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Original Research Article

Histopathology of placenta in covid-19 infection and correlation with fetal outcome

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ABSTRACT

Background: Placental examination can yield valuable information that may be essential to enhance our understanding of disease pathogenesis and to identify underlying causes of adverse pregnancy outcomes. There is increasing evidence that COVID-19 infection leaves tell-tale signs of injuries in the placenta.

Objectives: To study histopathological features of placenta of covid 19 positive mothers.

Study design: Prospective observational study.

Results: Out of fifteen placenta histopathological changes observed, intervillous fibrin deposition was most common finding that was present in 6 placenta (40%); calcifications, chorangioidis in 4 placenta(26.6%); deciduitis, thrombosis were present in 3 placentas(20%) respectively; increased fibrinoid material, decidual vasculopathy, chorioamnionitis were present in 1 placenta(6.6%) respectively. Out of fifteen infants, 13(86.6%) infants were term (>37weeks) and 2(13.3%) infants were preterm (<37 weeks) including one twin delivery. Two (13.3%) infants were IUGR and 3 (20%) infants were low birth weight and Small for gestational age. Six infants (40%) required admission in NICU of which 5 infants (33.3%) required respiratory support.

Conclusion: Placenta histopathological findings were suggestive of maternal vascular malperfusion like increased intervillous fibrin deposition, chorangioidis, deciduitis, calcifications, thrombosis and the findings were correlated with fetal outcome like preterm deliveries, small for gestational age, IUGR, respiratory distress requiring respiratory support.

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1. Introduction

The 2019 coronavirus disease (COVID-19), a novel zoonotic disease,¹ was first discovered in late December 2019 following an outbreak of severe pneumonia of unknown etiology in Wuhan, Hubei Province, China. The etiological agent was successfully isolated and identified as a previously unknown beta-coronavirus, which was provisionally coined as 2019 novel coronavirus (2019-nCoV).² It was later officially designated as Severe Acute Respiratory Syndrome Virus 2 (SARS-CoV-2) on the ground of phylogenetic analysis by the International

Committee on Taxonomy of Viruses.³ The emergence and rapid spread of SARS-CoV-2 via sustained human-to-human transmission poses a formidable pandemic threat to humankind globally. A proportion of patients with severe.

COVID-19 presented with extrapulmonary clinical manifestations related to cardiac-, kidney-, liver, digestive tract-injuries, and neurological disorders,⁴ besides suffering from classic respiratory symptoms and fever. Data from MERS-CoV and SARS-CoV, indicate that infection in pregnancy tends to be severe and associated with adverse neonatal outcomes, including increased risk of miscarriage, fetal growth restriction, and preterm birth.^{5–8} Data from the United Kingdom⁹ of more than 400 pregnant patients hospitalized with COVID-19 suggest an increased potential

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for adverse maternal outcomes in pregnant patients hospitalized with confirmed COVID-19 infection; while the risk of an intrauterine vertical transmission is inconclusive. There is increasing evidence that COVID-19 infection leaves tell-tale signs of injuries in the placenta. Placental examination can yield valuable information that may be essential to enhance our understanding of disease pathogenesis and to identify underlying causes of adverse pregnancy outcomes.¹⁰ Our aim is to study the pathological features manifested in placenta due to COVID-19 maternal infection at our hospital and their fetal outcomes.

2. Aim

To study pathological changes in the placenta in pregnant women infected with the new coronavirus.

3. Objectives

1. To study pathological changes of the placenta in mothers affected with covid-19.
2. To know the effects of COVID-19 on newborn/ fetal outcome.

4. Materials and Methods

It is a prospective observational study done at kamineni academy of medical sciences, LB nagar from July 2021 to February 2022. Pregnant women who are tested positive for COVID-19 by Rapid antigen, RTPCR, Covid Antibodies delivering between July 2021, and February 2022, were identified and placentas were examined with HPE (histopathological examination) and compared to the clinical outcomes in newborns. Pathomorphological examinations of the placentas were carried out in the pathology center, Kamineni academy of medical sciences, LB Nagar, Hyderabad.

