

COVID-19 Pandemic: Impact on Obstetric Services and Outcome: A Retrospective Study

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August 28, 2020

Abstract

Objective To determine the impact of the COVID-19 pandemic and service modification on obstetric outcomes. **Design:** Single centre retrospective study **Setting:** Royal Bolton Hospital, United Kingdom. **Population or Sample:** Obstetric population in the prepandemic and pandemic periods. **Methods** Data on Obstetric services and pregnancy outcomes of women during the pandemic was compared to those of women prior to the pandemic and introduction of service modification. Statistical analysis was performed using SPSS, with data comparison between both groups done using nonparametric Chi-square test. **Main Outcome Measures:** Comparable perinatal and maternal outcomes. **Results** There was no significant difference in the induction of labour rates (38.8% pre-pandemic vs 38.3% pandemic, $p = 0.78$), use of epidural anaesthesia in labour (13.2% prepandemic vs 15.9% pandemic, $p = 0.06$), instrumental deliveries (13.0% prepandemic vs 12.3% pandemic, $p = 0.56$) and caesarean sections (28.9% prepandemic vs 31.7% pandemic, $p = 0.09$). There was significant reduction in the use of general anaesthesia for caesarean sections (8.9% vs 4.9%, $p = 0.03$) as well as antenatal admissions during the pandemic (23.9% vs 18.5%, $p = <0.0001$). The number of antenatal growth scans performed during the pandemic was significantly increased (18.5% vs 20.1%, $p = <0.003$). The perinatal outcome in both periods are comparable, with no significant difference in the rates of preterm birth, stillbirth, early neonatal deaths and neonatal unit admissions. **Conclusions** Despite changes in obstetric care following the pandemic, pregnant women were able to access care with no significant adverse impact on obstetric outcomes. **Keywords** Coronavirus, COVID-19, Service modification, Obstetric outcome.

INTRODUCTION

The wide scale socioeconomic disruptions of COVID-19 pandemic and its impact on health care services are still being felt. Previous viral epidemics have resulted in adverse obstetric outcomes including maternal and perinatal mortalities¹. Besides the direct impact of COVID-19 on pregnancy, modification in service provision adopted following the pandemic in a bid to curb transmission of the infection in hospital settings, may have far reaching effect on obstetric outcomes.

In the United Kingdom lockdown measures were announced on the 23rd March 2020². Consequently, modification in obstetric care happened around this time in most UK units³. These changes included alteration of the provision of antenatal care by reducing face-to-face clinics, and offering more telephone or virtual consultations. Antenatal surveillance and screening pathways were also changed to reduce in-hospital attendance including the use of fasting blood sugar and HbA1c instead of oral glucose tolerance test, the use of home blood pressure monitoring and reduction of the frequency of serial growth scans^{3,4}.

These changes to care were aimed at reducing the risk of COVID-19 infection for pregnant women and healthcare staffs, and while women may find telephone consultations valuable and acceptable, these changes may also reduce the sense of communication between women and midwives⁴. Reducing face-to-face antenatal appointments could increase pregnancy complications particularly in high-risk groups such as victims of

domestic violence, deprived populations with limited access to advanced technology and those with mental health issues^{4,5}.

While pregnancy will be uncomplicated in many women, these changes in obstetric care are previously untested and the effect on outcomes is unknown; high risk women with antenatal complications could be missed, and anxiety about entering acute hospital settings might deter women with reduced fetal movements from seeking additional care during pregnancy⁴. Several studies have shown that women who do not attend antenatal services are at increased risk of maternal death, stillbirth and other adverse perinatal outcomes⁶⁻⁸.

It is possible that some women may be reluctant to seek urgent care when necessary for fear of contracting COVID-19. This may result in adverse perinatal outcomes including intrauterine fetal death in cases of delayed presentation for no/reduced fetal movements; and adverse maternal outcomes in high risk women with medical comorbidities including gestational diabetes and preeclampsia. Furthermore, acute alterations from familiar service pathways may create anxiety in some women resulting in failure to seek care with consequent reduced attendances of antenatal appointments for fetal growth scans and other antenatal surveillance.

