Maternal and Perinatal Outcome in COVID-19: A Hospital based Descriptive Study

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ABSTRACT

Introduction

Since the declaration of the pandemic by World Health Organization (WHO), COVID-19 infection has affected worldwide including vulnerable pregnant women, who are at risk of increased maternal as well as neonatal morbidities and mortality. This study aimed to evaluate the prevalence of COVID-19 as well as maternal and perinatal outcomes in pregnancy with covid infection compared to pregnancy without infection.

Methods

This hospital-based descriptive study was conducted in Tribhuvan University Teaching Hospital Obstetrics Department. All pregnant women delivered after the third trimester, positive for COVID-19 during the study period, were compared with age-matched control without infection for maternal outcomes in terms of morbidities, mode of delivery, complications as well as neonatal outcomes such as birth weight, Apgar score, intrauterine fetal demise (IUFD), Neonatal Unit (NNU), Neonatal intensive care unit (NICU) admission and neonatal death. Data were analyzed using Stata 14.1.

Results

During the study period, total 59 women with COVID-19 infection (prevalence 2.23%) and 118 women without infection were included. Obstetric complications were seen significantly more in study group than control group (13.55% vs 3.38%; p-value 0.01). Cesarean section and intensive care unit admission were also significantly more in study group than control group (81.35% vs 51.7%; p-value <0.001, 22.03% vs 0.85%, p-value <0.001). Women with COVID-19 infection had significantly more hospital stay than control group (p-value 0.005). but no significant difference was observed in the neonatal outcome.

Conclusion

Pregnancy with COVID-19 infection is associated with adverse obstetric complications, lower uterine segment Cesarean section and NICU admission but not with adverse neonatal outcomes compared to women without COVID-19 infection.

Keywords

COVID-19; maternal outcome; perinatal outcome

INTRODUCTION

After the first case of coronavirus disease 2019 (COVID-19) pneumonia reported in December 2019, World Health Organization (WHO) initially classified the outbreak as a Public Health Emergency of International Concern and later as a pandemic.[1,2] In Nepal first reported COVID-19 infection in pregnancy as well as first mortality was on May 2020 in a 29 years postpartum woman.[3] Pregnant women are considered vulnerable group as they have altered physiological, anatomical, and immunological response making them susceptible to viral respiratory infections.[4–6]

Increasing age, high body mass index (BMI), chronic hypertension, and pre-existing diabetes were maternal risk factors associated with severe COVID-19 infection as well as admission to an intensive care unit (ICU) and the need for invasive ventilation.[7] Pregnant women were more likely to be hospitalized, to be admitted to the ICU and receive mechanical ventilation than non- pregnant women.[8] COVID-19 infection is also associated with relatively higher rate of preterm birth (PTB), preeclampsia (PE), and caesarean section (C-section).[9] Regarding neonatal outcome there was more frequencies of low Apgar score, fetal distress, and neonatal intensive care unit (NICU) admissions.[10] However no differences between COVID-19 infected and non-infected pregnant women were determined according to maternal and neonatal outcomes in another study though the C-section rate and the need for ICU care was significantly higher.[6]

Possible association of COVID-19 infection with adverse obstetric outcome warrants determination of risk factors, careful monitoring and more effective and prompt interventions in this vulnerable group. Though numerous data's on impact of COVID-19 infection on pregnancy and its obstetric outcome are available limited information is present in our population. Hence this study aimed to evaluate the burden of COVID-19 during pregnancy along with determination and comparison of maternal and perinatal outcome of pregnancy with COVID-19 infection with pregnancy without infection.

METHODS

This was a hospital based descriptive study conducted from October 2020 to September 2021 in Tribhuvan University Teaching Hospital (TUTH) Obstetric department. Sample was calculated using non probability consecutive sampling technique. Sample size was calculated considering the similar study conducted by Li Na et al in China,[11] using Epi Info version 7 (StatCalc) with two sided confidence level of 95%, pPower (1-β) of 90%, taking ratio of study group to control group 1:2, percent of study group exposed 87.5% and percent of control group exposed 47.1%. Thus total sample size calculated with 10% non-response rate was 80, with 27 study group and 53 control group. Approval from the Institutional Review Committee of Institute of Medicine (IOM), TUTH, and Research Department was taken before starting study.

All pregnant women in third trimester after 28 weeks of gestation positive for COVID-19, detected by reverse transcriptase polymerase chain reaction (RT-PCR), admitted for delivery during the study period, were included in the study. After each case enrolled in study group subsequent two age matched (±5 years) controls admitted for delivery in third trimester with covid negative status were taken. Pregnant women with unknown covid status and women with covid positive status delivered at other centers were excluded from the study. The participants were explained properly and informed consent was taken.

