

CLINICAL ARTICLE

Obstetrics

The economic toll of COVID-19: A cohort study of prevalence and economic factors associated with postpartum depression in Kenya

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Abstract

Objective: The aim of the study is to examine the risk of postpartum depression (PPD) among women who delivered during the COVID-19 pandemic compared to women who delivered before the COVID-19 pandemic and how economic challenges are associated with PPD.

Methods: Data were collected from 2332 women. This includes 1197 women from healthcare facilities in 2019 who were followed up at 2–4 and 10 weeks postpartum. Additionally, we recruited 1135 women who delivered from March 16, 2020 onward when COVID-19 restrictions were mandated in Kenya in the same catchment areas as the original sample to compare PPD rates.

Results: Adjusting for covariates, women who delivered during COVID-19 had 2.5 times higher odds of screening positive for PPD than women who delivered before COVID-19 (95% confidence interval [CI] 1.92–3.15). Women who reported household food insecurity, required to pay a fee to cover the cost of PPE during labor and delivery and/or postnatal visit(s), and those who reported COVID-19 employment-related impacts had a higher likelihood of screening for PPD compared to those who did not report these experiences.

Conclusion: The COVID-19 pandemic has greatly increased the economic vulnerability of women, resulting in increases in PPD.

KEYWORDS

COVID-19, economic, food insecurity, Kenya, PPD

1 | INTRODUCTION

The COVID-19 pandemic has had enormous effects on mental health globally. Pregnant and postpartum women may be at elevated risk of depression given social distancing measures resulting in lack of social support, forced separation from newborns, increases in childcare demands, increases in intimate partner violence, and overall uncertainty during the pandemic.^{1,2} One meta-analysis found that

the COVID-19 pandemic increased stress, anxiety, and PPD among lactating mothers; however, of the 19 studies included, none were conducted in Africa.³ It is estimated that postpartum depression (PPD) affects approximately 6.9%–44% of women in Africa, suggesting this continues to be a major public health problem.⁴ PPD is associated with decreases in mother–child bonding⁵ and adverse child cognitive and socioemotional development.⁶ It is critical to examine factors associated with PPD during the COVID-19 pandemic

to ensure that the pandemic has not exacerbated inequities in health outcomes.

In particular, significant evidence suggests that the pandemic has had catastrophic effects on women's economic outcomes, with reports estimating that 47 million women and girls will be pushed into poverty as a result of the pandemic. Lack of social protections, increase in women's unemployment compared to men,¹ and unpaid care and domestic work⁷ all increase women's economic vulnerability as a result of COVID-19. Additionally, pregnant and postpartum women are particularly vulnerable to food insecurity because of increased nutritional needs. Studies prior to the pandemic found that persistent food insecurity was associated with perinatal depression in Kenya.⁹ Prior to the pandemic, out-of-pocket expenditures during maternity care also placed an economic burden on families.¹⁰ It is unclear how economic factors related to employment changes, household food insecurity, and healthcare facility-related costs are associated with PPD during the COVID-19 pandemic.

The objective of this study was to examine the impacts of COVID-19 on PPD. In particular, we assess economic factors resulting from the COVID-19 pandemic among postpartum women and the associations with PPD. We hypothesize that (1) women who delivered during the COVID-19 pandemic would have increased risk of PPD compared to women who delivered before the pandemic; and (2) women who experienced economic effects (i.e., household food insecurity, employment, and healthcare facility-related costs) due to COVID-19 would be more likely to report PPD compared to those who reported less economic effects.

2 | MATERIALS AND METHODS

2.1 | Study sample and recruitment

Two samples of reproductive-aged women (15–49 years) who had a singleton delivery and a functional phone for follow-up were recruited into the study. First, we include 1197 women who had enrolled in a previous maternal health study in 2019. At the time of original recruitment, women had delivered within the last seven days at one of six participating facilities in Nairobi or Kiambu Counties. Women were followed up at 2–4 and 10 weeks postpartum via phone. Further details on eligibility and procedures can be found in prior publications.¹¹ Second, we include 1135 women who delivered after March 16, 2020, or since COVID-19 restrictions were announced in Kenya. We sampled women based on the catchment areas surrounding the six facilities from the previous study for comparability. Recruitment of women occurred through close engagement with village elders and community health volunteers from the six catchment areas.

