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Original Research Article

COVID-19 in Late Pregnancy and Its Effect on Feto-Maternal Outcome: A Longitudinal One Year Follow Up Study

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Abstract:

Background: COVID-19 pandemic had imposed a significant health crisis and world is still calculating the aftermath of pandemic. COVID-19 infection to pregnant women imposes significant risk of infection transmission to child due to close contact; hospital-acquired illnesses; transmission by droplets (caregivers, family members, and family visitors); and exposure to public sources of infection.

Objective: Present study was aimed to analyze the feto-maternal outcome among COVID-19 positive pregnancies. We also followed up the child during the first year of life to analyze their development milestones.

Methodology: Total 64 pregnant women in their 3rd trimester with lab confirmed COVID-19 infection admitted to ward were included in the study. Neonates born to these women were evaluated for neonatal outcome. These neonates were followed up for one year to study long-term development consequences. The data was collected by detailed history taking/ examination and relevant investigations using a predesigned proforma.

Results: The mean age of the patients was 25.83 ± 4.923 years. At the time of clinical presentation, 85.9% of the patients were asymptomatic whereas 9 patients were symptomatic. Mode of delivery was LSCS in 34.4% cases, NVD in 51.6% cases, NVD- IUD expelled in 7.8% cases and assisted vaginal delivery (AVD) in 6.3% cases. Neonatal outcomes indicate intrauterine death (IUD) in 3/64 (4.7%) cases. NICU admission was required in 11.5% cases. During the follow up of the 1st year of life, development of babies was normal in all cases. The mean number of hospital visits in 1st year of life was 3.26 ± 3.44 and mean respiratory illness per month was 0.56 ± 0.82.

Conclusion: Present study provided the feto-maternal outcome of COVID-19 positive cases. A higher rate of LSCS was observed and IUD observed in 4.7% cases. However, during the follow up of first year of life, normal development was observed in all cases. Further studies are required to validate the findings of this study.

Keywords: COVID-19, maternal outcome, fetal outcome, IUD, development.

Introduction

COVID-19 was a global pandemic which was declared as an outbreak by WHO in 2020. Although the pandemic has been under control now but world is still calculating the aftermath of pandemic [1]. Anxiety has always been raised by the emergence of novel viral illnesses and their outbreaks among populations at risk of infection.

This has been particularly true for pregnant women, who frequently feel more worried for their unborn child than for themselves. During an epidemic, pregnant women, their fetuses, and newborns are the most susceptible members of society [2]. Pregnancy-related infections with MERS-CoV and SARS-CoV are typically severe and linked to poor outcomes for the unborn child, such as a higher chance of miscarriage, fetal growth restriction, and premature delivery [3]. An aggressive and rigorous case management program has been linked to good newborn outcomes for infected women in the final trimester in a small case series from Wuhan, China [4].

The innate and adaptive immune systems of fetuses and newborns are still developing, which leaves them extremely vulnerable to infections [5]. One of

the main concerns of women during the COVID-19 pandemic is how to care for their newborn, including nursing, immunizations, and neonatal screening. Respiratory viruses are mostly transmitted from mother to child through intimate contact, hospital-acquired diseases, contact with public sources of infection, and transmission by droplets (caregivers, family members, and visitors). However, there is limited literature and data regarding the potential effects on maternal, neonatal and long-term consequences on the infant [6].

The risk of infection of COVID-19 to pregnant women and the outcome of fetomaternal transmission has been evident by very few studies with several methodological limitations. The main limitations include small sample sizes, retrospective analysis of medical records with missing data, and the low proportion of newborns tested for SARS-COV-2 relative to the total number of births. Chinese pregnant women are mentioned in the majority of reported cases. When analyzing the data, it is limited by the fact that the majority of pregnant women were from China, taking into account cultural and epidemiological variations in contrast to pregnant women from other nations and cultures [7].

