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The Relationship Between Confirmed COVID-19 Positive Characteristics of Laboring Mothers and the Incidence of Asphyxia in Infants at Hospital Dr. Hasan Sadikin Bandung

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A B S T R A C T

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is the cause of Coronavirus Disease 2019 (COVID-19). In December 2021, the Omicron variation was first identified in Indonesia, and it has since been linked to nearly 72 million cases worldwide. When COVID-19 is present during pregnancy, unfavorable outcomes including stillbirth, preterm delivery, and maternal mortality may occur. The purpose of this research was to examine the association between the features of women who tested positive for COVID-19 and the incidence of asphyxia in their babies at Dr. Hasan Sadikin General Hospital in Bandung between July 2021 and July 2022. A quantitative descriptive technique was used, and 69 mothers and 70 babies were sampled overall. Medical records provided the data, which was then subjected to chi-square analysis. There was no discernible correlation between the incidence of hypoxia and the mother's age (p = 0.838), parity (p = 0.647), or delivery method (p = 0.313). Nonetheless, a noteworthy correlation was seen between the gestational age (p = 0.001) and the maternal difficulties (p = 0.013) associated with baby hypoxia. This research found that whereas age, parity, and delivery style were not substantially linked with newborn hypoxia, gestational age and COVID-19-related problems were.

INTRODUCTION

Coronavirus Disease2019 (COVID-19) is an infectious disease caused by a virus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARSCoV2) (Ministry of Health, 2020). This virus is a new type of coronavirus that has never been identified in humans (Ministry of Health, 2020). Omicron is the latest variant of the coronavirus that causes COVID-19. This new variant spreads faster than other COVID-19 variants but with milder symptoms or tends to be asymptomatic. This new variant of the omicron coronavirus was first discovered in Africa and has now been detected in several countries, including Indonesia (Widiastuti, 2022).

COVID-19 cases are increasing again (PDPI et al., 2020). Omicron in Indonesia was first detected in early December due to the arrival of Indonesian citizens from foreign countries at the end of November.(First Case of Omicron in Indonesia Allegedly from Indonesian Citizen Coming from Nigeria – Sehat Negeriku, nd)As of December 16, 2021, the total number of identified COVID-19 cases globally was 72,209,009, with 1,630,932 deaths (CFR 2.3%) in 219 affected countries and 180 local transmission countries. In Indonesia, as of December 16, 2021, there were 636,154 confirmed COVID-19 cases and 19,248 deaths (CFR: 3.0%) (PHEOC Ministry of Health of the Republic of Indonesia, 2023).

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Among the many people infected with COVID-19, several categories are vulnerable to COVID-19 (Posumah et al., 2021). Vulnerable groups to COVID-19 include the elderly, people with hypertension and diabetes mellitus, pregnant women, immunocompromised patients, men, obesity, and active smokers. Based on data from the Indonesian Obstetrics and Gynecology Association (POGI), around 13.7% of pregnant women tend to be more susceptible to COVID-19 infection than non-pregnant women. This is because, during pregnancy, there are changes in the immune system and physiology of the pregnant woman's body. This makes pregnant women more susceptible to COVID-19 (Posumah et al., 2021). In April 2020-April 2021, 536 pregnant women were infected with COVID-19, of which 3% died. This data was taken before the spike in COVID-19 cases in Indonesia between June and July 2021 due to the delta variant attack (Refrizal, 2019).

The characteristics of the mother in labor can affect the outcome of labor. The characteristics that influence include maternal age, gestational age, parity, type of labor, and labor complications. A study conducted in America stated that the incidence of preeclampsia was higher in pregnant women who were hospitalized for COVID-19 (Wastnedge et al., 2021). Based on the risks that can occur in pregnant women with confirmed COVID-19, it is important to emphasize maternal age, parity, type of delivery, delivery complications, and especially gestational age (Arruda et al., 2021). Mothers who give birth at a gestational age of less than 37 weeks or more than 42 weeks are more likely to give birth to asphyxia babies. Because at a gestational age of less than 37 weeks, the surfactant in the baby is still not enough, so the possibility of the baby experiencing asphyxia is greater (Sulfianti & Purba, 2020).

