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Characteristic of Patients Who Died With Covid-19 in Referral Hospital, Padang, Indonesia

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ABSTRACT

The death rate from COVID-19 is relatively high. In Indonesia, 146,356 patients have died from COVID-19. This study aims to determine the characteristics of patients who died with COVID-19 and the factors that affect mortality in COVID-19 patients. The data was taken at one of the COVID-19 referral hospitals based on medical records. The average age of death for patients with COVID-19 is 57 years with highest age range being 60-65 years. COVID-19 is found in more male corpses than females. Based on the body mass index (BMI) the most are obese patients with the main complaint on admission to the hospital is shortness of breath. Most chest X-rays during treatment were pneumonia, D-dimer levels > 500 ng/ml, leukocytes > 10,000/L, neutrophils > 70%, and lymphocytes < 20%.

KEYWORDS: COVID-19, risk factors, mortality

ARTICLE DETAILS

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INTRODUCTION

Coronavirus disease (Covid-19) is an infection of the respiratory system caused by the SARS-CoV2 virus. This virus spreads from person to person via droplets produced by coughing or sneezing.[1,2] Since the first case in Wuhan, Covid-19 has been spreading at an alarming rate. There were 418,650,474 cases and 5,856,224 deaths worldwide as of February 20, 2022. The total number of COVID-19 cases in Indonesia reached around 5,197,505 people, with 146,365 deaths.[3]

The study, which included patients diagnosed with COVID-19 in Wuhan, China, found many infected patients were between 30 and 70 years old. Men had around 50.7 %, while women had a prevalence of 49.3 %. The most common symptoms associated with COVID-19 were fever (91.7%), cough (75%), and fatigue (75%); thus, more than one-third of patients experienced dyspnea. Some gastrointestinal symptoms may occur, such as nausea, diarrhoea, and anorexia. Cardiovascular disease is the most common underlying disease found in patients, with hypertension approximately 23.2 %.[4]

The most common symptom of COVID-19 is pneumonia, which is characterized by symptoms such as coughing, fever, and shortness of breath. Radiographic examination reveals bilateral infiltrates, but fever is not a common symptom in patients. According to the findings, approximately 20% of patients had a low-grade fever (38°C).[5] Aside from pneumonia, COVID-19 patients had Acute respiratory distress syndrome (ARDS) manifestations due to acute systemic inflammation. The destruction of epithelial and endothelial cells during the early exudate stage causes alveolar damage. Covid-19 primarily affects the respiratory system, but it can also cause damage to other organs, such as acute myocardial injury (7.2-17%) and acute renal injury (2.9-15%), while ARDS (15.6-31%). In COVID-19, there is less sputum production. This is probably due to damage to epithelial and alveolar endothelial cells, causing less exudate.[6,7]

The most common cause of death in Covid-19 patients is acute respiratory distress syndrome (ARDS). A cytokine storm, which is an uncontrolled systemic immune response caused by the release of large amounts of proinflammatory cytokines (IFN-, IFN-, IL-1, IL-2, IL-6, IL-7, IL-10, IL-12, IL-18, IL-33, TNF-α and TGF), is the cause of ARDS in SARS-Cov2 infection (CCL2, CCL3, CCL5, CXCL8,

CXCL9 and CXCL 10). This overactive immune response can result in lung damage and fibrosis, as well as functional disability.[8]

Patients with comorbid Covid-19 have a higher risk of death than patients without comorbidities. Patients with comorbidities have a risk of death 2.5 times greater than those without comorbidities. Furthermore, age affects the risk of death, particularly for those over the age of 65 years old. A history of cardiovascular or cerebrovascular disease, CD3+CD+ T cells <75 cells/µl and troponin I >0.05 ng.mL. The most common comorbidities were diabetes mellitus, hypertension, and obesity. [9,10]

