ORIGINAL RESEARCH

COVID-19 in pregnancy: Maternal and perinatal outcomes at Dr. Mohammad Hoesin Hospital, Palembang, Indonesia

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ABSTRACT

Objective: The objective of this study was to analyze the maternal and perinatal outcomes of COVID-19 in pregnancy at Dr. Mohammad Hoesin Hospital, Palembang, Indonesia.

Materials and Methods: This retrospective cohort study was carried using medical records of pregnant mothers who delivered at Dr. Mohammad Hoesin Hospital Palembang from March 2020 to August 2021. The subjects were into two groups: pregnant women with and without COVID-19. Pearson Chi-Square test was used for bivariate analysis to determine the associations between COVID-19 and maternal as well as neonatal outcomes. The data were analysed using the Stata 15 statistical software. Multivariate analysis was done using the cox regression test to determine whether maternal characteristics affected those associations. P-value of < 0.05 were considered statistically significant.

Results: The study analyzed 220 subjects, including 62 COVID-19-positive (28.18%) and 158 COVID-19-negative (71.82%) patients. Among expectant mothers with COVID-19, caesarean sections were the most common maternal outcome (82.26%), while fetal distress was the most frequent perinatal outcome (12.13%). Significant associations were found between COVID-19 and maternal outcomes, including pneumonia (RR = 12.76), caesarean section (RR = 2.74), and ICU hospitalization (RR = 6.90). These associations remained significant after adjusting for maternal characteristics. However, no significant association was found between COVID-19 and perinatal outcomes.

Conclusion: COVID-19 increases the likelihood of adverse maternal outcomes throughout pregnancy.

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Highlights:

1. COVID-19 increases the likelihood of adverse maternal outcomes throughout pregnancy, including pneumonia, cesarean section, and ICU admission. Prompt diagnosis and treatment of COVID-19 may improve maternal outcomes.
2. COVID-19 does not increase the likelihood of adverse perinatal outcomes. Reassurance can be provided to expectant mothers.

INTRODUCTION

Initially found in Wuhan, China, coronavirus disease 2019 (COVID-19) is an infectious respiratory disease suspected to come from a bat. COVID-19 rapidly spread around the world and then is set as a pandemic by March 9th, 2020.[1] A country in Southeast Asia, Thailand, became the first country outside China who report a case, followed by Japan and South Korea. World Health Organization (WHO) data reported a total of 213.050.725 people in the world had been infected by the date August 24th, 2021.[2] Indonesia has a cumulative count of 4.026.837 individuals who have been tested positive for COVID-19. In South Sumatera, 56.525 people had been diagnosed COVID-19 at a similar time, and Palembang holds the number 29.458 of confirmed COVID-19 cases.[3]

Patients of all age groups from neonates to older adults had been screened positive for COVID-19. Pregnant women become one of the most susceptible groups based on the data from the Ministry of Health Republic Indonesia. From April 2020 to April 2021, 35.099 pregnant women had been confirmed to have COVID-19. Pregnancy induces physiological alterations that result in decreased immune function.[4] Indonesian Society of Obstetrics and Gynecology reported that 51.9% of the pregnant mother were asymptomatic and most of it was detected at 37 weeks of pregnancy.[5]

Each patient exhibited different manifestations of COVID-19. The most commonly observed symptoms include fever, cough, fatigue, sputum production, and dyspnea.[6] However, it is also possible for positive patients to be asymptomatic. Pregnant women who test positive for COVID-19 generally exhibit the same manifestation of COVID-19. In their study, Yan et al.[7] examined 116 laboratory-confirmed COVID-19 pregnant women. They observed that pregnant women with COVID-19 is mostly asymptomatic or showed symptoms i.e. fever, cough, and fatigue.

