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Initial screening of covid-19 patients based on body mass index, blood glucose level and clinical characteristics

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ABSTRACT

Background: Diabetes Mellitus (DM), chronic metabolic disorder characterized by hyperglycemia causing immune response dysfunction and decontrolled pathogens' spread. DM patients are more vulnerable towards infection. Regarding COVID-19 infection, it is essential and urgent to develop initial screening of DM or non-DM patients to establish effective clinical treatment.

Objective: Understanding the implementation of initial screening for Diabetes Mellitus based on Blood Glucose Level (BGL) and Body Mass Index (BMI) as guidance in clinical care and how it affects BGL and clinical parameters of DM and non-DM patients indicated positive COVID-19.

Methods: This research uses cohort retrospective study. COVID-19 patients in Royal Prima Hospital Medan match the purposive sampling inclusion criteria included in the research for further review through patient's medical record. 168 samples were divided into 54 DM and 114 non-DM patients. The variables are BMI and BGL. Data will be analyzed using Independent Sample T-Test.

Results: Clinical characteristics of COVID-19 patients are dyspneu, chest pain, cough, fever, epigastric pain, etc. Result shows that majority of respondents have normal BMI without DM (72.8%). The Independent Sample T-Test analysis result shows a significant difference in BMI and BGL between DM and non-DM patients.

Conclusion: Clinical evidence shows significant differences in BMI and BGL between DM and non-DM patients with COVID-19. Thus, BMI and BGL could be used as the initial screening to develop effective clinical treatment of controlled BGL of DM and non-DM COVID-19 patients based on clinical parameters evaluation.

Latar Belakang: *Diabetes Mellitus (DM) merupakan kelainan metabolik kronis ditandai dengan hiperglikemia yang menyebabkan disfungsi respon imun dan kegagalan mengontrol penyebaran patogen. Penderita DM diketahui lebih rentan terhadap infeksi. Terkait infeksi COVID-19, sangatlah penting dan mendesak untuk mengembangkan skrining awal pasien DM atau non-DM untuk menetapkan pengobatan klinis yang efektif.*

Tujuan: *Mengetahui hubungan pelaksanaan skrining awal Diabetes Mellitus berdasarkan Kadar Gula Darah (KGD) dan Indeks Massa Tubuh (IMT) sebagai acuan dalam perawatan klinis dan bagaimana pengaruhnya terhadap gula darah dan evaluasi parameter klinis pada pasien DM dan non-DM yang*

terindikasi positif COVID-19.
Metode: *Penelitian menggunakan studi kohort retrospektif. Pasien COVID-19 di R.S.U. Royal Prima Medan yang memenuhi kriteria inklusi purposive sampling dimasukkan dalam penelitian untuk dilakukan telaah retrospektif pada rekam medis pasien. Sampel penelitian ini sebanyak 168 yang dibagi menjadi dua kelompok yaitu 54 pasien DM dan 114 pasien non-DM. Variabel penelitian adalah IMT dan KGD pada masing-masing kelompok. Data dianalisis menggunakan independent sample T-Test.*
Hasil: *Karakteristik klinis pasien COVID-19 adalah dispnea, nyeri dada, batuk, demam, nyeri epigastrik, dll. Hasil penelitian ditemukan mayoritas responden memiliki IMT normal tanpa DM (72.8%). Hasil analisis Independent Sample T-Test menunjukkan terdapat perbedaan signifikan IMT dan KGD antara pasien DM dan Non-DM.*
Kesimpulan: *Bukti klinis menunjukkan perbedaan yang signifikan pada kadar BMI dan KGD antara pasien DM dan non-DM dengan positif COVID-19. Dengan demikian, BMI dan KGD dapat digunakan sebagai skrining awal untuk pemberian tindakan klinis yang efektif dalam mengontrol KGD pada pasien DM dan non-DM COVID-19 berdasarkan evaluasi karakteristik klinis.*

