International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Kashyap S et al. Int J Reprod Contracept Obstet Gynecol. 2021 Nov;10(11):4212-4219
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20214334

Original Research Article

Maternal and neonatal outcome in COVID-19 pregnancy: an ongoing review of first wave in a tertiary care center in North India

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Received: 12 September 2021
Accepted: 05 October 2021

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ABSTRACT

Background: This study analyzed the clinical outcomes in the obstetric patients with COVID-19 and their neonates in first wave of COVID-19 pandemic in North India, 2020.
Methods: This prospective study was conducted between 10 May 2020 to 31 December 2020 on 83 obstetric patients with COVID-19 and their 52 neonates.
Results: 36.14% obstetric patients presented with COVID-19 like symptoms with most common symptom as fever in 60% and cough in 53.33%. 4.81% patients were admitted in HDU and 1/83 (1.20%) patient who required ICU had mortality due post-operative complications. 20.48% had pre-existing medical diseases. Amongst (78) antenatal patients, 21.79% had pregnancy related hypertensive disorders, 12.82% had deranged liver function tests without hypertension and 8.97% had gestational diabetes mellitus. More probability of pre-term labour pains 2.4 (95% CI, 1.37-4.18) and IUFD 2.18 (1.13-4.20) were observed in symptomatic patients as compared to asymptomatic patients. Neonates born to COVID-19 symptomatic mothers had 1.81 (95% CI, 0.73-4.49) times the risk of being symptomatic, 1.37 (95% CI, 0.54-3.41) times the risk of getting admitted to NICU and 1.57 (95% CI, 0.48-5.09) times the risk of getting infected by SARS-CoV-2 and increased morbidity in neonates. 8% neonates had perinatal and 1.5% had horizontal transmission of SARS-CoV-2.
Conclusions: First wave of COVID-19 pandemic did not cause significant adverse outcome in pregnant patients and mother-newborn dyads in our tertiary care centre when active and intensive management of mothers and newborns were done but still there is possibility of severe morbidity and mortality due to COVID-19.

Keywords: COVID-19 in pregnancy, COVID-19 in neonate, First wave of COVID-19

INTRODUCTION

World health organization (WHO) declared COVID-19 a global health emergency after its first case was reported in December 2019 from Wuhan, China and declared it as a pandemic on March 11, 2020.[1-3] Human Coronaviruses (HCoV) like 229E, NL63, OC43 and HKU1 primarily infect humans. Certain strains of Coronaviruses infecting animals have evolved and infect humans to cause serious illness. These are known as new HCoV like Middle East respiratory syndrome (MERS-CoV), severe acute respiratory syndrome (SARS-CoV) and SARS-CoV-2 which is causative organism of current COVID-19 pandemic.[4] SARS-CoV-2 has human to human transmission and infection occurs due to close contact with infected person or from a contaminated surface or air borne route.[5,6] Vertical transmission (virus transmission from mother to child in antenatal and intrapartum period) is uncommon and and in cases where it occurs, it is not associated with mode of delivery, rooming-in and method of feeding.[5] Experience from previous Coronavirus outbreaks in humans of SARS-CoV

and MERS-CoV indicates poor outcomes in pregnant patients and their foetuses. Intensive care unit (ICU) admissions are common and mortality rate being as high as 35%.[7,8] Data from various studies on influenza have also shown higher maternal morbidity and mortality in comparison to non-pregnant women like Influenza pandemic (1918) had high maternal mortality rate of 37% when compared to 2.6% mortality rate of overall population. [9-11] During pregnancy physiological changes in the immune and respiratory system like changes in lung volumes, vasodilatation leading to respiratory mucosal oedema and increased respiratory secretions makes pregnant women vulnerable to develop severe disease.[9,12] Likewise, due to immature innate and adaptive immune systems, foetus and neonates are also vulnerable to infections.[13] But pregnant women are not at higher risk than normal population for contracting the disease.[5] United Kingdom obstetric surveillance system (UKOSS) study suggests that disease severity is more in third trimester and peripartum.[14]Advanced age, chronic diseases like, diabetes, chronic lung diseases, cancer and immune-suppression are also associated with increased disease severity.[15] Since COVID-19 is a new pandemic, studies are required to see outcome of pregnancies infected by SARS CoV-2 and to demonstrate the route of vertical transmission. There is a difference in infectivity rate, severity, and presentation in various waves of COVID-19 infection in various age groups, which is correlated to type of strain and geographical area. Outcome of pregnancy infected with COVID-19 virus will vary as per the level of facility care provided. There is a need to highlight COVID-19 infection outcome of mother-infant dyad during different time period of ongoing pandemic, so as to understand the disease pathophysiology.

