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Medicine

Blood Glucose Levels and Outcomes of COVID-19 Patients

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Abstract	Original Research Article

WHO reported that there were 356,955,803 confirmed cases of COVID-19 and 5,610,291 deaths worldwide as of January 26, 2022 [1]. Meanwhile in Indonesia as of January 26, 2022, there were 4,301,193 positive cases of COVID-19 and 144,254 deaths had been determined by the Ministry of Health of the Republic of Indonesia and the North Sulawesi Provincial Health Office reported 34,786 positive cases and 1,046 deaths [2]. During the COVID-19 pandemic, based on case reports, there were COVID-19 patients whose blood glucose levels increased while undergoing treatment at the hospital, even though these patients had no history of Diabetes mellitus. The effect of COVID-19 on increasing blood sugar levels is still not fully understood. Currently, while COVID-19 is still spreading, there is a need for continuous improvement in knowledge about the effective management of blood sugar control during COVID-19 infection. The purpose of this study was to investigate the relationship between blood glucose levels and clinical outcomes of COVID-19 patients undergoing treatment at the hospital. This research is a retrospective analysis using medical record data of Covid-19 patients treated at Sentra Medika Minahasa Utara Hospital for the period of March 2021 to August 2021. The results showed a significant relationship between elevated blood sugar levels and poor clinical outcomes in COVID-19 patients.
Keywords: Covid-19, blood sugar levels.

INTRODUCTION

Coronavirus disease (COVID-19) has caused mortality and morbidity throughout the world and was declared a pandemic on 11 March 2020 by the World Health Organization (WHO). The Covid-19 case caused by SARS-Cov-2 was first reported in December 2019 in Wuhan, Hubei Province, China. As of January 26, 2022, as reported by WHO there were 356,955,803 confirmed cases and 5,610,291 deaths worldwide [1]. Meanwhile in Indonesia, until January 26 2022, the Ministry of Health of the Republic of Indonesia and the North Sulawesi Provincial Health Office had reported 34,786 positive cases and 1,046 deaths in Indonesia until 26th January of 2022 [2].

The route of transmission of COVID-19 from person to person consists of direct transmission through coughing, sneezing, transmission through contact and transmission through droplets inhalation. In most cases the symptoms are mild such as cough, fever, loss of smell (anosmia) or headache; however in a minority of cases the infection with this virus can cause pneumonia and multi-organ failure. The clinical spectrum of COVID-19 is wide, ranging from asymptomatic cases to severe cases characterized by acute respiratory distress syndrome (ARDS) which can potentially cause death. COVID-19 patients who are elderly or with comorbidities including diabetes, obesity and hypertension, usually have high morbidity and mortality [3-7].

Patients who are not COVID-19 patients with high blood sugar levels during hospitalization often have poor outcomes even though they have no history of diabetes mellitus. Comorbidities including diabetes have been known to increase the severity of COVID-19. However, during the COVID-19 pandemic, based on case reports, there were COVID-19 patients whose blood glucose levels increased while undergoing treatment at the hospital, even though these patients had no history of diabetes mellitus. Some studies also suggest hyperglycemic condition could be a mortality predictor of COVID-19 patients [8-12].

Most cases of COVID-19 are cases with mild symptoms, but many diagnoses with severe clinical symptoms end in respiratory failure, septic shock and/or multiple organ failure. The mechanism behind this is not fully known. Therefore, identification of risk factors, severity of disease and appropriate treatment is

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very important. As the disease continues to spread, clinical and epidemiological characteristics must be further studied to increase our understanding of this disease in order to improve diagnosis and treatment and reduce its impact on morbidity and mortality.

The purpose of this study is to investigate the relationship between blood sugar levels and clinical outcomes in Covid-19 patients. The results of this study are expected to provide information to the public regarding the relationship between increased blood sugar levels and clinical outcomes in Covid-19 patients who are hospitalized and become one of the references in determining the prognosis in Covid-19 patients who experience elevated blood sugar levels and become scientific basis in policy making, especially in the handling of Covid-19 which in this case is closely related to the Institutional System Development and strengthening health policy program.

