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Case Report

Is COVID-19 Infection in Pregnancy A Risk Factor for Antepartum Fetal Compromise? A Case Series and Literature Review

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Abstract

This case series explores whether COVID-19 infection is an independent risk factor for abnormal antepartum Cardiotocogram (CTG). We describe retrospective case reviews of nine pregnant women with confirmed COVID-19 infection who were admitted to Al Wakra Hospital, Qatar between April 1 and May 22, 2021. Each woman had a pre-labour abnormal cardiotocogram (CTG) that necessitated delivery by emergency caesarean section. Five patients were admitted at less than 32 weeks gestation; the other four were 36 weeks or more. One had preeclampsia and gestational diabetes, another had gestational diabetes. Four patients were admitted with severe COVID-19 pneumonia, whereas the other five had mild COVID-19 symptoms. The four severe cases were on remdesivir and dexamethasone, including one on tocilizumab. Three patients were on hydroxychloroquine

and the other two were on symptomatic treatments. Four patients were on supplemental oxygen. Regarding fetal outcome, five babies had APGAR Scores of less than 5 at one minute, but all babies had APGAR Scores above 7 at five minutes. Five babies had arterial pH less than 7.20, two of them less than 7.00. Five babies were intubated, and one was cooled. None of the babies had a positive COVID-19 reverse transcription polymerase chain reaction (RT-PCR) result. We conclude that COVID-19 infection in pregnancy could be an independent risk factor for abnormal antepartum CTG. This study is small and so more research is needed to further ascertain this finding. We recommend enhanced antenatal fetal surveillance using CTG for pregnant women admitted with COVID-19 infection.

Keywords: Antepartum fetal compromise; Case series; COVID-19; Cardiotocogram (CTG); Pregnancy

1. Introduction

Research on COVID-19 in pregnancy is evolving. Available literature suggests that when compared to previous viral pneumonia pandemics like the H1NI, SARS-COV and MERS-COV, COVID-19 (SARS-COV-2) in pregnancy has not been associated with significant maternal morbidity and mortality [1-4]. Nevertheless, pregnancy remains a risk factor for severe COVID-19 disease. Compared to pregnant women without COVID-19, a COVID-19 diagnosis during pregnancy is associated with increased maternal and neonatal morbidity and mortality. There is increased incidence of ICU admission, preterm delivery and premature rupture of membranes. There is also a disproportionately high caesarean section (CS) rate, with some studies indicating a high CS rate for 'fetal distress' [1,5,6]. Few studies have been done on the effect of COVID-19 infection on antenatal fetal heart monitoring, the CardioTocoGram (CTG).

In a multinational cohort study (INTERCOVID study), COVID-19 in pregnancy was associated with consistent and substantial increases in severe maternal morbidity and mortality and neonatal complications when pregnant women with and without a COVID-19 diagnosis were compared [6]. In a prospective cohort study on 56 pregnant women with COVID-19 and 94 healthy pregnant women, fetal distress was seen in 16.1% of the exposed group and 4.3% of the control group (P = 0.016; RR = 3.84) [7]. An observational cohort study of maternal and neonatal outcomes among delivered women with and without SARS-CoV-2 during pregnancy was conducted from March 18 through August 22, 2020 at Parkland Health and Hospital System (Dallas, Texas). In this large, single-institution cohort study, SARS-CoV-2 infection during pregnancy was not associated with adverse pregnancy outcomes [8] A review of maternal and fetal outcomes after SARS-CoV-2 infection could not conclusively determine that it increases maternal, fetal or neonatal complications. However, increased risks of maternal, fetal and neonatal complications were noted in pregnant women with co-morbidities infected with SARS-CoV-2 [9]

2. Case Series Presentation

Between April 1 and May 22, 2021, our hospital in Qatar was the designated center for obstetrics and gynecology patients diagnosed with COVID-19 disease. During this period, 220 pregnant women were admitted with 89 deliveries. We reviewed the cases of nine of the women who all had pre-

labour abnormal fetal heart rate monitoring that required emergency caesarean delivery.

All nine patients had a positive COVID-19 reverse transcription polymerase chain reaction (RT-PCR), with eight of them (8/9) having cycle threshold (CT) value of less than 30. All patients were diagnosed by RT-PCR on samples from upper respiratory specimen–nasopharyngeal and oropharyngeal swab–following World Health Organization (WHO) and Qatar Ministry of Public Health guidelines [10,11]. All nine patients had antepartum emergency caesarean section for suspected fetal compromise (pathological CTG). We used the National Institute for Health and Care Excellence (NICE) 2017 criteria for CTG interpretation (Appendix 1) [12]. A summary of the maternal and fetal characteristics and outcomes are presented in Table 1.