METHODS

This study is a part of ongoing data collection of mother baby outcome of COVID-19 in mothers at Government medical college and hospital, Chandigarh, India from 10 May 2020 to 31 December 2020 in the department of obstetrics and gynaecology in collaboration with department of neonatology. All hospital admitted pregnant and postpartum patients with COVID-19 who were confirmed with SARS CoV-2 reverse transcription polymerase chain reaction (RTPCR) were recruited in this study. All patients admitted in hospital for antenatal care, in labour or for management of postpartum complications were tested for SARS CoV-2 with RTPCR and recruited for the study if tested positive.

Prospectively data for demographical details, epidemiological details, clinical COVID-19 symptoms, maternal complications, obstetric outcomes like interventions required, mode of delivery, indications of delivery, pregnancy complications and admission to high dependency unit (HDU)/ intensive care unit (ICU) required or not and their treatment was collected till discharge. Neonatal outcomes noted were birth weight, APGAR score, resuscitation required or not, neonatal SARS-CoV-2 RTPCR results, rooming in of baby with mother, breastfeeding and any evidence of vertical transmission was also noted.

Outcome of the pregnancy whether delivered or not and of postpartum patients were entered in Performa. RTPCR test in live born neonates was sent within 72 hours of delivery. Few patients underwent SARS-CoV-2 RTPCR testing from maternal vagina secretions, amniotic fluid, placental membranes, cord blood, placenta and colostrum for feasibility of isolating virus from different body sites and for establishing vertical transmission route. Mothers who were RTPCR positive were delivered using personal protective equipment in a separate area. After cord clamping baby was handed over to neonatologist who performed routine care or resuscitation as per Neonatal resuscitation Program (NRP) guidelines. Baby was roomed- in with mother if both mother and baby were healthy and gestation age at birth was >33 weeks and birth weight more than 1500 grams, while continued multi-mode counselling of hygiene, mask and exclusive breast milk, expressed breast milk (EBM) or donors' human milk (DHM) if inadequate milk ejection. In case baby was <33 weeks gestation and/<1500-gram birth weight and hemodynamically stable then baby was kept in a separate step-down care area in open care system with EBM/DHM if EBM was not sufficient, with RTPCR negative attendant. Once this baby was >33 weeks post menstrual age he/she was roomed-in with mother and given exclusive breast feeding. Sick neonates were taken to neonatal intensive care unit. Delayed cord clamping was promoted in vaginal delivery, rooming-in with mother, expression of breast milk if baby was sick and exclusive breast feeding if both mother-baby dyads were stable was reinforced and maintained. Telephonic follow up of patients both mother and baby was done till completion of quarantine period for any residual symptoms of COVID-19 or any new complaints were noted.

Data analysis

We decided to enrol all antenatal and postpartum patients in our centre with COVID-19 infection. This study is part of first wave of COVID-19 infection in India i.e. from May to December 2020. Statistical analysis was done using SPSS, version 23.0. Continuous variables are directly expressed as ranges. Categorical variables are expressed as number (%).

RESULTS

Various characteristics like demography details, epidemiology and medical disorders in symptomatic and asymptomatic obstetric patients (antenatal and postpartum) is shown in (Table 1) and obstetric complications in antenatal patients after period of viability are shown in (Table 2).

Table 1: Characteristics of obstetrics patients in relation to symptomatic and asymptomatic COVID-19 infection.

Parameters	Symptomatic patients (N=30) frequency (%)	Asymptomatic patients (N=53) frequency (%)	Total frequency (%)	Relative risk (95% CI)
Rural	22 (73.3)	37 (69.8)	59 (71.1)	1.11 (0.58-2.15)
Postpartum patients	1 (3.3)	4 (7.5)	5 (6)	0.53 (0.91-3.17)
Containment area	1 (3.3)	4 (7.5)	5 (6)	0.53 (0.09-3.17)
Pre-existing medical disease	4 (13.3)	13 (24.5)	17 (20.5)	0.64 (0.26-1.58)
Chronic hypertension	1 (3.3)	3 (5.7)	4 (4.8)	0.68 (0.12-3.81)
Hepatitis B, C	1 (3.3)	2 (3.8)	3 (3.6)	0.92 (0.18-4.67)
Hypothyroidism	1 (3.3)	7 (13.2)	8 (9.6)	0.32 (0.05-2.06)
Diabetes Mellitus (DM)	1 (3.3)	0 (0.0)	1 (0.0)	-

Table 2: Characteristics of symptomatic and asymptomatic COVID-19 antenatal patients (>24weeks).