Patients with a history of cardiovascular disease (CVD) have a higher risk for COVID-19 and have a worse prognosis. A study of 46,248 patients with confirmed Covid-19 found that the most common comorbidities were hypertension (17%), diabetes (8%), and CVD (3%).[5] High levels of troponin I (>28 pg/ml) were found in myocarditis (12%) and Acute Myocardial Infarction (AMI). Venous thromboembolic (VTE) may also be found. Systemic inflammation, abnormal coagulation, and multiorgan dysfunction can increase risk factors for VTE.[7,11]

Research reports that Acute Kidney Injury (AKI) is also a comorbid Covid-19.[4] The gastrointestinal system found diarrhoea, nausea, vomiting, and abdominal pain symptoms. Liver damage occurs in Covid-19 patients as well. Wong et al reported that 14.8-53.1 % of Covid-19 patients had abnormal alanine aminotransferase levels. [5]

Acute Cerebrovascular Disease is one of the most common neurological complications in Covid-19 patients. Fever, vomiting, and decreased consciousness are symptoms of encephalitis. Although very rare, it has been found in several cases with radiological features without Cerebral Spinal Fluid (CSF). In some cases, other diseases such as encephalopathy, Guillain-Barre Syndrome (GBS), and Hemophagocytic Lymphohistiocytosis (HLH).[11]

The researcher wanted to investigate the characteristics of patients who died from Covid-19 and the factors that influence death in Covid-19 patients using data from the forensic department's death register and medical records during treatment in this study.

METHODS

The study's design is a descriptive analysis of the patient's characteristics as well as the factors that contributed to his or her death from Covid-19. Data was collected from medical records and death registers at M Djamil Hospital Padang's forensic department from 2020 to 2021. The sample size was 81 people, and the sampling technique was convenience sampling. This study was approved by Dr.M. Djamil Padang's health research ethics committee, No: 172/KEPK/2021.

RESULTS

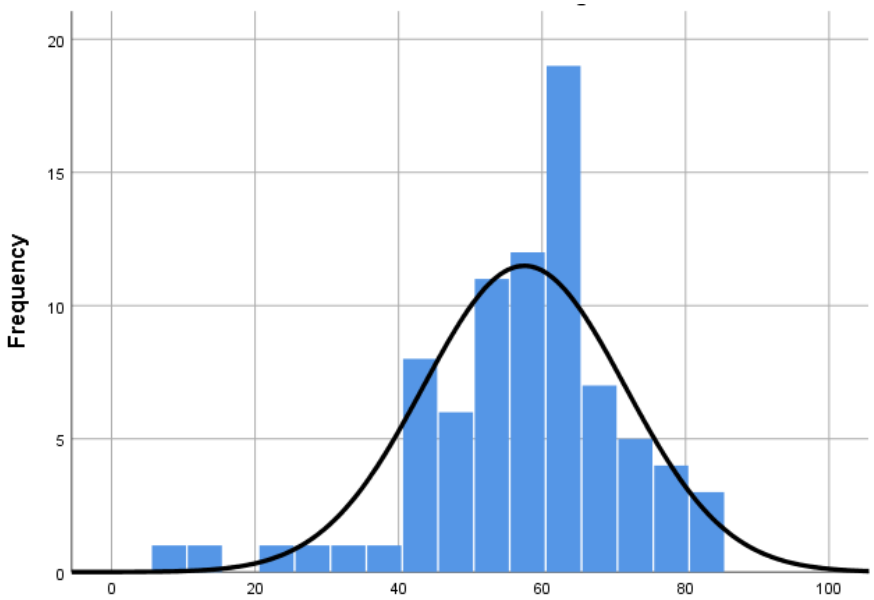

Figure 1. Age distribution

The average age of patients who died from Covid-19 was 57, with the most common age range being 60 to 65. The youngest of the death groups was 8 years old, while the oldest was 83.

