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Original Research Article

Comparison of maternal outcome in COVID-19 positive and negative antenatal women: a comparative study

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ABSTRACT

Background: Coronavirus is an RNA virus causing respiratory and gastrointestinal infections. It caused SARS and MERS epidemics. In late 2019, a mutation called SARS-CoV-2 caused COVID-19, a severe respiratory illness. Pregnant women are at risk, but information is limited. The second wave affected pregnant women more. Maternal COVID-19 can lead to preterm births and caesarean sections. Vertical transmission to neonates is possible. Ongoing research is crucial to understand COVID-19's impact on mothers.
Methods: A comparative prospective hospital-based study was conducted, including antenatal women with COVID-19 symptoms in the case group. The control group consisted of antenatal women who tested negative for COVID-19. The study analyzed 150 COVID-19-positive antenatal women and 350 COVID-19-negative antenatal women, excluding those who left the study prematurely or tested positive during the study period.
Results: In the case group, no abortions were reported (0%), while in the control group, there was 1 abortion (0.29%). PROM occurred in 5.78% of cases and 1.43% of controls, with a significant difference. PPROM occurred in 2.31% of cases and 2.57% of controls, showing no significant difference. Preterm labor was observed in 11.53% of cases and 3.71% of controls, with a significant difference.
Conclusions: Pregnant women with COVID-19 experience diverse symptoms, highlighting the importance of vigilant monitoring. Adverse maternal outcomes, including preterm labor and ICU admission, are more common in infected individuals. Managing comorbidities, such as diabetes, is crucial.

Keywords: COVID-19, Pregnancy outcome, Pregnant women

INTRODUCTION

Coronavirus is an enveloped, positive-stranded ribonucleic acid (RNA) virus belonging to the family Coronaviridae that causes respiratory and gastrointestinal infections, ranging from mild, self-limiting diseases to severe, systemic disorders such as viral pneumonia with sequelae (CDC, 2021).[1] Over the past two decades, the coronavirus has caused two major epidemics: severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). In late 2019, a unique mutation of the coronavirus, labelled SARS-CoV-2, was identified as the cause of coronavirus disease 2019 (COVID-19), a severe respiratory illness characterized by dyspnea and fever (WHO, 2020).[2] COVID-19 infections, which initially emerged as an epidemic in China, quickly spread to numerous nations, resulting in a significant increase in the number of infected cases on a daily basis. On January 30, 2020, COVID-19 was declared a public health emergency of international concern (PHEIC) by the World Health Organization (WHO).[2] India reported its first instance of the COVID-19 virus on the same day.[3] Subsequently, on March 11, 2020, the WHO confirmed the existence of a COVID-19 pandemic during a press conference.[4] It is well-known that pregnant women are more susceptible to a severe course of pneumonia due to physiological adaptations during pregnancy, which can increase maternal and fetal morbidity and mortality.[5] However, the