Previous studies have not yet investigated the long-term impact on fetal development and child health. Prior to the development of vaccines and antiviral therapies or the disappearance of cases, it is critical to record these results. For instance, in the lack of data from an untreated group, risks and benefits cannot be weighed in the event. A very large birth cohort with case-cohort analysis capabilities might eventually reveal unusual unfavorable outcomes, such as immunological or neurodevelopmental abnormalities. Present study was aim to analyze the feto-maternal outcome among COVID-19 positive pregnancies. We also followed up the child during the first year of life to assess their development.

Methodology

Study design: Present study was observational, prospective, single centric, descriptive and hospital-based study that was conducted among 64 pregnant women in their 3rd trimester with lab confirmed COVID-19 infection admitted to ward. Neonates born to these women were evaluated for neonatal outcome.

Data collection:

The data was collected by detailed history taking/ examination and relevant investigations using a predesigned proforma. Neonatal morbidities assessed were birth asphyxia, birth trauma, sepsis, meconium aspiration syndrome, congenital pneumonia, respiratory distress syndrome, neonatal hyperbilirubinaemia and congenital anomalies. Mothers and babies were examined daily for development of any complications till discharge. Neonatal nasopharyngeal swab will be taken 24 hours after delivery.

The neonate will be followed till infancy by regular OPD consultations and telephonic enquiry. These neonates were then followed up for one year to study long-term development consequences.

Stastical analysis:

The data was collected on physical proforma and a excel sheet was prepared. Data was analyzed using the SPSS 27.0. Mean and standard deviation was used for the quantitative data whereas number and percentages were used for qualitative data. Appropriate tables were used to depict the data.

Results

The mean age of the patients was 25.83 ± 4.923 years. 51.6% patients were primigravida and rest of 48.4% were multigravida. Previous mode of delivery was LSCS in 20.3% cases whereas was NVD in 25% cases. 90.6% patients were non-vegetarian whereas 6% were vegetarian.

Past history analysis indicates GDM in 6.3% cases, Hypothyroid in 6.3% cases, hypertension in 3.1% cases, heart disease in 1.6% case and other comorbidity in 1.6% case (Table 1).

Table 1: Demographic and clinical history of the patients

Variable	Subdomain	Mean or N	SD or Percent
Mean age		25.83	4.923
Previous mode of delivery	LSCS	13	20.3
	NVD	16	25
Diet	Non-veg	58	90.6
	Veg	6	9.4
Past history	GDM	4	6.3
	Hypothyroid	4	6.3
	Hypertension	2	3.1
	Heart disease	1	1.6
	Other	1	1.6

At the time of clinical presentation, 85.9% of the patients were asymptomatic whereas 9 patients were symptomatic. Symptoms at presentation indicates cough in 7.8% cases, fever in 6.3% cases, rhinitis in 4.7% cases, sore throat in 1.6% case, breathlessness in 1.6% case, PROM in 1.6% case, tiredness in 1.6% case and vomiting in 1.6% case (Table 2).

Table 2: Clinical presentation of the patients

Variable	Subdomain	Mean or N	SD or Percent
Clinical presentation	Asymptomatic	55	85.9
	Symptomatic	9	14.1
Symptoms at presentation	Cough	5	7.8
	Fever	4	6.3
	Rhinitis	3	4.7
	Sore throat	1	1.6
	Breathlessness	1	1.6
	PROM	1	1.6
	Tiredness	1	1.6
	Vomiting	1	1.6
Conscious/oriented		64	100
Piccle		15	23.4
Abnormal respiratory system		1	1.6
Abnormal CNS		0	0
Abnormal CVS		0	0
UTI		1	1.6
Anemia		9	14.1

Physical examination of the patients indicates mean pulse rate of 83.58 ± 6.27, mean systolic blood pressure of 113.38 ± 6.82, mean diastolic blood pressure of 71.59 ± 7.97, mean respiratory rate of 17.25 ± 2.00, mean SPO2 of 98.69 ± 0.90, mean Hb of 11.62 ± 1.30, mean platelets of 264895.31 ± 68963.27, mean FBS of 85.06 ± 13.15, and mean PPBS of 107.70 ± 15.13.