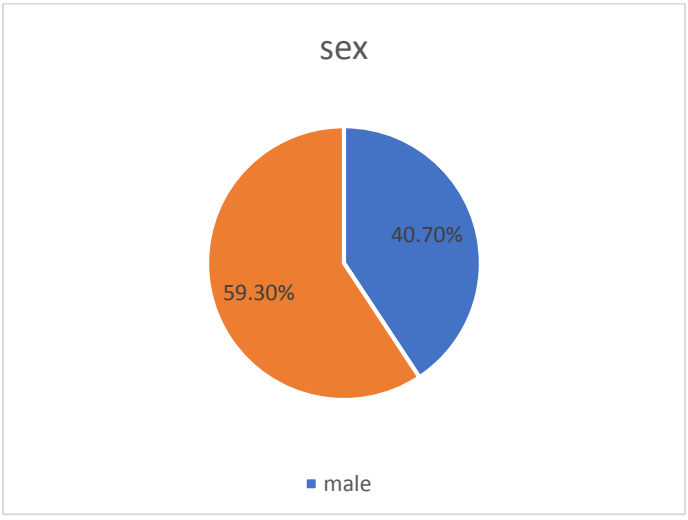

Figure 2. Gender distribution

Based on gender, there are more males than females. There were 59.3% male corpses with Covid-19 and 40.7% female corpses.

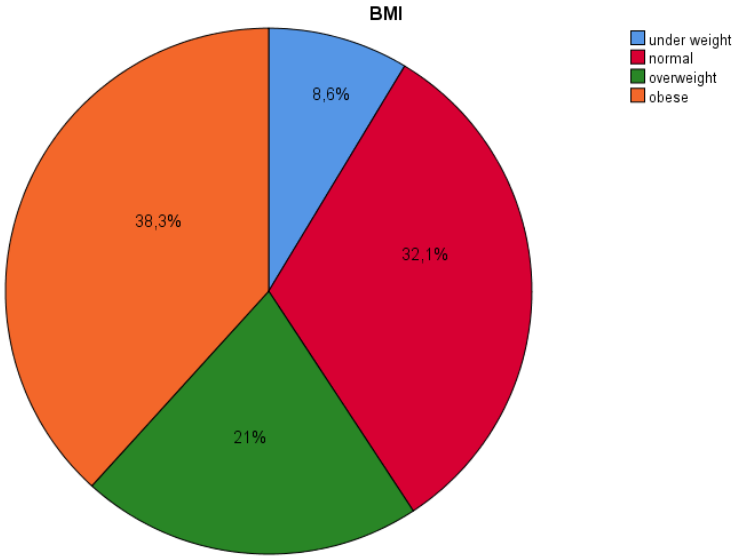

Figure 3. Distribution of Body Mass Index (BMI)

Obesity (BMI) > 24.9 accounted for 38.3 % of all cases. Normal BMI (18.5 – 22.9) was 32.1%, overweight (BMI 23-24.9) was 21%, and underweight (BMI 18.5) was 8.6 %.

