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# BMJ Paediatrics Open

## COVID-19 lockdown measures reduced institutional delivery and neonatal admissions, but not prematurity, in Lagos, Nigeria

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## COVID-19 lockdown measures reduced institutional delivery and neonatal admissions, but not prematurity, in Lagos, Nigeria

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### PATIENT AND PUBLIC INVOLVEMENT

This research was a retrospective analysis of anonymized hospital records and done without patient or public involvement. Patients were not invited to comment or to contribute to the methodology, interpret the results or contribute to the writing of the manuscript.

### Abstract

We assessed the effect of COVID-19 lockdown measures on deliveries and neonatal admissions according to gestation in Lagos, Nigeria. During lockdown (April–June 2020), there was a marked fall of about 50% in hospital deliveries and admissions to the neonatal wards for both in- and outborn infants compared with pre-lockdown (January–March 2020) and a comparison period (April–June 2019). However, the proportion of extreme and very preterm infants was similar in each period. Lockdown markedly reduced both hospital deliveries and healthcare seeking for sick newborns but did not affect the frequency of preterm births.

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Studies from Ireland,<sup>1</sup> Denmark <sup>2</sup> and the Netherlands<sup>3</sup> have reported that COVID-19 lockdown measures markedly reduced preterm births. These researchers have suggested that the effects of lockdown may shed light on mechanisms of preterm birth and, thereby, possible ways of preventing it and have called for similar data from different geographical settings. We are not aware of reports of the effects of lockdown on preterm births from low- and middle-income countries (LMICs). The Lagos State Government instituted lockdown measures on March 27<sup>th</sup> 2020.<sup>4</sup> Nationally, lockdown measures in Nigeria were eased in phases from May, 2020 and lasted until October 30, 2020.<sup>5</sup> During this period, there were restrictions on movements, economic activities and social gatherings. Schools, offices, markets, religious houses and businesses were shut down but health services remained open. We assessed the effect of lockdown on deliveries and neonatal admissions at the Lagos State University Teaching Hospital (LUTH), a referral hospital for primary, secondary and other tertiary facilities in Lagos and neighbouring states. LUTH is the largest neonatal unit in the country and served as a COVID-19 referral and delivery center for COVID-19 positive pregnant women.

We reviewed records for hospital deliveries and in- and out-born admissions to the neonatal wards according to gestation for three, 3-month time periods: lockdown (April–June 2020), pre-lockdown (January–March 2020) and a comparison period (April–June 2019). Estimation of gestational age remained unchanged during the study periods and was based on the best obstetric estimates or Ballard score according to usual clinical practice. The data extracted were de-identified and analyzed using simple descriptive statistics. Ethical approval for the study was obtained from the LUTH Health and Research Ethics Committee (approval number LUTHHREC/EREV/0520/28).

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During the 3 months of lockdown (April-June 2020), there were 121 hospital deliveries and 176 neonatal admissions, a fall of about 50% in both hospital deliveries and admissions to the neonatal wards. Admissions of in-born and out-born infants were reduced equally ( $p=0.57$ ; Table 1). However, the distribution of preterm births amongst deliveries ( $p=0.055$ ) and neonatal admissions ( $p=0.73$ ) was similar before and after lockdown measures were introduced (Table 1).

**Table 1. Deliveries and neonatal admissions according to study period**

	Comparison April-June 2019	Pre-lockdown Jan-Mar 2020	Lockdown April-June 2020	$\chi^2$ P value
<b>Deliveries n</b>	254	253	121	
• extreme preterm (<28 wks) n (%)	4 (1.6)	6 (2.4)	3 (2.5)	12.32 0.055
• very preterm (28-<32 wks) n (%)	23 (9.1)	20 (7.9)	12 (9.9)	
• moderate to late preterm (32-<37 wks) n (%)	48 (18.9)	58 (22.9)	10 (8.3)	
• term ( $\geq 37$ weeks) n (%)	179 (70.5)	169 (66.8)	96 (79.3)	
<b>Neonatal admissions n</b>	375	364	176	
<i>Place of delivery</i>				
• in-born n (%)	116 (30.9)	103 (28.3)	57 (32.4)	1.12 0.57
• out-born n (%)	259 (69.1)	261 (71.7)	119 (67.6)	
<i>Gestation</i>				
• extreme preterm (<28 wks) n (%)	11 (2.9)	19 (5.2)	5 (2.8)	3.63 0.73
• very preterm (28-<32 wks) n (%)	39 (10.4)	36 (9.9)	17 (9.6)	
• moderate to late preterm (32-<37 wks) n (%)	66 (17.6)	58 (15.9)	32 (18.2)	