COVID-19 in pregnancy may increase the risk of maternal and perinatal adverse outcomes. Allotey et al.[8] reported that pregnant women with COVID-19 had a higher likelihood of maternal death and admission to the Intensive Care Unit (ICU) compared to those without. Another study also reported an increased risk of preeclampsia, ICU admission, and maternal death in the COVID-19 group. Out of 706 neonates born to COVID-19 positive mothers, 13% of the neonates were also tested positive for COVID-19, 20.5% experience low birth weight, and 17% have severe perinatal morbidity and mortality index at birth requiring treatment in the Neonatal Intensive Care Unit (NICU). The risk of perinatal death has also been reported to be increased.[9]

The objective of this study was to analyze the maternal and perinatal outcomes of COVID-19 in pregnancy at Dr. Mohammad Hoesin Hospital Palembang.

MATERIALS AND METHODS

This retrospective cohort study examined medical records of all pregnant women who gave birth at Dr. Mohammad Hoesin General Hospital Palembang, Indonesia, between March 2020 and August 2021. Pregnant women with malignancy, autoimmune disease, uncontrolled hypertension, diabetes mellitus, multifetal pregnancy, congenital anomaly, and any serious pregnancy complications were excluded from the study. Characteristics data including maternal age, parity, nutritional status, educational level, work, and comorbidities were acquired, along with COVID-19 diagnosis, maternal outcomes, and perinatal outcomes. The subjects were then divided into two groups: pregnant women with and without COVID-19. COVID-19 diagnosis was confirmed by a positive real-time Polymerase Chain Reaction (PCR) test. Stata 15 statistical software (StataCorp LLC, US) was used to analyze the data. Pearson Chi-Square test was used for bivariate analysis to determine the associations between COVID-19 and maternal as well as neonatal outcomes. Multivariate analysis was done using the cox regression test to determine whether maternal characteristics affected those associations. P-value of < 0.05 were considered statistically significant. This study was approved by the Faculty of Medicine Universitas Sriwijaya Health Research Review Committee (Protocol number 227-2021).

RESULTS AND DISCUSSION

Medical records of a total of 220 pregnant women were included in the study, consisting of 62 pregnant women with COVID-19 (28.18%) and 158 pregnant women without COVID-19 (71.82%). Villar et al.[9] reported a comparable prevalence of COVID-19 (33%).

Subject characteristics

The majority of subjects were pregnant women aged 20 to 35 (91.94%) with multiparity (62.90%), no comorbidity (91.94%), overweight (51.62%), and primary education level (1.94%). Out of the total of 62 subjects, 49 (79.03%) worked from home. Except for educational level and type of work, no significant characteristic differences were found between pregnant women with and without COVID-19. The complete subjects' characteristics are displayed in Table 1.

Table 1. Subject characteristics

Subject Characteristics	COVID-19 (N=62) n (%)	Non-COVID-19 (N=158) n (%)	p value*
Age			0.070
<20	0 (0)	8 (5.06)	
20-35	57 (91.94)	127 (80.38)	
>35	5 (8.06)	23 (14.56)	
Parity			0.058
Primiparity	23 (37.10)	71 (44.94)	
Multiparity	39 (62.90)	78 (49.37)	
Grande multiparity	0 (0)	9 (5.70)	
Nutritional Status			0.712
Underweight	1 (1.61)	3 (1.90)	
Normal	29 (46.77)	67 (42.41)	
Overweight	32 (51.62)	88 (55.70)	
Educational Level			0.016
No education	3 (4.84)	0 (0)	
Primary Education	57 (91.94)	149 (94.30)	
(elementary/middle/high school)	2 (3.23)	9 (5.70)	
Diploma/bachelor's degree			
Work			0.033
Unemployed	0 (0)	10 (6.33)	
Work From Home	49 (79.03)	117 (74.05)	
Work From Outside	13 (20.97)	31 (19.62)	
Comorbidity			0.088
Yes	5 (8.06)	27 (17.09)	
No	57 (91.94)	131 (82.91)	

*Pearson's Chi-square

In this study, the majority of pregnant women with COVID-19 belonged to the age group of 20 to 35 (91.94%). Previous study in Bali by Wiyati et al.[10] reported a consistent finding that the age group between 20 and 35 exhibited the highest rate of infection. The number of infected subjects differed across age groups due to different age-specific susceptibility and contact exposures. The occupational characteristics of individuals between the ages of 20 and 35 elevate the likelihood of viral exposure.[11] From a physiological standpoint, however, advancing age leads to a decline in immunity, rendering individuals more susceptible to infectious diseases. Older patients infected by SARS-CoV-2 had a higher likelihood of experiencing catastrophic maternal outcomes, indicating that advancing age was a significant risk factor for poor maternal outcomes.[8] No significant difference was found between age groups ($p > 0.05$) in this study.