INTRODUCTION

PERKENI (Perhimpunan Endokrinologi Indonesia) and IDI (Ikatan Dokter Indonesia) has issued an official statement that Diabetes Mellitus (DM) is one of the risk factors that increased the severity of COVID-19 (Coronavirus Disease 2019) infection. The older DM patients (>60 years old) with uncontrolled BGL (Blood Glucose Level) and DM complications are associated with a poor prognosis of COVID-19. In China, the DM mortality rate diagnosed with COVID-19 is 7.3%, while in Italy, from total COVID-19 deaths, 36% is related to DM.[1] Based on the WHO (World Health Organization) declaration, IDF (International Diabetes Federation) has published a special note on individuals' risk with DM.[2]

TDiabetes Mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia because of insulin secretion abnormalities, how insulin works, and both.[3] Diabetes Mellitus (DM) is classified into Type 1 Diabetes Mellitus (T1DM) and Type 2 Diabetes Mellitus (T2DM). Type-1 Diabetes Mellitus (T1DM) consists of 5-10% of the total DM case in the younger-onset caused by insulin deficiency and later hyperglycemia. Type-2 Diabetes Mellitus (T2DM), also known as an older onset with DM symptoms in general, is often undiagnosed because this disease started silently. The clinical presentation is not dramatic, and the initial phase of symptom is asymptomatic for an extended period it impossible to determine until the patient comes with a complication. Therefore, DM is called a silent killer.[4, 5]

According to the standard guidelines, one of the diagnostic criteria for simple DM screening proposed by ADA (American Diabetes Association), IDF, WHO, and PERKENI is to check BGL. The results of fasting BGL examination classified into diabetic >126 mg/dl, prediabetic 100-125 mg/dl and normal for <100 mg/dl, while for the results of BGL value at any given time classified into diabetic ≥200 mg/dl and nondiabetic <200 mg/dl. On the other hand, obesity has become one of the metabolic diseases that leading causes of death and known as the main risk factor for several non-communicable diseases. This close bond creates a new connotation called 'diabesity' emphasizing that most DM patients are overweight to obesity.[6] Obesity is diagnosed with Body Mass Index (BMI) used to replace body fat mass percentage.7 WHO and CDC (Centers for Disease Control and Prevention) categorized obesity status with the interpretation BMI value ≥ 30.0 kg/m^{2}.[8, 9]

Indonesia had the highest COVID-19 mortality rate in Asia and it continues to increase. More than 500.000 have been infected with the virus and the death cases has reached more than 16,000 people.[11] In Indonesia, the highest comorbidity among patients with COVID-19 was hypertension and then it was gradually followed by diabetes, other cardiovascular diseases, and Chronic Obstructive Pulmonary Diseases (COPD). These phenomena were similar with the previous

reports in China and the U.K. COVID-19 patients with diabetes rank as the second largest number of comorbidities. Diabetic patients are a high-risk group for COVID-19 infection. The researchers have identified that poor glycemic control was related to the poor outcome of patients with severe COVID-19. These findings highlighted that diabetes is one of the high-risk factors for severe COVID-19 infection that needs more attention and medical care.[12]

COVID-19 transmission between human happens through close contact with an infected individual that produces droplets when coughing, sneezing, talking, or singing at about a 1-meter distance. Patients have clinical symptoms such as fever, non-productive cough, myalgia, shortness of breath, and standard leucocytes value or lower. It causes pneumonia, SARS (Severe Acute Respiratory Syndrome), kidney failure even death in severe cases.[13, 14]

Although the groups that are more susceptible to be affected more often and with worse complications from COVID-19 are the elderly and people who have records of chronic disease (comorbid), nonetheless COVID-19 can affect almost all age groups. DM is one of the risk factors for enhancing the severity of COVID-19 infection.[15] DM escalate the complications of COVID-19 and the risk of COVID-19 related mortality. The up-to-date evidence establish that patients with DM are more potential to feel severe symptoms and complications than patients without DM due to COVID-19.[16]

This study aims to determine how initial screening of DM (BMI and BGL) application can be used as a reference in clinical care and how it affects controlling BGL and clinical parameters in DM and non-DM patients indicated positive COVID-19 and as a rationale for further research.