MATERIALS AND METHODS

This was a single centre retrospective study to determine the impact of COVID-19 pandemic and service modification on obstetric outcome in the Royal Bolton Hospital, Bolton, United Kingdom. The first confirmed case of Covid-19 infection in the United Kingdom was reported on the 31st January 2020 with lockdown measures subsequently announced on the 23rd March 2020, therefore data was collected around these important timelines. Data on Obstetric services and pregnancy outcomes of women during the pandemic (1st March to 31st May 2020) was compared to those of women in the time period prior to the pandemic and introduction of service modification (1st November 2019 to 31st January 2020).

All data was obtained from the Business Intelligence Unit of the hospital. Statistical analysis was performed using SPSS (version 22, SPSS Inc., Chicago, IL, USA). Data comparison between both groups was done using the nonparametric Chi-square test with the level of significance set at <0.05 .

RESULTS

There were a total of 1562 births from 1544 women (1526 singletons and 18 twins) in the prepandemic period (1st November 2019 to 31st January 2020) and a total of 1472 births from 1452 women (1431 singletons and 21 twins) during the pandemic (1st March to 31st May 2020) constituting 14.1% and 14.6% of total maternities (10971- prepandemic, 9950- pandemic) effectively indicating an equal proportion of women in both study periods ($p=0.3$).

There was no statistically significant difference seen in induction of labour rates (38.8% pre-pandemic vs 38.3% pandemic, $p=0.78$, Table 1), use of epidural anaesthesia in labour (13.2% pre-pandemic vs 15.9% pandemic, $p=0.06$, Table 2). Mode of delivery was also unaffected as shown in Table 3; instrumental deliveries: vacuum and forceps- (13.0% vs 12.3%, $p=0.56$) and caesarean sections: emergency and planned- (28.9% vs 31.7%, $p=0.09$) during the prepandemic and pandemic periods respectively. There was a significant difference seen in use of general anaesthesia for caesarean section, with reduced rates seen during the pandemic (8.9% vs 4.9%, $p=0.03$) (Table 2).

The perinatal outcome in both periods are comparable, with no significant difference seen in the rates of preterm birth, stillbirth, early neonatal deaths or neonatal unit admissions (Table 3). The proportions of in-utero admissions and transfers are similar for both periods.

As shown in Table 4, antenatal admissions were significantly reduced during the pandemic period (23.9% vs 18.5%, $p<0.0001$) and an increased number of antenatal growth scans performed (18.5% vs 20.1%, $p<0.003$) during the pandemic; however, no significant difference was observed for the numbers of new antenatal bookings (14.71% vs 14.65%, $p=0.87$).

There was no maternal death recorded in the study period. A total of 9 women tested positive for SARS-CoV-2 infection in the study period; 5 cases were diagnosed in the 3rd trimester while the other 4 cases were

diagnosed postnatally within 48 hours of delivery. Most of the women (77.8%) were less than 30 years old (IQR 19-36 years, mean 27.4 years). The majority of the affected women (66.7%) were nulliparous, which is disproportionate given that only 10% (145) of women who delivered during the pandemic period were nulliparous. More than half (55.6%) of the women were of BAME ethnicity, and only 3 women (33.3%) had associated medical co-morbidity (PIH and/or GDM). Caesarean section was the mode of delivery in more than half of the women (55.6%) and spinal epidural was employed in all cases. Maternal compromise due to SARS-CoV-2 infection necessitating urgent delivery was not observed in any of these cases.

DISCUSSION

Main findings

In this study, there was no significant difference in adverse obstetric outcome before and during the pandemic. Although a trend towards an increase in poor perinatal outcome (preterm births, stillbirth, early neonatal deaths, and neonatal unit admissions), epidural in labour, and caesarean delivery was noted during the pandemic. It is possible that the short duration of this study may have played a role in this finding and that over an extended time period, these differences might be significant. A recent study found a significant increase in the incidence of stillbirth during the pandemic as compared to before the pandemic, however, no significant differences in preterm births, neonatal unit admission, or caesarean delivery were noted⁹.

