Research Article

Comparison of Death Rates between COVID-19 Patients with Type 2 Diabetes Mellitus and without Type 2 Diabetes Mellitus

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ABSTRACT

Background: Coronavirus Disease 2019 (COVID-19) is an acute airway infection caused by coronavirus, and one of the comorbid diseases that can increase the severity and mortality of COVID-19 is diabetes mellitus. **Purposes:** To compare mortality rates in COVID-19 patients with type 2 DM and those without type 2 DM at Bunda Margonda General Hospital, Depok Jawa Barat. **Methods:** This study is a comparative study with a cross-sectional design obtained from secondary data in the form of medical record data at Bunda Margonda Depok Hospital in January-December 2021. The collection was carried out using the total sampling technique. Data were tested using the Cross Tabulation (crosstab) test. **Results:** Of the 144 COVID-19 patients, 56.9% of COVID-19 patients died with type 2 DM, while 43.1% died without type 2 DM comorbidity. Based on the comparison results of the mortality rate of COVID-19 patients accompanied by Type 2 DM and those not accompanied by Type 2 DM, the P value is 0.127, which means there was no relationship between mortality rate and Type 2 DM status. The mortality rate male gender is more likely to die in COVID-19 cases with an incidence of (53.5%), while in women (46.5%). **Conclusion:** Patients with comorbidities are more susceptible to Covid-19, and their symptoms are divided into mild, moderate, and severe. In patients with comorbid diabetes mellitus, there will be an increased occurrence of Covid-19 disease due to decreased immune function, resulting in a longer healing time in patients with diabetes mellitus.

Keywords: covid-19, mortality, type 2 diabetes mellitus

INTRODUCTION

Coronavirus Disease (COVID-19 is an acute respiratory infection disease caused by coronavirus that was first discovered in December 2019 in Wuhan (1–3). COVID-19 is divided into asymptomatic, mild, moderate, severe, and critical groups. Patients may not feel symptoms until they can experience death due to respiratory failure, starting with acute respiratory distress syndrome (ARDS), sepsis shock, and multiple organ failure (4). Comorbid diseases such as diabetes mellitus (DM), heart, kidney, autoimmune, and other lung diseases can also aggravate COVID-19 patients. COVID-19 mortality can increase with age, whereas children are less vulnerable (5).

Diabetes Mellitus (DM) is a metabolic disease with characteristics of hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action, or both. Indonesia is ranked 7th in the world with the highest number of sufferers at 10.7 million and 3rd in Southeast Asia with

a prevalence of 11.3% (6). Research from Lee Kyu Moon found that diabetes is one of the comorbidities of COVID-19, with high morbidity and mortality. The severity of COVID-19 patients comorbidly occurring diabetes mellitus is significantly higher than that of non-diabetic mellitus due to decreased immune function. So that the length of healing time in diabetes mellitus patients is one of the things that must be considered because understanding the average duration of recovery and its predictors is very important in formulating preventive measures and optimizing treatment options (7).

In 2021, Pamantow researcher A.L Roeroe said that type 2 diabetes mellitus disease would increase the severity and mortality of COVID-19 patients due to risk factors such as the existence of a mechanism of association between diabetes mellitus and COVID-19 related to old age, obesity, chronic systemic inflammation, increased coagulation activity, the potential for direct damage to the pancreas, changes in the expression of Angiotensin-Converting Enzyme 2 receptors, dysregulation of the number and activity of immune cells, alveolar dysfunction, and endothelial dysfunction that can indirectly affect towards more severe complications due to COVID-19 (8,9). Based On the introduction, researchers have a goal, namely to determine mortality comparison of numbers and characteristics of COVID-19 patients accompanied by type-2 diabetes mellitus and those not accompanied by type-2 diabetes mellitus at Bunda Margonda Public Hospital. This study aimed to determine the characteristics and comparison of mortality rates in Covid-19 patients accompanied by type 2 diabetes mellitus and those not accompanied by type 2 diabetes mellitus at Bunda Margonda Public Hospital in Depok, West Java.

METHODS

A cross-sectional study was conducted at Bunda Margonda Hospital from October to December 2022. The research samples were deceased and recovered patients who met the inclusion and exclusion criteria. The inclusion criterion was patients with confirmed positive for Covid-19 based on the results of the SARS-Cov-2 PCR examination and COVID-19 patients who have type 2 diabetes mellitus and do not have type 2 diabetes mellitus. The exclusion criteria were patients over 65 and with type 1 and gestational diabetes mellitus. Bivariate Analysis using the Chi-square test with a p-value of >0.05.

