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Hematology Profile of Pregnant Women in Trimester III with Covid-19

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Abstract

Women pregnant classified as vulnerable groups because of changes in body physiology and immune response mechanisms in their bodies. SARS-CoV-2 infection in pregnancy stimulates an increase in the expression of proinflammatory cytokines, namely IL-6, IL-12, IL-1β, dan IFNγ which can damage lung organs. The purpose of this study was to look at the hematological profile of pregnant women with COVID-19, especially in the third trimester as an effort to detect the severity of the infection experienced by the mother. This study was a quantitative descriptive study with a retrospective design using secondary data from medical records. This study was carried out at dr. Soebandi Hospital Jember, medical record data were taken from January to December 2021. The subjects of study were pregnant women in the third trimester with COVID-19. The sampling technique total sampling. Method of analysis in this study used a frequency distribution. Results of the study showed that 100% of pregnant women with COVID-19 had symptoms of cough, runny nose, fever and shortness of breath. Results of the mother's hematological examination showed an increase in leukocytes (48%) and a decrease in lymphocytes (92%), most of the mothers had anemia (76%), there was a decrease in platelets (8%) and an increase in platelets (20%). In conclusion, they had the same symptoms as patients in general, including cough, runny nose, fever to shortness of breath, an increase in leukocytes and a decrease in lymphocytes, most of the mothers also experience anemia and changes to abnormal maternal platelets occur.

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INTRODUCTION

COVID-19 is a disease that is endemic almost all over the world that is capable of infecting the entire community, especially the category of vulnerable groups. Groups categorized as vulnerable include the elderly, pregnant, individuals who suffer from weakness, or who have several chronic conditions such as having diabetes, heart disease, chronic lung disease, cancer, immune disorders, blood clotting problems, or leading to other conditions like sepsis (Pradana, 2020). Based on data obtained from the Indonesian Obstetrics and Gynecology Association (POGI) there were 536 pregnant women exposed to Covid-19 in the period April 2020 to April 2021. As many as 3% of them died. Similar data has been reported from RSUD dr Soetomo, Surabaya, East Java, which stated that 28 pregnant women had died due to exposure to Covid-19 in the period July to August 2021 (Maharani, 2021). Cases of maternal deaths in Jember Regency in 2020 were recorded as many as 61 cases of death with details of 22 deaths of pregnant women, 9 deaths delivery mothers, and 30 cases of postpartum maternal deaths. It appears that in 2020 maternal mortality has increased compared to 2019, namely from 47 maternal deaths to 61 maternal deaths (Profi Kesehatan Jember, 2020). Several cases have been reported, 80% of patients with SARS-CoV-2 infection are asymptomatic or with mild symptoms, 15% with moderate symptoms and 5% with severe symptoms (Rohmah, 2020).

Pregnant women are a group that is susceptible to health problems, especially infectious diseases due to changes in body physiology and immune response mechanisms in their bodies (Nurdianto, 2020). In addition, there is also a change in the body's immunity from the Th1 to the Th2 direction. Where Th2 is a producer of cytokines IL-4, IL-10, IL-13, and TGFβ which act as anti-inflammatory (Nurdianto, 2019). The shift in the T helper population makes pregnant women more susceptible to infection, including SARS-CoV-2 infection. SARS-CoV-2 infection in pregnancy stimulates an increase in the expression of proinflammatory cytokines, namely IL-6, IL-12, IL-1β, dan IFNγ which can damage lung organs. The more dominant Th2 shift makes anti-inflammatory cytokines can offset the expression of proinflammatory cytokines such as IL-6 which causes severity and death in COVID-19 patients (Nurdianto et al, 2020). This is the cause of the lower severity of COVID-19 in pregnant women (Dashraath et al, 2020).

Laboratory tests such as hematological examinations play an important role in screening patients who have the potential to lead to COVID-19. Theresults of the patient's hematological examination showed a decrease in monocytes and lymphocytes, total leukocytes, an increase in platelets and hemoglobin (Hb), an increase in lactate dehydrogenase (LDH), and a decrease in creatinine, fibrinogen and D-Dimer (Martinelli et al, 2020). Hematologic changes such as in leukocytes (lymphocytes, eosinophils, neutrophils) can describe an infectious process or indicate a suspicion of its severity (Leticia, 2020). In addition, thrombotic complications in patients with COVID-19 are common and contribute to organ failure and death, so it is very important to do examination and monitoring of platelets (Manne, 2020).

The main target in this study is the group of pregnant women, because the condition of pregnancy is very susceptible to infection. Therefore, researchers are interested in looking at the hematological profile of pregnant women with Covid-19, especially in the third trimester, in the hope that it can help reduce maternal mortality (MMR) and provide earlier information for further treatment actions that are more appropriate according to the symptoms experienced by the mother pregnant

METHOD

This research was a quantitative descriptive study with a retrospective study design by using secondary data from medical records. This study was carried out at dr. Soebandi Hospital Jember, medical record data were taken from January 2021 to December 2021. The subjects of the study were pregnant women in the third trimester with COVID-19. The sampling technique was purposive sampling. The variable measuring instrument in this study used medical record data. The method of analysis in this study uses a frequency distribution. This study has passed the ethical test from the KEPK University dr.Soebandi.