Pregnant women are susceptible to COVID-19 because the physiological changes of pregnancy involve the cardiorespiratory and immune systems, which may result in altered responses to SARS-CoV-2 infection in pregnancy. Physiological changes during pregnancy significantly impact the immune system, respiratory system, cardiovascular function, and coagulation, which have positive or negative effects on the development of COVID-19 disease (Luluk, 2020). This is because pregnant women experience physiological and mechanical changes in the body, including increased oxygen consumption, edema of the respiratory tract mucosa, increased diaphragm, and changes in lung volume during pregnancy. These changes reduce the total lung capacity (TLC) and the body's ability to clear the respiratory tract (Nurdianto et al., 2020). Pneumoniae tends to predispose to pulmonary infections that worsen maternal and neonatal outcomes, just as COVID-19 can cause an acute respiratory syndrome in the mother and cause asphyxia in the baby (Arruda et al., 2021).

In addition to the vulnerability of pregnant women to COVID-19 infection, this infection can cause undesirable outcomes such as premature birth, maternal death, abortion, and stillbirth. According to research by Arruda V, Souza B et al. regarding the risk of premature pregnancy in mothers with COVID-

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19, it was stated that mortality and the prevalence rate of premature newborns occurred around 47% due to complications caused by COVID-19 (Arruda et al., 2021). However, another study by Nayak AH, Kapote DS, et al. showed that COVID-19 infection did not affect the outcomes of mothers and babies during pregnancy (Nayak et al., 2020). However, long-term newborn monitoring is necessary to confirm the possibility of delayed effects (Nayak et al., 2020). Previous studies also stated that data related to maternal and infant outcomes in COVID-19 cases still had limitations (Nayak et al., 2020).

Dr. Hasan Sadikin General Hospital Bandung is one of the referral hospitals in West Java and Nationally, has national standards from the Hospital Accreditation Commission (KARS), is accredited as an international standard hospital by the Joint Commission International (JCI), manages cases of patients with confirmed COVID-19. For almost 2 years of the pandemic, Hasan Sadikin Hospital (RSHS) Bandung has experience as the main referral hospital for COVID-19 patients (Minister of Health Hands Over JCI Certificate and Inaugurates Orchid Building of Dr. Hasan Sadikin General Hospital – Healthy My Country, nd). Therefore, the researcher was interested in Dr. Hasan Sadikin General Hospital as a place for research and referring to the previous explanation, the researcher raised the research title "The Relationship Between Characteristics of Mothers Who Have Confirmed COVID-19 and Infant Outcomes at Dr. Hasan Sadikin General Hospital, Bandung, July 2021-July 2022".

METHOD

This study employs an analytical research method using a descriptive quantitative approach. The subjects comprise mothers with confirmed COVID-19 who gave birth and their newborns at Dr. Hasan Sadikin Hospital, Bandung. The total sample includes 69 mothers and 70 newborns. This study was conducted from July 2021 to July 2022 at Dr. Hasan Sadikin Hospital, Bandung. The inclusion criteria for this study were mothers who gave birth with a positive diagnosis of COVID-19 and mothers who had complete medical record data (medical record number, age, gestational age, parity, type of delivery, complications of delivery, and APGAR Score). The exclusion criteria for this study were mothers who gave birth with comorbidities (concomitant diseases) such as asthma, heart disease, and diabetes. The sampling technique used total sampling. The research instrument used was the medical records of mothers who gave birth at Dr. Hasan Sadikin Hospital. Hasan Sadikin Bandung Hospital in the period July 2021-July 2022. The collected data were analyzed using the chi-square test, which aims to determine the relationship between the characteristics of mothers giving birth confirmed with COVID-19 and the incidence of asphyxia in babies at Dr. Hasan Sadikin Bandung Hospital in the period July 2021-July 2022

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RESULT

The results of the study on the relationship between the characteristics of mothers giving birth confirmed with COVID-19 and the incidence of asphyxia in infants can be seen from the distribution table.

