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Research Article

Comparison of Thoracic Radiography in Patients with Moderate COVID-19 with Diabetes Mellitus and without Diabetes Mellitus at Jakarta Islamic Hospital Pondok Kopi

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ABSTRACT

Background: Coronavirus Disease-19 (COVID-19) is still a health problem worldwide, including in Indonesia. Each individual's symptoms are different and can be affected by comorbidities such as Diabetes Mellitus (DM). Diabetes Mellitus is believed to worsen the COVID-19 disease. Therefore, an RT-PCR examination and radiological examination using the Brixia Score are needed to diagnose and evaluate COVID-19 disease. **Purpose**: To compare thoracic radiography in patients with moderate COVID-19 with DM and without DM at Jakarta Islamic Hospital Pondok Kopi in January – December 2021 by using Brixia Score as a tool to help determine the severity and prognosis of COVID-19 patients. **Methods**: This study uses analytic observational research, namely, a cross-sectional approach from secondary data using medical records. Statistical test analysis using the independent t-test. **Result**: From 54 samples of moderate-degree COVID-19 patients at RSIJ Pondok Kopi (24 people without DM and 30 people with DM), It was found that men and women have the same number, namely 12 people (50%). The majority of Brixia scores in the group without DM is 6 – 10, as many as 12 people (50%), while in the group with DM as 11 – 15, as many as 18 people (60%). The group with DM had a higher Brixia Score than those without DM. The thoracic radiography on the lower zone of the group with DM is dominantly alveolar infiltrate. **Conclusion**: There is a significant difference in the Brixia score of moderate degree COVID-19 patients without DM and with DM ($p<0.001$).

Keywords: COVID-19, brixia score, diabetes mellitus

INTRODUCTION

COVID-19, first identified in December 2019 in Wuhan, China, was declared a global pandemic by WHO on March 11, 2020. Indonesia reported the first confirmed cases on March 2, 2020, with two cases. COVID-19, caused by the SARS-CoV-2 virus, primarily affects the respiratory system and presents symptoms such as fever, cough, throat discomfort, dizziness, weakness, nausea, vomiting, diarrhea, and loss of taste, with some individuals being asymptomatic (1,2). Transmission occurs via droplets and contact with contaminated surfaces, especially during close interactions like talking, coughing, or sneezing (3). Patients with conditions such as hypertension, diabetes, cardiovascular disease, and chronic liver disease are at a higher risk for severe illness and death (4–6).

According to the International Diabetes Federation (IDF), in 2021, there were 537 million adults aged 20-79 lived with diabetes (DM) (7). In Indonesia, diabetes is the second most common comorbidity among COVID-19 patients (8). The American Diabetes Association (ADA) reports that patients with Diabetes have a fourfold increased risk of experiencing Long COVID-19 symptoms (9,10).

The real-time reverse-transcription polymerase chain reaction (RT-PCR) test is the primary examination for confirming COVID-19. Additionally, radiological imaging, particularly thoracic radiography, plays a significant role in the management and prognosis of COVID-19 during the pandemic (11,12).

Thoracic radiography is often used as a first-line diagnostic tool due to its availability in hospitals. In COVID-19 patients with diabetes mellitus (DM), thoracic radiography reveals increased airspace consolidation, and the severity of this consolidation correlates with higher mortality rates. There is a scoring system called the Brixia score that can help determine the severity and prognosis of COVID patients. The scores are obtained from the sum of the six lung zones, with a range of 0 - 18. If the Brixia score is more than 9 and less than 7, intensive treatment needs to be considered, such as the using of a ventilator and ICU (12,13). Therefore, this study aims to compare thoracic radiography in patients with moderate COVID-19 with Diabetes Mellitus (DM) and without Diabetes Mellitus (DM) at Jakarta Islamic Hospital Pondok Kopi in January – December 2021.

METHODS

This study uses analytic observational research using a cross-sectional approach from secondary data using medical records. This study compares thoracic radiography in moderate-degree COVID-19 patients with Diabetes Mellitus (DM) and without Diabetes Mellitus (DM). This research was conducted at the Jakarta Pondok Kopi Islamic House by collecting secondary data, namely medical records, at the Jakarta Pondok Kopi Islamic Hospital from January to December 2021. The population in this study consisted of moderate-degree COVID-19 patients at the Jakarta Pondok Kopi Islamic Hospital from January to December 2021. The sampling technique in this study was purposive sampling, which selected samples from among the population according to what the researcher wanted so that the sample could represent the expected characteristics of the population (14). The way to collect this data is by looking at the clinical characteristics (age, sex, and history of DM diagnosis) of moderate-degree COVID-19 patients through medical records and then looking at the results of their thoracic radiography to see if there are any abnormalities in their lungs such as infiltrates and also assessing their Brixia Score by divided the chest x-ray into six parts and then seen for any abnormalities. Where one part of the lung can be evaluated with a score of 0-3. For score 0, there are no lung abnormalities; for score 3, there are infiltrates predominantly in the alveolar area. The scores are obtained from the sum of the six lung zones, with a range of 0 - 18. This score can determine the severity and prognosis of COVID-19 patients. If the score is more than 9 and less than 7, intensive treatment needs to be considered.

This study used the Independent T-test to compare the two variables. The research has passed ethical approval with number 356/PE/KE/FKK-UMJ/XII/2022 issued by the Health Research Ethics Commission of the UMJ Faculty of Medicine and Health.This study used the

Independent T test to find out the comparison of the two variables. This research has passed ethical approval with number: 356/PE/KE/FKK-UMJ/XII/2022 issued by the Health Research Ethics Commission of the UMJ Faculty of Medicine and Health.