While the number of antenatal booking remained largely unchanged during the pandemic, it is interesting to note that there was a significant reduction in the proportion of antenatal inpatient admissions. This is consistent with recommendations on reducing inpatient attendances and encouraging remote consultations where possible as part of measures aimed at reducing the risk of transmission of the infection^{3,8,9}. There is no doubt that changes in obstetric care introduced following the pandemic consequently led to significant reduction in inpatient admission. Despite this reduction, it is worthy to note that this study did not demonstrate significant increase in adverse perinatal and maternal outcomes arising from service modification in obstetric care during the pandemic. The reduction in inpatient antenatal admissions may have been compensated for by an increase in fetal growth scans during the pandemic seen in this study; which in essence represents increased outpatient surveillance. This is contrary to previous studies^{6,8}. It therefore stands to reason that adverse obstetric outcomes due to reduction in antenatal face-to-face attendances and inpatient admissions can be compensated for possibly by increasing local scanning capacity and enhanced outpatient management.

Strengths and Limitations

In light of the ongoing pandemic, this study provides useful data on key obstetric interventions that may be instrumental in reducing long term adverse impact of COVID-19 pandemic on obstetric outcome. Although retrospective in nature with small sample size and study duration, this single-centre study can generate appropriate stimuli for larger more robust studies to influence current practice.

Intepretation

Contrary to finding from a recent study in London United Kingdom that reported a significant increase in the incidence of stillbirth during COVID-19 pandemic vs the prepandemic period⁹, our study demonstrated no significant difference in adverse obstetric outcome between both periods. Although differences in study demography may have played a role in outcome differences, the significant increase in antenatal growth scans performed during the pandemic in our study may have contributed to a much reduced stillbirth rate. Furthermore, despite the significant reduction in antenatal in-patient admissions and face-to-face antenatal consultations during the pandemic which are established risk factors for adverse obstetric outcomes^{5,7}, the obstetric outcomes (perinatal and maternal) prepandemic vs during the pandemic are comparable. The increase in antenatal scans during the pandemic may have played a significant role in mitigating the resultant adverse impacts from these risk factors.

The association between COVID-19 infection and poor maternal outcome in pregnant women with severe infection has been established from previous studies^{1,10}, however, ongoing controversies abound about the

risk to babies of infected mothers⁸. The evidence is conflicting, and while some studies have demonstrated the absence of coronavirus in amniotic fluid, nasopharyngeal, cord blood, and placental specimens^{1,10,11}, others have reported an increased risk of vertical transmission^{12,13}. In the national cohort study using the UK Obstetric Surveillance System (UKOSS), 2.5% of babies (n=6) had a positive nasopharyngeal swab within 12 hours of birth⁴. In our study, no case of vertical transmission was seen (all 9 women who tested positive to SARS-CoV-2 infection had good perinatal outcome and none of their babies tested positive to the virus).

It is unlikely that the trend towards adverse perinatal outcome seen in this study could have been due to the direct impact of coronavirus on pregnancy. A major risk factor for poor obstetric outcome is the failure to seek urgent care when necessary particularly in high risk women such as those with intrauterine growth restriction, hypertensive disorders, diabetes, or those with reduced fetal movements. This problem was particularly heightened in the early stages of the pandemic when women did not attend their routine appointments because of fear of contracting the virus or anxiety surrounding changes in obstetric care⁴.

The significant reduction in general anaesthesia as well as small increase in labour epidural during the pandemic are consistent with recommendations from several professional bodies including the Royal College of Anaesthetists-Obstetric Anaesthetists' Association (RCoA-OAA), and the Royal College of Obstetricians and Gynaecologists (RCOG)^{8,14}. General anaesthesia is an aerosol-generating procedure and associated with increased risk of transmission of SAR-CoV-2 infection. Consideration for early regional (epidural) analgesia for pain relief in labour is recommended to reduce the need for general anaesthesia in the event of a category 1 emergency caesarean section¹⁴. In this study, all the women who tested positive to SAR-CoV-2 infection and delivered by caesarean section had spinal anaesthesia.