Characteristics	Symptomatic patients (N=26) frequency (%)	Asymptomatic patients (N=45) frequency (%)	Total frequency (%)	Relative risk (95% CI)
Pre-term labour pains (PTLP)	4 (15.4)	1 (2.2)	5 (7.0)	2.4 (1.37-4.18)
Premature rupture of membranes (PROM)	2 (7.7)	8 (17.8)	10 (14.1)	0.50 (0.14-1.82)
Postdated at delivery	1 (3.8)	7 (15.6)	8 (11.3)	0.31 (0.04.02)
Pregnancy related hypertensive disorders	4 (15.4)	12 (26.7)	16 (22.5)	0.62 (0.25-1.55)
Gestational diabetes mellitus (GDM)	4 (15.4)	2 (4.4)	6 (8.5)	1.97 (1.01-3.81)
Intrauterine foetal demise (IUFD)	3 (11.5)	1 (2.2)	4 (5.6)	2.18 (1.13-4.20)

General characteristics

During this period 83 SARS-CoV-2 RTPCR confirmed admitted antenatal and postpartum patients were included from 10 May 2020 to 31 December 2020. Age of the patients ranged from 20 to 40 years with mean of 27.60±4.56 years. Gestation age varied 46 days to 285 days in 78 antenatal patients with mean of 235.03±49.07 days.

COVID-19 related signs and symptoms

30/83 (36.14%) women had COVID-19 like symptoms including 2 patients who became symptomatic after testing. One patient was from containment area, 4 patients had confirmed/suspected contact history and rest were diagnosed COVID-19 during routine testing as per Indian council of medical research (ICMR) guidelines. Most common symptom observed was fever in 18/30 (60%) patients ranging from 1 episode to lasting for 13 days followed by cough in 16/30 (53.33%), dyspnea in 9/30 (30%), vomiting in 5/30 (16.67%), cold, sore throat, headache, myalgia each in 3/30 (10%), diarrhoea in 2/30 (6.67%), and chest pain, anosmia each in 1/30 (3.33%) patients.

Obstetric complications

Total 52/78 (66.67%) antenatal patients were admitted for safe confinement or obstetric management were asymptomatic and incidentally detected SARS-CoV-2 RTPCR positive on routine testing. However, 2/52 of these patients developed symptoms soon after RTPCR testing. 26/78 (33.33%) antenatal patients had symptoms related to COVID-19 at admission. Maximum antenatal 17/78 (21.79%) patients presented with hypertensive disorders of pregnancy followed by 10/78 (12.82%) patients had deranged liver function tests (LFT) without hypertension (7 patients had intra-hepatic cholestasis of pregnancy (IHCP) and 3 may have developed transaminitis due to COVID-19 disease), 1/78 (1.28%) had both IHCP and haemolysis, elevated liver enzymes

and low platelet count (HELLP syndrome), 10/78 (12.82%) patients presented with pre-mature rupture of membranes (PROM), 5/78 (6.41%) with pre-term labour pains (PTLP), 7/78 (8.97%) with gestational diabetes mellitus (GDM), 8/78 (10.26%) patients were post dated on the day of delivery, 4/78 (5.13%) patients had twin pregnancy and 2/78 (2.56%) were diagnosed with ectopic pregnancy.

Table 3: Characteristics and outcomes of neonates in relation to symptomatic and asymptomatic COVID-19 infection in mothers.