Multiparous mothers had the highest infection rate in this study, contrary to study by Yan et al.[7] which reported highest infection rate in nulliparous mothers. Multiparous mothers are generally older and therefore more susceptible to infectious diseases.[8] Also, nulliparous mothers were reported to have better access to information and better preventive behavior against COVID-19.[12] In this study, however, no significant difference was found between parity groups ($p > 0.05$).

Pregnant mothers with higher body mass index (BMI) emerged as the most heavily afflicted by COVID-19. We obtained a comparable outcome from previous study by Figueiro-Filho et al.[13] In this study, no significant difference was found between BMI groups ($p > 0.05$). However, obese patients were more likely to have catastrophic maternal outcomes.[8]

The group with a basic educational level were more susceptible to contracting COVID-19 ($p < 0.05$). A prior study indicated a correlation between educational level and the preventive behavior of COVID-19.[12] Our findings diverged from a prior study in China which indicated that the group with bachelor's degrees and higher education levels exhibited the highest infection rates.[14] The disparate outcome was attributed to the different characteristics of a sample being studied. Another study in Indonesia reported that pregnant women with basic educational level were more likely to have COVID-19 due to poorer risk perception and preventive behaviour.[15]

Table 2. Maternal outcomes

Maternal outcomes	COVID-19 (N=62) n (%)	Non-COVID-19 (N=158) n (%)
Pneumonia		
Yes	35 (56.45)	7 (4.43)
No	27 (43.55)	151 (95.57)
PROM		
Yes	18 (29.03)	45 (28.48)
No	44 (70.97)	113 (71.52)
Caesarean section		
Yes	51 (82.26)	48 (30.38)
No	11 (17.74)	110 (69.62)
ARDS		
Yes	6 (9.68)	0 (0)
No	56 (90.32)	158 (100)
Preterm labor		
Yes	6 (9.68)	22 (13.92)
No	56 (90.32)	136 (86.08)
Preeclampsia		
Yes	8 (12.90)	19 (12.03)
No	54 (87.10)	139 (87.97)
Eclampsia		
Yes	1 (1.61)	6 (3.80)
No	61 (98.39)	152 (96.20)
Maternal Mortality		
Yes	5 (8.06)	0 (0)
No	57 (91.94)	158 (100)
Sepsis		
Yes	0 (0)	1 (0.63)
No	62 (100)	157 (99.37)
ICU Admission		
Yes	6 (9.68)	4 (2.53)
No	56 (90.32)	154 (97.47)
Total	62 (100)	158 (100)

PROM: premature rupture of membrane
ARDS: acute respiratory distress syndrome
ICU: intensive care unit

Maternal jobs were also being studied in this study. Mothers who were working from home are more likely to be infected by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, $p < 0.05$). A prior study yielded a comparable outcome, indicating that women who worked remotely experienced the highest rate of infection.[14] Pregnant mothers who worked from home had much more time to spend to go out to places with less strict COVID-19 preventive measures compared to workplaces.[15] Previous study shared a similar result where mothers who worked from home were the most infected.[14]

Surprisingly, pregnant mothers without comorbidity became the most infected by SARS-CoV-2 in this study. This might be due to background characteristics of the study population as no significant difference of SARS-CoV-2 was found between comorbidity groups ($p > 0.05$).