• term (≥37 weeks) n (%)	259 (9.1)	251 (9.0)	122 (9.3)
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The findings from high-income countries of an unprecedented reduction in the birth of extreme preterm and extremely low birthweight deliveries<sup>1-3</sup> have suggested that lockdown measures may have reduced preterm birth through several mechanisms including improvements in ambient air quality, reductions in maternal stress (e.g. less work-related stress; better social support) and reduced exposure to infections.<sup>3</sup> Our finding that lockdown did affect preterm births disproportionately suggests that it had different effects in our population. Lockdown measures worsen existing socioeconomic inequalities and likely resulted in greater economic hardship and the associated stress for the large number of Lagosians who depend on daily wages. Also, confinement to homes with larger family sizes may actually increase exposure to infection. Interestingly, in the study of the Netherlands, the reduction of preterm deliveries occurred mainly amongst higher socioeconomic groups.<sup>3</sup>

A highly concerning finding was the marked reduction in deliveries at LUTH. This was not observed in the study in Ireland that was also based on hospital records<sup>2</sup> and again suggests markedly different effects of lockdown in different populations. The equally concerning fall in neonatal admissions for out-born infants also indicates that lockdown had a marked negative effect on healthcare seeking behaviour amongst the parents and families of sick newborns. Assessment of the effects of lockdown measures in different contexts, including LMICs, will provide greater insights into their effects on health and also mechanisms of preterm birth. Strategies to counter the the negative effects of lockdown on the health of vulnerable populations will need to be tailored to specific contexts.

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# Impact of COVID-19 lockdown measures on institutional delivery, neonatal admissions and prematurity: a reflection from Lagos, Nigeria

Beatrice N Ezenwa,<sup>1</sup> Iretiola B Fajolu,<sup>1</sup> Helen Nabwera,<sup>2</sup> Duolao Wang,<sup>2</sup> Chinyere Ezeaka,<sup>1</sup> Stephen Allen<sup>2</sup>

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## PATIENT AND PUBLIC INVOLVEMENT

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## Abstract

We assessed the effect of COVID-19 lockdown on deliveries and neonatal admissions according to gestation in Lagos, Nigeria. During lockdown (April–June 2020), there was a marked fall of about 50% in in-hospital deliveries and admissions to the neonatal wards for both in- and outborn infants compared with pre-lockdown (January–March 2020) and a comparison period (April–June 2019). However, the proportion of preterm infants was broadly similar in each period. Lockdown markedly reduced hospital deliveries and healthcare-seeking for sick newborns but did not influence the overall proportion of preterm births among in-house deliveries and out-born neonatal admissions.

Studies from high-income countries (HICs)<sup>1-3</sup> have reported that COVID-19 lockdown measures markedly reduced preterm births and this may shed light on mechanisms of preterm birth and possible preventive strategies. In contrast, reports from Nepal<sup>4</sup> and India<sup>5</sup>, low- and middle-income countries (LMICs), noted that institutional deliveries reduced significantly during lockdown and preterm birth increased in Nepal. We are not aware of reports of the effects of lockdown on deliveries and preterm births from Sub-Saharan Africa. The Lagos State Government instituted lockdown measures on March 27<sup>th</sup> 2020.<sup>6</sup> Nationally, lockdown measures in Nigeria were eased in phases from May, 2020 and lasted until October 30, 2020.<sup>7</sup> During this period, there were restrictions on movements, all businesses, schools and religious houses and businesses were shut down but health services remained open. We assessed the effect of lockdown on deliveries and neonatal admissions at the Lagos State University Teaching Hospital (LUTH), a referral hospital for primary, secondary and other tertiary facilities in Lagos and neighbouring states. LUTH is the largest neonatal unit in the country and served as a COVID-19 referral and delivery center for COVID-19 positive pregnant women.

