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Original Research Article

A prospective study of maternal and fetal outcome in patients with hypertensive disorders of pregnancy and COVID-19 infection in a tertiary care center

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ABSTRACT

Background: During the current COVID-19 epidemic, managing pregnant patients is an issue. Pregnant women with coronavirus infection have an increased risk of miscarriage, preclampsia, caesarean delivery, and neonatal mortality. The additive effect of COVID-19 infection and preclampsia in pregnancy may affect the fetal and maternal outcome in a more complicated way. There have been only a few studies till now to observe the combined effect of both in pregnancy. Our study aims to observe and analyse the maternal and fetal outcomes in pregnancy complicated by preclampsia and COVID-19 infection.

Methods: This is a prospective study at a tertiary referral facility. This research included women with hypertension who were hospitalized for delivery and screened for SARS-RTPCR using a nasopharyngeal swab from April 2020 to September 30, 2021. The maternal and neonatal outcomes were studied and analyzed.

Results: In our study of 65 women with COVID-19 infection and hypertensive disorders in pregnancy, about 6 (9.2%) had eclampsia, 6 (9.2%) had abruptio placenta, 5 (7.6%) had DIC, 3 (4.6%) had HELLP, 2 (3.07%) had acute kidney injury, 2 (3.07%) had ARDS, and 1 (1.5%) had PRESS. 4 (6.1%) had chronic hypertension. Further, 12 (18.4%) of patients needed ICU admission with ventilatory support; about 5 (7.6%) was the rate of maternal deaths in our study. 43 (65%) of neonates were appropriate for gestational age, while 20 (32%) were low birth weight and 2 (3%) were extremely low birth weight. 45% of women with preclampsia develop complications.

Conclusions: Our study concluded that complications from preclampsia are more common in women with COVID-19 infection, but a larger sample size is necessary for statistical significance.

Keywords: Hypertensive disorders, COVID-19, Maternal and fetal outcome

INTRODUCTION

According to the world health organization (WHO), the first coronavirus infection was reported in Wuhan, in the Chinese province of Hubei, on December 31st, 2019.¹ The WHO designated coronavirus disease (COVID-19) a public health emergency of worldwide significance on March 11, 2020.¹ The COVID-19 virus was able to develop a foothold in India quite fast, with the first case

being recorded on January 30th 2020. According to the world health organization, there were 33,563,421 confirmed cases of COVID-19 in India between January 3, 2020 and September 23, 2021, resulting in 446,050 fatalities.² Approximately 818,513,827 vaccine doses have been provided as of September 21st, 2021.² Coronavirus is a positive-stranded ribonucleic acid (RNA) enveloped virus belonging to the coronaviridae family that causes respiratory and gastrointestinal

infections ranging from mild, self-limiting conditions to more serious disorders such as viral pneumonia with systemic complications.³ Droplets are the mode of transmission, and they might be produced by a patient's sneeze or cough. The incubation period varies between two days and two weeks after the injection of the virus.⁴ The early signs and symptoms are fever, dry cough, tachypnea, and shortness of breath.⁵ The symptoms of COVID-19 also include dizziness, chest pain, vomiting, and nausea, among other things. A sore throat, sneezing, nasal congestion, sputum production, anosmia, and viral conjunctivitis are all potential signs of the infection. Although approximately 20-25 percent of people infected with MERS-CoV or SARS-CoV experience diarrhea, digestive symptoms are uncommon in COVID-19 patients.⁶

Women who are pregnant or planning to become pregnant are regarded to be at high risk due to concerns regarding the effects of COVID-19 on them during and after pregnancy, as well as on their fetus.⁷ Pregnant women are more sensitive to becoming victims of pathogens than non-pregnant women because of physiological changes in the cardiovascular, respiratory, and immunological systems that occur during pregnancy. This is particularly true in the case of outbreaks like the COVID-19 infection. Hypertensive disorders of pregnancy include gestational hypertension, preclampsia, chronic hypertension, chronic hypertension superimposed with preclampsia and eclampsia.⁸ Preeclampsia can be classified as mild, moderate, or severe. Blood pressure greater than 160/110 mmHg, proteinuria, central nervous system dysfunction, hepatocellular injury, thrombocytopenia, oliguria, pulmonary edema, cerebrovascular accident, and severe intrauterine growth restriction are all signs of severe preeclampsia.⁹ It is recommended that a laboratory evaluation be performed to determine hemoglobin, hematocrit, and platelet count as well as liver function as well as fetal well-being and growth. The overall incidence of hypertensive disorders in pregnancy is 5-10%. Women with severe preeclampsia must be admitted to the hospital to confirm the diagnosis, assess the severity of the disease, monitor the progression of the disease, perform antepartum fetal surveillance and attempt to stabilize the condition.⁸ Preeclampsia is associated with considerable morbidity and mortality in both the mother and the fetus.

