



**ANALYSIS OF MATERNAL DEATH BASED ON CYCLE THRESHOLD  
POLYMERASE CHAIN REACTION VALUES IN PREGNANT WOMEN  
CONFIRMED WITH COVID-19**

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**ABSTRACT**

COVID-19 is an infectious disease caused by SARS-CoV-2. COVID-19 infect all groups, including pregnant women, resulting in a high positive rate pregnant women. COVID-19 diagnosis process can be supported by RT-PCR test. The RT-PCR test there is a CT-Value which is used to see the viral load which can affect the severity of COVID-19, including pregnant women who experience physiological changes in the body that can lead to maternal death. The purpose of this study was to analyze CT-Value RT-PCR on maternal mortality. This research is an observational analytic study with a cross-sectional approach. The sampling technique used was total sampling. The number of samples were 76 pregnant women with COVID-19 at Abdul Moeloek Regional General Hospital, Lampung Province period March 2020-October 2021. The number of pregnant women who died due to COVID-19 at Abdul Moeloek Hospital, Lampung Province period March 2020-October 2021, was 12 (15.8%) of all pregnant women who were confirmed COVID-19, namely 76 patients. In the statistical test, the p-value was 0.211 ( $p > 0.05$ ), it was concluded that the CT-Value of pregnant women with COVID-19 did not affect maternal mortality. Maternal mortality is not affected by CT-Value PCR pregnant women with confirmed COVID-19.

Keywords: covid-19; ct-value; maternal death

**PENDAHULUAN**

Coronavirus Disease 2019 (COVID-19) is one of the problems in the health sector that has hit the whole world and has become very dangerous because of its characteristics of spreading very easily and quickly. The spread of COVID-19 is also influenced by the high mobilization of people to various countries, since then COVID-19 has spread rapidly and widely to countries in the world. In March 2020, the World Health Organization (WHO) declared this disaster a pandemic (Bedford et al., 2020). To date, according to data from Worldometer, it is reported that 223 countries in the world are affected by COVID-19 with more than 222 million positives and 4.5 million deaths. All countries in Asia are affected by COVID-19 with 71.5 million positives and 1.05 million deaths. Indonesia has been affected by COVID-19 since March 2, 2020. Since then, COVID 19 cases in Indonesia have increased continuously, until now Indonesia is ranked 13th in the number of positive cases of COVID-19 in the world where these cases are spread across 34 provinces, in Indonesia recorded 3.75 million positive cases with the death toll reaching 112,000. Lampung Province recorded the number of positive numbers of COVID-19 reaching 39,446 with fatalities reaching 2,665 people (Kemenkes RI, 2021).

The high transmission rate of COVID-19 makes it possible to infect vulnerable groups including pregnant women. During pregnancy, the mother's body is in an immunosuppressive state and undergoes physiological changes during pregnancy. This situation occurs due to an increase in the diaphragm, increased oxygen consumption and edema of the respiratory mucosa which is susceptible to hypoxia and can increase the risk of contracting infectious

diseases (Zaigham, 2020). Currently, research on COVID-19 infection and its impact on pregnancy and the fetus remains limited. As a result, there are no established guidelines for managing COVID-19 in pregnant women. However, some studies suggest that pregnant women are at a higher risk of severe illness, complications, and mortality compared to the general population (POGI, 2020). In other studies, pregnant women with confirmed COVID-19 experience general symptoms such as fever, dry cough, dyspnea and some pregnant women experience diarrhea. In addition, other studies also showed symptoms of lymphocytopenia in pregnant women with COVID-19. Regarding perinatal outcomes, some studies show no adverse effects, but there are other studies that show cases of neonatal death and symptoms in newborns such as shortness of breath, fever, thrombocytopenia accompanied by liver function abnormalities, tachycardia, vomiting and pneumothorax (Zhu et al., 2020).

According to data from the Center for Disease Control and Prevention (CDC), more than 125,000 pregnant women have been confirmed with COVID-19. Meanwhile, in Indonesia, data from the Ministry of Health (Kemenkes RI) based on hospital fee claims reports 35,099 confirmed cases among pregnant women. The mortality rate of pregnant women during the COVID-19 pandemic has also increased, with 18-20% of deaths attributed to COVID-19 (Kemenkominfo, 2021). Virus detection begins with converting RNA into DNA, a process facilitated by the enzyme reverse transcriptase. The target genetic material is then amplified using an RT-PCR machine, which utilizes fluorescence. During amplification, fluorescent signals are generated and captured by a detector throughout the RT-PCR process. This amplification cycle is repeated up to approximately 40 times, with the fluorescent signal increasing in proportion to the level of amplification. When the fluorescence reaches a minimum threshold, it is interpreted as a positive result. This threshold is known as the Cycle Threshold (CT) Value. The CT Value is inversely proportional to the viral load in a sample, meaning a lower CT Value indicates a higher viral presence. Consequently, the CT Value can serve as an indirect marker of viral replication activity, influencing the infectivity of SARS-CoV-2 in patients (RSUI, 2020).