Eight experienced, female enumerators and one female supervisor participated in three-day virtual training on the study procedures. Pilot testing was conducted with 30 women to ensure quality of questionnaire and survey logistics. Enumerators contacted women by phone and obtained verbal consent which was audio-recorded. Women could continue with the survey or schedule an appointment.

For those unable to be reached, up to nine phone call attempts were made at varying days and times. The 30-min phone survey included modules on employment and financial impacts of COVID 19, health care utilization during COVID-19, trust in health care systems, socio-demographic questions, and pregnancy and childbirth history. Women who consented to participate received approximately \$1.00 worth of mobile credit as an appreciation for their time.

2.2 | Measures

PPD was the primary outcome of interest and was evaluated using the World Health Organization's Maternal WOICE Tool for postnatal care.¹² The measure includes 16 items whereby respondents are asked whether they felt bothered by various problems, for example, not being able to stop or control worrying, becoming easily annoyed or irritable, and having little interest or pleasure in doing things. All participants were administered the first 10 questions; however, only respondents who indicated having little interest or pleasure in doing things and/or feeling down, depressed, or hopeless were asked the remaining 6 questions. Items were scored from 0 ("not at all") to 3 ("nearly every day") to assess the frequency of depressive symptoms over the last 2 weeks. Items were then summed and scores of 10 or more on either set of questions was considered to be indicative of depression. Among women who delivered before COVID-19, PPD was measured at 2–4 and 10 weeks after delivery; depression was assessed by examining whether the outcome occurred at either follow-up interview. Among women who delivered during COVID-19, depression was measured at the single survey occurring within 8 months of delivery.

Individual-level demographic characteristics include age, marital status, educational attainment, employment status, self-rated health status, and parity. COVID-related economic impacts were also captured among women who delivered during COVID-19, including household food insecurity, facility-level policies requiring women to pay fees to cover the cost of personal protective equipment (PPE) during delivery and post-natal visits, and experiencing employment-related impacts such as job loss or decreased pay. An index of household food insecurity was constructed using items from the Household Food Insecurity Access Scale,¹³ whereby women were asked whether they experienced six indicators of food insecurity in the past 4 weeks (1 = yes, 0 = no). Responses were summed across all six indicators to construct an index score, with possible scores ranging from 0 to 6 signifying the number of household food insecurity indicators endorsed. Employment-related impacts were assessed only among those women who reported to have been employed at the start of and/or during the pandemic. An employment-related impact score was derived by summing the number of impacts reported with possible scores ranging from 0 to 5.

2.3 | Analyses

Among women who delivered before the pandemic, the sample was restricted to those who completed at least one follow-up visit and

thus had complete information on PPD ($N = 1014/1197$ or 85%). The sample of women who delivered during COVID-19 included women who delivered in facilities and at home. Because all the women who delivered before COVID-19 had facility deliveries, the sample of women who delivered during the pandemic was restricted to women with facility deliveries only ($n = 1072/1135$ or 95%) to make these two samples more comparable. This yielded a final analytic sample of 1014 women who delivered before COVID-19 and 1072 women who delivered during COVID-19.

Data were analyzed using descriptive, bivariate, and multivariable statistics using StataSE version 15.1.¹⁴ Pearson chi-square tests were used to assess potential differences in the distribution of demographic and health characteristics across the study samples. Several multivariable logistic regression models were also run to assess the relationship between select COVID-related economic impacts (i.e., household food insecurity score, being required to pay a fee to cover the cost of PPE during delivery and postnatal visits, respectively, and employment-related impact score) and screening positive for PPD among women who delivered during COVID-19. Ethical clearance was received from the Kenya Medical Research

Institute (KEMRI), Scientific and Ethics Review Unit (NON-KEMRI 702) and from the University of California Los Angeles Institutional Review Board (IRB #20-001421).