Aims and objectives

The aim of this study was to describe the maternal and fetal outcomes of pregnant women with hypertensive disorders and COVID-19 infection using various parameters. Study parameters included age, parity, weeks of gestation, gravida and parity status, comorbid conditions, and mode of delivery. Complications of preclampsia were also studied, which include HELLP Syndrome, DIC, ARDS, Eclampsia, AKI, PRESS, Abruptio, ICU admissions, and maternal deaths.

Neonatal complications include stillbirths, neonatal deaths, IUGR, preterm deliveries, and NICU admissions.

METHODS

This research is a prospective observational study that was performed at Lokmanya Tilak municipal medical college and general hospital in Mumbai, India, a tertiary care referral centre with an average of 10,000 deliveries every year. The study period included 1st April 2020 to 30th September 2021. ANC women with hypertensive disorders in pregnancy were sequentially hospitalised for delivery and screened via nasopharyngeal swab for SARS-reverse transcriptase polymerase chain reaction (RT-PCR). This research included 65 patients with hypertensive disorders who tested positive for COVID-19 and were hospitalized at a tertiary-care general hospital. Primary outcome measurements were risk factors, mortality, and morbidity in pregnant women with hypertensive diseases who were infected with COVID-19. All factors were examined and evaluated using percentages. Due to the fact that this was observational research, maternal and neonatal data were examined using descriptive statistics such as percentages and proportions, and no statistical tests were used.

RESULTS

The study was conducted at a tertiary care centre over the span of 18 months. 65 cases of COVID-19 positive patients who had hypertensive disorders were admitted during this period. Most patients in the study were referred for tertiary care management. The following observations from the study are as follows: 30 (46.15%) of the study subjects were in the age range of 25 years, followed by 27 (41.5%) in the age group of 26-30 years, and only 8 (12.30%) of the women were over 30 years. The results are similar to the age distribution of women with hypertensive disorders of pregnancy without COVID-19 infection in our institute. 18 (29.1%) of women had preterm delivery, and 47 (71%) were > 37 weeks.

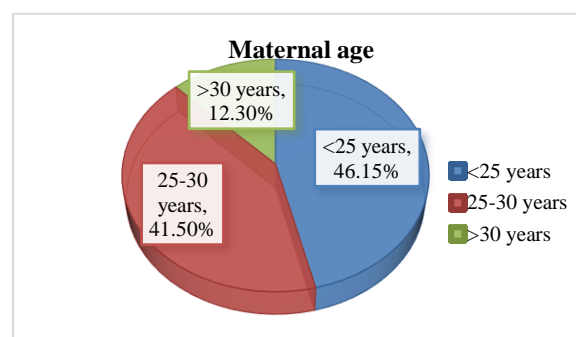


Figure 1: Age-wise distribution.

Preterm delivery is caused by obstetrical complications. The most common causes of preterm delivery were abruptio placentae and HELLP syndrome (haemolysis,

elevated liver enzymes, and low platelet count). Due to the COVID-19 infection and its complications, no preterm delivery was conducted. According to our study of 65 hypertensive pregnant women, COVID-19 infection was not responsible for preterm births. 42 (63.9%) of the women were multigravida, while only 23 (36.07%) were primigravida. 5 (7%) of the multigravida had a history of preeclampsia in their previous pregnancy and had a recurrence in the present pregnancy.

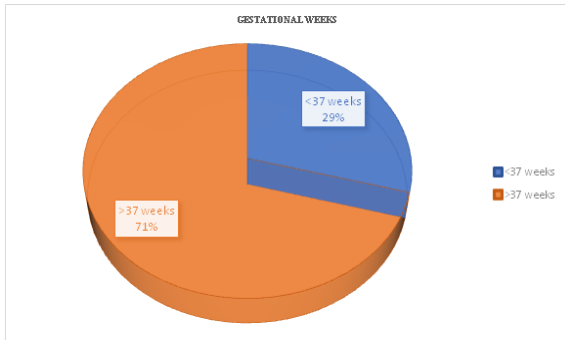


Figure 2: Gestational week-wise distribution.