Characteristics	Symptomatic mother (n=14) frequency (%)	Asymptomatic mother (n=38) frequency (%)	Total frequency (%)	Relative risk (95% CI)
Induced labour	1 (7.1)	12 (31.6)	13 (25)	0.23 (0.03-1.59)
Caesarean section	11 (78.6)	24 (63.2)	35 (67.30)	1.78 (0.57-5.55)
Antenatal corticosteroids	7 (50)	14 (36.8)	21 (40.38)	1.47 (0.60-3.59)
Male sex	8 (57.1)	19 (50)	27 (51.92)	1.23 (0.49-3.06)
Small for gestation age	5 (35.7)	15 (39.5)	20 (38.46)	0.88 (0.34-2.27)
Resuscitation	3 (21.4)	8 (21.1)	11 (21.15)	1.01 (0.34-3.02)
Neonatal ICU (NICU) admission	5 (35.7)	10 (26.3)	15 (28.84)	1.37 (0.54-3.41)
Managed with mother	4 (28.6)	25 (65.8)	29 (55.76)	0.37 (0.11-0.88)
Exclusive breast feeding	7 (50)	26 (68.4)	33 (63.46)	0.57 (0.23-1.39)
Rooming in	5 (35.7)	25 (65.8)	30 (57.69)	0.40 (1.15-1.04)
SARSCoV-2 RTPCR positive	2 (14.3)	3 (7.9)	5 (9.61)	1.57 (0.48-5.09)
Symptomatic neonate	8 (57.1)	14 (36.8)	22 (42.30)	1.81 (0.73-4.49)
Fever	0	1 (2.6)	1 (1.92)	-
Hyaline membrane disease (HMD)	0	3 (7.9)	3 (5.76)	-
Transient tachyapnea of newborn (TTNB)	5 (35.7)	10 (26.3)	15 (28.84)	1.37 (0.54-3.41)
Sepsis	4 (28.6)	8 (21.1)	12 (23.07)	1.33 (0.50-3.49)
Meconium aspiration syndrome (MAS)	1 (7.1)	0	1 (1.92)	-
Gastrointestinal symptoms	1 (7.1)	1 (2.6)	2 (3.84)	1.92 (0.44-8.30)
Hypoxic ischemic injury (HIE)	1 (7.1)	1 (2.6)	2 (3.84)	1.92 (0.44-8.30)
Seizures	1 (7.1)	1 (2.6)	2 (3.84)	1.92 (0.44-8.30)
Renal symptoms	1 (7.1)	1 (2.6)	2 (3.84)	1.92 (0.44-8.30)
Multiple organ dysfunction syndrome	2 (14.3)	5 (13.2)	7 (13.46)	1.07 (0.30-3.80)
Intravenous antibiotics	5 (35.7)	8 (21.1)	13 (25)	1.66 (0.68-4.07)
Oxygen therapy	8 (57.1)	13 (34.2)	21 (40.38)	1.98 (0.79-4.85)
Endo-tracheal intubation	0	1 (2.6)	1 (1.92)	-
Continuous positive airway pressure (CPAP)/ Non-invasive ventilation (NIV)	5 (35.7)	7 (18.4)	12 (23.07)	1.85 (0.76-4.47)
Inotropes	2 (14.3)	4 (10.5)	6 (11.53)	1.27 (0.37-4.37)
Discharged	13 (92.9)	35 (92.1)	48 (92.30)	1.08 (0.18-6.29)

#One SARSCoV-2 RTPCR positive baby not included in above table as it was confirmed horizontal transmission case.

All 4 cases of intra-uterine foetal demise (IUFD) were referred from other institute for obstetric complications management including one with single foetal demise in monochorionic monoamniotic twin pregnancy. Amongst 7 patients <24 weeks of gestation 2/3 (66.7%) who were symptomatic and 3/4 (75.0%) who were asymptomatic had pregnancy loss in form of ectopic pregnancy and abortions.

Management

30/83 (36.14%) patients had symptoms likely due to COVID-19 and 25 patients received antibiotic therapy for

COVID-19 symptoms and 5 patients were not given antibiotics due to mild or very short duration of the

symptoms. 3 patients received oxygen therapy by venturimask and maintained normal saturation levels on oxygen. 1 patient was admitted in ICU for ventilator support. 2 patients received injectable steroids (dexamethasone) and thromboprophylaxis with low molecular weight heparin. There were 4 HDU admissions and 1 ICU admission in our study period. Amongst HDU admissions, one patient with severe COVID-19 disease at 32 weeks gestation but no additional co-morbidity was managed for fever, cough since 12 days and difficulty in breathing for 6 days. Her oxygen saturation level was 88% on admission and she was managed conservatively with antibiotics (amoxicillin with clavulanate and azithromycin), injectable steroids, thromboprophylaxis with low molecular weight heparin and oxygen therapy. She was discharged after 7 days for home isolation.