METHODS

This research is a retrospective cohort study using secondary data in medical records regarding applying initial screening of COVID-19 patients based on BMI and BGL with an ethical clearance review number 013/KEPK/UNPRI/VIII/2020. The population in this study is COVID-19 patients in Royal Prima Hospital Medan with a purposive sampling technique. This study covers 168 patients divided into two groups: COVID-19 non-DM and COVID-19 with DM. Data were collected from medical records, including necessary clinical manifestations, BMI rate, respondents' BGL, examination, radiology characteristic, comorbidity, range age, recovery rate, and mortality rate.

The sample used in this research are COVID-19 patients with and without DM in Royal Prima Hospital Medan that fit the inclusion and exclusion criteria. The inclusion criteria are all COVID-19 patients, COVID-19 with DM, COVID-19 with well-controlled BGL and uncontrolled BGL, COVID-19 patients with complete medical records. While the exclusion criteria are COVID-19 patients with incomplete medical records (i.e. referral patients), COVID-19 patients with DM but having hypoglycemia (BGL <70 mg/dL) or unavailable BGL result and COVID-19 patients with and without DM but in pregnant, acute organ failure, chronic organs dysfunction and tumor.

Secondary data processing using Statistical Product and Service Solution (SPSS) computer programme to analyze whether or not there is a significant effect of two or more independent variables on the dependent variable. Multiple linear regression model for the population, after the conditions for research have been met, the next step is carried out data analysis with T-Test. The last step is testing the partial regression coefficient test (T-Test), partial regression coefficient testing aims to determine whether the partially formed regression model equations the independent (X1 and X2) have a significant effect on the dependent variable (Y).

RESULTS

Medical record of 168 respondents showed characteristics of sex, age, and length of stay as follows:

Table 1. Respondents' characteristic based on medical record

Characteristic	Parameter	Frequency (n)	Percentage (%)
Sex	Men	98	58.3
	Women	70	41.7
Age (year old)	5-11	1	0.6
	12-24	13	7.7
	25-45	79	47.0
	46-55	26	15.5
	56-65	30	17.9
	66-80	19	11.3
Length of Stay (day)	1-14	124	73.8
	> 14	44	26.2
Diabetic status	DM	54	32.1
	Non-DM	114	67.9
Total	168	100.0	

Table 1 shows the majority of respondents is men (58.3%) compares to women (41.7%) with age 25-45 years old (47.0%), most of the respondents have 1-14 days length of stay as much as 124 (73.8%) respondents, and there are more non-DM than DM cases.

Identification on 168 respondents showed clinical manifestations as follows:

Table 2. Clinical manifestations of COVID-19 Patients with or without DM on Medical Records

Clinical Manifestations	Non-DM		DM		Total frequency
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Dyspnea	63	64.9	34	35.1	97
Chest Pain	3	50.0	3	50.0	6
Cough	74	67.3	36	32.7	110
Fever	89	72.4	34	27.6	123
Epigastric Pain	13	81.3	3	18.8	16
Nausea	30	65.2	16	34.8	46
Gag	20	62.5	12	37.5	32
Malaise	30	68.2	14	31.8	44
Odynophagia	25	69.4	11	30.6	36
Myalgia	22	81.5	5	18.5	27
Cephalgia	6	85.7	1	14.3	7
Abdominal Pain	6	66.7	3	33.3	9
Loss of Consciousness	2	66.7	1	33.3	3
Influenza	2	100.0	0	0	2
Arthralgia	2	66.7	1	33.3	3
Hematochezia	1	100.0	0	0	1

Identification on 168 respondents showed several parameters as follows:

Table 3. Clinical Characteristics of COVID-19 Patients with or without on Medical Records

BMI Rate	Non-DM		DM		Total
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Normal	83	72.8	11	20.4	94
Overweight	26	22.8	27	50.0	53
Obesity	2	1.8	16	29.6	18
Less Weight	3	2.6	0	0	3
Total	114		54		168

BG Level	Non-DM		Controlled DM		Uncontrolled DM		Total
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Female	49	43.0	10	52.6	12	34.3	71
Male	65	57.0	9	47.4	23	65.7	97
Total	114		19		35		168

Radiology	Non-DM		DM		Total
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Normal	46	40.4	8	14.8	54
Unilateral	27	23.7	11	20.4	38
Bilateral	41	36.0	35	64.8	76
Total	114		54		168

Comorbidity	Non-DM		DM		Total
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Hypertension	32	69.6	25	75.8	57
Tuberculosis	4	8.7	3	9.1	7
Coronary Artery Disease	3	6.5	4	12.1	7
Chronic Obstructive Pulmonary Disease	4	8.7	1	3	5
Stroke	1	2.2	0	0	1
Hepatitis	1	2.2	0	0	1
Vertigo	1	2.2	0	0	1
Total	46		33		79

Range Age (year old)	Non-DM		DM		Total
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
5 -11	1	0.9	0	0	1
12 – 25	20	17.5	1	1.9	21
26 – 35	33	28.9	4	7.4	37
36 – 45	23	20.2	11	20.4	34
46 – 55	16	14.0	10	18.5	26
56 – 65	11	9.6	18	33.3	29
66 – 80	10	8.8	10	18.5	20
Total	114		54		168

Recovery Rate (year old)	Non-DM		DM		Total
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
5 -11	1	0.9	0	0	1
12 – 25	20	18.3	1	2.6	21
26 – 35	32	29.4	3	7.9	35
36 – 45	22	20.2	9	23.7	31
46 – 55	15	13.8	9	23.7	24
56 – 65	11	10.1	13	34.2	24
66 – 80	8	7.3	3	7.9	11
Total	109		38		147

Mortality Rate	Non-DM		DM		Total
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
5 -11	0	0	0	0	0
12 – 25	0	0	0	0	0
26 – 35	1	20.0	2	6.3	2
36 – 45	1	20.0	3	12.5	3
46 – 55	1	20.0	2	6.3	2
56 – 65	0	0	6	37.5	6
66 – 80	2	40.0	6	37.5	8
Total	5		16		21

Based on the results of the normality test with One Sample Kolmogorov Smirnov shows that the probability value of BGL 0.000 < Level of Significant = 0.05, thus the BGL data does not meet the homogeneity assumption. Therefore, for the result of BGL data, the analyzed value is equal variance not assumed.

Tabel 4. BMI & BGL difference in all COVID-19 patients for DM and Non-DM patients

Variable	Mean DM	Mean Non-DM	Mean Diff	p-value
BMI	27.4929	22.8146	4.67834	0.000
BGL	235.17	105.20	129.965	0.000

Based on the result in Table 4, the Independent Sample T-Test obtains p-value = 0.000 < α = 0.05 (p-value < α = 0.05). This shows there is a significant difference in BMI and BGL between DM and Non-DM patients.

DISCUSSION

Jin did the first preliminary study investigating the role of gender in morbidity and mortality in patients with COVID-19.[19] They collect COVID-19 datas from Chinese Public Health Science Data Center, the data consists of the first 37 cases of COVID-19 patients who died and 1.019 cases of COVID-19 survivors. The first result is the median age of COVID-19 patients was 62 years, this proves that the age at risk of being exposed to COVID-19 is the elderly, while based on this research data, the age between 24 – 45 years tend to be exposed to COVID-19 as they are more productive, actively working and engaging in many daily activities. The second result is the most common symptoms experienced by COVID-19 patients were fever (95.3%) and cough (65.1%), while the uncommon one was