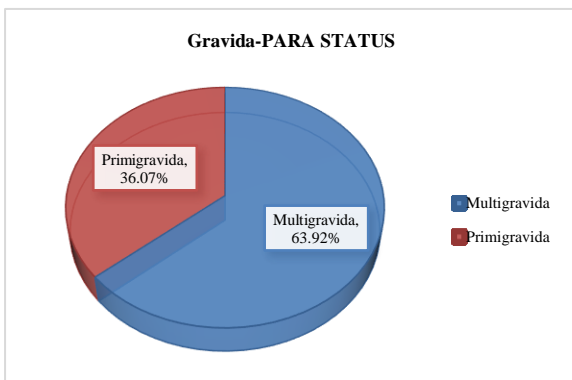


Figure 3: Gravida wise distribution.

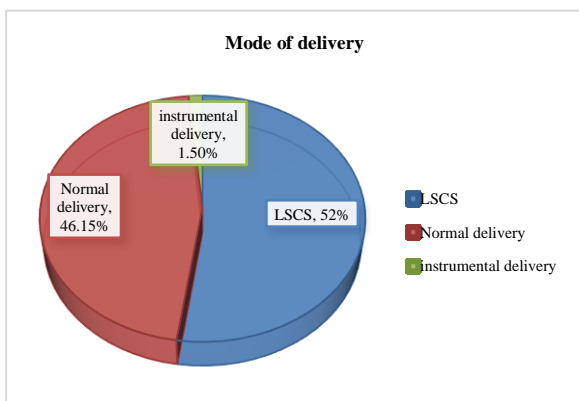


Figure 4: Mode of delivery wise distribution.

About 33 (52%) of the cases were delivered by C-section, 31 (46.15%) of the cases were delivered vaginally, and only 1 (1.5%) were delivered by instrumental delivery. LSCS was done only for obstetric indications. The rates of LSCS were comparable to the non-covid women's

hypertensive disorders in pregnancy. The most common indication for emergency LSCS was fetal distress in labor.

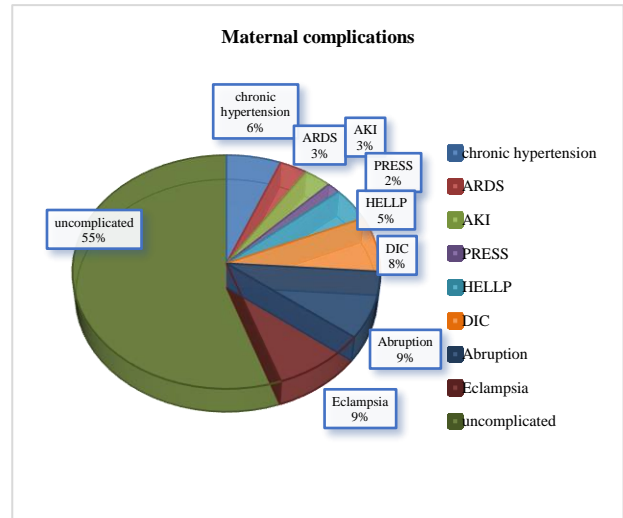


Figure 5: Maternal complications wise distribution.

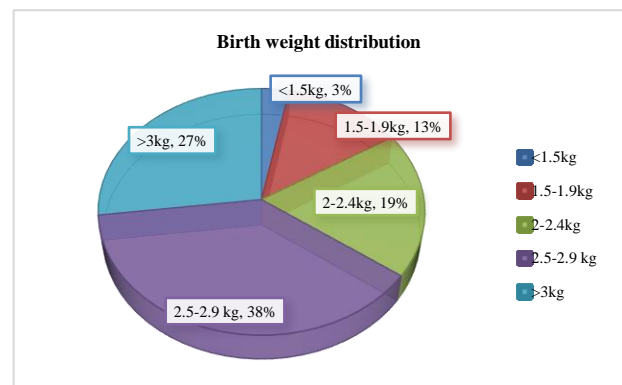


Figure 6: Birth weight wise distribution.

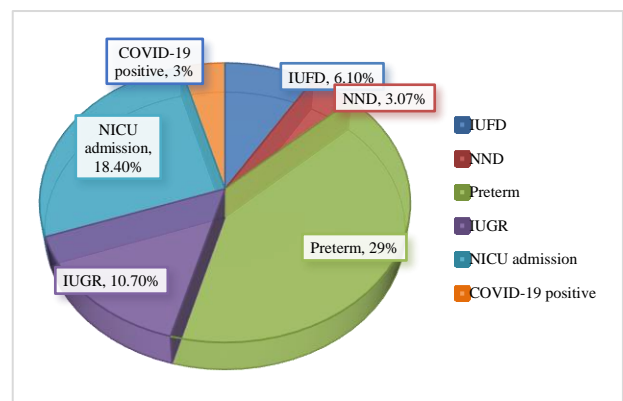


Figure 7: Neonatal complications wise distribution.