Maternal and perinatal outcomes

The results of our study indicate that the majority of pregnant mothers with COVID-19 underwent caesarean section (82.26%). Most of them also had pneumonia (56.45%). The incidence of other comorbidity was lower i.e. premature rupture of membrane (PROM, 29.03%), and preeclampsia (12.90%). Additionally, we identified cases of Acute Respiratory Distress Syndrome (ARDS), preterm labor, hospitalization to the Intensive Care Unit (ICU), eclampsia, and maternal death among pregnant mothers with COVID-19. No case of sepsis was observed among pregnant women with COVID-19 in our study (Table 2).

The study findings indicated a higher prevalence of pneumonia, premature rupture of membranes (PROM), caesarean section, acute respiratory distress syndrome (ARDS), preeclampsia, maternal mortality, and intensive care unit (ICU) admission in the COVID-19

group. The predominant maternal outcome seen was caesarean delivery, accounting for 82.26% of cases. Other studies similarly reported a high prevalence of caesarean section.[9,10] Prior study has indicated that respiratory problems were among the factors that warranted a caesarean section delivery.[16] Pneumonia was the second most common maternal consequence observed. Out of the expectant mothers with COVID-19 under investigation, 56.45% had x-ray findings indicative of pneumonia. Previous study in China also reported that 94% of individuals diagnosed with COVID-19 had developed pneumonia.[17] Out of the total number of expectant mothers with COVID-19, 18 cases (29.03%) were diagnosed with PROM. This result confirmed that PROM was higher on COVID-19 cases even there was only a slight difference with the non-COVID-19 cases. Consistent with a prior study,[18] infection with SARS-CoV-2 increased the likelihood of PROM. Other maternal outcomes yielded comparable findings. The incidence of ARDS was higher in the COVID-19 group, supporting the hypothesis that severe cases can result in ARDS.[19,20] We have identified five cases of maternal mortality, the majority of which occurred while the patients were receiving treatment in the Intensive Care Unit (ICU). Previous studies affirm a correlation between COVID-19 and both maternal mortality and increased ICU admissions.[7,21]

The results of our study indicate that the majority of perinatal outcomes seen in neonates born from mother with COVID-19 were fetal distress (16.13%), followed by low birth weight (12.90%) and preterm birth (9.68%). However, the incidence of low birth weight was higher in the non-COVID-19 group. No case of stillbirth or NICU hospitalization were identified in this study (Table 3).

Our research revealed a higher incidence of preterm labor, eclampsia, and sepsis in the non-COVID-19 group. It diverged from the result of prior multinational cohort study with 1.320 subjects. The discrepancy arose due to the huge difference in the sample size.[9,18] The perinatal outcomes observed in neonates born to pregnant mothers with COVID-19 included fetal distress (16.13%), preterm birth (9.68%), and COVID-19 positive neonates (4.84%). Previous study reported similar results.[9] COVID-19 was hypothesized to be a potential risk factor for fetal distress and preterm birth.

Table 3. Perinatal outcomes

Perinatal outcomes	COVID-19 (N=62) n (%)	Non-COVID-19 (N=158) n (%)
Preterm birth		
Yes	6 (9.68)	8 (5.06)
No	56 (90.32)	150 (94.94)
Low birth weight		
Yes	8 (12.90)	27 (17.09)
No	54 (87.10)	131 (82.91)
Stillbirth		
Yes	0 (0)	3 (1.90)
No	62 (100)	155 (98.10)
Neonatal death		
Yes	-	1 (0.63)
No	-	157 (99.37)
IUFD		
Yes	2 (3.23)	7 (4.43)
No	60 (96.77)	151 (95.57)
Fetal distress		
Yes	10 (16.13)	15 (9.49)
No	52 (83.87)	143 (90.51)
NICU Admission		
Yes	0 (0)	1 (0.63)
No	62 (100)	157 (99.37)
COVID-19		
Yes	3 (4.84)	0 (0)
No	59 (95.16)	158 (100)
Total	62 (100)	158 (100)

IUFD: intrauterine fetal death
NICU: neonatal intensive care unit
COVID-19: coronavirus disease 2019

Table 4. The association between COVID-19 infection with maternal and perinatal outcomes