Table 1 Frequency distribution of characteristics of mothers giving birth confirmed with COVID-19 at Dr. Hasan Sadikin General Hospital, Bandung, July 2021-July 2022

Characteristics of Mothers in Labor	Number (n)	Percentage (%)
Mother's age		
<20 years	5	7.2
20-35 years	49	71.0
>35 years	15	21.7
Parity		
Primipara	23	33.3
Multipara	43	62.3
Grand multipara	3	4.3
Gestational Age		
Premature	21	30.4
Aterm	48	69.6
Postterm	0	0
Types of Childbirth		
Spontaneous	39	56.5
SC	30	43.5
Complications of childbirth		
Yes	40	58.0
No	29	42.0

Based on Table 1, it was found that the age of the majority of mothers giving birth was 20-35 years old at 71.0%, multiparity parity at 62.3%, term gestational age at 69.6%, spontaneous delivery type at 56.5%, complications during pregnancy at 58%.

Table 2 Distribution of frequency of asphyxiated babies from mothers giving birth confirmed with COVID-19 at Dr. Hasan Sadikin General Hospital, Bandung, July 2021-July 2022

Baby Outcome	Number (n)	Percentage (%)
APGAR Score		
Asphyxia	22	31.4
No asphyxia	48	68.6
Amount	70	100

Based on Table 2, it was found that the majority of mothers giving birth gave birth to babies without asphyxia, amounting to 68.6%.

Table 3 Frequency distribution of gestational age in asphyxiated babies at Dr. Hasan Sadikin General Hospital, Bandung, July 2021-July 2022

Gestational Age	Asphyxia	
	Number (n)	Percentage (%)
Gestational Age		
Premature	13	59.1
Aterm	9	40.9
Postterm	0	0.0
Amount	22	100

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In Table 3 above, the majority of mothers giving birth gave birth with preterm gestational age, amounting to 59.1%.

Table 4 Relationship between characteristics of mothers giving birth confirmed with COVID-19 and the incidence of asphyxia in babies at Dr. Hasan Sadikin General Hospital, Bandung, July 2021-July 2022

Characteristics of Mothers in Labor	APGAR Score				TOTAL		*p-value**
	Asphyxia		No Asphyxia				
	N	%	N	%	N	%	
Mother's age							
<20 years	2	2.90	3	4.35	5	7.25	0.838
20-35 years	16	23.19	33	47.82	49	71.01	
>35 years	4	5.80	11	15.94	15	21.74	
Parity							
Primipara	9	13.04	14	20.29	23	33.33	0.647
Multipara	12	17.39	31	44.93	43	62.32	
Grand multipara	1	1.45	2	2.90	3	4.35	
Gestational Age							
Premature	13	18.84	8	11.60	21	30.44	0.001*
Aterm	9	13.04	39	56.52	48	69.56	
Postterm	0	0.0	0	0.0	0	0.0	
Types of Childbirth							
Spontaneous	10	14.49	29	42.03	39	56.52	0.313
SC	12	17.39	18	26.09	30	43.48	
Complications of childbirth							
Yes	18	26.09	22	31.88	40	57.97	0.013*
No	4	5.80	25	36.23	29	42.03	

Note: *chi-square

Based on the results in Table 4, it was found that there was no significant relationship between age, maternal parity, and type of delivery confirmed with COVID-19 and the incidence of asphyxia in infants (p-value>0.05). Meanwhile, the characteristics of gestational age and complications of childbirth experienced by mothers confirmed with COVID-19 had a significant relationship with the incidence of asphyxia in infants (p-value<0.05).

DISCUSSION

Mother's Age

The frequency distribution table is based on age characteristics: most mothers are 20-35. In terms of maternal health, mothers aged <20 years and >35 years are at 2-3 times greater risk compared to those aged 20-35 years (Utami & Wilis Sukmaningtyas, 2020). The age of pregnant women <20 years or >35 years is a risky age for pregnancy. At a younger age, namely <20 years, blood circulation to organs that play a role in pregnancy, such as the uterus and cervix, is not yet perfect, so the distribution of nutrients to the fetus can be disrupted, while at the age of >35 years, reproductive tissues and organs have changed,

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and the birth canal becomes inflexible. Other diseases, such as hypertension, tend to be found in the age group >35 years.

