$5088, but their costs were subsidized by 42%–65% (Table 4). Using the most conservative estimates for the potential cost subsidies being received by the women, facility-based costs were subsidized by between 21% and 51% (Table S1).

4 | DISCUSSION

Regarding facility-based costs, we found that pregnant women with COVID-19 are paying as much as US \$228 for SVD when they have mild COVID-19 and US \$2939 for emergency CD when they present with severe COVID-19. In a 2020 systematic review, median

TABLE 4 Subsidies received by women through donations and exemptions in US \$.

Case	Days in delivery theater	Delivery and immediate postpartum (US \$)	First day postpartum till discharge (US \$)	Hospital admission fees (US \$)	Additional days beyond week 1 (US \$)	Total subsidy received (US \$)	Actual amount paid by women (US \$)	PPE cost less cost paid by women for PPE (US \$)	Total that would have been paid (US \$)	% paid by women	% paid by other sources
1	8	780	770	74	36	1264	847	478	2111	40%	60%
2	4	780	385	74	127	851	1109	597	1960	57%	43%
3	4	780	385	74	118	993	903	446	1896	48%	52%
4	4	780	385	74	55	930	975	445	1905	51%	49%
5	4	780	385	74	0	1018	749	303	1767	42%	58%
6	16	780	1539	74	137	2149	1517	463	3666	41%	59%
7	7	780	673	74	127	1508	764	229	2272	34%	66%
8	7	780	673	74	73	1408	719	274	2127	34%	66%
9	2	127	71	28	0	110	228	116	338	67%	33%

Abbreviations: PPE, personal protective equipment.

cost of SVD across low- to middle-income countries was US \$40 in a public hospital whereas CD was US \$178 in public hospitals.¹² This suggests that pregnant women with COVID-19 are paying six times more for SVD, and as much as 16 times more if they have severe COVID-19 and require CD.¹²

It is established that tertiary hospitals like LUTH are significantly more expensive for care compared with secondary and primary facilities, mostly because of their specialist expertise.¹² However, the standard cost for an unbooked patient managed in LUTH pre-COVID-19 (US \$464) is still less than the maximum obtainable cost reported for another Nigerian teaching hospital (US \$667) in 2013.¹³ In our study, despite government-mandated exemptions on certain cost components and donations to support care provision,^{14,15} pregnant women with COVID-19 are paying as much as two times more for SVD, and three times more facility-based costs for CD when compared with the pre-COVID-19 era. The major cost driver was PPE. Pre-COVID-19, most reported that medicines and supplies, transport, and lodging were the major cost drivers that women had to tackle to access care.¹² However, there is also the emergence of medical oxygen as the major cost driver in severe cases that require long hospital admission. This is despite oxygen being the second most important component for COVID-19 care.¹⁶

In our study, no woman reported giving any gifts to health workers. With so much caution being taken with care of pregnant women with COVID-19, it might be the case that the women are simply not giving gifts. However, this is unlikely, as Nigerian pregnant women typically show their appreciation of the efforts of health workers in taking care of them by gifting.¹³ A more plausible explanation may be that the health workers themselves are refusing to receive gifts or tips because they want to minimize contact, conscious of the possibility of being infected through the gifting.

For the other cost components, the median transport cost (US \$10) reported in our study is higher than in Tanzania (US \$0.09) but lower than the US \$51 reported in Bangladesh.^{17,18} In our study, opportunity costs ranged from US \$243 to US \$572, while in the literature, adjusted estimates ranging from US \$3 in Lao PDR for SVD, to US \$89 for CD in Nepal have been reported.¹² This may be because pregnant women with COVID-19 were hospitalized for longer, so their partners had to stay away from work for longer.

Our study findings have clear policy implications. Pre-COVID-19, providers used some PPE, albeit not as much as is now being required. Indeed, demand currently far outstrips supply, with 60% of providers reporting insufficient PPE to keep them safe while providing care.¹⁹ With such gaps in the PPE supply chain, costs are being passed on to women. This increases the risk of catastrophic health expenditure. Providers, more so those in low- to middle-income countries, need to explore innovative ways to source PPE without passing the burden on to pregnant women.²⁰ There is a case for governments to mobilize local PPE production and negotiate with sellers, while offering incentives for reduced costs and regulating sell-on costs. New thinking is also needed for oxygen supply. Pre-COVID-19, there was already concern about oxygen sufficiency in Africa.¹⁶ Approaches such as installing oxygen concentrators,

enabling private construction of oxygen plants, and use of solar-powered oxygen delivery are being implemented to boost oxygen supply during the pandemic,¹⁶ but these costs should not be passed on to pregnant women.

It should be noted that the women in our study were all educated and they and/or their partners were employed, yet, as our results showed, they benefited from 32%–62% of subsidies in facility-based costs. With 40% of the population living below the poverty line,²¹ many will not be able to afford the increased service utilization costs of the COVID-19 era without these donations and exemptions. Indeed, there might be a case for a comprehensive fee exemption policy, as was introduced by a state government in Nigeria.²² However, it is not known how long this can be sustained, with treatment of one patient with COVID-19 costing the government US \$260–US \$2604/day.²³ Likewise, how long can donations last?

With the pandemic still ongoing, costs of childbirth may yet rise for all pregnant women, with some experts already proposing the need for universal testing of pregnant women for COVID-19 and a lower threshold for admitting pregnant women to hospital and intensive care units.^{24,25} This and any other additional costs may cause pregnant women to delay care-seeking, putting them at a greater risk of otherwise preventable obstetric complications. As these costs still need to be paid, the pandemic provides an opportunity to drive advocacy for enrollment in health insurance schemes.

There are limitations to bear in mind when interpreting the findings of this study. First, we did not collect data on household costs in the pre-COVID-19 era. Second, we only reported costs from one public tertiary hospital, and this cost may not be representative of the costs being incurred by women around the country, especially within the private sector, where costs for using services are typically higher than in the public sector.¹² Follow-up studies should be conducted to capture utilization costs for using other public and private facilities.

In conclusion, the cost of using maternity services for childbirth has increased and is likely to remain significantly high for women if the exemptions being offered by governments become unaffordable, donations reduce, or new requirements for universal testing have a chargeable fee. If COVID-19 becomes the new normal, then there will be many more pregnant women with COVID-19, including many who cannot afford the huge costs of care. Urgent measures are needed to ensure that women and their families are not being locked out of the health system.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

AUTHOR CONTRIBUTIONS

AB-T conceived the study. AB-T and CAA led the study design. CCM, BBA, and TAA-N collected the data. AB-T and CCM conducted the data analysis. AB-T, CCM, MB, BBA, and CAA were involved in drafting the manuscript. All authors read and approved the final version of the manuscript.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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