COVID-19	RR	SE	P value	95% CI
Maternal Outcomes				
Pneumonia	12.74	5.27	<0.001	5.66-28.69
PROM	1.02	0.28	0.945	0.59-1.76
Caesarean section	2.71	0.54	<0.001	1.83-4.02
ARDS			1.000	
Preterm labor	0.69	0.32	0.430	0.28-1.71
Preeclampsia	1.07	0.45	0.867	0.47-2.45
Eclampsia	0.42	0.46	0.428	0.05-3.53
Maternal mortality			1.000	
Sepsis			1.000	
ICU admission	3.82	2.47	0.038	1.08-13.54
Perinatal Outcomes				
Preterm birth	1.91	1.03	0.230	0.66-5.51
Low birth weight	0.75	0.30	0.485	0.34-1.66
Stillbirth			1.000	
Neonatal death			1.000	
IUFD	0.73	0.58	0.692	0.15-3.50
Fetal distress	1.70	0.69	0.194	0.76-3.78
NICU admission			1.000	
COVID-19			1.000	

PROM: premature rupture of membrane; ARDS: acute respiratory distress syndrome, ICU: intensive care unit; IUFD: intrauterine fetal death; NICU: neonatal intensive care unit; COVID-19: coronavirus disease 2019; RR: risk ratio; SE: standard error; 95%CI: 95% confidence interval

We observed confirmed SARS-CoV-2 positive neonates from pregnant mothers with COVID-19. Previous research reported a similar result. However, vertical transmission was infrequently observed.[22] We observed one neonatal death among the non-COVID-19 group.

The association between COVID-19 with maternal and perinatal outcomes

A statistically significant association was seen between COVID-19 and three maternal outcomes: pneumonia, caesarean section, and ICU admission ($p < 0.05$). No statistically significant association was found between COVID-19 and any other maternal outcomes. Furthermore, this research found no statistically significant correlation between COVID-19 and perinatal outcomes ($p > 0.05$). The association between COVID-19 infection with maternal and perinatal outcomes was demonstrated in Table 4.

This study identified a significant association between COVID-19 and three maternal outcomes. COVID-19 was significantly associated with pneumonia, caesarean section, and hospitalization to the ICU. Pregnant mothers who contracted SARS-CoV-2 infection were 12.74 times more likely to develop pneumonia compared to mothers who were not infected (95% CI 5.66-28.69). Viral infection may result in a cytokine storm, causing lung damage, leading to pneumonia.[6,23] Similar result was reported in previous research.[24]

Pregnant mothers who had COVID-19 were 2.71 times more likely to have a caesarean section during labour compared to pregnant mothers without COVID-19 (95% CI 1.83-4.02). A previous study reported similar outcome that pregnant mothers with COVID-19 have 1.28 times more at risk to undergo a cesarean section.[9] COVID-19 could lead to maternal hypoxia, which can undermine the reliability of fetal heart rate assessment and can lead to caesarean section.[25] Further analysis was necessary due to the fact that the clinical symptoms of COVID-19 were mild compared to SARS and MERS and was not the indication of caesarean section.[26]

Pregnant mothers with COVID-19 were 3.82 times more at risk to be treated in the ICU (95% CI 1.08-13.54). Another study yielded similar findings, indicating that expectant mothers diagnosed with COVID-19 were 5.04 times more likely to require treatment in the ICU.[9] Severe cases of COVID-19 can lead to ARDS and Multiple Organ Dysfunction Syndrome (MODS), necessitating the use of respiratory support in the ICU.[27]

The association between COVID-19 infection and maternal characteristics with maternal and perinatal outcomes

There were significant associations between mother characteristics and some maternal as well as perinatal outcomes was statistically significant (Table 5). Maternal educational level was linked with ARDS and maternal mortality. Maternal nutritional status was associated with preeclampsia. Maternal age and maternal job were associated with eclampsia. Maternal age was significantly associated with ICU admission.

Additionally, the maternal job was found to be associated with intrauterine fetal demise (IUFD).