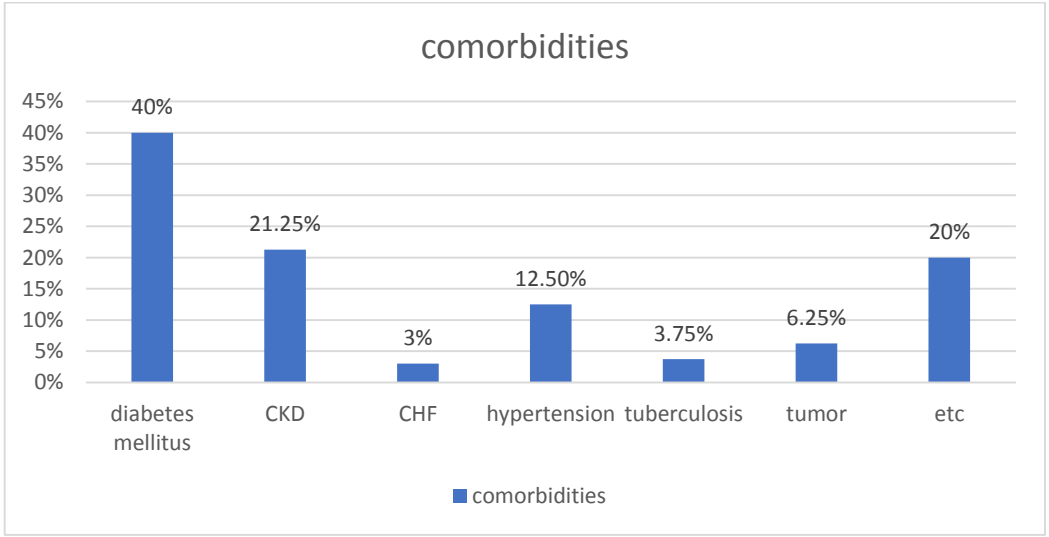

Figure 4. Distribution of comorbidities

The most common comorbidities patients who died with Covid-19 were diabetes mellitus, as much as 40 %, Chronic Kidney Disease (CKD) for up to 21,25%, hypertension (12,5%), tumor (6,25%), tuberculosis (3,75%), and chronic heart failure (CHF) as much as 3%.

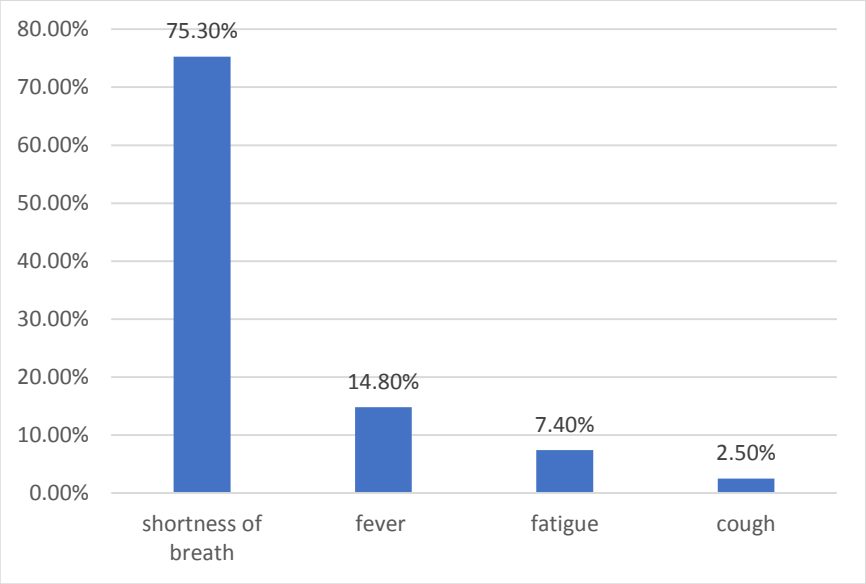

Figure 5. Distribution of main complaints when admitted to the hospital

The most common main complaints patients who died with Covid-19 when admitted to the hospital were shortness of breath (75.3 %), fever (14.8 %), fatigue 7.4 %, and cough (2.5 %).

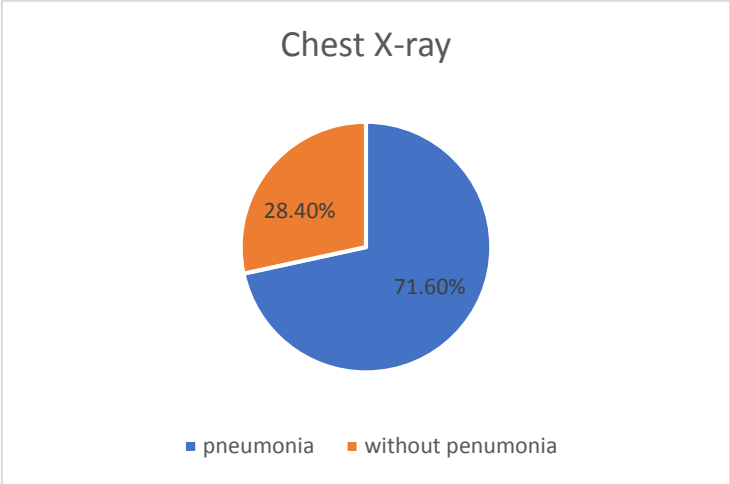

Figure 6. Distribution of chest X-ray patient with Covid-19

X-ray results of patients who died with Covid-19 during treatment was pneumonia (71.6%), without pneumonia (pulmonary TB, pulmonary Ca, pleural effusion, cardiomegaly, and normal) as much as 28.4%.