3 | RESULTS

Differences in demographic characteristics between women who delivered before and during COVID-19 are presented in [Table 1](#). A significantly higher proportion of women who delivered during COVID-19 screened positive for PPD than women who delivered before ($p < 0.001$). In adjusted models, women who delivered during COVID-19 had significantly higher odds of screening positive for PPD than women who delivered before (adjusted odds ratio [aOR] 2.46, 95% confidence interval [CI] 1.92–3.15) [Table 2](#).

[Table 3](#) provides the distribution of various COVID-related economic impacts as reported by women who delivered during COVID-19. About 91% of women endorsed at least one indicator of household food insecurity with a mean (standard deviation [SD]) index score of 3.8 (1.8). About 8% and 5% of women reported being

TABLE 1 Demographic and health characteristics of women who delivered before and during COVID-19, respectively

Characteristic	Women who delivered before COVID-19 $N = 1014$	Women who delivered during COVID-19 $N = 1072$	P-value ^a
Age, years			<0.001
Less than 25	468 (46.2)	381 (35.5)	
25–29	323 (31.9)	333 (31.1)	
30–34	152 (15.0)	232 (21.6)	
35 and older	71 (7.0)	126 (11.8)	
Married or partnered, yes	829 (81.8)	733 (68.4)	<0.001
Educational attainment			<0.001
Primary or less	443 (43.7)	386 (36.0)	
Some secondary	392 (38.7)	170 (15.9)	
Secondary	152 (15.0)	396 (36.9)	
College/University	27 (2.7)	120 (11.2)	
Employment status at time of survey			<0.001
Employed, informal sector	308 (30.4)	202 (18.8)	
Employed, formal sector	103 (10.2)	26 (2.4)	
Unemployed	603 (59.5)	844 (78.7)	
Self-rated health status			<0.001
Fair, poor, or very poor	128 (12.6)	399 (37.2)	
Excellent, very good, or good	886 (87.4)	673 (62.8)	
Parity			<0.001
1	362 (35.7)	303 (28.3)	
2	362 (35.7)	349 (32.6)	
3	185 (18.2)	250 (23.3)	
4 or more	105 (10.4)	170 (15.9)	
Screened positive for PPD, yes	169 (16.7)	411 (38.3)	<0.001

Note: Frequency (proportion) shown. Percentages may not add to 100 due to rounding.

^aPearson chi-squared test.

required to pay a fee to cover the cost of PPE during labor/delivery or during postpartum and/or postnatal visits, respectively. Among women who were employed at the start of or during COVID, 94% reported at least one employment-related impact due to COVID-19 with a mean (SD) of 1.9 (1.5). The most reported employment-related impact was job loss, endorsed by nearly 70% of women.

After adjusting for individual-level characteristics, increasing household food insecurity score was associated with increased odds of screening positive for PPD (Table 4). Specifically, the odds of screening positive for PPD increased by 56% for each one-unit increase in household food insecurity score (Model 1; aOR 1.56, 95% CI 1.42–1.72). Women who were required to pay a fee to cover the cost of PPE during labor/delivery had significantly higher odds of screening positive for PPD than women who were not (Model 2; aOR 2.31, 95% CI 1.40–3.80). Similarly, women who were required to pay a fee to cover the cost of PPE during postpartum and/or postnatal visit(s)

also had increased odds of screening positive for depression (Model 3; aOR 4.56, 95% CI 2.30–9.04). Among women who delivered during COVID who reported to have been working at the start of the pandemic, the odds of screening positive for depression increased by 28% for each one-unit increase in the employment-related impacts score (aOR 1.28, 95% CI 1.15–1.42). In general, results remained consistent when including all economic indicators in a single model (Model 5) except for being required to pay a fee to cover the cost of PPE during labor/delivery which was no longer significantly associated with screening positive for PPD when holding all over economic indicators and individual-level characteristics constant.