MATERIALS AND METHODS

This research is a retrospective study using medical record data of Covid-19 patients at Sentra Medika Hospital North Minahasa for the period March 2021 to August 2021. We obtained Ethical Clearance from Ethics Committee of the Faculty of Medicine, Sam Ratulangi University, Prof. R. D. Kandou General Hospital, Manado.

Medical record data taken were adult patient data (≥18 years) with a confirmed diagnosis of Covid-19 (proven by a positive RT-PCR swab examination) and having blood sugar levels data when admitted to the hospital (normal levels of Random Blood Sugar is 100-140 mg/dL) without a history of Diabetes mellitus and clinical outcome data.

COVID-19 patients with moderate symptoms are patients with clinical symptoms of pneumonia (fever, cough, shortness of breath, rapid breathing) without signs of severe pneumonia and oxygen saturation (SpO2) > 93% with room air, while COVID-19 patients with severe symptoms are patients with clinical symptoms of pneumonia (fever, cough, shortness of breath, fast breathing) plus one of the three criteria: respiratory rate > 30x/minute; severe respiratory distress; or oxygen saturation (SpO2) < 93%.

Data analysis was carried out descriptively. The results are narrated and made clear by tables. For statistical tests, the level of significance (significance) used is 0.05.

RESULTS AND DISCUSSION

This is a retrospective study using medical record data of Covid-19 patients at Sentra Medika Hospital in North Minahasa. Of the 115 patients who had random blood sugar levels, there were 65 patients with moderate clinical outcomes and 50 patients with severe clinical outcomes.

We were using normal reference by WHO of oxygen saturation at 95 -100% and Random Blood Sugar (RBS) value 100-140 mg/dL on patients wihout history of diabetes.

1. Characteristic of Respondents

	N	Minimum	Maximum	Mean	Std. Deviation
Age	115	21	88	57.60	16.503
RBS	115	62	428	185.91	99.168

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	68	59.1	59.1	59.1
	2	47	40.9	40.9	100.0
	Total	115	100.0	100.0	

2. Normality Test Results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
RBS (moderate outcomes)	0.227	65	0.000	0.846	65	0.000
RBS (severe outcomes)	0.153	50	0.005	0.846	50	0.000

Based on the results of the normality test using the Kolmogorov Smirnov test (for the number of samples> 50) it was obtained a significance value for the GDS variable in the moderate and severe symptom groups, respectively p=0.000 and p=0.005 (p<0.05) so it is interpreted to have an abnormal data distribution. Furthermore, for the comparison test, a non-parametric test (abnormal distribution) was used, namely the Mann-Whitney test.

3. Comparison Test of GDS Levels in the Moderate Symptom and Severe Symptom Groups

	Group	N	Mean Rank	Sum of Ranks
RBS	Moderate Symptom	65	52.48	3411.50
	Severe Symptom	50	65.17	3258.50
	Total	**115**		

The table above shows the Mean Rank for each group, namely in the Moderate Symptoms group the average RBS rating is 52.48, lower than the Severe Symptoms group's average of 65.17.

Mann-Whitney Tesr Result	
	Levels of RBS
Mann-Whitney U	1266.500
Wilcoxon W	3411.500
Z	-2.023
Asymp. Sig. (2-tailed)	0.043

The table above shows a U value of 1266.500 and a W value of 3411.500. When converted to a Z value, the magnitude is -2.023. The Sig or P value was 0.043 ($p < 0.05$) which concluded that there was a significant difference in the average (Mean) RBS between the group with moderate symptoms and the group with severe symptoms.

CONCLUSION

Based on the results of the analysis, there were differences in random blood sugar levels in the moderate and severe symptom groups significantly. The mean rank of RBS in the moderate symptom group was lower than in the severe symptom group, thus it was concluded that the RBS would be higher in the group with severe symptoms.

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