	Case 1	**Case2**	**Case 3**	**Case 4**	**Case 5**	**Case 6**	**Case 7**	**Case 8**	**Case 9**
Obstetrics and maternal data									
Age	41	32	29	28	37	21	23	25	32
G/P	G6P3	G3P2	G2P1	G2P0	G7P5	G1P0	G1P0	G2P1	G2P1
Comorbidity	GDM,PE	GDM	None	None	None	None	None	None	None
G.A. weeks	36	30	34	35	29	30	31	31	39
Covid-19 severity	Severe	Severe	Severe	Severe	Mild	Mild	Mild	Mild	Mild
Medications	R/Dex	R/Dex tociluzumab	R/Dex	R/Dex	HCQ	HCQ	HCQ	Symp. Rx	Symp. Rx
CT value	27.3	18.6	17.9	19.9	24.8	22.1	25.8	27.7	36.2
O2 therapy	HFN	NRFM	SM	SM	RA	RA	RA	RA	RA
Fetal data									
Fetal Wt. (Grams)	2542	1744	2900	2900	900	1580	1756	1600	2590
Apgar 1 m	4	1	7	9	1	8	2	1	9
Apgar 5 m	7	6	9	9	7	9	7	8	9
Arterial PH	6.79	7.087	6.9	7.3	7.07	7.35	7.22	7.16	7.25
Arterial BE-	25.1	14.3	24	2.1	9.9	5.9	4.1	7.9	2.6
Intubation	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No
Cooling	Yes	No	No	No	No	No	No	No	No
Baby RT-PCR	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	`Neg

Abbreviations: GDM, gestational diabetes mellitus; PE, preeclampsia; R, Remdesivir, Dex, dexamethasone; HCQ, hydroxychloroquine; HFN, high flow nasal cannula; NRFM; non-re-breathable face mask; SM, simple mask, RA; room air

Table 1: Summary of maternal and fetal characteristics and outcomes.

Three patients were primigravids and six were multigravidas. Five patients were at less than 32 weeks gestation and the other four were 36 weeks or more. One patient had preeclampsia and gestational diabetes and one had gestational diabetes only. Four patients were admitted with severe COVID-19 pneumonia, and the other five had mild COVID-19 symptoms. The four severe cases were on remdesivir and dexamethasone, including one on tocilizumab. Three patients were on hydroxychloroquine and two were on symptomatic treatments. Four patients were on supplemental oxygen, but all patients were maintaining their O2 saturation above 95%. All patients had abnormal CTGs necessitating delivery by emergency cesarean section. Five babies had Apgar scores of less than 5 at one minute but all babies had Apgar scores above 6 at five minutes. Five babies had arterial pH less than 7.20, with two of them less than 7.00. Six babies were intubated, and one was cooled. None of the babies had a positive RT-PCR result.

3. Discussion

COVID-19 is associated with increased maternal and neonatal morbidity and mortality. There is increased incidence of preterm delivery and premature rupture of membranes. There is also a disproportionately high CS rate, with some studies indicating a high CS rate for 'fetal distress' [1,4-6]. Some of the reasons given for the suspected and/or associated fetal compromise in COVID-19 pregnancies include maternal pyrexia, hypoxemia, acidosis, and the inflammatory response dubbed "cytokine storm" [13]. Few studies have been done on the effect of COVID-19 infection on antenatal fetal heart monitoring. One case report of a pregnant woman with COVID-19 who developed coagulopathy in the absence of severe clinical symptoms outlined how she had a CS delivery because of a non-reassuring fetal heart rate [14]. A retrospective review of nine pregnant women diagnosed with COVID-19 pneumonia in China reported fetal distress in two cases. No neonatal asphyxia was observed in the new-born babies [15]. In another study, fetuses of pregnant COVID-19 patients showed a raised baseline FHR (>10 percent), loss of accelerations, late decelerations, ZigZag pattern, and absence of cycling, probably due to the effects of maternal pyrexia, maternal inflammatory response and the cytokine storm. However, the perinatal outcomes appeared to be favourable [13]. COVID-19 in pregnancy has also been implicated as a cause of intra-uterine fetal death in a case-series from Brazil and another case in the USA, with characteristic placental histological features described [16,17]. Vertical transmission of SARS-CoV-2 has been described in a few cases (less than 5%), though the mechanisms of transmission are still being debated [18,19].

Between April 1 and May 22, 2021, our hospital was the designated center for obstetrics and gynecology patients with COVID-19 disease in Qatar. During that period, 220 pregnant women were admitted, with 89 deliveries. Our case series reviews nine of these women, all of whom had emergency CS deliveries due to pre-labour abnormal CTG. There was no other identified reason for the abnormal CTG findings.

Four of the women required supplemental oxygen, and it could be argued that the CTG abnormality was secondary to maternal hypoxemia, although all the patients maintained normal oxygen saturation just before delivery. We had adopted a local policy of enhanced fetal surveillance with

eight hourly CTGs for patients over 28 weeks gestation on admission with COVID-19. This enabled us to identify these cases and manage them expediently with the resultant favorable neonatal outcomes.

4. Conclusion

COVID-19 infection in pregnancy could be an independent risk factor for abnormal CTG, regardless of the severity of symptoms. As this study is small, more research is needed to further explore this finding. Although there is no strong evidence, we suggest enhanced antenatal fetal surveillance using CTG for pregnant women admitted with COVID-19, regardless of the severity of the symptoms.

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