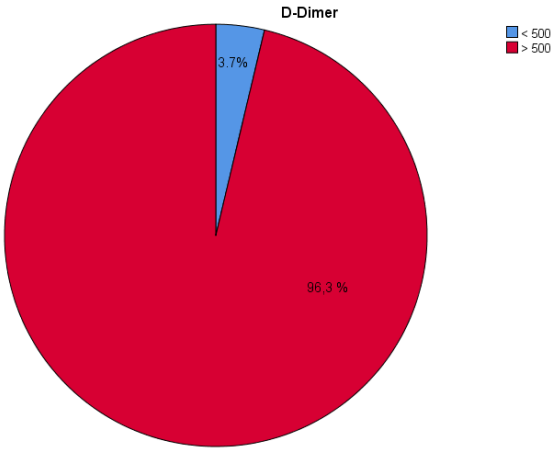

Figure 7. Distribution of D-dimer level patient with Covid-19

The D-dimer level of patients who died with Covid-19 during treatment were > 500 ng/ml (96.3 %), and the D-dimer level < 500 ng/ml were 3.7 %.

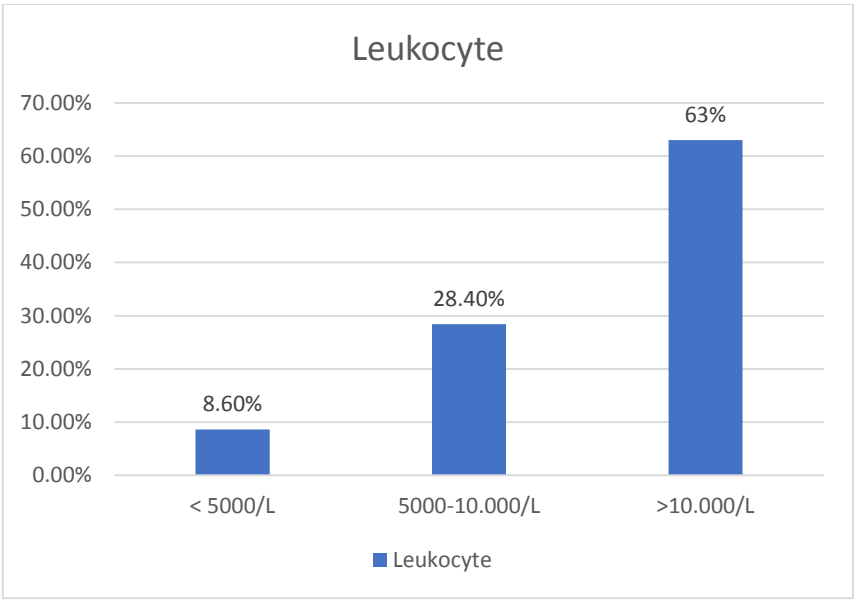

Figure 8. Distribution of Leukocyte level patient with Covid-19

The highest number of leukocytes in Covid-19 patients who died with Covid-19 were >10,000 (63%), < 5000/L as many as 8.6 %, and 5000-10,000/L as many as 28.4 %.