About 6 (9.2%) had eclampsia, 6 (9.2%) had abruption placenta, 5 (7.6%) had DIC, 3 (4.6%) had HELLP, 2 (3.07%) had acute kidney injury, 2 (3.07%) had ARDS, and 1 (1.5%) had PRESS. 4 (6.1%) had chronic hypertension. Further, 12 (18.4%) of patients needed ICU admission

with ventilatory support, about 5 (7.6%) was the rate of maternal deaths in our study. The most common cause of maternal death was acute kidney injury. Eclampsia is described as preeclampsia with generalised tonic-clonic convulsion. Despite the fact that eclampsia is uncommon in developed nations, it remains a leading cause of maternal morbidity and mortality throughout the world. Severe preeclampsia can cause sudden loss of vision due to involvement of the occipital brain lobe or the retina. One of the rare complications of severe preeclampsia is subcapsular hematoma, characterised by pain in the epigastric region and right side of the abdomen, which is mainly caused by disseminated intravascular coagulopathy. Preeclampsia and eclampsia account for 10-15 percent of all maternal deaths worldwide. In underdeveloped nations, eclampsia is the leading cause of death, whereas in developed countries, the most common cause is severe preeclampsia. 43 (65%) of neonates were appropriate for gestational age, while 20 (32%) were low birth weight and 2 (3%) were extremely low birth weight. Low birth weight babies were transferred to the NICU. The most common causes of low birth weight were preterm birth and IUGR.

Among the 65 births, 4 (6%) were still births, 2(3%) were neonatal deaths, 7 (10.7%) had IUGR, 18 (29%) were preterm births, and 12 (18.4%) had to be admitted to the NICU for treatment after delivery. Only 2 (3%) babies were tested positive and treated in the NICU. According to a few studies, maternal pneumonia is associated with intrauterine fetal death (IUFD), intrauterine growth restriction (IUGR), and neonatal death have been associated with maternal pneumonia. It is still not well established if COVID-19 can vertically transmit the infection. More extensive studies are required as there is limited data on neonatal outcomes in hypertensive mothers with COVID-19 infections.

DISCUSSION

COVID-19 infection is caused by the virus that causes severe acute respiratory syndrome (SARS-CoV-2). However, the nature of the link between COVID-19 and pregnancy outcomes is still unknown, and there have only been a few meta-analyses including individuals with COVID-19 who were pregnant. There is presently very little information available on the outcomes of mothers who have COVID-19 infection during pregnancy. When pregnant women are infected with COVID-19, there is a possibility that they will experience more severe symptoms, such as pneumonia and marked hypoxia, similar to those experienced by people who are elderly, immunosuppressed, or who have pre-existing morbidities such as diabetes, cancer, or chronic pulmonary disease.¹ According to the study, pregnant women with COVID-19 had a higher rate of admission to critical care units than non-pregnant women with the disease. In pregnant women, the vast majority of cases are asymptomatic or moderately symptomatic in nature. For individuals with symptomatic conditions, the most commonly reported

clinical symptoms were fever, cough, and dyspnea.¹⁰ The effect of COVID-19 on mothers and newborns during pregnancy was studied in a large, longitudinal, prospective, observational study involving 2184 pregnant women. The study concluded that preeclampsia (as well as high blood pressure) appears to be a significant risk factor for SARS-CoV-2 infection and the complications that may result. There was no indication that COVID-19 is an etiological factor in preterm delivery or high blood glucose levels during pregnancy.¹¹ It is important for clinicians to be aware of the extra hazards posed by COVID-19. According to a second, prospective study of 125 pregnant women infected with COVID-19 that was based on accumulated clinical and outcome data, there is no indication that pregnant women are at an increased risk of succumbing to COVID-19 infection and developing severe pneumonia.¹ According to the findings of the WHO research, unfavorable pregnancy outcomes are prevalent in these individuals because respiratory syndromes may worsen pulmonary oedema and lower oxygen saturation levels in the blood.