RESULT

Table 1: Frequency Distribution of Patient by Age

Age	Count	Frequency %
<20	0	0
20-35	19	79
>35	6	21
TOTAL	25	100

Source. Medical records

Based on the table above, we can see that most of the patients were in the reproductive age category between 20-35 years as many as 19 patients (79%)

Table 2: Frequency Distribution of Patients Based on Symptoms

Category	Count	Frequency %
Symptomatic	25	100
Asymptomatic	0	0
TOTAL	25	100

Source. Medical records

From the table above we can see that all patients are symptomatic (100%). Symptoms experienced include cough, runny nose, fever to shortness of breath.

Table 3: Hematological Profile of Third Trimester Pregnant Women with Covid-19

Hematological Profile	Count	Frequency %
Hb (11,7-15,5)		
Normal	6	24
Anemia	19	76
Leukocytes (3.600-11.000)		
Decrease	0	0
Increase	12	48
Normal	13	52
Lymphocytes (25-40%)		
Decrease	23	92
Increase	0	0
Normal	2	8
Platelets (150.000-440.000/µl)		
Decrease	2	8
Increase	5	20
Normal	18	72

Source. Medical records

From the table above, we can see that most pregnant women are anemic. Of the 25 patients 19 of them had anemia (76%). Judging from the number of leukocytes, there are some pregnant women who experience an increase in the number of leukocytes. Of the 25 patients, 13 of them had a normal leukocyte count (52%). Most pregnant women experience a decrease in the number of lymphocytes. Of

the 25 patients, 23 of them had decreased lymphocyte count (92%). For the mother's platelet count decreased and increased. Of the 25 patients, 18 of them had a normal platelet count (72%).

DISCUSSION

This study was conducted on third trimester pregnant women with COVID-19. Data was obtained from hospital medical records from January to December 2021. There were 75 data on pregnant women with COVID-19, but 25 patients who met the inclusion criteria were pregnant women in the third trimester with Covid-19. Of the 25 pregnant women, 19 (79%) were in the category of healthy reproductive age (20 35 years) and 6 (21%) of them were >35 years old. According to Siswosudarmo (2016) the age of 20-35 years is a healthy reproductive age where this period is the ideal age for pregnancy and childbirth, while age > 35 years is an old reproductive age where pregnancy and childbirth in this age period are not only high risk to the child but also the mother. Maternal and child morbidity and mortality increase sharply at this age period, so it is expected to use steady contraception to be able to delay pregnancy in old reproductive age.

SARS-CoV-2 infection is a disease that is capable of infecting the entire community, especially pregnant women who are classified as vulnerable groups. Pregnant women are classified as vulnerable groups because of changes in body physiology and immune response mechanisms in their bodies (Nurdianto, 2020). In addition, there is also a change in the body's immunity from the Th1 to the Th2 direction. Where Th2 is a producer of cytokines IL-4, IL-10, IL-13, and TGFβ which act as anti-inflammatory (Nurdianto, 2019). The shift in the T helper population makes pregnant women more susceptible to infection, including SARS-CoV-2 infection.

Pregnant women can be exposed to SARS-CoV-2 in the first, second, and third trimesters (Pradana, 2020). As gestational age changes, the mechanisms of the adaptive immune response also change. The first trimester is called the proinflammatory stage to support embryo implantation. The second trimester is called the anti-inflammatory stage; This stage is needed to maintain fetal growth and in the last trimester is called the proinflammatory stage because it is close to the time of delivery (Mor G, 2017). This mechanism underlies why the most cases of COVID-19 in pregnancy are in the final trimester (Qiancheng, 2020).

The clinical manifestations of COVID-19 infection in pregnancy are no different from viral infections in general. Symptoms include fever (53%), cough (42%), shortness of breath (12%), headache, and loss of smell or anosmia. More severe symptoms are found in pregnant women who have risk factors such as Asian race, dark skin, age over 35 years, obesity, and have comorbid diseases (immune system disorders, diabetes, cancer, and chronic lung disease) (Christyani, 2020). This is in line with the results of research conducted by researchers, which found that all pregnant women had symptoms of cough, runny nose, fever to shortness of breath (100%), and there were 6 (21%) pregnant women aged >35 years.