Second HDU admission was of a primigravida with moderate COVID-19 disease at 34 weeks 5 days with pre-term premature rupture of membranes (PPROM), oligohydramnios, dengue fever and fluctuating oxygen saturation levels between 92% to 98% with complaints of fever, generalized body aches, one sided chest pain and her chest X-ray showed pleural effusion and bilateral lower lobes lung infiltrates. Her third SARS-CoV-2 RTPCR sample was positive at day 11 as repeated sampling was done due to her clinical symptoms as per hospital policy. Her high-resolution computed tomography (HRCT) chest was highly suggestive of COVID-19 pneumonia (CORADS-4) showing bilateral pleural effusion with underlying subsegmental atelectasis with multiple irregular patchy areas of ground glass opacities and bilateral lung field consolidation. She received oxygen therapy with venturimask and antibiotic therapy (amoxycillin and potassium clavulanate). She delivered at 35 weeks 4 days by elective caesarean section due to severe oligohydramnios and poor Bishop's score. Another 2 HDU admissions were primarily for management of obstetrical complications. Third patient was admitted with antepartum eclampsia and posterior reversible encephalopathy syndrome (PRES) in post-caesarean period, and fourth patient was admitted with chickenpox infection, PPROM and required subtotal hysterectomy for refractory post-partum haemorrhage. Both were discharged after 11 days of hospital stay. In nut shell patients requiring HDU services recovered well.

The only patient requiring ICU for ventilator support was received as referral on 7th post-operative day in irreversible septic shock, perforation peritonitis and oxygen saturation of 50% at room air following caesarean section for PROM and foetal distress. The maternal mortality happened even before she could be recouped for surgical intervention. It is possible that in this patient her COVID positive status may have been a contributory factor in the final outcomes along with delayed referral.

Neonatal outcomes

54 antenatal patients with COVID-19 delivered 55 babies (including 1 set of live born twins) during the study period in our institute. 3 babies were dead born with intrauterine demise during antenatal period. 52 babies were live born to 51 mothers at the age of 27.25±4.4 years, at gestation age of 257.34±23.3 days with birth weight of neonates 2326.8±659.47 grams and APGAR score of 8.5±1.6 at 5 minutes. 20 small for gestation age babies were born with mean birth weight of 1816.25 kg. 22/52 (42.31%) babies who were delivered in our institution were symptomatic. Most common symptom was transient tachypnea of newborn in 15/52 (28.9%).

In all neonates first RTPCR test was done within 72 hours of birth with mean of 21.6 hours. 6/52 (11.54%) were SARS-CoV-2 RTPCR positive (5 were perinatal transmission and 1 was horizontal transmission case of neonatal COVID-19 infection). Most of neonates with perinatal COVID-19 were asymptomatic with 1/5(20%) being symptomatic. 4 neonates born to COVID-19 positive mother who expired were <29 weeks of gestation and expired of late onset sepsis, while continuing to be RTPCR negative throughout the stay in hospital. SARS CoV-2 RTPCR test was done for placental membranes, cord blood, colostrum in 9 patients each, amniotic fluid in 8 patients, placenta in 6 patients and vaginal fluid in 5 patients. All these samples were negative for SARS-CoV-2 and all the neonates of these 9 patients were also SARS CoV-2 RTPCR negative.

DISCUSSION

Maternal

The mean age of patients in our study was 27.60 years and 85.90% pregnant women were in third trimester, which is similar to a systemic review of case series of 108 pregnant COVID-19 patients reporting mean age to be between 29 to 32 years and mostly in third trimester.[16] In study by Huijun Chen et al all the 9 patients had epidemiological history of exposure whereas no patient in the confirmed COVID-19 pneumonia group had exposure history in Na Li et al study compared to our study where only 4/83 patients had confirmed exposure history.[17,18] More probability of asymptomatic patients (95% CI, 0.26-1.58) was observed in containment area or to have known history of contact with COVID-19 patient compared to symptomatic patients (95% CI, 1.01-3.81). Pre-pregnancy chronic diseases like diabetes and chronic hypertension are considered as risk factors for getting infected and hospitalization according to RCOG.[5] Whereas in our study symptomatic patients had 0.64 (0.26-1.58) times the risk of having underlying medical diseases like hypertension, diabetes, hepatitis andhypothyroidism than asymptomatic patients and risk of GDM in symptomatic patient was 1.97 (1.01-3.81) which could be chance occurrence due to less number of patients.