4 | DISCUSSION

This study found that women who delivered during the COVID-19 pandemic were 2.5 times more likely to screen for PPD compared to women who delivered before the pandemic. This corroborates other studies which have found that PPD has increased globally during the pandemic.^{3,8,15} This study offers insights into PPD in Kenya, and found that over 38% of women in Kenya reported PPD during the pandemic compared to about 17% of women who delivered before the pandemic.

This study assessed a number of economic factors associated with PPD including employment impacts due to COVID-19, reports of household food insecurity, and facility healthcare costs related to COVID-19. Almost 80% of women who delivered during the pandemic were unemployed compared to 60% of women who delivered before the pandemic, and it should be noted that among those who

TABLE 2 Multivariable logistic regression adjusted odds ratios (95% confident intervals) of PPD comparing women who delivered during the COVID-19 pandemic to those who delivered before

Sample	Screened positive for PPD
Women who delivered before COVID-19	Ref
Women who delivered during COVID-19	2.46 (1.92–3.15)***

Note: Model adjusts for individual characteristics including age, marital status, education, employment, self-rated health status, and parity.

*** $P < 0.001$.

TABLE 3 Economic impacts due to COVID-19 among women who delivered during the COVID-19 pandemic

COVID-related impact	Yes	No
Household food insecurity ($N = 1072$)		
Endorsed any household food insecurity indicator	972 (90.7)	100 (9.3)
Household food insecurity score ^a , mean (SD)	3.8 (1.8)	
Facility-level policies ($N = 1072$)		
Woman required to pay fee to cover cost of PPE during labor/delivery	80 (7.5)	992 (92.5)
Woman required to pay fee to cover cost of PPE during postpartum and/or postnatal visit(s) ^b	47 (4.4)	1014 (95.6)
Employment related impacts ($N = 841$) ^c		
Reported any employment-related impact	790 (93.9)	51 (6.1)
Employment-related impacts score ^d , mean (SD)	1.9 (1.5)	
Job loss	571 (67.9)	270 (32.1)
Decreased pay	310 (36.9)	531 (63.1)
Job disruptions due to childcare responsibilities	291 (34.6)	550 (65.4)
Decreased job security	275 (32.7)	566 (67.3)
Loss of hours	188 (22.4)	652 (77.7)

Note: Frequency (proportion) shown unless otherwise noted. Percentages may not add to 100 due to rounding. SD, standard deviation.

^aHousehold food insecurity score denotes the number of household food insecurity indicators endorsed; possible scores range from 0 to 6.

^bRestricted to those who reported utilizing postpartum and/or newborn care ($N = 1061$).

^cRestricted to those who reported being employed at the start of/during COVID.

^dEmployment-related impacts score denotes the number of impacts reported; possible scores range from 0 to 5.

TABLE 4 Multivariable logistic regression adjusted odds ratios (95% confident intervals) examining economic determinants of PPD due to COVID-19

COVID-related impact	Screened positive for PPD				
	Model 1	Model 2	Model 3	Model 4	Model 5
Household food insecurity score	1.56 (1.42–1.72)***	–	–	–	1.53 (1.37–1.70)***
Required to pay fee to cover cost of PPE during labor/delivery	–	–	–	–	–
No		Ref			Ref
Yes		2.31 (1.40–3.80)**			1.77 (0.92–3.44)
Required to pay fee to cover cost of PPE during postpartum and/or postnatal visit(s)	–	–	–	–	–
No			Ref		Ref
Yes			4.56 (2.30–9.04)***		2.41 (1.08–5.39)*
Employment-related impact score	–	–	–	1.28 (1.15–1.42)***	1.29 (1.15–1.45)***