diarrhea (16.3%), while based on this research the most common symptoms for COVID-19 patients without DM are fever (72.4%) and cough (67.3%), while for COVID-19 with DM are cough (32.7%) and dyspneu (35.1%). The third result is among all COVID-19 patients, it is known that 37.2% of them have at least one congenital comorbid (ie, hypertension, diabetes, cardiovascular disease, and chronic lung disease), while the data in this research, out of 168 patients, 79 of them come with comorbid. This proves that comorbids are a risk factor for the development of COVID-19. The fourth result is the comparison of symptoms and comorbidities between the male and female groups was carried out, the results were comparable. According to the clinical classification of severity, men tended to develop more serious cases than women, which is in line with the study.[19]

Based on the medical record presented in Table 1, most of the COVID-19 patients have 1-14 days length of stay as much as 124 (73.8%) respondents, and there are more non-DM than DM cases. This data was in line with a study reported by Karyono and Wicaksana, the duration of hospitalization which is as long as self-quarantine is usually about 14 days.[12] The rates for hospital admission and self-quarantine (HASQ) were varied in which hypertension, diabetes, and other cardiovascular diseases accounted for 4.1%, 2%, and 1.8%, respectively.[12] Another study by Alkundi reported that compared with patients without diabetes, COVID-19 patients with diabetes were more likely to stay longer in the hospital (14.4 vs 9.8 days).[20] But the outcome of COVID-19 patients with diabetes in terms of gender, age, type of diabetes, control of diabetes, and comorbidities not showed statistically significant differences.[20]

Based on the medical record presented in Table 1, most of the COVID-19 patients are men (58.3%). This data was in line with a study reported by Karyono and Wicaksana, in terms of gender, the COVID-19 virus infected more males (54.6%, n = 15.123) than females.[12] The males had a recovery rate of 31.62% and mortality rate of 6.84%, relatively higher than females. Women are known to be more resilient in terms of viral infection. This is associated with the X-chromosome protection and estrogen hormones, which have an essential role in the adaptive immunity mechanisms. The X-chromosome involves several genes that are associated with the immunological process, such as multiple cytokine receptors, genes involved in T-cell and B-cell activities, and transcriptional and translational regulatory factors. In addition, women have more estrogen receptors which protect the body and assist the immune system, including T-cells, B-cells, macrophages, neutrophils, dendritic cells, and natural killer cells.[12]

Based on the identification of clinical manifestations presented in Table 2, the order of the most significant clinical manifestations of the COVID-19 patients are fever, cough dyspneu, nausea, malaise, odynophagia, gag, myalgia, epigastric pain, abdominal pain, cephalgia, chest pain, loss of consciousness, astralgia, influenza, and hematokezia. This data was in line with a study reported by Zhu, the major symptoms for DM and Non-DM patients were fever 6,385 participants in 952 participants (71.8%), cough (63.5%), fatigue (32.3%), and dyspnea (16.1%).[21] Another study reported by Yashiro said that several initial symptoms of the COVID-19 virus infection can be found in the respiratory system.[22] Fever and cough are seen in 60-90 % cases. Common cold symptoms, like nasal discharge, cough, fever, and sore throat can be found.[22] Manifestations of COVID-19 among individuals with diabetes and without diabetes significantly varied among different age groups.[23] Leelarungrayub has reported the reduction in levels markers of oxidative stress (total antioxidant capacity, glutathione, malondialdehyde, and nitric oxide and inflammatory cytokines such as TNF-α and IL-6) following the 4-week breathing exercise to assume that these may help reduce the severity of COVID-19 (though the research study needs to be undertaken).[24]

Based on the identification of BMI rate presented in Table 3, the biggest number of