Table 3: Physical examination of the patients

Variable	Mean or N	SD or Percent
Pulse rate	83.58	6.27
Systolic blood pressure	113.38	6.82
Diastolic blood pressure	71.59	7.97
Respiratory rate	17.25	2.00
SPO2	98.69	0.90
Hb	11.62	1.30
Platelets	264895.31	68963.27
FBS	85.06	13.15
PPBS	107.70	15.13

Maternal outcomes indicate that period of gestation was <37 weeks in 25% cases, 37-40 weeks in 67.2% cases and >40 weeks in 7.8% cases. Mode of delivery was LSCS in 34.4% cases, NVD in 51.6% cases, NVD- IUD expelled in 4.7% cases and AVD in 9.3% cases. Indications of LSCS was previous LSCS in 14.1% patients, non-progression of labour in 7.8% patients, failed induction in 4.7% patients, CPD in 3.1% patients, deflexed head in 1.6% patient, placenta previa in 1.6% patient, primi with mobile head in 1.6% patient.

Table 4: Maternal outcomes

Variable	Subdomain	Mean or N	SD or Percent
Period of gestation	<37 weeks	16	25
	37- 40weeks	43	67.2
	>40 weeks	5	7.8
Mode of delivery	LSCS	22	34.4
	NVD	33	51.6
	NVD- IUD expelled	3	4.7
	AVD	6	9.3
Indications of LSCS	Previous LSCS	9	14.1
	Non progression of labour	5	7.8
	Failed induction	3	4.7

	CPD	2	3.1
	Deflexed head	1	1.6
	Placenta previa	1	1.6
	Primi with mobile head	1	1.6

Neonatal outcomes indicate intrauterine death in 3/64 (4.7%) cases. In remaining 61 cases, the mean birth weight was 2.90 ± 0.51 kg. APGAR score at 1 minutes was 7 and 8 in 46.9% and 48.4% cases respectively. APGAR score at 5 minutes was 8 and 9 in 1.6% and 93.8% cases respectively. There were 59.4% male child and 40.6% female child. Congenital anomalies were observed in 2 (3.1%) cases. NICU admission was occurred in 11.5% cases. The primary indication of NICU admission include hypoglycemia in 1.6% case, icterus in 1.6% case, jaundice in 1.6% case, MSAF in 1.6% case, observation in 1.6% case, preterm LBW care in 1.6% case, and weak cry - required BMV in 1.6% case (Table 5). The mean duration of hospital stay was 3.90 ± 1.28 days.

Table 5: Neonatal outcomes

Variable	Subdomain	Mean or N	SD or Percent
Intrauterine death		3	4.7
Birth weight		2.90 kg	0.51 kg
APGAR at 1 minute	7	30	46.9
	8	31	48.4
APGAR at 5 minutes	8	1	1.6
	9	60	93.8
Gender of child	Male	38	59.4
	Female	26	40.6
Congenital anomalies		2	3.1
NICU admission		7	11.5
Indication of NICU admission	Hypoglycemia	1	1.6
	Icterus	1	1.6
	Jaundice	1	1.6
	MSAF	1	1.6
	Observation	1	1.6
	Preterm LBW care	1	1.6
	Weak cry - required BMV	1	1.6
Duration of hospital stay		3.90 days	1.28 days

During the follow up of the 1st year of life, breastfeeding was reported in 98.4% cases. RT-PCR and metabolic screening was negative in all cases. OAE and CCHD was pass in all cases. Allergy in family was observed in 11.5% cases. None of the baby was on ATT/LTBI. Infant weight was appropriate in 86.9% cases whereas inappropriate in 13.1% cases. 96.7 child were immunized whereas 3.3% child were unimmunized. Development of babies was normal in all cases.