After being adjusted with maternal characteristics (maternal age, parity, and comorbidity), there was still a significant association between COVID-19 with pneumonia, cesarean section, and ICU admission ($p < 0.05$). Pregnant mothers with COVID-19 are 12.76 times more likely to have pneumonia, 2.74 times more likely to undergo a caesarean section, and 6.90 times more likely to require treatment in the ICU. There was no significant association found between maternal factors and the occurrence of pneumonia and caesarian section (Table 6). Similar results were reported in previous study. SARS-CoV-2 infiltrates the lung, which serves as a host organ expressing ACE (Angiotensin Converting Enzyme)-2. SARS-CoV-2 triggers the activation of inflammatory mediators, resulting in damage to the lungs.[6] The caesarean section was performed due to maternal hypoxia caused by SARS-CoV-2.[25]

The study found a significant association between maternal age and admission to the ICU. The majority of admissions were in the age category of 20 to 35 years (RR = 0.06, 95% CI 0.01-0.39). In this study, maternal age is the confounding factors affecting the association between COVID-19 and ICU admission. On the other side, previous study reported a significant increase in the relationship between COVID-19 and ICU admission (RR = 1.76, 95% CI 1.49-2.08) even after adjusting to maternal age.[9] Further study with larger sample size is needed to resolve these conflicting findings.

Table 5. The adjusted association between COVID-19 infection and maternal outcomes

Maternal Outcomes	Crude RR (95% CI)	RR[a] (95% CI)	RR[b] (95% CI)	RR[c] (95% CI)
Pneumonia	12.76 (5.66-28.73)	12.11 (5.68-25.18)	13.71 (5.87-32.02)	13.01 (5.67-29.86)
Caesarean section	2.74 (1.85-4.08)	2.81 (2.12-3.74)	2.80 (2.09-3.76)	2.83 (2.10-3.80)
ICU admission	6.90 (1.40-33.99)	6.68 (1.39-32.11)	6.40 (1.30-31.55)	5.76 (1.17-28.31)

[a]Adjusted for maternal age
[b]Adjusted for maternal age and parity
[c]Adjusted for maternal age, parity, and comorbidity

Table 6. The association between maternal characteristics with maternal and perinatal outcomes

Maternal and perinatal outcomes	COVID-19 infection and mother characteristics	RR	SE	P value	95% CI
Pneumonia	COVID-19	12.76	5.28	<0.001	5.66-28.73
	Comorbidity	1.44	0.46	0.255	0.77-2.68
PROM	Parity	0.71	0.16	0.139	0.45-1.12
Caesarean section	COVID-19	2.74	0.55	<0.001	1.85-4.08
	Work	0.85	0.20	0.493	0.54-1.34
ARDS	Educational Level	0.07	0.07	0.014	0.01-0.58
Preterm labor	Work	0.48	0.20	0.078	0.21-1.09
Preeclampsia	Nutritional status	1.71	0.38	0.017	1.10-2.66
Eclampsia	Age	0.15	0.12	0.018	0.03-0.72
	Work	0.18	0.13	0.024	0.04-0.80
Maternal mortality	Educational Level	0.06	0.06	0.009	0.01-0.50
Sepsis	Nutritional status	0.23	0.39	0.388	0.01-6.53
ICU admission	COVID-19 infection	6.90	5.61	0.018	1.40-33.99
	Age	0.06	0.06	0.003	0.01-0.39
Preterm birth	Comorbidity	2.35	1.39	0.149	0.74-7.49
Low birth weight	Age	0.44	0.20	0.065	0.18-1.05
Stillbirth	Educational Level	9.42	11.49	0.066	0.86-102.76
IUFD	Work	0.17	0.12	0.009	0.04-0.65
Fetal distress	Parity	0.31	0.19	0.053	0.09-1.02
NICU admission	Nutritional status	0.23	0.39	0.388	0.01-6.53
COVID-19	Nutritional status	0.23	0.23	0.135	0.03-1.58