The risk of pregnancy loss in asymptomatic pregnant patient <24 weeks was 1.20 (95% CI, 0.25-5.70) as high as the pregnancy loss risk in the symptomatic subjects which could be incidental finding due to small number of cases. The risk of IUFD was high, 2.18 (95% CI, 1.13-4.20) in symptomatic patients who were >24 weeks of gestation. Most of the women (63.86%) in our study were asymptomatic for COVID-19, which is almost similar to the PregCOV-19 Living Systematic Review with 74% pregnant women with SARCoV-2 infection being asymptomatic.[19]Amongst symptomatic most common symptom of COVID-19 was fever in 60% , which is also a finding in study conducted by Na Li et al in Wuhan, China.[18] Contrarily in PregCOV-19 Living Systematic Review most common symptoms were cough and fever with almost equal frequency of 41% and 40% respectively. [19]

Though a study on very small number Huijun Chen et al found severe COVID-19 pneumonia in none but in our study 2 patients each had moderate and severe COVID-19 illness.[17] According to RCOG Coronavirus (COVID-19) Infection in Pregnancy guidelines by RCOG quotes that severe illness in pregnant women of reproductive age is uncommon. A retrospective study from US also stated that maternal deaths were uncommon but significantly higher than that for pregnant women without COVID-19.[20] However, increasing reports of pregnant women with COVID-19 at more risk of developing severe disease than non-pregnant women especially in last trimester have been reported.[5] There was no maternal mortality or severe COVID-19 complication requiring critical care admission in the study by Na Li et al as well by Huijun Chen et al did not report any maternal mortality.[17,18] Zaigham et al in a systemic review of 108 pregnancies with COVID-19 reported 3 cases of ICU admissions, no maternal mortality but reported severe maternal morbidity due to COVID-19 and perinatal mortalities.[16] In our study there was 1 ICU admission and mortality of same patient which was due to postoperative complications. HDU admission for oxygen support due to hypoxia was required by 2 patients.

UKOSS study states that preterm birth is more common amongst symptomatic pregnant women with COVID-19 and were higher than in asymptomatic (19% and 9% respectively). 78% of pre-term births were iatrogenic.[14] More probability of pre-term labour pains were observed in symptomatic patients 2.4 (95% CI, 1.37-4.18) as compared to asymptomatic patients. Though in our study none of preterm births 27/54 (50%) both in symptomatic or asymptomatic patients with COVID-19 appear to be related to maternal compromise due to COVID-19. All preterm birth were either spontaneous or due to obstetric indications.

All 9 patients in a study by Chen et al underwent caesarean section due to indications like severe pre-eclampsia, previous caesarean section, foetal distress and most importantly due to unsurety of mother to child transmission of COVID-19 during vaginal delivery.[17] Likewise in a study by Na Li et al all except 2 patients (who presented in labour) in the confirmed group (16) and suspected COVID-19 pneumonia group (18) were delivered by caesarean section as they considered COVID-19 confirmed/suspected pneumonia as an indication for caesarean section.[18] In our study, 54 antenatal patients delivered out of 78 antenatal patients. 20/54 (37.03%) had vaginal delivery and 34/54 (62.96%) patients had caesarean section due to obstetrical or foetal indications, and none for any COVID related indication. This is probably because of more asymptomatic or mild symptoms in our study population. Also it is also possible that in early reports more caesareans were done due to lack of clarity on pathogenesis or perinatal routes of transmission.