Their clinical characteristics were noted in the predefined Performa. They were followed for delivery and any co-morbidities, labour events, mode of delivery, complications and duration of hospital stay were documented. Covid related symptoms and morbidities such as pneumonia, ICU admission and ventilator support were also noted. Study group were categorized as asymptomatic, mild, moderate, severe and critical illness according to The National Institutes of Health (NIH) assessment scale as follows: (Table 1)[4]

Table 1. NIH COVID-19 severity assessment scale

Severity	Symptoms
Asymptomatic	Positive test for SARS-CoV-2 but no symptoms
Mild illness	Any signs and symptoms (e.g., fever, cough, sore throat, malaise, headache, muscle pain) without shortness of breath, dyspnea, or abnormal chest imaging.
Moderate illness	Evidence of lower respiratory disease by clinical assessment or imaging and a saturation of oxygen (SaO_2) > 93% on room air at sea level.
Severe illness	RR > 30 breaths per minute, SaO_2 ≤ 93% on room ail, ratio of arterial partial pressure of oxygen to fraction of inspired oxygen (PaO_2/FiO_2) < 300, or lung infiltrates > 50%.
Critical illness	Respiratory failure, septic shock, and/or multiple organ dysfunctions.

RESULTS

During the study period total 59 pregnant women with covid positive status confirmed by RT-PCR delivered at TUTH; accounting prevalence of 2.23%. Taking two age matched controls that delivered successively following case 118 women with covid negative status were included in the study. The general characteristics of these women are shown in the Table 2. There were no statistically significant difference in socio-demographic characteristics between the study group and control group. The parity, period of gestation as well as BMI was similar among the two groups. Preexisting comorbidities such as diabetes, hypertension, hypothyroidism, thrombocytopenia, bronchial asthma were present more in study group (23.73%) than in control group (14.41%) but the difference didn't reach statistically significant. Among the study participant's unbooked women without any antenatal checkup at our center were significantly more in study group than in control group (13.56% vs 1.69%; p-value 0.001). The study group was categorized according to NIH COVID-19 severity of cases as shown in figure 1. Most of the participants were asymptomatic (60%), whereas 7% and 4% were severe and critically ill respectively.

Table 3 depicts the maternal and neonatal outcome of the study population. There was no significant difference in antenatal obstetric morbidities such as pregnancy induced hypertension (PIH), gestational

Table 2. Socio-demographic and general characteristics of the study participants

Factors	Number (%)	PCR for COVID-19		p-value
		Negative (n=118)	Positive (n=59)	
Age groups (years)				
20-25	47 (26.55)	28 (23.73)	19 (32.20)	0.27
26-30	93 (52.54)	67 (56.78)	26 (44.07)	
31-35	37 (20.90)	23 (19.49)	14 (23.73)	
Age in years, mean + SD	27.67 ± 3.65	27.82 ± 3.53	27.38 ± 3.90	0.46
Ethnicity				
Brahmin/chhteri	113 (63.84)	81 (68.64)	32 (54.24)	0.17
Janajati	26 (14.69)	15 (12.71)	11 (18.64)	
Others	38 (21.47)	22 (18.64)	16 (26.12)	
Occupation				
Employed	67 (37.85)	50 (42.37)	17 (28.81)	0.08
Housewife	110 (62.15)	68 (57.63)	42 (71.15)	
Education				
Lower secondary	31 (17.51)	15 (12.71)	16 (27.12)	0.057
Higher secondary	89 (50.28)	62 (52.54)	27 (45.76)	
Graduate or above	57 (32.20)	41 (34.75)	16 (27.12)	
BMI				
Normal	36 (20.34)	24 (20.34)	12 (20.34)	0.81
Overweight	98 (55.37)	67 (56.78)	31 (52.54)	
Obesity	43 (24.29)	27 (22.88)	16 (27.12)	
BMI kg/m^2	27.71 ± 4.20	27.48 ± 3.76	28.15 ± 4.97	0.32
Parity				
Primi	86 (48.59)	57 (48.31)	29 (49.15)	0.92
Multi	91 (51.41)	61 (51.69)	30 (50.85)	
POG				
Term	130 (73.45)	87 (73.73)	43 (72.88)	0.99
Preterm	23 (12.99)	15 (12.71)	8 (13.56)	
Post term	24 (13.56)	16 (13.56)	8 (13.56)	
Pre-existing Comorbidity				
No	146 (82.49)	101 (85.59)	45 (76.27)	0.12
Yes	31 (17.51)	17 (14.41)	14 (23.73)	
Booked				
Booked	167 (94.35)	116 (98.31)	51 (86.44)	0.001*
Unbooked	10 (5.65)	2 (1.69)	8 (13.56)	