Several studies have reported variations in the relationship between patient infectivity and viral load based on CT-Value. A study in France found a significant correlation between CT-Value and viral culture levels. The study showed that samples with a CT-Value between 13 and 17 exhibited positive culture growth, while the positivity rate decreased progressively as the CT-Value increased. At a CT-Value of 33, culture growth was minimal, and no viral culture was obtained from samples with a CT-Value greater than 34. These findings suggest that a higher CT-Value can serve as an indicator of reduced infectivity (La Scola, 2020). Research conducted by Magleby et al. states that COVID-19 positive patients with low viral load levels assessed by CT-Value have a higher chance of dying. The results of this study are strengthened when looking at the symptoms that appear, comorbidities and the body condition of the patient (Magleby et al., 2020). Therefore, researchers aim to know whether CT-Value RT-PCR affects maternal mortality in pregnant women confirmed with COVID-19 at RSUD Dr. H. Abdul Moeloek Lampung Province. The choice of research location is because Abdul Moeloek Regional General Hospital itself is one of the referral hospitals in Lampung Province and is also an isolation center for patients with COVID-19.

## **METODE**

This research design uses descriptive analytic type. Researchers measured the independent and dependent variables, then analyzed the data collected to determine the relationship between CT-Value RT-PCR in pregnant women confirmed COVID-19 with Maternal Mortality using a cross sectional approach. Data collection is only done once, namely through

medical records and no treatment is carried out. This research was conducted in October-December 2021 at Dr. H. Abdul Moeloek Hospital, Lampung Province. Samples were selected from the population group, namely pregnant women with a diagnosis of COVID-19 at Dr. H. Abdul Moeloek Hospital, Lampung Province. This study uses a sampling technique with the total sampling method, namely by taking the same number of samples as the population. After the data is obtained, the next step is data processing using a statistical data processing program supported by data processing software.

## HASIL

Table 1.  
CT Value Distribution

CT Value	f	%
CT Value <34	45	59.2
CT Value >34	31	40.8

The frequency distribution of CT-Value PCR in pregnant women at Abdul Moeloek Regional General Hospital Lampung Province for the period March 2020 - October 2021 based on table 1 obtained samples with CT-Value groups which were divided into CT Value 34. The sample group with CT Value 34 amounted to 31 patient samples (40.8%).

Table 2.  
Distribution of Maternal Mortality of Patients

Maternal Mortality	Frequency	
	f	%
Live	64	84.2
Died	12	15.8

Based on table 2, it can be seen that out of 76 pregnant women with confirmed COVID-19 who meet the research criteria. From the results of the study, there were 2 groups of pregnant women confirmed COVID-19, namely the living and dead groups. The living group amounted to 64 research samples (84.2%) and was the largest group, while the dead group amounted to 12 research samples (15.8%).

Table 3.  
Age Distribution of Patients

Age	Frequency	
	f	%
Teens	17	22.4
Adults	54	71.1
Middle-aged	5	6.6

Table 3 is the age distribution of patients with confirmed COVID-19 who have met the criteria, from the results of the study obtained 3 age groups of patients, namely adolescents, adults, and middle-aged. The adolescent age group amounted to 17 (22.4%), the adult age group amounted to 54 (71.1%) which was the largest age group, while the middle-aged age group amounted to 5 (6.6%) which was the smallest group.

Table 4.  
Distribution of gestational age

Pregnancy Age	Frequency	
	f	%
1 <sup>st</sup> Trimester	8	10.5
2 <sup>nd</sup> Trimester	4	5.3
3 <sup>rd</sup> Trimester	64	84.2

Table 4 is the distribution of gestational age of pregnant women with confirmed COVID-19 which is divided into 3 groups, namely trimester 1, trimester 2, and trimester 3. The age group of trimester 1 pregnancy amounted to 8 (10.5%) samples, the age group of trimester 2

pregnancy amounted to 4 (5.3%) samples which were the smallest group, the age group of 3 pregnancy amounted to 64 (84.2%) samples which were the largest group

Table 5.  
Parity Distribution of Patients

Parity	Frequency	
	f	%
Nullipara	23	30.3
Primipara	33	43.4
Multipara	20	26.3

Table 5 is the frequency distribution of the number of parities of pregnant women confirmed COVID-19 which is divided into 3 categories, namely nulliparous, primiparous and multiparous. The nulliparous category amounted to 23 (30.3%) samples, the primiparous category amounted to 33 (43.4%) samples which was the largest group, while the multiparous category amounted to 20 (26.3%) samples which was the smallest group.