Note: All models adjusted for individual characteristics including age, marital status, education, employment, self-rated health status, and parity.
* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

were employed, most held jobs in the informal sector. This may explain why almost 70% of women reported being impacted by the COVID-19 pandemic with job loss given that work in the informal sector is generally precarious, unstable, and often dangerous, in addition to providing low wages compared to formal work.^{16–18} As Kenya instituted a nationwide lockdown with movement restrictions and nightly curfews, open-air markets and interpersonal exchange of goods – which is foundational to those working in the informal sector – were shut down.^{16,19} This all contributes to loss in informal jobs, accounting for 83% of total Kenyan workers or 15 million Kenyans, and particularly among women, who outnumber their male counterparts in both informal and domestic work.²⁰

This study also found that reported food insecurity was associated with screening for PPD. Our study found that over 90% of women reported at least one indicator of food insecurity. Additionally, in multivariate analyses, reporting an increase in food insecurity was associated with increased PPD. Past studies have also found that inadequate nutrition is associated with PPD.²¹ Addressing the social determinants of health, including receiving adequate nutrition during and after childbirth when nutritional needs may be higher, is critical to maternal mental health care.

One overlooked factor in the perinatal literature is the economic burdens related to delivering in a healthcare facility during COVID-19. Past studies find that perceived financial burdens related to delivering in a facility deterred women from accessing care.^{22,23} In our study, about 8% and 5% of women reported being required to pay a fee to cover the cost of PPE during labor/delivery or during postpartum and/or postnatal visits, respectively. Even small costs may deter women from receiving quality care, decrease person-centered care, and potentially add barriers for women to access healthcare facilities in the future either for herself or her newborn.¹⁰ Reporting a required payment for PPE during labor/delivery and postnatal visits

was associated with PPD; however, in models where all economic indicators were included in the model, only paying for PPE during postnatal visits was associated with PPD. One potential explanation for this association may lie in the fact that postnatal visits are typically completely free, in contrast to deliveries, which often require purchase of extraneous items (razor, cotton wool, etc); thus, PPE during labor/delivery represented an expected, and therefore acceptable, cost. Future studies may further explore these relationships.

The study has a few limitations worth noting. First and foremost, the nature of the study did not allow us to follow-up the same women before and during the pandemic, thus making comparison between the groups imperfect. For example, we did not ask questions regarding food insecurity in the sample of women who delivered before the pandemic and, thus, are unable to make comparisons between those who delivered before and during the pandemic. However, we mitigated this by recruiting women in the same catchment areas of the facilities to create as comparable of a sample as possible. Other studies of PPD have relied on social media or internet surveys.^{15,24} This study leverages an existing, ongoing survey and cohort of women who delivered before the pandemic and recruited a new sample of women through trusted community networks, including village leaders and community health volunteers. Additionally, the study was in Kiambu and Nairobi counties; therefore, the results may have limited generalizability in other contexts.

The study has a number of clinical, programmatic, and research implications. A multi-pronged approach is critical to addressing women's economic vulnerability during the pandemic. Healthcare facilities should reduce out-of-pocket expenditures and provide up-to-date information on what may be required across the continuum of reproductive healthcare, including antenatal, intrapartum, postpartum, and postnatal visits. Community health programs should be implemented to ensure that women receive timely access to

affordable, nutritional food. Community health volunteers may also have a role to play in providing social and emotional support to pregnant and postpartum women, in addition to serving as a conduit to healthcare facilities and providing appropriate information regarding planning for pregnancies and postnatal visits. Lastly, policy makers should pass policies that ensure adequate safety nets for pregnant and postpartum women, including those in the informal sector, given increasing childcare demands and economic vulnerability.

CONFLICTS OF INTERESTS

None to report.

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AUTHOR CONTRIBUTIONS

MS led the design, analysis, interpretation of the study and drafted the manuscript. AL contributed to data collection, analysis, interpretation, and writing drafts of the manuscript. JM contributed to data collection, analyses, and writing of the manuscript. GG contributed to the design, data collection, interpretation and writing of the manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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