PROM: premature rupture of membrane; ARDS: acute respiratory distress syndrome, ICU: intensive care unit; IUFD: intrauterine fetal death; NICU: neonatal intensive care unit; COVID-19: coronavirus disease 2019; RR: risk ratio; SE: standard error; 95%CI: 95% confidence interval

Maternal characteristics also affected the rate of ARDS, preeclampsia, eclampsia, and maternal mortality. Maternal educational level become the risk factor for ARDS and maternal mortality with basic educational level as the majority group ($p < 0.05$, RR = 0.07, 95% CI 0.01-0.58, RR = 0.06, 95% CI 0.01-0.50 consecutively). The results did not match the previous study due to the sample size difference. Preeclampsia had a significant association with maternal nutritional status, where normal nutritional status was the dominant group ($p < 0.05$, RR = 1.71, 95% CI 1.10-2.66). Similar as the association between eclampsia with maternal age and a maternal job were age 20 to 35 and working from home were the majority groups ($p < 0.05$, RR = 0.15, 95% CI 0.03-0.72, RR = 0.18, 95% CI 0.04-0.80 sequentially). The results were different from previous research which stated that there was an association between COVID-19 infection with preeclampsia and eclampsia.[9] The difference happened due to the sample size difference.

The rate of ARDS, preeclampsia, eclampsia, and maternal mortality was also influenced by maternal factors. Maternal educational level has been identified as a risk factor for ARDS and maternal mortality ($p < 0.05$, RR = 0.07, 95% CI 0.01-0.58), with the majority of cases occurring among those with a basic educational level ($p < 0.05$, RR = 0.06, 95% CI 0.01-0.50). The discrepancy in results can be attributed to the disparity in sample sizes between the current and the prior study.[9] The study found a strong correlation between preeclampsia and maternal nutritional status, with the normal nutritional status group being the most prevalent ($p < 0.05$, RR = 1.71, 95% CI 1.10-2.66). The study found a significant link between eclampsia and maternal age, as well as maternal employment. Specifically, the majority of cases occurred among women aged 20 to 35 ($p < 0.05$, RR = 0.15, 95%CI 0.03-0.72) who worked from home ($p < 0.05$, RR = 0.18, 95% CI 0.04-0.80). The findings diverged from prior research that reported a correlation between COVID-19 infection and the occurrence of preeclampsia and eclampsia.[9] The discrepancy arose as a result of the disparity in sample sizes.

Even after adjusting for maternal characteristics, there was no observed association between COVID-19 and perinatal outcomes. Nevertheless, a significant correlation was found between maternal factors and intrauterine fetal demise (IUFD). Maternal job was found to have a significant relationship with IUFD (RR = 0.17, 95% CI 0.04-0.65). There was no statistically significant correlation between maternal factors and any other perinatal outcome. Prior investigations have yielded contradictory findings about the statistical correlation between COVID-19 and perinatal outcomes.[9] The discrepancy arises due to the disparity in sample sizes. We did not observe any correlation between maternal COVID-19 and neonatal COVID-19. Until now, there has been a lack of evidence about vertical transmission of COVID-19.[28,29]

This is the first study to investigate the correlation between COVID-19 and maternal and perinatal outcomes in pregnant women in Dr. Mohammad Hoesin Hospital, Palembang. Potential confounding factors from different maternal characteristics had been investigated and the adjusted OR was calculated. Due to the nature of the study, potential bias in data collecting is inevitable. Due to limited available data from medical records, potential confounders including such as COVID-19 severity and the vaccination status of the group were not investigated. Further study with prospective design, larger sample size, and more comprehensive data should be done to generalize these findings.

CONCLUSION

COVID-19 in pregnancy is associated with pneumonia, cesarean section, and ICU admission. There is no association between COVID-19 in pregnancy and perinatal outcomes.

DISCLOSURES

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Conflict of interest

All authors declare that there is no conflict of interest.

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Author Contribution

All authors have contributed equally to all processes in this research, including preparation, data gathering and analysis, drafting, and approval for publication of this manuscript.

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