This study's results align with research conducted by Amorita and Syahriarti, which stated that the population of pregnant women confirmed with COVID-19 was mostly found in the age range of 20-35 years. When viewed only from the age variable, most pregnant women confirmed with COVID-19 have a relatively low risk.(Amorita & Syahriarti, 2021)Thus, it is not always the case that the age of the mother giving birth who is at risk (<20 years or >35 years) experiences asphyxia in the baby because there are various other factors, such as the absence of pregnancy and childbirth disorders, and the readiness of the female reproductive organs that are not the same. The age of the mother giving birth who is at risk of experiencing asphyxia in the baby can be caused by various factors such as maternal factors, placental factors, fetal factors, and childbirth factors (Syarif & Umar, 2019).

The results of the Chi-Square test showed that the p-value = 0.838>α = 0.05, so there is a significant relationship between the age of the mother confirmed with COVID-19 and the incidence of asphyxia in infants.

Parity

Parity is a term that indicates the number of pregnancies that result in the birth of a fetus that can survive outside the womb. Parity that is too high and pregnancy spacing that is too close affect the condition of the mother and fetus. Parity is divided into several parts or classifications, namely, primipara is a woman who has given birth once; multipara is a woman who has given birth less than five times, and grand multipara is a woman who has given birth more than five times. Low parity (parity one) indicates the mother's unpreparedness in dealing with complications that occur during pregnancy, childbirth and postpartum. Primiparous parity is risky because the mother is not ready medically or mentally (Isrofiana, 2017).

Mothers who are giving birth for the first time tend to experience difficulties compared to mothers who have given birth before. This is because mothers with primiparous parity will experience difficulties during labor due to muscles that are still stiff and not elastic, which will affect the length of labor, causing the baby to experience asphyxia. In contrast, mothers with multiparous parity experience weakness or lack of uterine muscle strength, which can prolong the labor process (Deastri Pratiwi, 2019).

A study conducted by Marsden KA et al. stated that there was no significant relationship between the number of parties and the prevalence or severity of COVID-19 in the population of mothers giving birth infected with COVID-19. In the study's results on the outcomes of babies with multiparous mothers, it was also found that the babies were in good condition where they were born alive, had normal birth

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weight, and were not asphyxiated. This is because the greater the number of parties, the worse the baby's outcomes can be (Marsden et al., 2021).

This condition does not always mean that parity is at risk of asphyxia. This is because mothers who are at risk but do not experience asphyxia can be caused by the different experiences of each woman and the absence of complications in pregnancy and childbirth. Parity that has a risk of asphyxia is influenced by several factors, such as not being medically or mentally ready, as well as the presence of complications in pregnancy and childbirth (Syarif & Umar, 2019).

The Chi-Square test results showed that the p-value = 0.647>α = 0.05, so there is no significant relationship between the parity of mothers confirmed with COVID-19 and the incidence of asphyxia in infants.

Gestational Age

Pregnant women who are infected with COVID-19 are at risk for depression, anxiety, fear, and confusion. Symptoms of anxiety and depression in pregnant women are often associated with an increased risk of premature birth. According to research conducted by the Centers for Disease Control (CDC), the risk of premature birth in pregnant women who are confirmed positive for COVID-19 is 3 times higher than in mothers who are not confirmed positive for COVID-19 (Chen et al., 2020).

One mechanism that may be associated with an increased risk of preterm birth in mothers infected with COVID-19 is an excessive inflammatory response in the body. COVID-19 can cause the immune system to overreact, resulting in a strong inflammatory reaction. Significant inflammation can have a negative impact on the placenta and interfere with fetal growth and development. This, in turn, can lead to an increased risk of preterm birth.

In addition, other factors such as high blood pressure, lung disease, and blood clotting disorders that can occur due to COVID-19 infection can also contribute to the risk of preterm birth. However, it is important to remember that each pregnancy and individual is unique, and factors other than COVID-19 can also affect the incidence of preterm birth.

Babies born to mothers with a term gestational age have live birth outcomes, no asphyxia, and normal birth weight. A study in Italy stated that healthy newborns were born to mothers with pneumonia caused by COVID-19, and all mothers gave birth at term. Babies born at term gestational age are less at risk of experiencing poor outcomes (Perrone et al., 2020).