This research has passed the ethical test with number: 285/PE/KE/FKK-UMJ/XI/ 2022 November 3, 2022 – November 3, 2023, from the Health Research Ethics Commission Institute Faculty of Medicine and Health, Universitas Muhammadiyah Jakarta.

RESULTS

Based on the results of medical record data (secondary data) from COVID-19 patients obtained in January-December 2021, researchers found that as many as 144 COVID-19 patients died following the inclusion criteria.

Table 1. Characteristics of COVID-19 patients who are accompanied by type 2 diabetes mellitus and not accompanied by type 2 diabetes mellitus

Characteristics	Die		Recover	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Age				
18 – 65 years	98	68.1	118	81.9
>65 years	46	38.9	26	18.1
Gender				
Male	77	53.5	75	52.1
Female	67	46.5	69	47.9
BMI				
Malnutrition	0	0	0	0
Normal	5	3.5	28	19.4
Pre obesity	2	1.4	15	10.4
Obesity 1	7	4.9	7	4.9
Obesity 2	3	2.1	3	2.1
Blood Sugar Level				
>200	38	26.4	56	38.9
140 – 199	9	6.3	25	17.4
80 – 139	10	6.9	22	15.3
Type 2 Diabetes Mellitus				
Yes	82	56.9	79	54.9
No	62	43.1	65	45.1

Abbreviations: Body Mass Index (BMI)

Based on Table 1, the age of COVID-19 patients who died was dominated by adults (18 – 65 years), as many as 98 out of 144 samples (68.1%), ages over 65 years, and as many as 46 samples (38.9%). This study also showed that the male sex died more in COVID-19 cases, with a total incidence of 77 samples (53.5%). Meanwhile, in women, there were 67 samples (46.5%).

Referring to Table 1, the results of medical records in 144 patients were not all found to be information on nutritional status, weight, and height. Researchers only found this information in 17 patients, so the results obtained were that 3.5% had normal nutritional status, 1.4% pre-obesity nutritional status, 4.9 obesity nutritional status 1, 2.1% obesity 2. As is characteristic of BMI, not all patients have a GDS description in their medical records. Researchers found only 56 of the 144 samples. Based on Table 1, patients who experienced an increase in GDS >200 mg/dL in as many as 38 patients (26.4.7%), GDS 149 - 199 mg/dL in as many as nine patients (6.3%), and GDS 149 - 199 mg/dL as many as ten patients (6.9%).

Based on Table 2, 82 COVID-19 patients died accompanied by type 2 diabetes mellitus (56.9%), while 62 patients (43.1%) were accompanied by type 2 diabetes mellitus. In addition, based on Table 2, the symptoms complained of were fever 68.1%, cough 65.3%, weakness 77.8%, nausea vomiting 94.4%, shortness of breath 54.9%, headache 75.7%, sore throat 77.1%, runny nose 58.3% and other symptoms 34.0%.

Table 2. Overview of COVID-19 patients based on symptoms

Symptom	Die		Recover	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Fever	98	68.1	109	75.7
Cough	94	65.3	129	89.6
Cold	84	58.3	50	34.7
Shortness of breath	79	54.9	122	84.7
Limp	112	77.8	126	87.5
Sore throat	111	77.1	129	89.6
Headache	109	75.7	109	75.7
Vomiting nausea	136	94.4	115	79.9
Other	49	34.0	107	74.3

Table 3. Comparison of Deaths in Covid-19 Patients with Comorbid DM and Non-DM Type 2

Variable	Output		Total	*P-value*	OR	CI 95%
	Die N (%)	Recover N (%)				
Type 2 diabetes mellitus	82 (28.5)	79 (27.4)	161 (55.9)	0.127	1.088	0.683-1.733
Non-type 2 diabetes mellitus	62 (21.5)	65 (22.6)	127 (44.1)			

Based on Table 3, the results of the crosstab analysis with supporting methods using the Chi-Squared Person Test obtained a p-value of 0.127 which means a p-value of >0.05. Thus, it can be said that there is no difference between the mortality rate of Covid-19 patients accompanied by type 2 diabetes mellitus and the mortality rate of Covid-19 patients and those not accompanied by type 2 diabetes mellitus which is seen from the outside of patients dying with recovery. Then it can be concluded that the hypothesis is not accepted.