Table 3. Maternal and neonatal outcomes

Variables	Total (n=177)	PCR		p value[1]
		negative (n=118)	positive (n=59)	
	n (%)	n (%)	n (%)	
Maternal Outcomes				
Obstetric comorbidity antepartum				
No	134 (75.71)	93 (78.81)	41 (69.49)	0.17
Yes	43 (24.29)	25 (21.19)	18 (30.51)	
Obstetric complications				
No	165 (93.22)	114 (96.61)	51 (86.44)	
Yes	12 (6.77)	4 (3.38)	8 (13.55)	0.011*
Mode of delivery				
Emergency CS	82 (46.33)	41 (34.75)	41 (69.49)	<0.001*
Elective CS	27 (15.25)	20 (16.95)	7 (11.86)	
Vaginal delivery	64 (36.16)	53 (44.92)	11 (18.64)	
Instrumental delivery	4 (2.26)	4 (3.39)	0	
Duration of stay (days)	3.55 ± 3.45	2.92 ± 1.93	4.81 ± 5.12	0.005*
ICU stay				
No	163 (92.09)	117 (99.15)	46 (77.97)	<0.001*
Yes	14 (7.91)	1 (0.85)	13 (22.03)	
Neonatal Outcomes				
Birth weight (kg) mean $\pm$ SD	3.14 ± 2.4	3.3 ± 2.9	2.9 ± 4.9	0.37
APGAR score at 1 min (mean $\pm$ SD)	6.93 ± 0.42	6.88 ± 0.48	7.01 ± 0.22	0.06
APGAR score at 5 min (mean $\pm$ SD)	8.00 ± 0.22	7.99 ± 0.24	8.03 ± 0.18	0.24
Admitted in NICU/NNU				
No	155 (87.57)	104 (88.14)	51 (86.44)	0.74
Yes	22 (12.43)	14 (11.86)	8 (13.56)	
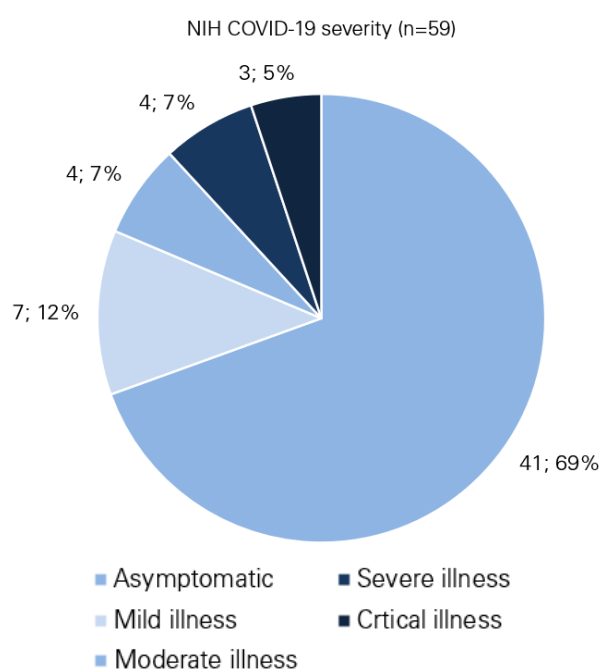
Figure 1. National Institutes of Health (NIH) COVID-19 severity of cases

diabetes mellitus (GDM), obstetric cholestasis, gestational thrombocytopenia among study group and control group. Conversely postpartum obstetric complications (PPH, shoulder dystocia, prolonged catheterization, bladder injury, caesarean hysterectomy) were seen significantly more in study group than control group (13.55% vs 3.38%; p value 0.011). There was only1 mortality in study group and no mortality in control group. C-section also occurred more in study group than control group (81.35% vs 51.7%; p value <0.001). Most common indication of C-section was previous LSCS (18.64%) in study group and meconium stained liquor (15.25%) in control group (Table 4). Total 14 (7.91%) study participants were managed in ICU, among which only 1 (0.85%) was in control group whereas 13 (22.03%) were in study group and the difference was statistically significant (p-value<0.001). Women with covid infection had significantly more hospital stay than control group (4.81±5.12 days vs 2.92±1.93 days, p-value 0.005). There was no significant difference in the neonatal outcome in terms of birth weight, Apgar score, NNU and NICU admission of the neonates.