literature currently lacks sufficient information regarding the effects of coronavirus infections specifically during pregnancy, which hampers counselling and care for these individuals. Notably, during the second wave of COVID-19 in the United Kingdom, there appeared to be a greater impact on pregnant women. At the Royal Brompton Hospital in London, one of the designated severe acute respiratory failure centers offering extracorporeal membrane oxygenation (ECMO) in England, the number of pregnant and peripartum women with severe COVID-19 disease increased during the second wave, necessitating intensive care admission and consideration of ECMO treatment.[6] While the reported rise in pregnant women with severe COVID-19 may be attributed to the emergence of a more pathogenic strain of SARS-CoV-2, preliminary data indicates that there is limited evidence to suggest that the B.1.1.7 variant, which arose in the United Kingdom during the second wave, is more contagious or causes more severe disease in pregnant women compared to other variants.[7] Instead, the increase in severe cases among pregnant women during the second wave could be related to the overall surge in COVID-19 cases, resulting in a higher infection rate in this population. This hypothesis aligns with UK data indicating a significant increase in cases during the second wave compared to the first wave.[8] However, changes in testing availability and reporting methods between the two waves may have influenced case reporting. Alternatively, experiences from Spain, where the number of hospitalized pregnant women during the second wave was ten times higher than the first wave, while the total number of hospitalized patients increased by only 30% during the same period, suggest that factors beyond the total number of cases may contribute to this trend. The exact extent to which these factors contribute to the increase in severe diseases among pregnant women remains unknown and warrants further investigation.[9] Medical literature indicates that maternal COVID-19 can impact pregnancy outcomes, resulting in increased rates of caesarean section deliveries due to maternal impairment.[10] While one London hospital reported an increase in stillbirths during the COVID-19 epidemic, registry data from the UK, US, and England do not support this finding.[11] Additionally, it has been observed that SARS-CoV-2 can be transmitted vertically to neonates, with the majority of infections occurring postnatally, but a significant proportion potentially being congenital.[12] However, there is still no consensus on the laboratory diagnosis of congenital infection and the mechanism of transmission. To address the lack of information, this study aimed to compare and contrast the maternal outcomes in pregnant women who tested positive and negative for COVID-19. The data on maternal outcomes during pregnancy are continuously being collected worldwide, and ongoing research is crucial to better understand the effects of COVID-19 on the mother and, as well as any potential associations.

METHODS

A comparative prospective hospital-based study was conducted at the PMSSY 200-bed hospital and Nehru Chikitsalay, BRDMC Gorakhpur, from April 1, 2021, to March 31, 2022. The case group included antenatal women who tested positive for COVID-19 and were admitted to the PMSSY hospital for obstetric reasons or due to COVID-19 symptoms. The control group comprised COVID-19 negative antenatal women admitted to the gynaecology emergency department of Nehru Chikitsalay. Inclusion criteria for the case group were all antenatal women who tested positive for COVID-19, while the control group included COVID-19 negative antenatal women. Antenatal controls who tested positive for COVID-19 during the study period were excluded from the analysis. During the study period, all COVID-19 positive antenatal women admitted to the PMSSY hospital between April 1, 2021, and March 31, 2022, were analyzed. A total of 159 patients COVID positive pregnant women visited the hospital, of which 9 participants left the study prematurely. Additionally, 372 COVID-19 negative antenatal women were recruited from the emergency obstetrics and gynecology department of Nehru Chikitsalay. Among the control group, 10 participants left the study prematurely, and 12 tested positive for COVID-19 during the study. Obstetric management for COVID-19 positive antenatal patients followed the guidelines provided by FOGSI, while COVID-19 management adhered to the guidelines outlined by ICMR. The data collected in the study were entered into Microsoft Excel 2010 software for subsequent analysis. Statistical analysis was conducted using either EpiInfo 7.0 software or SPSS version 23.0, employing relevant statistical tools such as data sorting, tabulation, Chi-square and visualization through histograms. In order to maintain ethical standards, written informed consent was obtained from all participants, and the study protocol received ethical approval from the Institutional Ethics Committee of the University.

RESULTS

In both the case and control groups, the majority of women were aged between 18-27 years, accounting for 66 (50.77%) in the case group and 249 (71.14%) in the control group. Among the 28-37-year age group, 63 (48.46%) patients were in the case group, while 96 (27.43%) patients were in the control group. There was only one patient in the case group and five patients in the control group who were observed in the 38-45-year age group. A statistically significant difference was found in the age distribution between the case and control groups ($p<0.0001$). In terms of gravidity, 45 (64.34%) patients in the case group were primigravida, while 183 (52.29%) in the control group were primigravida. Among the multigravida (>G2) group, 38 (29.23%) patients were in the case group and 48 (13.71%) were in the control group. There was a statistically significant difference between the case and control groups, with a higher percentage of primigravida and multigravida patients in the case group compared to the control group ($p<0.0001$). The majority of patients in both the case group (83, 64.34%) and control group (268, 76.57%) belonged to rural areas. The control group had a significantly higher number of rural patients compared to the case group ($p=0.0052$) (Table 1).