DISCUSSION

This study obtained secondary data from medical records for January – December 2021, during which this period was a significant increase in patients with Covid-19 death cases in Indonesia. Based on this data, there were 144 cases of Covid-19 deaths at Bunda Margonda Hospital. In this study, as many as 82 (56.9%) patients who met the inclusion criteria of the study sample were confirmed positive for Covid-19, had type 2 diabetes mellitus disease and were declared dead. This is following one of the studies in India; patients who have higher comorbidities have an increase in Covid-19 cases such as diabetes mellitus, while in patients who are not accompanied by diabetes mellitus, there are also more Covid-19 patients caused by several factors such as acute respiratory distress syndrome (ARDS), hypertension, other cardiovascular diseases (10).

In this study, it was found that the initial symptoms most felt by patients were fever 68.1%, cough 65.3%, weakness 77.8%, nausea vomiting 94.4%, shortness of breath 54.9%,

headache 75.7%, sore throat 77.1%, runny nose 58.3% and other symptoms 34.0% (11). Of all these symptoms are the main symptoms experienced by COVID-19 patients and other symptoms such as headaches, diarrhea to severe cases, according to data from the Tanjung Pinang City area (12).

Based on the results of the Blood Glucose examination, it was found that patients who experienced an increase in GDS >200 mg/dL as many as 38 patients (66.7%), GDS 149 - 199 mg/dL as many as nine patients (15.7%) and GDS 149 - 199 mg/dL as many as 11 patients (17.6%). This data is different from the results of data from research in the Tanjungpinang City area which shows that the majority of patients have blood sugar results between <100 and >140, with a total of 43 people (82.7%) (12).

In COVID-19, patients with diabetes mellitus tend to have a poor prognosis (13,14). This can occur due to pulmonary dysfunction and very severe inflammation. This can occur due to pulmonary dysfunction and very severe inflammation. The severity of the disease and even death can occur if the number of ACE-2 in Covid-19 patients increases (15,16). An increase in ACE-2 receptors may occur in patients with diabetes mellitus. An increase in ACE-2 can result in low insulin levels and higher levels of lung inflammation, thus threatening the lives of Covid-19 patients with diabetes mellitus (5,17). Impaired T cell function and increased IL-6 levels also affect the development of Covid-19 with diabetes mellitus concomitant (18).

In this study, there were COVID-19 patients who died accompanied by type 2 diabetes mellitus 82 patients (56.9%), while without diabetes mellitus type 2, as many as 62 patients (43.1%). Based on the results of the Cross Tabulation test analysis, statistically, the p-value test was 0.127 (>0.05), which showed no significant difference in the mortality rate of Covid-19 patients accompanied by type 2 diabetes mellitus and those not by type 2 diabetes mellitus. These results have similarities with the results of a study conducted in Bangkalan Regency, from 35 samples of patients who died of Covid-19, there were 16 patients with diabetes mellitus participation, with a p-value of 0.133 (>0.005) between type 2 diabetes mellitus and non-diabetes mellitus (5).

In the study conducted by Doong Wok Kim et al. 2020 among the most common comorbidities identified in patients who have comorbidities such as hypertension (15.8%), cardiovascular and cerebrovascular conditions (11.7%), and diabetes (9.4%) (19), the same as the data taken by researchers who have comorbidities other than type 2 diabetes mellitus such as pneumonia, hypertension, chronic renal failure, pulmonary tuberculosis, hepatitis, asthma (13).

Based on these data, it shows a percentage difference only through univariate analysis in the mortality rate of Covid-19 patients who are accompanied by type 2 diabetes mellitus and those who are not accompanied by type 2 diabetes mellitus. In the male sex, 77 samples were obtained (53.5%) which showed that gender is a risk factor for the death of Covid-19 patients, where the male sex will be at 1.3 times greater risk of dying from Covid-19 cases than women. Based on this study, it was found that there were limitations when conducting research, namely the relatively short time to process data and see patients who fit the inclusion criteria. For suggestions as follows: Future researchers are expected to add other factors besides type 2 diabetes mellitus co-morbidities and research that has not been done before, such as the relationship with type 1 diabetes mellitus or gestational diabetes patients, and in seeking the

results of subsequent patient examinations medical record data can be more effective and efficient.

CONCLUSION

Patients with comorbidities are more susceptible to Covid-19, and their symptoms are mild, moderate to severe. In patients with comorbid diabetes mellitus, there will be an increased occurrence of Covid-19 disease due to decreased immune function, resulting in a longer healing time in patients with diabetes mellitus.

ACKNOWLEDGMENTS

CONFLICT OF INTEREST

The researcher has no conflict of interest and no affiliation or connection with any entity or organization that could raise questions could be in the discussion and conclusion of the manuscript.

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