(RESEARCH ARTICLE)

Profile of patients died as a result of covid-19 with comorbid diabetes mellitus who was treated in the ICU with mechanical ventilation at Airlangga university hospital for the period of January - December 2021

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Abstract

COVID-19 is an acute respiratory infection caused by the SARS- Cov-2 type coronavirus. The severity of death in COVID-19 patients can also be influenced by the morbidity of diabetes mellitus. However, currently there is still controversy regarding the results of research regarding comorbid factors of diabetes mellitus (DM) with COVID-19. In my research, the aim is to find out whether there is an influence between Diabetes Mellitus (DM) on the level of severity and mortality in COVID-19 patients at Airlangga University Hospital in 2021. This research uses a data collection method in the form of total sampling. The sample used in this study was medical record data on all COVID-19 patients treated at Airlangga University Hospital for the period 1 January – 31 December 2021 who met the inclusion criteria. It was found that male gender, old age (56-65 years), high school education, private sector employment, and complaints of shortness of breath had a major contribution to the mortality of COVID-19 patients with diabetes. Based on the Chi Square test, the relationship between blood sugar levels and mortality in COVID-19 patients showed an outcome p of 0.208.

Keywords: Blood glucose level; Mortality; COVID-19; Critical

1. Introduction

COVID-19 or Corona Virus Disease 2019 is an acute respiratory disease caused by a corona virus called SARS-CoV-2 which was first confirmed on December 31 2019 in the city of Wuhan, China. [1] The President of Indonesia announced that on 2 March 2020, the first confirmed case of COVID-19 in Indonesia. [2] COVID-19 spread more aggressively so that it became a pandemic in Indonesia within a few months. [2] Based on the WHO World Health Organization), as of July 31, 2021 there were 3,372,374 confirmed cases and 92,311 deaths from the total cases in Indonesia. [3] COVID-19 patients who have comorbidities are more susceptible to infection. And there was a significant spike in deaths. [4] Based on research data, diabetes is a disease related to the patient's lungs and heart. with the mortality rate for COVID-19 patients who have diabetes, namely 28.21% of the total 454 patients. [4] Estimates of diabetes mellitus sufferers in East Java alone reached 867,257 cases (93.3% of existing diabetes sufferers) the percentage in the city of Surabaya was 108%. [4]

Diabetes is a disorder of the metabolic system which is genetically and clinically characterized by fasting hyperglycemia. Diabetes mellitus has become a global problem. The incidence of diabetes mellitus is increasing throughout the world, including in Indonesia. [5] Based on previous research, it is stated that clinical conditions, behavior, and lifestyle factors influence the incidence of diabetes mellitus, such as increased obesity, stress factors and poor eating patterns. [5] Diabetes tends to occur in certain demographic groups, namely those aged 30 years and over who must be more aware

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of the risk of DM, based on research results that people aged > 45 years and over are 8 times more likely to suffer from DM compared to those aged 45 years. [5]

Currently it is known that diabetes can cause increased inflammation in the blood, namely lipopolysaccharides, inflammatory cytokines which will become natural killer cells which will cause increased interstitial permeability and vascular which will activate pro-inflammation, ultimately causing damage to the lungs. [5] The relationship between patients suffering from type 2 diabetes mellitus can be a problem that worsens and will increase the severity or death and mortality of COVID-19 patients, such as due to dysregulation of the amount of immune cell activity, changes in ACE 2 receptor expression, damage to the pancreas, alveolar dysfunction, and endothelial dysfunction which will certainly worsen COVID-19. [5]

Airlangga University Hospital is one of the referral hospitals for treating COVID-19 patients in Surabaya, so it is very important to know the factors related to the mortality and morbidity of this disease. This study aims to determine the relationship between diabetes and mortality in COVID-19 patients, which is one of the diseases with rapid transmission at Airlangga University Hospital. It is hoped that by knowing this, management of COVID-19 patients with comorbid diabetes can be improved and therapy targets become more precise.

2. Material and methods

2.1 Ethical clearance

This study was ethically approved by the Health Research Ethics Committee of Airlangga University Hospital, Surabaya (No. 117/KEP/2023) on 10-08-2023.

2.2 Methods

This research uses a data collection method in the form of total sampling. The sample used in this study was medical record data on all COVID-19 patients treated at Airlangga University Hospital for the period 1 January – 31 December 2021 who met the inclusion criteria. The criteria inclusion were COVID-19 patients aged over 17 years at Airlangga University Hospital for the period January - December 2021. The criteria exclusion patients with incomplete data on the studied variables and patients with pregnancy. The data collection technique is to use the total sampling method.