5. Results

During the study period fifteen pregnant women diagnosed with COVID-19 infection in any trimester of pregnancy tested positive by COVID-19 nucleic acid test or Rapid antigen test or Covid Antibodies was positive were included. Eleven mothers (73.3%) were tested positive by RTPCR for COVID-19, 3 mothers (20%) were tested positive by covid Antibodies and 1 mother (6.6%) by Rapid antigen for COVID-19 (Table 1). Two mothers tested positive in first trimester, 4 mothers in second trimester and 9 mothers in third trimester (Table 2). Out of fifteen mothers 13 mothers had no comorbidities, two mothers had comorbidities out of which one had gestational diabetes mellitus and other had gestational hypertension. None of the fifteen women had serious illness or mortality (all mothers were cured and discharged). Out of fifteen infants delivered, 13(86.6%) were term (>37 weeks) and 2(13.3%)

infants were preterm (<37 weeks). Two infants (13.3%) were IUGR and 3 infants (20%) were low birth weight and Small for gestational age. Six infants (40%) required admission in NICU of which 5 (33.3%) required respiratory support of either bubble cpap or heated humidified high flow nasal cannula (Table 3). In placenta histopathology we observed that intervillous fibrin deposition was most common finding, followed by calcification, chorangioma, decidual vasculopathy, thrombosis.

Table 1: Method of testing for covid-19 infection

Methods of testing	Number of mothers tested positive	Percentage
RTPCR	11	73.3%
Rapid antigen	1	6.6%
Covid antibodies IG G,IG M	3	20%

Table 2: Covid-19 positivity during pregnancy

Mothers tested positive for covid-19 in	Number of mothers tested positive	Percentage
1st Trimester	2	13.3%
2nd Trimester	4	26.6%
3rd Trimester	9	60%

Table 3: Fetal outcome

Baby details	Number	Percentage
Delivery by LSCS	9	60%
Delivery by NVD	6	40%
TERM infants (>37 weeks)	13	86.6%
Preterm infants (<37weeks)	2	13.3%
AGA Babies	10	66.6%
SGA (Weight<10th centile)	3	20%
LBW(Weight<2500grams)	3	20%
IUGR	2	13.3%
Admission in NICU	6	40%
Respiratory support	5	33.3%

6. Discussion

In this study we have evaluated the histopathological features of placenta in mothers with covid 19 infection and the possible neonatal outcomes. A higher frequency of maternal vascular malperfusion (MVM) of the placental bed was reported in placentas of pregnant women infected with SARS-CoV-2 by 13 studies.^{11–23} It is a recognized pattern of placental injury related to abnormal uterine perfusion leading to a myriad of pathological changes such as accelerated villous maturation, increased perivillous and intervillous fibrin deposition, decidual vasculopathy, Tenney–Parker change, villous infarction, and intervillous

Table 4: Placenta changes in covid-19 affected mothers

Placenta changes	Number	Percentage
Intervillous fibrin deposition	6	40%
Increased fibrinoid material	1	6.6%
Decidual vasculopathy	1	6.6%
Deciduitis	3	20%
Calcifications	4	26.6%
Chorangiosis	4	26.6%
Chorioamnionitis	1	6.6%
Thrombosis	3	20%
Accelerated villous maturation	0	0%
Tenney–Parker change	0	0%
Villous infarction	0	0%

thrombosis.²⁴ Taglauer et al. reported that 14 of the 15 (93%) third trimester placentas revealed at least a feature of MVM, with infarcts and increased fibrin deposition being the most frequently observed, compared to healthy controls where MVM was observed only in 30% (3/10) of cases.²⁰ In our study we found all the placenta (15, 100%) showed signs of malperfusion.

We observed that intervillous fibrin deposition was most common finding that is present in 6 placentas (40%); followed by calcifications, chorangiosis in 4 placentas (26.6%); deciduitis, thrombosis in 3 placentas (20%) respectively; increased fibrinoid material, chorioamnionitis, decidual vasculopathy in 1 placenta (6.6%) respectively which were similar to the findings observed in previous studies.^{13–24} In Elisheva et al study, histological features of placenta were suggestive of maternal vascular malperfusion but decidual arteriopathy being most common feature of placenta followed by intervillous thrombus.²⁵ In our study calcifications in the placenta was the second most common finding which was not a common finding in previous studies.^{13–24}

In our study, Out of 15 infants 13(86.6%) were term (>37 weeks) and 2 (13.3%) were preterm (<37 weeks). Two infants (13.3%) were IUGR and 3 (20%) were low birth weight and small for gestational age. Six infants (40%) required admission in NICU of which 5 (33.3%) required respiratory support of either bubble cpap or heated humidified high flow nasal cannula. These findings were similar to Salut Mohidin et.al study preterm deliveries and low birth weight babies were present, but post-partum fever were present which was not present in our study.²⁶

7. Conclusion

In COVID -19 infected mothers, Placenta histopathological findings were suggestive of maternal vascular malperfusion like increased intervillous fibrin deposition, chorangiosis, deciduitis, calcifications, thrombosis. It appears that there is a risk of preterm delivery, low birth weight, intra uterine growth restriction, neonates requiring respiratory support.

8. Conflicts of Interest

All contributing authors declare no conflicts of interest.

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None.

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