The determination of the diagnosis of COVID-19 in pregnancy is the same as that of the non-pregnant female population, namely based on clinical and RT-PCR examination as a standard diagnosis and other supporting examinations such as laboratories. Laboratory examinations carried out in this study included levels of Hb, Leukocytes, Lymphocytes and Platelets. From the results of the examination of Hb levels, it was found that most pregnant women were anemic. Of the 25 patients 19 of them had anemia (76%) and 6 of them did not have anemia (24%). Liu (2020) revealed that the coronavirus disease 2019 (COVID-19) can attack hemoglobin in red blood cells through a series of cellular actions, ultimately rendering red blood cells unable to carry oxygen. Red blood cells are important oxygen carriers to various cells in the body. Inside the red blood cells is a molecule called hemoglobin which contains a heme group. Each of these heme groups is a molecular “ring” (porphyrin) that has Iron ions or FE ions. The FE ions that help transport oxygen in the bloodstream depend on the degree of oxidation.

Red blood cells pick up oxygen from the lungs to be transported to other parts of the body. Once inside the human host cell, viral RNA also encodes a number of non-structural proteins made during the replication process. These proteins are not part of the virus itself

but help the virus to "hijack" other cellular means to facilitate its survival within the host. This protein is used to hijack red cells and remove iron ions from heme groups (HBB) and replace them with them. This makes hemoglobin unable to transport oxygen. As a result the lungs become stressed and inflamed while other organs are also affected (Liu, 2020).

From the results of maternal hematological examination, it was found that 12 pregnant women experienced an increase in the number of leukocytes (48%). According to Azab (2020) which states that this leukocytosis is closely related to pregnancy where there has been an increase in neutrophils since the second month of pregnancy and this continues to increase along with the progress of pregnancy. The number of lymphocytes decreases in pregnant women. Platelet levels are 10% lower at term than before pregnancy. This statement supports the results of the study which found that 23 pregnant women experienced a decrease in the number of lymphocytes (92%) and 2 pregnant women experienced a decrease in platelets (8%). This condition is thought to be due to the effect of dilution and faster destruction of platelets due to injury and damage. This is due to gestational thrombocytopenia (75%), hypertensive disorders (15%-20%), immune processes (3%-4%), and the remaining 1%-2% due to infection and malignancy Azab (2020). If correlated with the results of this study; anemia, thrombocytopenia, and leukocytosis in pregnant women are caused by physiological changes in pregnant women and are supported by the accompanying COVID-19 infection during pregnancy.

Huang (2020) showed a correlation between an increase in leukocytes and a decrease in lymphocytes in patients with COVID19 infection. Huang compared the leukocyte and lymphocyte counts between patients infected with COVID-19 with severe and mild symptoms. Lymphopenia can be associated with the severity of patients infected with COVID19, this is due to the presence of : direct lymphocyte infection causing lymphatic tissue damage, inflammation resulting in lymphocyte apoptosis, or lymphocyte inhibition by metabolic disorders such as lactic acidosis. The results of a similar study were also conveyed by Nurinasari (2021) who stated that the COVID-19 leukocyte number was lower than in non-COVID-19 patients.

SARS-CoV-2 infection can stimulate an immune response in the host, leading to a decrease in lymphocytes and an excessive increase in cytokines in the patient. SARS-CoV-2 RNA and protein, interact with various receptors that activate the antiviral immune response and regulate viral replication and spread within the host in vivo. However, an overactive and overactive immune response will lead to immune damage and subsequent tissue inflammation (Jesenak et al., 2020). The results of the examination of 99 cases infected with SARS-CoV-2 in Wuhan, found an increase in total neutrophils (38%), reduced total lymphocytes (35%), an increase in serum IL-6 (52%) and an increase in c-reactive protein (84%). An increase in neutrophils and a decrease in lymphocytes is also associated with the severity of the disease and mortality in patients with COVID-19 (Rosyanti, 2020).

CONCLUSION

Pregnant women are classified as vulnerable groups because of changes in body physiology and immune response mechanisms in their bodies. Pregnant women with COVID-19, especially in the third trimester, have the same symptoms as patients in general, including cough, runny nose, fever and shortness of breath. The results of the mother's hematological examination showed an increase in leukocytes (48%) and a decrease in lymphocytes (92%), most of the mothers had anemia (76%), there was a decrease in platelets (8%) and an increase in platelets (20%).

SUGGESTION

Suggestions for further research can be developed using the same research method and primary sampling in order to minimize confounding factors.

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CONFLICTS OF INTEREST

There was no conflict of interest in this article. The study process went smoothly both in terms of funding and the proces.

AUTHORS CONTRIBUTION

The research was carried out by 3 researchers, namely Ririn Handayani as the lead researcher, Ernawati Anggraeni and Nazmi Kamila as research members. Each researcher has a task that supports the success of the research. Chairman Prepare research proposals; Carrying out the research process starting from the licensing process, land approach, sample collection, data analysis; Compile research report, Outcome publication is mandatory. Member Assisting researchers in the process of completing the administration of preparing proposals and research reports as well as assisting in data collection and research processes.

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