Table 6: Follow up during the 1st year of life

Variable	Subdomain	Mean or N	SD or Percent
Breastfeeding	Yes	60	98.4
	No	1	1.6
RT PCR	Negative	61	100
Metabolic screening	Negative	61	100
OAE	Pass	61	100
CCHD	Pass	61	100
Allergy in family		7	11.5
Baby on ATT/LTBI		0	0
Infant weight	Appropriate	53	86.9
	Inappropriate	8	13.1
Immunization status	immunized	59	96.7
	Unimmunized	2	3.3
Development of baby	Normal	61	100

The mean number of hospital visits in 1st year of life was 3.26 ± 3.44. Reason of hospital visit was cold in 23% cases, cough in 32.8% cases, fever in 39.3% cases, sore throat in 1.6% cases, rhinitis in 4.9% cases, febrile seizure in 3.3% cases and URI in 1.6% case. Respiratory illness per month was 0.56 ± 0.82. Treatment for respiratory illness includes drugs in 52.5% cases and nebulization in 27.9% cases.

Table 7: Number of hospital visits in 1st year of life

Variable	Subdomain	Mean or N	SD or Percent
Mean number of hospital visits		3.26	3.44
Reason of hospital visit	Cold	14	23
	Cough	20	32.8
	Fever	24	39.3
	Sore throat	1	1.6
	Rhinitis	3	4.9
	Febrile seizure	2	3.3
	URI	1	1.6
Respiratory illness per month		0.56	0.82
Treatment for respiratory illness	Drugs	32	52.5
	Nebulization	17	27.9

Discussion

The purpose of this study was to examine the variables linked to the fetal and maternal outcomes caused by COVID-19 infection. Since the negative effects are linked to non-obstetric causes such viral pneumonia complicating pregnancy, there is little information available about the outcomes for mothers and newborns as a result of the severity of COVID-19 infection during pregnancy [3]. A research by Creanga et al. showed that pregnant H1N1 influenza-infected mothers might have severe illness and poor outcomes for their unborn children [8].

In present study, mean age of the patients was 25.83 ± 4.923 years. In the study by Shree et al., the maximum number of patients (67.31%) were in the age group of 19-25 years which is corroborated with our findings [9]. The mean maternal age was 30.8 years in a study by Yan et al. [10]. In present study, previous mode of delivery was LSCS in 20.3% cases whereas was NVD in 25% cases, rest of 54.7% cases were primigravida. In the study by Shree et al., the percentage of primigravida was 40.38% while multigravida was 59.62% [9]. Comparably, 18 (48.6%) of the women in a study by Gupta et al. were primiparous, while 19 (51.4%) were multiparous [11].

The majority of the patients were asymptomatic in present study which is similar to the study by Tapasvi et al. [12]. Also, in the study by Pirjani et al., there were 69.38 % asymptomatic patients and 28.57% having mild symptoms [13]. In Shree et al. study, COVID-19-positive pregnant patients were mostly asymptomatic (48.07%) [9]. In present study, the main symptoms at presentation were cough (7.8%), fever (6.3%) and rhinitis (4.7%). In the study by Tapasvi et al. the main presenting symptoms were cough, dyspnea, and fever which is in line with our study [12]. These were the typical symptoms that both pregnant and non-pregnant cases with COVID-19 presented with, according to several investigations [14-16]. According to Panahi et al., there are no variations in COVID-19-related symptoms and indicators between women who are pregnant and those who are not [17]. In our study, the most common comorbidity was anemia which was reported in 14.1% cases. In the study by Tapasvi et al., the most common of which were anemia (8.9%) and pregnancy-induced hypertension (5.9%) which is similar to present study [12]. Pregnancy-induced hypertension, observed in 31.37% of patients, was the most prevalent comorbidity in a research by Mullins et al. [18]. The most frequent presenting symptoms in the Shree et al. research were fever (32.69%), myalgia/malaise (19.23%), and cough (44.23%) [9]. Fever and myalgia were the most frequently reported symptoms in the Gupta et al. research, with cough coming in second (10.8%) [11].