CONCLUSION

Service modification in obstetric care following the COVID-19 pandemic has brought about significant reduction in inpatient care. Despite these changes, pregnant women were able to access both routine and emergency care with no significant adverse impact on perinatal and maternal outcomes. Consequently, the current modifications in obstetric care put in place to mitigate the spread of the virus particularly increase in antenatal outpatient scan capacity can be given long term consideration as we battle to prevent a 2nd wave of the pandemic. On a long term these measures may appear cost effective- ensuring judicious utilisation of available resources; however, continuous evaluation of these modifications is necessary in order to avoid the risk of compromising patient safety.

DISCLOSURE OF INTERESTS

The authors have no conflict of interest to declare.

CONTRIBUTION TO AUTHORSHIP

Conception and Design: AA, AW; Data analysis and interpretation: AA, HK; Initial draft of manuscript: AA, HK; Manuscript review and approval for intellectual content: AA, AW, HK, SP.

DETAILS OF ETHICS APPROVAL

In accordance with the UK Health Research Authority regulations, ethics committee approval and informed consent were not required.

FUNDING

This study did not receive any funding

ACKNOWLEDGEMENTS

The authors would like to thank the maternity staffs and members of the Business intelligent unit, Royal Bolton Hospital, Bolton, United Kingdom.

REFERENCES

1. Schwartz DA. An Analysis of 38 Pregnant Women with COVID-19, Their Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal Coronavirus Infections and Pregnancy Outcomes. *Arch Pathol Lab Med.* 2020; 799-805.
2. <https://www.gov.uk/government/speeches/pm-address-to-the-nation-on-coronavirus-23-march-2020>.
3. Rimmer MP, Al Watter BH, Barlow C, black N, Carpenter C, Conti-Ramsden F, et al. Provision of obstetrics and gynaecology services during the COVID-19 pandemic: a survey of junior doctors in the National Health Service. *BJOG An Int J Obstet Gynaecol.* 2020; 1123-8.
4. Knight M. Characteristics and Outcomes of pregnant women hospitalised with confirmed SARS-CoV-2 infection in the UK: a national cohort study using the UK Obstetric Surveillance System (UKOSS). *J Chem Inf Model.* 2020; 53(9):1689-99.
5. Ayres A, Chen R, Mackle T, Ballard E, Patterson S, Bruxner G, et al. Engagement with perinatal mental health services: a cross-sectional questionnaire survey. *BMC Pregnancy Childbirth* 2019; 19:170.
6. Knight M, Bunch K, Tuffnell D, Improving Mothers' Care. Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2014–16. 2018
7. Dowswell T, Carroli G, Duley L, et al. Alternative versus standard packages of antenatal care for low-risk pregnancy. *Cochrane Database Syst Rev* 2015(7):CD000934. doi: 10.1002/14651858.
8. RCOG. Coronavirus (COVID-19) infection and pregnancy. 2020 [www.rcog.org.uk/globalassets/documents/guidelines/2020-06-18-coronavirus-covid-19-infection-in-pregnancy.pdf] Assessed 9 June 2020.
9. Khalil A, von Dadelszen P, Draycott T, Ugwumadu A, O'Brien P, Magee L. Change in the Incidence of Stillbirth and Preterm Delivery During the COVID-19 Pandemic. *JAMA.* Published online July 10, 2020. doi:10.1001/jama.2020.12746
10. Liu Y, Chen H, Tang K, Guo Y. Clinical manifestations and outcome of SARS-CoV-2 infection during pregnancy. *J Infect* 2020. Doi: 10.1016/j.jinf.2020.02.028.
11. Chen H, Guo J, Wang C, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet* 2020;395 (10226):809–815.
12. Lamouroux A, Attie-Bitach T, Martinovic J, et al. Evidence for and against vertical transmission for SARS-CoV-2 (COVID-19). *American journal of obstetrics and gynecology* 2020 doi: 10.1016/j.ajog.2020.04.039
13. Dong L, Tian J, He S, et al. Possible Vertical Transmission of SARS-CoV-2 From an Infected Mother to Her Newborn. *JAMA* 2020 doi: 10.1001/jama.2020.4621
14. Bauer ME, Bernstein K, Dinges E, et al. Obstetric Anesthesia During the COVID-19 Pandemic. *Anesth Analg* . 2020;131(1):7-15.