According to WHO, gestational age is divided into 3, namely premature (<37 weeks), mature (37-42 weeks), and postmature (>42 weeks) (Rahma & Armah, 2014). Premature babies (< 37 weeks) have a higher risk of death from asphyxia. Respiratory failure in preterm babies occurs due to immaturity of surfactant in the baby's lungs (Mumpuni et al., 2021). Mothers with pregnancies of more than 42 weeks

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(post-term) also have a 3.571 times greater risk of giving birth to a baby with asphyxia (Deastri Pratiwi, 2019). This is because the placental function is no longer optimal due to aging, which causes reduced oxygen transport from the mother to the fetus. Placental function peaks at 38 weeks of gestation and then begins to decline, especially after 42 weeks, as evidenced by a decrease in estriol and placental lactogen (Saridewi, 2014).

The results of the Chi-Square test showed that the p-value = 0.001 <α = 0.05, so there is a significant relationship between the gestational age of mothers confirmed with COVID-19 and the incidence of asphyxia in infants.

Types of Childbirth

In a study conducted by Rahmah et al., it was stated that mothers who gave birth by CS had a 4.44 times greater risk of giving birth to babies with asphyxia compared to mothers who gave birth normally/spontaneously. In line with the study conducted by Yelis, it was found that the type of delivery with CS had a 5.47 times greater risk of experiencing baby asphyxia compared to mothers who gave birth normally (Tahir, 2008).

According to a systematic review study, the rate of CS in mothers who were infected with COVID-19 was higher than in pregnant women who were not infected. This was done to minimize poor maternal and infant outcomes after giving birth. According to information from the hospital, it was also reported that several mothers gave birth to CS due to COVID-19 infection. However, it will be returned to the SOP in force at the hospital.

Currently, there is still insufficient evidence that cesarean delivery can increase adverse effects on infants with COVID-19 and prevent vertical transmission from pregnant women with COVID-19 to newborns. COVID-19 infection should not be an indication for cesarean delivery. CS should be performed on pregnant women infected with COVID-19 after assessing the severity of the disease and also for other obstetric indications (Cai et al., 2021).

The results of the Chi-Square test showed that the p-value = 0.313>α = 0.05, so there is no significant relationship between the type of delivery of mothers confirmed with COVID-19 and the incidence of asphyxia in babies.

Complications

Preeclampsia is a higher risk of COVID-19 infection. Many deaths in patients with COVID-19 are due to acute respiratory distress syndrome. This endothelial protection is disrupted in acute respiratory disease, leading to excessive tissue swelling and inflammation. Risk factors for COVID-19, such as advancing age, obesity, diabetes, and cardiovascular disease, are all associated with endothelial cell dysfunction.

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Given the critical role of endothelial cells in the development and progression of COVID-19, these women may be at increased risk (PRADANA, 2022).

Research conducted by Youssef et al., in 2021 stated that COVID-19 infection can cause preeclampsia through increased coagulation cascade activity. Increased coagulation cascade activity can be observed through changes in PT (prothrombin time), BT (bleeding time), aPTT (activated Partial Thromboplastin Time), and CT (clotting time) parameters (Youssef et al., 2021).

In addition, research conducted by Baboolall et al. also stated that COVID-19 infection could increase the inflammatory response characterized by increased CRP (C-reactive protein), D-dimer, and NLR (neutrophil-lymphocyte ratio) values, which can ultimately also trigger preeclampsia (Baboolall et al., 2019). The risk of preeclampsia in pregnant women with COVID-19 increases with the severity of COVID-19 experienced. Pregnant women with COVID-19 who experience severe symptoms have a 5-fold higher risk of preeclampsia compared to pregnant women with COVID-19 without symptoms.

The existence of a bad condition of the baby that occurs in newborns can be caused by complications of childbirth. Complications that can cause bad conditions in newborns include preeclampsia, eclampsia, premature rupture of membranes, cephalopelvic disproportion (CPD), and others.

The results of the Chi-Square test showed that the p-value = 0.013 $<\alpha = 0.05$, so there is a significant relationship between maternal complications confirmed with COVID-19 and the incidence of asphyxia in infants.

CONCLUSION

The relationship between the characteristics of mothers confirmed with COVID-19 and the incidence of asphyxia in infants showed that there was no significant relationship between the age, parity of the mother, and type of delivery confirmed with COVID-19 with the incidence of asphyxia in infants (p-value>0.05). Meanwhile, the characteristics of gestational age and complications of childbirth experienced by mothers confirmed with COVID-19 had a significant relationship with the incidence of asphyxia in infants (p-value<0.05).

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