We reviewed the hospital delivery registers, admission registers and case note records for all in- and out-born admissions to the neonatal wards during lockdown (April–June 2020), pre-lockdown (January–March 2020) and a comparison period (April–June 2019). Gestational age estimation was based on the best obstetric estimates or Ballard score. Data were de-identified and analyzed using Poisson regression,  $\chi^2$  and  $\chi^2$  for trend tests. The study’s ethical approval was obtained from the LUTH Health Research and Ethics Committee (LUTHHREC/EREV/0520/28).

During lockdown, there was a fall of about 50% in both hospital deliveries and admissions to the neonatal wards ( $P<0.001$ ; Poisson regression analyses of both outcomes). There was some decrease in the proportion of moderate to late preterm deliveries during lockdown but this was of borderline statistical significance ( $\chi^2$  test  $P=0.045$ ;  $\chi^2$  for trend test  $P=0.19$ ). There was a reduction in both in-born and out-born neonatal admissions, but their distribution remained similar across the three periods. The distribution of preterm births amongst neonatal admissions was similar before and after lockdown measures were introduced (Table 1).

The findings from HICs of an unprecedented reduction in the birth of extreme preterm and extremely low birthweight deliveries<sup>1-3</sup> have suggested that mechanisms including improvements

in ambient air quality, reductions in maternal stress and reduced exposure to infections reduced preterm birth.<sup>3</sup> We found that lockdown did not affect preterm births disproportionately and we note the increased risk of preterm births in the Nepal study.<sup>4</sup> Lockdown measures worsen existing socioeconomic inequalities and economic hardship<sup>8</sup> and confinement to homes with larger family sizes may actually increase exposure to infection. Interestingly, in the study of the Netherlands, the reduction of preterm deliveries occurred mainly amongst higher socioeconomic groups.<sup>3</sup>

A highly concerning finding was the marked reduction in in-hospital deliveries at LUTH. This was not observed in the study in Ireland that was also based on hospital records<sup>2</sup> but was noted in the studies from Nepal<sup>4</sup> and India.<sup>5</sup> The equally concerning fall in out-born neonatal admissions also indicates that lockdown had a marked negative effect on healthcare seeking behaviour amongst families of sick newborns. Our study is limited in being small, single centre and retrospective in nature. Assessment of the effects of lockdown measures in different contexts, including LMICs, will provide greater insights into their effects on health and also mechanisms of preterm birth. Strategies to counter the negative effects of lockdown on the health of vulnerable populations will need to be tailored to specific contexts.

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**Table 1. Deliveries and neonatal admissions according to study period<sup>1</sup>**

	Previous year April–June 2019	Pre-lockdown Jan–Mar 2020	Lockdown April–June 2020	$\chi^2$ P value	$\chi^2$ for trend P value
<b>Deliveries n</b>	254	253	121	<0.001	
Term ( $\geq 37$ weeks)	179 (70.5)	169 (66.8)	96 (79.3)	0.045	0.19
Preterm (<37 weeks)	75 (29.5)	84 (33.2)	25 (20.7)		
• extreme preterm (<28 weeks)	4 (1.6)	6 (2.4)	3 (2.5)	-	-
• very preterm (28-<32 weeks)	23 (9.1)	20 (7.9)	12 (9.9)		
• moderate to late preterm (32-<37 weeks)	48 (18.9)	58 (22.9)	10 (8.3)		
<b>Neonatal admissions n</b>	375	364	176	<0.001	
Place of delivery				0.57	0.92
In-born	116 (30.9)	103 (28.3)	57 (32.4)		
Out-born	259 (69.1)	261 (71.7)	119 (67.6)		
<b>Gestational age</b>				0.97	0.97
Term ( $\geq 37$ weeks)	259 (69.1)	251 (69.0)	122 (69.3)		
Preterm (<37 weeks)	116 (31.0)	113 (31.0)	54 (30.7)		
• extreme preterm (<28 weeks)	11 (2.9)	19 (5.2)	5 (2.8)	-	-
• very preterm (28-<32 weeks)	39 (10.4)	36 (9.9)	17 (9.6)		
• moderate to late preterm (32-<37 weeks)	66 (17.6)	58 (15.9)	32 (18.2)		

1. All data are n (%)

2. P value from comparing mean numbers using Poisson regression model