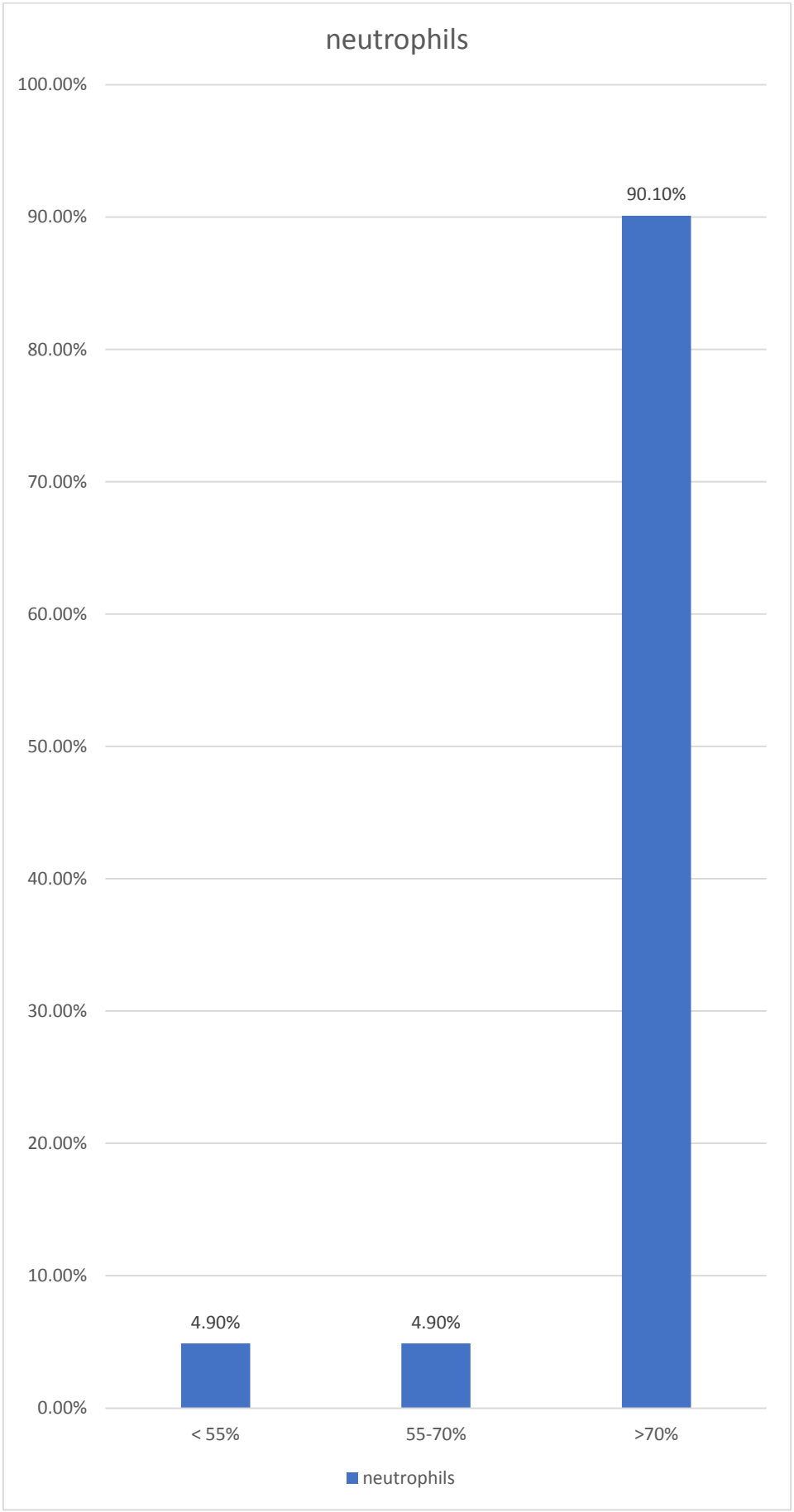

Figure 9. Distribution of Neutrophils level patient with Covid-19

Neutrophils level patients who died with Covid-19 during treatment were >70% as many as 90.1 %, 55-70% as many as 4.9 %, and neutrophils < 55% as many as 4.9 %.