BMI of the COVID-19 patients are normal BMI 94 (56.0%). This is contradictary to a study reported by Brooks that shows 24% of patients were normal or underweight (<1%) of overall patients were underweight) while 76% of patients were obese (51%) or overweight (49%), and 18% of patients had DM.[25] Hendrawati conclude that we should have efforts to maintain an ideal weight and lose weight for the overweight and obesity.[26] However, the efforts will be difficult because the pandemic situation contributes for stress that can cause appetite in certain people to increase. In addition, the current situation requires us to do work from home that causes fewer physical activities and becomes a risk factor of overweight. Therefore, we must maintain a diet and exercise at home.[26]

Based on the respondents' BGL examination presented in Table 3, the number of BGL of the COVID-19 patients without DM is much higher than patients with DM (114 versus 54). This is contradictary to a study reported by Zhu that shows BGL was much higher in the diabetic group compared to the non-diabetic group.[27] On the other hand, the number of COVID-19 patients with uncontrolled BGL is higher than controlled BGL (35 versus 19). This is data was in line to a study reported by Zhu that shows the median BGL was much lower in the well-controlled BGL group than the poorly controlled BGL group.[27]

Wu reported that BGL was an independent risk element to predict the progression to critical cases/mortality in non-critical cases and in-hospital mortality in critical cases, while patients with higher median BGL during the hospital stay or after critical diagnosis had significantly poorer clinical outcomes.[27] Keep in track of and control BGL are important for diabetic patients and acute hyperglycemia to help avoid and control infections and their complications. Therefore, a well-controlled BGL could improve outcomes for patients with COVID-[19.28]

Based on the identification of radiology characteristic presented in Table 3, the biggest number of radiology characteristic of the COVID-19 patients are bilateral 76 (45.2%). This data was in line with a study reported by Hosseiny that conclude early evidence suggests that initial chest imaging will show abnormality in at least 85% of patients, with 75% of patients having bilateral lung involvement initially that most often manifests as subpleural and peripheral areas of ground-glass opacity and consolidation.[29] Older age and progressive consolidation might suggest a poorer prognosis. Besides the acute phase, CT is recommended for follow-up in individuals who are recovering from COVID-19 to evaluate long-term or permanent lung damage including fibrosis, as is seen with SARS and MERS (Middle East Respiratory Syndrome) infections.[29]

Based on the identification of comorbidity presented in Table 3, the order of comorbidity of the COVID-19 patients are hypertension 57 of 168 (34%), TBC (4%), Coronary Artery Disease (4%), COPD (3%), Stroke (1%), Hepatitis (1%), Vertigo (1%), and the other is non-comorbidity 89 (53%). This data was in line with a study reported by Sanyaolu that shows the most common comorbidities identified in COVID-19 patients were hypertension (15.8%), cardiovascular and cerebrovascular conditions (11.7%), and diabetes (9.4%).[30] Authorities speculate that when compared to patients without comorbidity, patients with comorbidity experiencing more severe symptoms when infected with COVID-[19.30]

Based on the identification of range age presented in Table 3, most of the COVID-19 patients in age 26-35 and 36-45 years old. This data was in line with a study reported by Karyono and Wicaksana, the majority of COVID-19 cases occurred in the age group of 31-45 years (29.3%) and it was followed by the age group of 46-59 years (27.3%).[12] Patients in the productive age (18-59 years old) have dominated the incidence of COVID-19 in Indonesia. Adult people are actively working and engaging in many daily activities. As a result, it was easy for them to be infected when they did not strictly adhere to the protocols of COVID-19 control.[12]

Based on the identification of recovery rate presented in Table 3, total recovery rate is 147 patients. The biggest number of recovery rate

of the COVID-19 patients with DM are in age 26-35, which is 32 patients. Whereas, the biggest number of recovery rate of the COVID-19 patients non-DM are in age 56-65, which is 13 patients. This data was in line with a study reported by Karyono and Wicaksana, the recovery rate was dominated by the age group of 31-45 years (32.21%) and it was followed by the adult groups.[12]