Table 1: Distribution and association of study subjects according to their age, gravida status and population characteristic.

Parameters	Cases (N=130)		Controls (N=350)		P value
	Frequency	%	Frequency	%	
Age (years)					
18-27	66	50.77	249	71.14	X=18.98, p<0.001**
28-37	63	48.46	96	27.43	
38-45	01	0.77	05	1.43	
Grand total	130	100.00	350	100.00	
Gravida					
Primi	45	34.34	183	52.29	X=19.10, p<0.001**
G2	47	36.15	119	34.00	
≥G3	38	29.23	48	13.71	
Grand total	130	100.00	350	100.00	
Rural/Urban					
Rural	83	64.34	268	76.57	X=7.811, p=0.005*
Urban	47	36.15	82	23.43	
Grand Total	130	100.00	350	100.00	

*Significant (p <0.05), **Highly Significant (p<0.001)

Table 2: Distribution of gestational age and severity of cases (n=130).

Parameters	Cases	
	N	%
Gestational age at COVID infection (weeks)		
<12	0	0.00
12-28	13	10.00
29-37	71	54.62
>37	46	35.38
Total	130	100
COVID severity		
Asymptomatic	28	15.4
Mild Symptomatic	40	30.8
Moderate Symptomatic	42	32.3
Severe	20	15.4
Total	130	100

Table 3: Distribution and association of maternal medical conditions of study subjects.

Medical conditions		Case (N=130)	Control (N-350)	P value
Gestational HTN		8 (6.15)	23 (6.57)	0.8686
Mild preeclampsia		6 (4.62)	25 (6.57)	0.3167
Severe preeclampsia		7 (5.38)	18 (5.14)	0.9156
Eclampsia		8 (6.16)	12 (3.42)	0.184
Diabetes mellitus-2		2 (1.54)	0 (0)	0.0201*
Gestational diabetes mellitus		5 (3.85)	3 (0.86)	0.0230*
Anaemia	Mild	57 (74.03)	128 (71.51)	0.8548
	Moderate	14 (18.18)	38 (21.23)	
	Severe	6 (7.79)	13 (7.26)	

*Significant (p <0.05), **Highly Significant (p<0.001)

Table 4: Distribution and association of maternal outcome among study subjects.

Maternal outcome N (%)	Cases	Control	P value
Abortion	0 (0)	1 (0.29)	0.5418
PROM	7 (5.38)	5 (1.43)	0.0136*
PPROM	3 (2.31)	9 (2.57)	0.8694
Preterm labour	15 (11.53)	13 (3.71)	<0.001**
LSCS	109 (83.85)	223 (63.29)	<0.001**
Maternal death	17 (13.08)	12 (3.43)	<0.001**
ICU admission	25 (19.23)	10 (2.85)	<0.001**
Postpartum haemorrhage	1 (0.77)	2 (0.57)	0.806

PROM- Premature rupture of membranes, PPROM- Preterm premature rupture of membranes, LSCS- Lower segment caesarean section

Most women in the case group had a gestational age of 29-37 weeks (54.62%) or >37 weeks (35.38%). There were no antenatal women in the <12-week gestational age group, and 13 antenatal women were included in the 12-28-week gestational age group. The control group did not have any recorded gestational age data since they were COVID negative. In the case group, the majority of women were moderately symptomatic (32.3%), followed by mild symptomatic (30.3%). There were 20 severely symptomatic patients (15.4%) and 28 asymptomatic patients (15.4%) (Table 2).

In the case group, 4.62% had mild pre-eclampsia compared to 6.57% in the control group (p=0.3167). Severe pre-eclampsia was observed in 5.39% of cases and 5.14% of controls (p=0.9156). Eclampsia was present in 6.1% of cases and 3.42% of controls (p=0.184). Type 2 diabetes mellitus was seen in 5 cases (3.85%) and none in the control group (p=0.0201). Gestational diabetes was found in 5 cases (3.85%) and 3 controls (0.86%) (p=0.0230). Mild anemia was prevalent in 74.03% of cases and 71.51% of controls. Severe anemia was observed in 7.79% of cases and 7.26% of controls. Moderate anemia was seen in 18.18% of cases and 21.23% of controls (p=0.8548) (Table 3).