2.3 Data Analysis

Analysis was carried out with analytical statistics to test the hypothesis using the chi square test which is used to obtain the relationship between the independent variable and the dependent variable if the data meets the requirements. The chi square test is fulfilled if the expected value is > 5. If the data does not meet the requirements, namely the expected value <5 obtained by more than 20%, then use an alternative test, namely fisher exact test.

3. Results

3.1 General Characteristics of Research Subjects

Table 1 General Characteristics of Research Subjects

Variable	Frequency	Result n (%)
Gender		
Male	82	82 (57,7%)
Female	60	60 (42,3%)
Age (years)		
17-25	3	3 (2,1%)
26-35	7	7 (4,9%)
36-45	17	17(12,0%)
46-55	40	40 (28,2%)

56-65	46	46 (32,4%)
>65	29	29 (20,4%)
Education		
Elementary School	14	14 (9,9%)
Senior High School	69	69 (48,6%)
Associate Degree	3	3 (2,1%)
Bachelor Degree	52	52 (36,6%)
Work		
Doesn't Work	4	4 (2,8%)
Housewife	31	31 (21,8%)
Private Sector Employee	48	48 (33,8%)
Civil Servant	21	21 (14,8%)
Self-Employee/Trader	23	23 (16,2%)
Teacher/Doctor/Lecturer	6	6 (4,2%)
Retired	9	69 (6,2%)
Complaint		
Congested	89	89 (62,7%)
Cough	5	5 (3,5%)
Fever	11	11 (7,7%)
Decreased Consciousness	7	7 (4,9%)
Limp	11	11 (7,7%)
Painful	6	46 (4,2%)

3.2 Descriptive Numerical value Blood Sugar levels on the first day of hospitalization for COVID-19 Patients

Table 2 Descriptive Numerical Value of Blood Sugar Levels on the First Day of Hospitalization for COVID-19 Patients

Random Blood Glucose	N	Mean ± SD
Mg/dl	142	234.49 ± 81,928 mg/dl

33 Frequency of Diabetes and Mortality

Table 3 Mortality rate for COVID-19 Patients on the 14 Day of Treatment

Variable	Mortality Outcome		p-Value
	Died	Recovered	
Random Blood Glucose			
Pre Diabetes Mellitus	32 (94,1%)	2 (5,9%)	0.208
Diabetes Mellitus	81 (88.0%)	11 (12,0%)	

4. Discussion

In this study, based on the chi square test, a p value was obtained of 0.208, which means there is a significant relationship between diabetes and mortality in COVID-19 patients. A study states that diabetes can increase the severity of COVID-19 by 2.95 times compared to without comorbid diabetes. [6] The severity of COVID-19 disease caused by SARS- CoV-2 infection, in patients with comorbid diabetes mellitus, COVID-19 can influence infected individuals to experience hyperglycemia, interactions with other risk factors, hyperglycemia can change the immune response and inflammation, thereby making COVID-19 patients more susceptible to severe and potentially fatal outcomes. There is a role for angiotensin-converting enzyme 2 (ACE- 2), which is part of the renin, angiotensin, aldosterone system (RAAS), is the main entry receptor on SARS-CoV- 2, dipeptidyl peptidase 4(DPP4) may also act as a target binding (Lim., et al 2021). disturbances in T-cells and interculin-6 (IL-6) levels can also play a role in increasing the severity of COVID-19 infection in diabetes sufferers. [7] There is a decrease in function in macrophages which can also increase in severity in COVID-19 patients with comorbid diabetes mellitus. Chronic hyperglycemia and inflammation can cause abnormal immune responses that are ineffective due to decreased mobilization of polymorphonuclear leukocytes, phagocytic activity, chemoctasis, decreased cytokine secretion. and inhibition of Tumor Necrosis Alpha activity in T-cells. [7] Diabetes mellitus, especially type 2, will of course increase the severity and mortality of COVID-19 patients due to risk factors, namely due to the mechanism of the relationship between diabetes mellitus and COVID-19 related to old age, chronic systemic inflammation, increased coagulation activity, damage to pancreas, dysregulation of the number and activity of immune cells, changes in ACE2 receptors, and endothelial dysfunction which may not directly influence the course of more severe complications due to COVID-19 infection. [8]

5. Conclusion

Based on the results, it can be concluded that the diabetes is associated with mortality in COVID-19 patients who use mechanical ventilation.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflicts of interest concerning this article.

Statement of ethical approval

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