Based on the identification of mortality rate presented in Table 3, total mortality rate is 21 patients. The biggest number of mortality rate of the COVID-19 patients with DM are in age 66-80, which is 2 patients. Whereas, the biggest number of mortality rate of the COVID-19 patients non-DM are in age 56-65 and 66-80, which is 12 patients. This data was in line with a study reported by Karyono and Wicaksan, the highest proportion of deaths was identified among the elderly (43.8%).[12] The mortality rate indicated a similar trend in which the elderly contributed to the highest rate (17.69%).[12] Current research by Akter reported that the prevalence of DM and elevated BGL can act as independent factors of mortality and morbidity related to COVID-19; firstly because individuals with diabetes have a prolonged recovery duration from viral diseases due to having a compromised immune system and secondly for the virus ability to sustain itself in an environment with high glucose levels putting individuals with diabetes mellitus at a vulnerable position from the aspect of casualties due to COVID- [19.23]

The mortality and severity of COVID-19 patients are influenced by their comorbids. According to Sanyaolu, the hightest comorbids were hypertension (22.07%), diabetes (11.34%), cardiovascular disease (10.76%), liver disease (6,31%), coronary heart disease (5.52%), kidney disease (3.82%), and COPD (2.53%). [30] In the research found the extant COPD makes it four times more likely that severe COVID-19 will develop. While in terms of clinical manifestations, the most common were fever (74.52%), cough (62.15%), myalgia/fatigue (38.77%), dypnea (33.9%), ARDS (20,6%), diarrhea (11.21%) and chest tightness/pain (16.82%). Some comorbidities such as obesity, hypertension, Diabetes Mellitus (DM) and smoking may worsen the Covid-19 clinical presentation. [31]

Independent Sample T-Test shows that there is a significance difference in BMI between DM and Non-DM patients (p-value = 0.000 < Level of Significant = 0.05). This research result is in accordance with Leitner, where the research shows that there is a significance difference between DM and Non-DM patients. Body Mass Index (BMI) is a calculation of weight adjusted to height, calculated in the form of body weight (kg) divided by height quadrant (m^2) and gets a value with units of kg/m^2. BMI is used as an indicator of measuring excess body weight compared to excess body fat levels.

Independent Sample T-Test analysis result shows that there is a significance difference in BGL between DM and Non-DM patients (p-value = 0.000 < Level of Significant = 0.05). This research is in accordance with Berbudi, where the research shows that there is a significance difference in BGL between DM and Non-DM patients. [32] The results of this study are in accordance with Berbudi, where the results showed that there were significant differences in KGD between DM and Non-DM patients. The results of laboratory examinations showed that KGD was much higher in the DM group than in the non-DM group, as expected, namely 8.3 mmol/L (6.2 – 12.4) versus 5.2 mmol/L (4.7 to 6.1), with a higher HbA1c value of 7.9% (6.8% - 8.5%) versus 6.1% (5.7% - 6.6%). [32]

Due to strict regulations during the pandemic, we were not allowed for direct observation of COVID-19 patients, so we could not encounter any confounding variables regarding BGL and BMI. Furthermore, there is a disproportionate amount of sample between COVID-19 patients with and without DM and COVID-19 patients with well-controlled BGL and uncontrolled BGL. These might be the limitation of this study. This study suggests that physicians and medical personnel develop an effective medical treatment by applying an initial screening of COVID-19 patients to control BGL, BMI, and clinical parameters.

CONCLUSION

Clinical evidence shows significant differences in BMI and BGL between DM and non-DM patients with positive COVID-19. COVID-19 patients with DM who has higher BMI and BGL results have a longer length of stay, poor clinical manifestations, lower recovery rate and higher mortality rate. Thus, BMI and BGL could be used as the initial screening to develop an effective clinical treatment of DM and non-DM COVID-19 patients based on clinical parameters evaluation.

CONFLICT OF INTEREST

TAll authors declare that there are no any conflicts of interest in this study

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