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Clinical characteristics and outcomes of neonates born to mothers with confirmed COVID-19 infection at Dr. Soetomo regional general hospital, Surabaya, in 2021

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Abstract---To describe the characteristics of neonates born to mothers with confirmed Covid-19 infection. A descriptive retrospective study using medical record data of patients treated in the neonatal intensive care unit (NICU) of Dr. Soetomo Regional General Hospital from January 1 to July 24, 2021. A total of 174 mothers were confirmed with positive COVID-19 reverse transcription-polymerase chain reaction (RT-PCR) swab test results. A total of 11 neonates were confirmed with positive COVID-19 RT-PCR swab test results, and 30% of them (52 neonates) were born preterm. The delivery method was dominated by the Caesarean section, as many as 117 pregnant women (67%). A total of 48 neonates (27%) were born with a birth weight of < 2,500 grams, 18 babies (10%) were born died with 2 positive COVID-19 RT-PCR swab test results. Currently, no vertical transmission of COVID-19 was proven. Meanwhile, the horizontal transmission was assumed to be the source of COVID-19 infection in neonates. Indeed, the application of health protocols was proven to prevent such infection effectively.

Keywords---mothers with confirmed Covid-19 infection, RT-PCR, neonate outcomes, clinical characteristics.

Introduction

Coronavirus disease 2019 (COVID-19) was first reported in December 2019 in Wuhan, Hubei province, China, with a clinical picture of pneumonia and has now spread throughout the world.(1) Based on data from the World Health Organization (WHO) dated July 29, 2021, a total of 195,266,156 cases were confirmed, with a total death of 4,180,161 people or 2%. Based on data from the Ministry of Health of the Republic of Indonesia, there were 3,287,727 confirmed cases in Indonesia, with a total death of 88,659 people as of July 28, 2021, and a mortality rate of 2.6%. The overall mortality rate of Covid 19 was still lower than the extraordinary cases caused by other types of coronavirus such as Severe Acute Respiratory Syndrome-coronavirus (SARS-CoV) and Middle East Respiratory Syndrome-coronavirus (MERS-CoV), with a mortality rate of 10% and 40%, respectively.(2)

Such data on pregnant women and neonates have not been widely published. The study of Breslin et al.(3) Evaluating the initial 2-week period of SARS-CoV-2 infection in pregnant women showed that there was no evidence of vertical transmission after delivery. Up to now, no clear data on the impact of COVID-19 on neonates born to mothers with confirmed COVID-19 infection has been published. Allotey et al.(4) reported a higher preterm birth rate in pregnant women with confirmed COVID-19 infection than that in those without such infection. High rates of preterm birth and cesarean delivery may lead to vertical transmission, but they have not been proven.(5) Although some studies have shown no evidence of vertical transmission, others have demonstrated that SARS-CoV-2, detected by nasopharyngeal PCR swab test, and mild respiratory disease or pneumonia in neonates are self-limiting.(1,6) Given the continued spread of SARS-CoV-2 globally, it is essential to monitor its spread to pregnant women and their neonates. It is related to hospital policies in managing pregnant women with confirmed SARS-CoV2 infection and their neonates.(6) This paper presents data on pregnant women with confirmed SARS-CoV2 infection and their neonates born at Dr. Soetomo Regional General Hospital, Surabaya, from January 1 to July 24, 2021. This paper aimed to describe the clinical characteristics of neonates born to mothers with SARS-CoV2 infection and observe possible vertical transmission between the mothers and neonates.

Method

It was a retrospective study conducted at Dr. Soetomo Regional General Hospital, Surabaya. The data was collected from the patients' medical records started from January 1 to July 24, 2021. During this pandemic, all pregnant women undergoing treatment at Dr. Soetomo Regional General Hospital underwent screening for COVID-19 according to the applicable SOP. Data on neonates born to mothers with confirmed Covid-19 infection, based on the RT-PCR swab test results, were included in this study. The neonates also underwent RT-PCR swab tests at least in the first 24 hours after birth. The diagnosis of mothers and neonates with COVID-19 infection was obtained from the nasopharyngeal swab test results performed by the microbiology laboratory of Dr. Soetomo Regional General Hospital, Surabaya. Patient data records included the results of RT-PCR

swab tests of mothers and neonates, maternal age, gestational age, delivery method, neonates birth weight, Apgar score, and mortality.

Results

In this study, 174 pregnant women were confirmed infected according to the positive COVID-19 RT-PCR test results. Meanwhile, the nasopharyngeal RT-PCR tests performed in neonates showed predominantly negative results of Covid-19 infection, namely 163 neonates (94%), while 11 neonates (6%) showed positive results. The majority of maternal age was found to be more than 35 years old, as many as 134 mothers (77%). A total of 98 mothers (56%) indicated a gestational age of less than or equal to 37 weeks, and the rest, 76 mothers (44%), indicated a gestational age of more than 37 weeks. Most of the delivery methods were Caesarean section in 117 patients (67%), followed by vaginal/normal delivery in 57 patients (33%).

The preterm births were divided into late preterm (32-36 weeks), peri preterm (28-31 weeks), and extremely preterm (less than 28 weeks). The majority of the premature neonates (65%) belonged to the late preterm group, and 12% of them belonged to the extremely preterm group. A total of 126 neonates (72%) had a birth weight of more than 2,500 g, followed by 30 neonates (17%) with a birth weight of 1,500–2,499 g, then 11 neonates (6%) with a birth weight of more than or equal to 1,000–1,499 g, and finally 7 neonates (4%) with a birth weight of less than 1,000 g. A total of 18 neonates (10%) born to mothers with Covid-19 infection died due to respiratory failure and prematurity.

Table 1
Clinical characteristics of the mothers.