Neonatal

Overall caesarean section rate in our study is higher as discussed previously and symptomatic mothers had a high relative risk of giving birth by caesarean section although all caesarean section in our study were done due to obstetric indications. Neonates of symptomatic mothers had high relative risk i.e. 1.81 (95% CI, 0.73-4.49) of being symptomatic, 1.37 (95% CI, 0.54-3.41) times the risk of getting admitted to NICU and 1.57 (95% CI, 0.48-5.09) times the risk of getting infected by SARS-CoV-2 within 72 hours of life in comparison to neonates of asymptomatic mothers. Symptomatic COVID-19 infection in mother had risks of increased morbidity in neonate like transient tachypnea of the newborn (TTNB) and suspected sepsis and also need for oxygen therapy. The increased incidence of TTNB was high probably because of more caesarean sections. All mother and neonate dyads were roomed-in if both were stable and exclusive breastfeeding was ensured with all COVID-19 appropriate behaviour, neonates who were managed separate from mothers were given either expressed breast milk or breast milk from our hospital human milk donor bank.According to national neonatology forum (NNF) study there was high transmission risk of SARS-CoV-2 in neonates who were roomed-in mothers (RR 1.16, 95%CI 1.1 to 2.4; p=0.01) whereas in our study 3/29 (10.34%) neonates roomed-in with mother became infected and 3/23 (13%) who were managed separate from mothers were infected. This suggests that neonates roomed-in with mother with all COVID-19 precautions were not at higher risk of getting infected. However, this mandates strict COVID protection protocols to be followed.

There was no difference between foetal compromise at birth in asymptomatic pregnant women with COVID-19 and pregnant women without COVID-19 but few case series report foetal compromise in symptomatic COVID-19 pregnant women.[5] In our study 15/52 (28.85%) foetuses had foetal distress for which caesarean section was done but it is less likely that this compromise was due to COVID-19 as most of these patients had co-morbidities like hypertension, IHCP, foetal growth

restriction (FGR), antepartum haemorrhage (APH) and oligohydamnios which could have been cause of foetal compromise..

In a systematic review by Raschetti et al, 55% of neonates were symptomatic and in NNF study 30/143 (21%) of SARS-CoV-2 positive intramural babies were symptomatic.[21,22] Our results are different from both these studies as in our study 2/6 (33.3%) neonate with COVID-19 were symptomatic, and like their study most common symptoms was respiratory distress.[22] Most of the symptomatic neonates born to COVID-19 positive had good outcome in our study mothers, 18/22 (81.8%) were discharged and 4 neonates who expired were not infected with SARS-CoV-2. A study reported 8% perinatal transmission and 1.5% horizontal transmission in their neonates which is almost similar to our study with 5/52 (9.61%) neonates with COVID-19 developed perinatal transmission and 1/52 (1.92%) horizontal transmission.[22]

All samples of amniotic fluid, cord blood, placental membranes, placenta, colostrum and maternal vaginal secretions were negative in our study. Newborns of all these 9 mothers were also SARS CoV-2 RTPCR negative.As we did not do these tests in all patients therefore data for SARS-CoV-2 infected neonates is deficit in our study. Huijun Chen et al also tested cord blood, amniotic fluid and neonatal throat swab for SARS-CoV-2 and found them negative for all their patients.[17]

Wong et al studied maternal and perinatal outcome of 12 women with SARS in 2003 in Hong Kong and concluded high incidence of preterm birth (4/5 patients after 24weeks), 57% incidence of spontaneous abortion in first trimester (4/7), 2 cases of foetal growth restriction in second and third trimester and high case fatality rate of 25% (3/12) and no newborn had perinatal SARS infection.[7]Alfaraj et al reported mortality of 27%, foetal demise in 27% and 54% patients requiring ICU admission in 11 pregnant patients with MERS.[8]Our study shows that in comparison to SARS and MERS maternal and foetal outcome is good in COVID-19 pregnant women. Our study shows good maternal and foetal outcome in pregnancies infected with SARS-CoV-2 and the possibility of vertical transmission needs more investigations. These findings are similar in a systemic review by Khalil et al.[23]

Limitations

The main limitation of present study is its smaller number of patients in first and second trimester, lack of universal testing in pregnant women in initial phase of pandemic and absence of long term follow up of mother and their neonates post quarantine period.

CONCLUSION

First wave of COVID-19 pandemic did not cause significant adverse outcome in pregnant patients and mother-newborn dyads in our tertiary care centre when active and intensive management of mothers and newborns were done but still there is possibility of severe morbidity and mortality due to COVID-19. We acknowledge the limitation of this study as our sample was small.