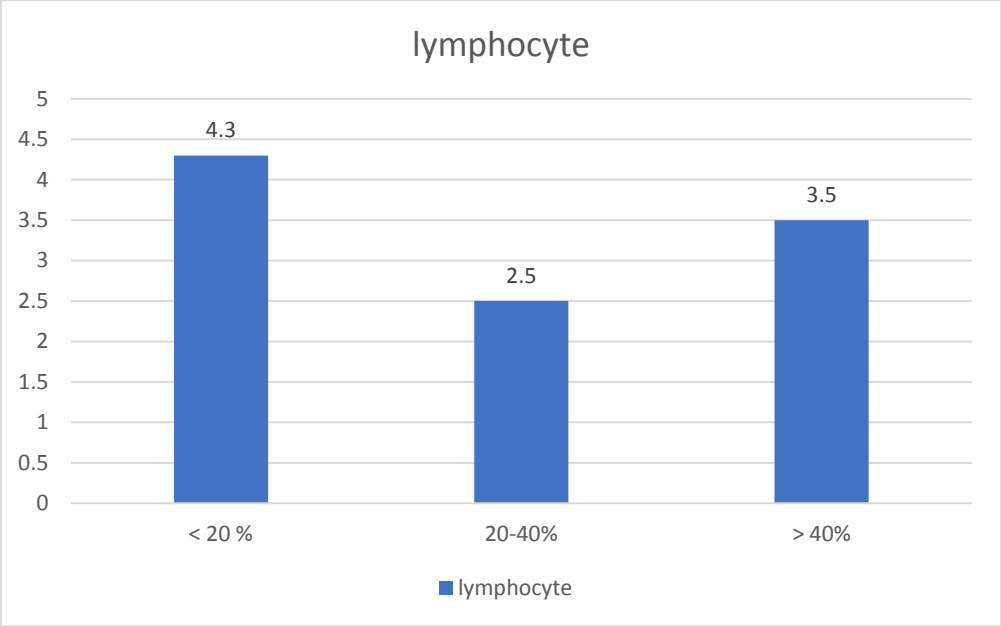

Figure 10. Distribution of Leukocyte level patient with Covid-19

Lymphocyte test results patients who died with Covid-19 during treatment were < 20% (88.9%), 20-40% as many as 7.4% and > 40% as much as 3.7%.

DISCUSSION

Previous studies have linked age, complications, comorbidities, immune factors, and hospital facilities to death in Covid-19 patients. Several studies found that most Covid-19 patients over the age of 47 had a higher risk of death. As people get older, they experience various changes, including decreased organ function and a low immune system. The low immune system in the elderly makes them vulnerable to different microbes, including coronavirus. Respiratory failure, or ARDS, which results in death, can be caused by anatomical and physiological changes in the respiratory organs, elasticity, and lung capacity in the elderly.[9,12] The average age of death for COVID-19 patients in this study was 57 years, with the largest age range 60-65 years.

Coronavirus pathogenesis is known to cause respiratory system damage quickly. Patients with Covid-19 who are not properly treated will develop complications as a result of the rapid infection process damaging various vital organs. The respiratory system, according to most studies, is the first to respond to infection. Covid-19 disease can progress to ARDS if not treated quickly. Covid-19, according to another study, causes pneumonia. The main symptoms of pneumonia, an infection of the alveolar lung tissue, are shortness of breath and a high fever. Hypoxic conditions develop in the tissue when the alveoli are damaged, lowering oxygen saturation and increasing the risk of death.[10,13] 71.6 % of chest X-rays had pneumonia, in this study, while 28.4 percent did not. Saturation < 95 was 48.1 % at hospital admission, and > 95 was 51.9 %.

Patients who test positive for Covid-19 do not always show typical symptoms. In some cases, the symptoms are fatal. The most common chief complaints upon hospital admission in this study were shortness of breath (75.3 %), fever (14.8 %), tiredness (7.4 %), and coughing (2.5 %). The immune system is the best predictor of a patient's clinical condition. Patients with Covid-19 who have weakened immune systems may deteriorate and die if not properly treated. According to Liu (2020), leukopenia and lymphocytopenia were present in 80% of patients.[10,12] In this study, 8.6 % of Covid-19 patients had leukopenia, and 63 % had leukocytosis. In this study, the patient with a significantly high leukocyte count was admitted to the hospital with secondary pneumonia caused by bacterial infection. In up to 88.9 % of the cases, the lymphocyte examination revealed lymphocytopenia. The neutrophil examination revealed a high number of neutrophils, up to 90%. D-dimer levels greater than 500 ng/ml were found in 96.3 % of blood tests, while D-dimer levels less than 500 ng/ml were found in 3.7 %. COVID-19 patients have elevated D-dimers in general. According to Yoa Y et al., D-dimer levels correlate with disease severity. In COVID-19 patients, it is a reliable prognostic marker for in-hospital mortality.[14]