In the case group, no abortions were reported (0%), while in the control group, there was 1 abortion (0.29%). The difference between the groups was not statistically significant (p=0.5418). Both the case group (5.78%) and control group (1.43%) had cases of premature rupture of the membranes (PROM). PROM was significantly more common in the case group (p=0.0136).

Preterm Premature Rupture of the Membranes (PPROM) occurred in 2.31% of cases and 2.57% of controls, with no significant difference between the groups (p=0.8694). Preterm labor was observed in 11.53% of cases and 3.71% of controls, showing a significant difference (p=0.0012). A higher percentage of cases (83.85%) and controls (63.71%) underwent caesarean section (LSCS), with a significant difference (p<0.0001).

There was a significant difference in mortality between the case group (13.08%) and control group (2.85%) (p=0.0001). A higher proportion of cases (19.23%) were admitted to the Intensive Care Unit (ICU) compared to controls (2.85%) (p=0.001). Postpartum haemorrhage (PPH) occurred in 0.77% of cases and 0.57% of controls, with no significant difference (p=0.8069) (Table 4).

DISCUSSION

The present study aimed to investigate the clinical characteristics and maternal outcomes of pregnant women with COVID-19. The study found that the age distribution of subjects in the case and control groups was statistically significant, with a higher proportion of younger individuals in the control group. This finding is consistent with previous studies that have reported a higher risk of severe illness among older individuals.[13,14] Regarding the gestational age at the time of COVID-19 infection, the majority of subjects in the case group were infected in the third trimester, while other studies have reported a higher proportion of infections in the second trimester.[14,15] This discrepancy may be attributed to variations in the study populations and geographical locations. Nevertheless, it is important to note that pregnant women in any trimester can be susceptible to COVID-19 infection, and appropriate preventive measures should be implemented throughout pregnancy. In terms of symptom severity, the majority of pregnant women in the case group exhibited mild to moderate symptoms, consistent with previous studies.[16,17] However, there were variations in symptom presentation and asymptomatic cases across different studies, indicating the diverse clinical manifestations of COVID-19 in pregnant women.[18,19] This highlights the importance of close monitoring and early detection of symptoms in pregnant women to provide timely medical interventions. The study also assessed the prevalence of maternal medical conditions among case and control groups. Gestational diabetes and pre-existing diabetes mellitus were found to be more prevalent in the case group, which is consistent with previous studies.[13,20] However, the prevalence of conditions such as gestational hypertension and pre-eclampsia did not show significant differences between the groups, in contrast to some previous findings.[21,22] These discrepancies may be attributed to the sample size and population characteristics in different studies. In terms of maternal outcomes, the study found a higher rate of preterm labor and caesarean delivery among pregnant women with COVID-19 compared to the control group. Similar findings have been reported in previous studies, indicating an increased risk of adverse outcomes such as preterm birth and caesarean section in COVID-19 positive pregnant women.[13,23] The higher rate of ICU admission among the case group further emphasizes the potential severity of COVID-19 infection in pregnant women.[14] In conclusion, this study highlights the clinical characteristics and maternal outcomes of pregnant women with COVID-19. The findings indicate that pregnant women infected with COVID-19 are at increased risk of adverse outcomes such as preterm labor, caesarean delivery, and ICU admission. Close monitoring and timely interventions are crucial to ensure the well-being of the mother.

CONCLUSION

Pregnant women with COVID-19 experience diverse symptoms, highlighting the importance of vigilant monitoring. Adverse maternal outcomes, including preterm labor and ICU admission, are more common in infected individuals. Managing comorbidities, such as diabetes, is crucial.

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