Parameters	Number	N(%)
Maternal Age (years old)		
≥ 35 years old	40	23
< 35 years old	134	77
Gestational Age (week)		
< 37 weeks	76	44
≥ 37 weeks	98	56
Delivery Methods		
Caesarean section	117	67
Vaginal delivery	57	33

Table 2
Clinical features and characteristics of the neonates.

Parameters	Number	N(%)
Covid 19 RT-PCR Test Results		
Positive	11	6
Negative	163	94
Premature		
Late preterm (32-36 weeks)	34	19

<i>Peri preterm</i> (28-31 weeks)	12	6
<i>Extremely preterm</i> (< 28 weeks)	6	3
Birth weight (gram)		
≥ 2,500	126	72
1,500–2,499	30	17
≥ 1,000–1,499	11	6
< 1,000	7	4
Apgar Scores		
≤ 7	29	17
> 7	145	83
Clinical Outcomes		
Died	18	10
Lived	156	90

Discussion

The COVID-19 pandemic is quite challenging for today's world community and is considered one of the most infectious diseases the world has faced so far. Data regarding the impact of COVID-19 on neonates born to mothers with positive COVID-19 infection, including vertical transmission from mother to fetus, are very limited.(7) Data on previous types of coronavirus (SARS-Cov and MERS-CoV) show that pregnant women are at high risk for suffering from diseases with greater clinical severity, morbidity, and mortality compared to the general population.(8) The perinatal risks of maternal infection with COVID-19 vary widely, including preterm delivery, fetal distress, respiratory distress, thrombocytopenia with impaired liver function, and even death, and there is little evidence to explain vertical transmission.(9) Chen et al., in their study on clinical characteristics and placental pathology of three pregnant women with confirmed COVID-19 infection, reported that no SARS-CoV-2 nucleic acid was detected in placenta swabs or throat swabs on neonates.(6) Karimi et al., reported that none of the neonates born to 31 pregnant women with COVID-19 infection was infected, which indicated no evidence of COVID-19 intrauterine transmission.(10)

In this study, 11 neonates (6%) born to mothers with COVID-19 infection indicated positive COVID-19 test results, while the majority of those, 163 (94%) neonates, indicated negative results. Sheth et al., reviewed 39 published studies and reported that of 326 pregnant women with confirmed COVID-19 infection, 23 neonates (7.05%) were confirmed infected, and an estimated 3% of infections were acquired through vertical transmission.(11) The results of this study were in line with several studies stating that the number of neonates with confirmed COVID-19 was indeed significantly low. Still, no placental swab was carried out in this study to prove vertical transmission. Chen et al., reported no changes in the morphological features of the placenta of COVID-19 infected mothers, and no nucleic acids were found.(6)

The American Academic of Pediatrics (AAP) recommended screening babies born to mothers with confirmed COVID-19 infection in the first 24 and 48 hours after birth. AAP also recommended medical personnel to use personal protective equipment during neonatal resuscitation, including gowns, gloves, N95 masks, and protective eyewear or air-filtering breathing apparatus.(11) The application of

strict infection prevention protocols during the perinatal period could significantly reduce the horizontal transmission of the COVID-19 virus.(10) WHO stated that COVID-19 infected mothers could safely provide exclusive breastfeeding as long as they comply with relevant health protocols, including washing hands before and after touching the infant's skin and wearing a medical mask during contact with the infant.

In this study, as many as 117 mothers (67%) delivered by Cesarean section and 57 mothers (33%) had a vaginal/normal delivery, which is proven not to affect the transmission of the COVID-19 virus to neonates.(17) Kalamdani et al., reported that more deliveries were performed by Cesarean section than vaginal/normal deliveries.(12) The delivery method shall be adjusted to the obstetric indications of the Covid-19 infected patients since each individual is different. It is in accordance with the WHO recommendation that Covid-19 infected mothers do not have to give birth by Cesarean section.

Deterioration in maternal conditions and fetal distress are some of the causes of preterm births in pregnant women with COVID-19 infection. It suggests that COVID-19 is not the sole cause of the increased risk of preterm birth.(13) The overall high preterm birth rate is likely to contribute to poor neonate conditions and lead to increased NICU care.

Viral pneumonia in pregnant women is one of the main causes of morbidity and mortality.(14) It is associated with various clinical outcomes of delivery, such as premature rupture of membranes (PROM), preterm delivery, intrauterine fetal death (IUFD), low birth weight (LBW), and neonatal death.(15) A study conducted by De Bernardo et al., reported that the manifestation of clinical symptoms and signs of COVID-19 infection in neonates was lighter than that in adult patients.(16) The main symptoms included fever, vomiting, cough, shortness of breath. In addition, no neonate had been reported died from COVID-19. In the study, 145 (83%) of 174 neonates born to mothers with confirmed COVID-19 infection had an Apgar Score of more than 7, and 52 (30%) neonates were born prematurely. A total of 126 neonates (72%) had a birth weight of more than or equal to 2,500 g, and only 7 neonates (4%) had a birth weight of less than 1,000 g. There were 18 cases of neonatal mortality born to COVID-19 infected mothers, with the main causes of death being respiratory failure and prematurity, with 2 infants confirmed COVID-19. Up to now, the correlation between COVID-19 infection in neonates and its clinical manifestations has not been widely known.

Conclusion

The COVID-19 pandemic is today's worldwide health problem. Pregnant women and neonates are vulnerable to the transmission of the COVID-19 virus. To date, no evidence of COVID-19 vertical transmission in neonates from infected mothers has been found. Horizontal transmission is assumed to be the main transmission method in neonates. The application of health protocols can effectively prevent COVID-19 viral infection in neonates. Further research is urgently needed to understand the COVID-19 virus transmission methods and its symptoms, as well as its clinical outcomes in neonates.

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