In current study, the mode of delivery was LSCS in 34.4% cases, NVD- IUD expelled in 7.8% cases and AVD in 6.3% cases. According to study by Chen et al. and Yu et al., LSCS was performed on every patient who tested positive for COVID-19 [4,19]. Only obstetric reasons and related comorbidities, such as prior LSCS, meconium-stained liquor, and fetal distress, were dealt with LSCS in the research by Tapasvi et al. [12]. According to the Chaichian et al. research, 15.38% of newborns were delivered with NVD, with the other neonates being delivered via LSCS [20]. 38 women (82.60%) out of 46 births in the research by Pirjani et al. underwent LSCS [13]. In a research by Liu et al., 10/13 pregnant women who tested positive for COVID had LSCS [21]. Research by Antoun et al. similarly found greater LSCS frequencies in COVID patients, while a meta-analysis by Lopes et al. found that 65% of women had LSCS [7, 22]. According to Nayak et al.,

women who tested positive for COVID-19 had a greater risk of LSCS than women who did not, although the difference was not statistically significant [23].

In the Shree et al. study, the early first-trimester abortion rate was 2.0%, LSCS was 24.0%, and the proportion of NVD was 74.0% [9]. In the Singh et al. research, 44 (36.07%) of the 78 (63.93%) women delivered by NVD had an LSCS [24]. In order to ascertain if the technique of delivery may influence the COVID-19 vertical transmission between mothers and their offspring, Cai et al. created a systematic review research. According to their findings, the method of delivery had no effect on the vertical transmission, and doctors should select the best way of delivery in accordance with the severity of the illness and the obstetric indications [25]. Although, a few case report investigations revealed the feasibility of vertical transmission [26, 27].

In present study, neonatal outcomes indicate intrauterine death in 3/64 (4.7%) cases. According to Chen et al. and Qiancheng et al., there is presently no proof that women who get COVID-19 pneumonia in the latter stages of pregnancy might have an intrauterine infection brought on by vertical transmission [19, 28]. Nonetheless, five cases of vertical transmission were documented in a research by Tapasvi et al. [12]. This might be caused by the research population racial and geographic diversity as well as the likelihood of infection with various COVID-19 strains. With the exception of few mortality cases due to sepsis and pneumonia, all other newborns who received cautious care are recovered well.

In present study, NICU admission was occurred in 11.5% cases. Out of the 49 live deliveries in the research by Shree et al., only one (2.04%) infant was COVID-19 positive, while four (8.16%) neonates were admitted to a NICU [9]. Two newborns (1.65%) in the research by Singh et al. tested positive, out of 40 (33.06%) babies that were admitted to the NICU [24]. During the follow up in the 1st year of life, normal development of babies was observed in all cases. However, Edlow et al., found that maternal SARS-CoV-2 may be associated with neurodevelopmental sequelae in some offspring [29]. In the study by Gutiérrez et al., 34.2% of obstetric patients with acute COVID-19 infection presented post-COVID-19 condition symptoms [30].

This study has some limitations, including a limited sample size and a single-center design. Data pertaining to COVID-19 testing in samples of cord blood, placenta, and amniotic fluid were not available. This research is conducted in a limited geographic area. In India, there were few data on feto-maternal outcomes throughout all COVID-19 waves. Further studies are required to validate the findings of this study.

Conclusion

Our research aims to increase understanding of COVID-19 pregnancy by providing further information about its varied consequences. Based on our findings, COVID-19 during pregnancy may be linked to severe feto-maternal complications. A higher rate of LSCS was observed and IUD observed in 4.7% cases in present study. However, during the follow up of first year of life, normal development was observed in all cases. At this time, it is not entirely possible to rule out the possibility of maternal-fetal transmission. Reports from meta-analyses or larger research are needed to verify this transmission.

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