In Covid-19 patients, the presence of comorbidities increases the risk of death. Hypertension, diabetes, and obesity were found to be the most common comorbidities in previous studies. The most common comorbidities found in this study

were diabetes mellitus (40%) and Chronic Kidney Disease (CKD) for up to 21,25%, hypertension (12,5%), tumor (6,25%), tuberculosis (3,75%), and chronic heart failure (CHF) as much as 3%. Diabetes mellitus increases the expression of the ACE-2 receptor. Furin, a type-1 membrane protease that aids in the entry of SARS-Cov2 into cells and viral replication, also increased. Because antidiabetic drugs inhibit the enzyme Dipeptidyl Peptidase IV (DPP4), an aminopeptidase in cell membranes that performs a role in various physiological processes, including immune responses, diabetes can worsen Covid-19 infection.[9,10]

Reduced macrophage function increases the severity of Covid-19 in diabetic patients. Due to decreased mobilization of polymorphonuclear leukocytes, chemotaxis, phagocytic activity, reduced cytokine secretion, and inhibition of tumor necrosis factor (TNF) activity on T cells, chronic hyperglycemia and inflammation cause abnormal and ineffective immune responses. Diabetes mellitus patients in Covid-19 have a twofold increased risk of death. Acute Kidney Injury (AKI) is also a comorbid Covid-19, according to research. Acute tubular necrosis is the most common cause of AKI, which is often accompanied by sepsis, shock, and multiorgan failure.[5]

Obesity (BMI > 24.9) accounted for 38.3 % of the participants in this study. Normal BMI (18.5 – 22.9) was found to be 32.1 %, overweight (BMI 23-24.9) was 21 %, and underweight (BMI 18.5) was 8.6 %. Obesity can disrupt the immune system by altering the secretion of cytokines, adipokines, and interferons. Obesity is associated with high leptin levels, which are pro-inflammatory and can increase the expression of cytokines and adipokines. Furthermore, there is a dysregulation in the expression of tissue leukocytes and macrophages, which play a role in the inflammatory response and natural lymphoid (innate lymphoid), leading to an impaired immune response. In Covid-19 patients, serum levels of Il-6 and TNF are a predictor of increased severity and risk of death. Obesity disrupts the immune response, reducing the reaction of cytotoxic cells to immunocompetent cells, which play an important role as anti-virals. The expression of ACE-2 receptors is higher in adipose tissue than in the lung. As a result, obesity with increased adipose tissue mass increases the number of ACE-2 receptor expressions.[9] Obese people who receive hospital treatment have a death risk that is up to twice that of non-obese people. Obesity was found to be a comorbid in 41.7 % of Covid-19 patients, according to a study conducted in New York. Obesity is also associated with other comorbidities, where Covid-19 patients with obesity will have a higher risk of type 2 diabetes mellitus, cardiovascular disease, and kidney failure. [10]

CONCLUSION

The average age of death for COVID-19 patients is 57 years, with the highest number of deaths occurring in the 60-65 year range. COVID-19 is found on the bodies of more men than women. Diabetes mellitus is the most common comorbidity discovered. Obesity (BMI > 24.9) was the most common condition. Shortness of breath was the most common reason for hospitalization. Chest X-ray pneumonia, D-dimer levels > 500 ng/ml, leukocytes > 10,000/L, neutrophils > 70%, and lymphocytes 20% were the most common results of supporting tests obtained during treatment.

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