Table 6.  
Distribution of comorbidities

Comorbid	Frequency	
	f	%
None	64	84.2
There Is	12	15.8

Table 6 is an explanation of the distribution of comorbidities of pregnant women with confirmed COVID-19 which has 2 categories, namely no comorbidities and comorbidities. The category of no comorbidities amounted to 64 (84.2%) patient samples, while the category of comorbidities amounted to 12 (15.8%) samples.

Table 7.  
Bivariate Analysis of Maternal Mortality Based on CT Value RT-PCR in Pregnant Women Confirmed with COVID-19

CT Value	Output				P value
	Live		Died		
	f	%	f	%	
<34	40	52.6	5	6.6	0.211
>34	24	31.6	7	9.2	

Based on the data presented in table 7, from the results of the study it was found that the number of pregnant women with a CT-Value of 34 amounted to 31 samples with details of 24 (31.6%) living samples and 7 (9.2%) samples died. This study aims to determine whether the CT-Value in pregnant women with confirmed COVID-19 can affect maternal mortality or not, so that the data obtained from this study were statistically tested with the Fisher Exact test using the SPSS 26.0 for windows software program. The results of the Fisher Exact statistical test obtained a p-value of 0.211 ( $p > 0.05$ ) which indicates that the CT-Value in pregnant women with confirmed COVID-19 does not affect maternal mortality.

## PEMBAHASAN

In COVID-19 cases, CT-Value is commonly reported as part of the RT-PCR test. CT Value is reported to improve the accuracy of diagnosis, determine the infectiousness of the patient, and estimate disease prognosis. CT-Value in RT-PCR refers to the number of cycles required to amplify viral RNA to reach detectable levels. CT-Value is inversely correlated with SARS CoV-2 viral load (Camargo, 2021). Research conducted by Choudhuri et al (2020) regarding a retrospective study of positive COVID-19 patients found that low CT-Value examined at the first time of arrival increased the risk of severity and death in patients. However, the study

still requires further study given the variation in results due to different specimen quality and disease phase (Choudhuri et al., 2020).

According to research conducted by Kapoor (2021) on all categories of COVID-19 patients regarding the relationship between CT Value and RT-PCR positivity during COVID-19 isolation, the CT-Value RT-PCR detection does not correlate with infectivity. This is because from the study sample, all patients had very mild severity and were even asymptomatic despite the positive RT-PCR test results and very low CT-Value (Kapoor et al., 2021). This finding aligns with research by Destylya (2021), which reported that most pregnant women with confirmed COVID-19 had a moderate disease severity. Similarly, a study by Qiancheng et al. (2020) comparing pregnant and non-pregnant women found that only 9.8% of pregnant patients required ICU care. Hapsy et al. (2021) also reported that 13.9% of pregnant women with COVID-19 in New York experienced critical illness. Meanwhile, Huntley et al. (2020) concluded from several systematic reviews and cohort studies that there was no significant increase in maternal mortality among hospitalized pregnant women with COVID-19. The mortality rate among pregnant and non-pregnant patients was relatively similar. In two systematic reviews conducted in New York and based on a large-scale database, the maternal mortality rate was recorded at 0.0%. Furthermore, a study by Khan et al. (2020) in China also found no reported deaths among pregnant women due to COVID-19 (Destylya, 2021).

The assertion that CT-Value or viral load cannot be used as a sole determinant in diagnosing death is supported by a study conducted by Wang et al. (2020) on 107 COVID-19 patients at Hubei Provincial Hospital, China. The study found a significant association between age and COVID-19 infection, with a p-value of 0.001. Additionally, it highlighted that comorbid conditions such as hypertension, cardiovascular disease, diabetes, cerebrovascular disease, and chronic obstructive pulmonary disease were linked to COVID-19 mortality. These findings align with research by Dia et al. (2020), which analyzed 414 RT-PCR swabs from 94 patients. Their study reported that high viral loads were detected early after symptom onset, but there were no significant differences in viral loads across disease severity levels. Furthermore, the mortality rate among hospitalized patients was 9.5%, and viral load was not associated with mortality. Instead, older age, CRP positivity, and CT scan severity were identified as significant risk factors for death (Wang et al., 2020). Clinical understanding of COVID-19 continues to evolve, but data on the correlation between viral load and patient prognosis, including mortality and disease progression, remains limited. Given the diverse clinical course of COVID-19, the ability to identify patients at high risk of deterioration and poor outcomes is crucial in medical practice. Therefore, ongoing assessment of CT-Value, along with consideration of other clinical factors, will be valuable in determining the cause of death and guiding patient management (Rao, 2020).

## **SIMPULAN**

During the period from March 2020 to October 2021, a total of 12 pregnant women (15.8%) out of 76 confirmed COVID-19 cases at Abdul Moeloek Hospital, Lampung Province, died due to the infection. Based on the research findings, it can be concluded that the CT-Value in pregnant women with confirmed COVID-19 does not have a significant impact on maternal mortality.

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