Funding: No funding sources
Conflict of interest: None declareds
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. N Engl J Med. 2020;382:727-33.
2. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395 (10223):497-506.
3. WHO Director-General's opening remarks at the media briefing on COVID-19-11 March, 2020. Available at: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020. Accessed on 1 Jan 2021.
4. Human Coronavirus Types, 2020. Available at: https://www.cdc.gov/coronavirus/types.html. Accessed on 1 Jan 2021.
5. Coronavirus infection (COVID-19) in pregnancy:Information for healthcare professionals, 2020. Available at: https://www.rcog.org.uk/globalassets/documents/guidelines/2021-02-19-coronavirus-covid-19-infection-in-pregnancy-v13.pdf. Accessed on 18 May 2021.
6. Greenhalgh T, Jimenez JL, Prather KA, Tufekci Z, Fisman D, Schooley R. Ten scientific reasons in support of airborne transmission of SARS-CoV-2. lancet 2021;397(10285):1603-5.
7. Wong SF, Chow KM, Leung TN, Ng WF, Ng TK, Shek CC, et al. Pregnancy and perinatal outcomes of women with severe acute respiratory syndrome. Am J Obstet Gynecol. 2004;191(1):292-7.
8. Alfaraj SH, Al-Tawfiq JA, Memish ZA. Middle East respiratory syndrome coronavirus (MERS-CoV) infection during pregnancy: report of two cases and review of the literature. J Microbiol Immunol Infect. 2019;52:501-03.
9. Rasmussen SA, Jamieson DJ, Uyeki TM. Effects of influenza on pregnant women and infants. Am J Obstet Gynecol. 2012;207(3):3-8.
10. Silasi M, Cardenas I, Racicot K, Kwon J-Y, Aldo P, Mor G. Viral infections during pregnancy. Am J Reprod Immunol. 2015;73(3):199-213.
11. Gottfredsson M. The Spanish flu in Iceland 1918. Lessons in medicine and history. Laeknabladid. 2008;94:737-45.

12. Nelson-Piercy C. Respiratory disease. In: Handbook of Obstetric Medicine. 5th ed. Boca Raton: CRC Press; 2015:371.
13. van Well GTJ, Daalderop LA, Wolfs T, Kramer BW. Human perinatal immunity in physiological conditions and during infection. Mol Cell Pediatr. 2017;4:4.
14. Vousden N, Bunch K, Morris E, Simpson N, Gale C, O'Brien P, et al. The incidence, characteristics and outcomes of pregnant women hospitalized with symptomatic and asymptomatic SARS-CoV-2 infection in the UK from March to September 2020: a national cohort study using the UK Obstetric Surveillance System (UKOSS). Plos One 2021; 16(5):0251123.
15. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of coronavirus disease 2019 in China. NEMJ. 2020;382:1708-20.
16. Zaigham M, Andersson O. Maternal and perinatal outcomes with COVID-19: a systematic review of 108 pregnancies. Acta Obstet Gynecol Scand. 2020;99(7): 823-9.
17. Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, 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):809-15.
18. Li N, Han L, Peng M, Lv Y, Ouyang Y, Liu K, et al. Maternal and neonatal outcomes of pregnant women with coronavirus disease 2019 (COVID-19) pneumonia: a case-control study. Clin Infect Dis. 2020;71(16):2035-41.
19. Allotey J, Stallings E, Bonet M, Yap M, Chatterjee S, Kew T, et al. Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis. BMJ. 2020;370:3320.
20. Jering KS, Claggett BL, Cunningham JW, Rosenthal N, Vardeny O, Greene MF, et al. Clinical characteristics and outcomes of hospitalized women giving birth with and without COVID-19. JAMA Intern Med. 2021;181(5):714-7.
21. Raschetti R, Vivanti AJ, Vauloup-Fellous C, Loi B, Benachi A, De Luca D. Synthesis and systematic review of reported neonatal SARS-CoV-2 infections. Nat Commun. 2020;11(1):5164.
22. Kumar P, More K, Chawla D, Murki S, Tandur B, Deorari AK, et al. Outcomes of Neonates Born to Mothers With Coronavirus Disease 2019 (COVID-19)-National Neonatology Forum (NNF) India COVID-19 Registry. Indian Pediatr. 2021;58(6):525-31.
23. Khalil A, Kalafat E, Benlioglu C, O'Brien P, Morris E, Draycott T, et al. SARS-CoV-2 infection in pregnancy: A systematic review and meta-analysis of clinical features and pregnancy outcomes. E Clin Med. 2020;25:100446.

Cite this article as: Kashyap S, Pandher DK, Sehgal A, Jain S. Maternal and neonatal outcome in COVID-19 pregnancy: an ongoing review of first wave in a tertiary care center in North India. Int J Reprod Contracept Obstet Gynecol. 2021;10:4212-9.