Table 1: Comparison of Types of Labour Prepandemic and Pandemic Periods

Outcomes	Prepandemic period (n=1544 deliveries)	Pandemic period (n=1452 deliveries)	Difference (95% CI)	P-value
Spontaneous labour, (%)	688/1544 (44.6)	635/1452 (43.7)	0.9 (-2.66 to 4.45)	0.62
Induced labour, (%)	599/1544 (38.8)	556/1452 (38.3)	0.5 (-2.99 to 3.98)	0.78
No labour onset, (%)	257/1544 (16.6)	261/1452 (18.0)	1.4 (-1.31 to 4.12)	0.31

Table 2: Comparison of Anaesthesia at Delivery Prepandemic and Pandemic Periods

Outcomes	Prepandemic period (n=451 deliveries)	Pandemic period (n=466 deliveries)	Difference (95% CI)	P-value
Epidural (%)	24/451 (5.3)	28/466 (6.0)	0.7 (-2.38 to 3.76)	0.65
Spinal (%) CSE (%)	367/451 (81.4)	389/466 (83.5)	2.1 (-2.83 to 7.04)	0.40 0.41
General (%)	20/451 (4.4)	26/466 (5.6)	1.2 (-1.70 to 4.11)	
Epidural in Labour (%)	40/451 (8.9)	23/466 (4.9)	4.0 (0.71 to 7.40)	0.03
	170/1287* (13.2)	189/1191# (15.9)	2.7 (-0.08 to 5.49)	0.06

* Women in labour (spontaneous and induced) prepandemic

Women in labour (spontaneous and induced) during the pandemic

Table 3: Comparison of Mode of Delivery and Perinatal Outcomes Prepandemic and Pandemic Periods

Outcomes	Prepandemic period (n=1562 births)	Pandemic period (n=1472 births)	Difference (95% CI)	P-value
Spontaneous vaginal (%)	891/1562 (57.0)	805/1472 (54.7)	2.3 (-1.23 to 5.82)	0.20
Instrumental Forceps (%)	93/1562 (6.0)	79/1472 (5.4)	0.6 (-1.07 to 2.26)	0.56
Vacuum (%)	109/1562 (7.0)	102/1472 (6.9)	0.1 (-1.73 to 1.91)	
Caesarean sections				
<i>Emergency (%)</i>	268/1562 (17.2)	285/1472 (19.4)	2.2 (-0.56 to 4.96)	0.09
<i>Elective (%)</i>	183/1562 (11.7)	181/1472 (12.3)	0.6 (-1.71 to 2.93)	
Perinatal outcomes				
<i>Preterm deliveries (No. per 1000 births)</i>	122/1562 (78)	118/1472 (80)	0.2 (-1.72 to 2.14)	0.83
<i>Stillbirth (No. per 1000 births) END</i>	9/1562 (5.8)	11/1472 (7.5)	0.17 (-0.44 to 0.82)	0.56 0.48
<i>(No. per 1000 births)</i>	1/1562 (0.6)	2/1472 (1.4)	0.08 (-0.23 to 0.44)	
<i>Neonatal admissions (No. per 1000 births)</i>	83/1562 (53.1)	95/1472 (64.5)	1.14 (-0.54 to 2.84)	0.18

END- Early neonatal death (within 7 days of birth)

Preterm (24+0 to < 37 weeks gestation)

Table 4: Comparison of Antenatal Care Prepandemic and Pandemic Periods

Outcomes	Prepandemic period (n=10971 maternities)	Pandemic period (n=9950 maternities)	Difference (95% CI)	P-value
In-utero admissions (%)	29/10971 (0.26)	31/9950 (0.31)	0.05 (-0.10 to 0.20)	0.49
Antenatal booking (%)	1614/10971 (14.71)	1458/9950 (14.65)	0.06 (-0.90 to 1.02)	0.87
Antenatal admissions (%)	2622/10971 (23.9)	1839/9950 (18.5)	5.4 (4.29 to 6.50)	<0.0001
Antenatal growth scans (%)	2025/10971 (18.5)	2005/9950 (20.1)	1.6 (0.53 to 2.67)	<0.003