Table 4. Indications of LSCS of the participants

Indications	Number (%)	PCR for COVID-19		p-value
		Negative (n=118)	Positive (n=59)	
None	67 (37.85)	56 (47.46)	11 (18.64)	<0.001 *
Previous CS	27 (15.25)	16 (13.56)	11 (18.64)	
MSL	24 (13.55)	18 (15.25)	6 (10.16)	
Breech	11 (6.21)	6 (5.08)	6 (5.08)	
NPOL	-	6 (5.08)	1	
Dec in CTG	7 (3.95)	5 (4.23)	2 (3.38)	
Severe COVID pneumonia	7 (3.95)	-	4	
COVID positive status	-	-	8	
Others	21 (11.86)	11 (9.32)	10 (16.94)	

DISCUSSION

In this descriptive study maternal and perinatal outcome of pregnant women with covid infection were compared with outcome of pregnant women without COVID infection.

Most of the COVID infected women were asymptomatic as reported by other studies.[12,13] Covid infection in pregnant women with preexisting co-morbidities were associated with more risk of severity of disease, ICU admission and ventilator support.[7] In this study, though slightly higher, but no significant difference in preexisting co-morbidities was there in both the groups, yet infected women had significantly more complications than non-infected women. Durray Shahwar et al suggested that the presence of risk factors such as obesity, hypertension, respiratory disorders and black race increased the chance of pregnant women being symptomatic. In addition risk of C-section, low birth weight, PTB and NICU admission were also higher amongst symptomatic pregnant women than asymptomatic pregnant women.[14]

Obstetric complications were seen significantly more in study group than control group in the present study finding consistent with other studiy.[15] On the other hand Allotey et al did not find any increase in adverse obstetric outcome like GDM, PE, intrauterine growth restriction (IUGR), PROM, stillbirth, PPH and postpartum infection in comparison to non-infected women.[7] As universal screening was not performed for all, controls were taken on the basis of clinical criteria, so despite using precise exclusion criteria there was chance of enrolling asymptomatic covid positive women in control group which was the limitation of their study. In our study, study group and control group were enrolled after doing COVID RT-PCR in all patients.

Admission to ICU was higher among study group than control group in our study which was in accordance to other studies.[6,15–17] Studies have remarked that mortality in the women with COVID-19 infection is more than without infection however mortality was seen in only one women in study group and none in control group in the present study.[15,16]

Though Royal college of Obstetrics and gynecology (RCOG) guideline suggests that mode of delivery in COVID-19 patients should be determined primarily by obstetric indication[18] cesarean delivery is seen significantly more in covid infected women than non-infected women.[6,9,12,15] In our study too women with covid infection had significantly higher rate of caesarean delivery which could be due to increased cases of previous C-section as well as an early decision making considering their COVID status. Indication for LSCS varied in different studies, fetal distress being the most common indication while previous C-section was the most common indication in our study.[5,15,19]

COVID infection increases the likelihood of still birth, NICU admission and neonatal death 10 but in the present study no significant differences between groups in terms of adverse neonatal outcomes was determined finding similar to another study.[6] Furthermore more frequent preterm deliveries in covid infected women than without infection is reported.[7,11,15,17] But it was not observed in our study as well as another study.[6]

Vertical transmission of COVID-19 to the neonate is a controversial issue with few studies reporting detection of covid-19 in the new born.[6,12,13,20] Universal testing of COVID-19 in all neonates born to covid infected women was not carried out in our center so the possibility of vertical transmission was not assessed in this study.

Limitation of present study was that we included pregnant women in 3rd trimester only which excluded large number of women before 28 weeks gestation. There were 2 more mortalities in covid infected women before 28 weeks during the study period which were excluded. So for better interpretation of the pregnancy outcome women at all gestation age should be included in study, if any done in future. Small sample size and single

center nature are also the limitations of the study nevertheless this descriptive study is the only study of this type done in our population though few observational studies are there in literature.[19,21]

CONCLUSION

Pregnancy with COVID-19 infection was associated with adverse obstetric complications compared to pregnancy without infection. Operative delivery and intensive care management was significantly high in COVID infected women. No difference in neonatal adverse outcome was observed compared to women without infection. Early recognition, close monitoring and prompt intervention adopting multidisciplinary approach are crucial measures for better outcome.

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CONFLICT OF INTEREST

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