Another meta-analysis was published by Karimi-Zarchi et al estimating the risk and prevalence of preeclampsia and SARS-CoV-2 infection in pregnant women, published in February 2020.¹² It was decided to include all studies that documented the prevalence of preeclampsia in pregnant women who had been infected with SARS-CoV-2 in the study. The inclusion criteria were met by a total of ten case-control studies and fifteen case series. The results of the pooled data revealed that there was no statistically significant difference in the risk of preeclampsia between infected and uninfected pregnant women. When pregnant women infected with COVID-19 were compared to the general population, the prevalence of preeclampsia was 8.2 percent (95 percent confidence interval: 0.057-0.117).

Even when varied exposure and delivery durations are taken into account, early COVID-19 infections are linked to hypertensive disorders of pregnancy (HDP), suggesting that COVID-19 infection may modify pregnancy physiology and increase the probability of HDP development over time. Furthermore, new research reveals that COVID-19 regulates angiotensin-converting enzyme 2 expression in the placenta, which may be linked to HDP progression.¹³ The question still remains whether SARS-CoV-2 causes placental dysfunction, if it interferes with blood pressure homeostasis, and whether it causes placental abruption. However, there is a potential risk that COVID-19 may result in hypertensive crises, which might be fatal. In order to maintain blood pressure control in pregnant women, particularly those who already have hypertensive illnesses, it is critical to monitor and regulate their blood pressure closely. During the SARS-CoV-2 pandemic, women who appear with high blood pressure and other symptoms indicative of COVID-19 must be admitted to the nearest hospital immediately and get immediate medical assistance, as their health may worsen quickly if left untreated.

A large, longitudinal, prospective, unmatched diagnosed and undiagnosed observational study was done on the effects of COVID-19 on mothers and neonates during pregnancy. The study sample included 43 universities from 18 different nations. Women with COVID-19 alone, preeclampsia alone, both conditions, and those without any of the two conditions were compared. COVID-19 is highly linked to preeclampsia during pregnancy, especially in nulliparous women. COVID-19 severity does not appear to play a role in this relationship. Both disorders are linked to preterm birth, severe perinatal morbidity and mortality, and poor maternal outcomes, both alone and in combination. When it comes to the hazards posed by COVID-19, women with pre-eclampsia should be considered a particularly vulnerable group. According to the findings of research conducted by Nayak et al the vast majority of women were released without experiencing any serious difficulties, and there was no indication of vertical transmission of the COVID-19 virus. Four patients with preeclampsia and COVID-19 infection were studied by Chavan et al. They found no indication of increased mortality or morbidity in patients with preeclampsia and COVID-19 infection.³ According to the findings of research conducted by Mendoza et al 42 successive pregnancies were recruited and divided into two groups: severe COVID-19 and non-severe COVID-19, based on the incidence of severe pneumonia in the mothers. Angiogenic factors (soluble Fms-like tyrosine kinase-1/placental growth factor; sFlt-1/PlGF) and the Uterine Artery Pulsatility Index (UtAPI) were measured in this study. According to the results of the study COVID-19 categorized 34 instances as non-severe and 8 cases as severe. Women with PE presented with signs and symptoms in five cases (11.9 percent), with all five cases (62.5 percent) falling into the severe COVID-19 category. They came to the conclusion that pregnant women with severe COVID-19 may have a PE-like illness that can be separated from genuine PE by measuring sFlt-1/PlGF, LDH, and UtAPI levels.¹⁴

A meta-analysis was done which included 28 observational studies to determine if SARS-CoV-2 infection during pregnancy was associated with preeclampsia or not.¹⁵ The purpose of this study was to investigate the link between SARS-CoV-2 infection during pregnancy and the risk of preeclampsia. It was discovered that the risk of developing preeclampsia was considerably higher among pregnant women who had been exposed to SARS-CoV-2 infection than among those who had not been exposed to the virus. According to the findings of the study, infection with SARS-CoV-2 during pregnancy is associated with a higher risk of preeclampsia.¹³

CONCLUSION

Prospective observational research among all pregnant women with hypertensive disorders in pregnancy and COVID-19 infections who were hospitalized in labour and delivery units at a tertiary care facility was

conducted, and the findings are reported. Clinical presentation, obstetric and neonatal outcomes in individuals with hypertension throughout pregnancy and related to COVID-19 at the time of delivery are described in this paper. Our study concluded that complications with preeclampsia are more common in women with COVID-19 infection, but a larger sample size is necessary for statistical significance. It is necessary to do a multi-centric analysis with a larger population size in order to statistically verify that it is significant. Women with severe diseases should be admitted to a high dependency unit or intensive care unit at a tertiary care hospital under the supervision of a medical and obstetrics team for appropriate management.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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