RESULTS

Based on data and observations of moderate degree COVID-19 patients with DM and without DM at Rumah Islam Jakarta Pondok Kopi, the following results were obtained. There were 54 samples (24 samples without Diabetes Mellitus and 30 samples with Diabetes Mellitus) that met the inclusion criteria. Based on table 1, the group without DM, shows an equal distribution of sex, with 12 males (50%) and 12 females (50%) while in the group with DM mostly were men with a total 18 men (60%). In both group, the highest age group is 46-55 years, with 9 (37.5%) and 11 (36.7%) individuals in each group. Based on the Brixia score, in the group without DM the majority of Brixia score is score of 6 – 10 by 12 people (50%) while score in the group with DM is 11 – 15. Which means score in the group with DM is associated with an increased risk of death.

Table 1. Description of the characteristics of moderate degree COVID-19 patients with and without Diabetes Mellitus (DM)

Characteristics in Patients Without DM	**Number (n)**	**Percentage**
Sex		
Men	12	50
Women	12	50
Total	**24**	**100**
Age		
17 – 25 years	1	4.2
26 – 35 years	3	12.5
36 – 45 years	6	25
46 – 55 years	9	37.5
56 – 65 years	3	12.5
>65 years	2	8.3
Total	**24**	**100**
Brixia Score		
0 – 5	8	33.3
6 – 10	12	50
11 – 15	4	16.7
16 – 18	0	0
Total	**24**	**100**

Characteristics in Patients With DM	Number (n)	Percentage
Sex		
Men	18	60
Women	12	40
Total	**30**	**100**
Age		
17 – 25 years	0	0
26 – 35 years	4	13.3
36 – 45 years	2	6.7
46 – 55 years	11	36.7
56 – 65 years	7	23.3
>65 years	6	20
Total	**30**	**100**
Brixia Score		
0 – 5	0	0
6 – 10	10	33.3
11 – 15	18	60
16 – 18	2	6.7
Total	**30**	**100**

Based on table 2, an analysis of the difference in Brixia scores of moderate degree COVID-19 patients without DM and with DM was obtained. Data normality test using Kolmogorov-Smirnov. Data normality test Brixia score is normal (p> 0.05), the data analysis is using Independent T test. From the table, after calculations using Independent T test, the result of P value is 0.000 (p <0.05). This means that there is a significant difference in the Brixia scores of moderate degree COVID-19 patients without DM and with DM at the Jakarta Islamic Hospital Pondok Kopi for the period January - December 2021.

Table 2. Differences in Brixia Scores of moderate Degree COVID-19 patients without DM and with DM

Variable	Without DM (n=24)	With DM (n=30)	P Value (<0.05)
	Mean ± SD	Mean ± SD	
Brixia Score	6.83 ± 2.599	11.20 ± 2.565	0.001

DISCUSSION

Based on the results of the study on the characteristics of moderate-degree COVID-19 patients without Diabetes Mellitus (DM) at the Jakarta Islamic Hospital Pondok Kopi period January - December 2021 it was found that the proportion of men and women in the group without DM was the same. The number of men is 12 people (50%) and women are 12 people (50%). Although this is not in accordance with the literature which states that male patients are more at risk of contracting COVID-19 (15). This happened because there were differences in data in

the groups without DM and with DM. However, when the two groups are combined, the total number of men affected by COVID-19 is greater than that of women, so that this is consistent with the literature.

In the group with Diabetes Mellitus (DM), the result is mostly are men who infected with COVID-19, namely 18 people (60%) while there were 12 women (40%). This is in line with research conducted by Aeda Ernawati (2021) which showed that the majority of COVID-19 patients were 931 men (53%) while 810 women (47%).

This can happen because men have higher expression of ACE2 which is related to sex hormones which makes it easier for men to be infected with COVID-19. ACE2 expression is encoded by a gene found on the X chromosome, where the X chromosome is more dominant in women (XX) than men (XY) so that men have the potential to increase ACE2 expression. In the research conducted by Aeda Ernawati, it was also stated that mostly men have smoking habits so that it can make lung cells easier to be infected with COVID-19 by increasing its receptor, namely the ACE2 molecule (15,16).

Based on the results of the study, it was found that the largest number of samples without Diabetes Mellitus (DM) were in the age group of 46-55 years as many as 9 people (37.5%). Whereas for the sample with Diabetes Mellitus (DM) the most was also in the age group 46-55 years as many as 11 people (36.7%). This is in line with research conducted by M. Biswas where he divided age into two groups, namely age <50 years and age >50 years. The results of this study are that the age group >50 years is more susceptible to contracting COVID-19 and the risk of death is also high because of the relationship between age and a person's natural immunity. Where natural immunity will gradually decrease with age (17).

From the results of this study, it was found that in samples without DM, the majority of Brixia score is score 6-10 for 12 people (50%). Whereas in the sample with DM, the majority of Brixia score is score 11-15 with 18 people (60%). This is in line with research conducted by Redy Ayu Triutari et al, namely that there are significant differences in thoracic radiography using the Brixia Score for groups without DM and with DM (18). Where in DM patients there is an increase in the expression of ACE2, furin, type 1 membrane protease which plays a role in helping the COVID-19 virus replicate (4). In addition, in DM sufferers there is an increase in proinflammatory cytokines, especially IL-1, IL-6, and TNF-α, as well as other markers such as C-Reactive Protein, D-dimer, and Fibrinogen. This can then prolong the cytokine storm and cause severity in COVID-19 patients with DM.

From the results of the study, a comparison of the Brixia scores of patients with moderate degrees of COVID-19 without DM and with DM obtained a P value of 0.000 which was previously tested using the Independent T test, which means that there is a difference in the Brixia score of COVID-19 patients without Diabetes Mellitus (DM) and with Diabetes Mellitus (DM). Where in the group with DM has a higher Brixia score. On the thoracic radiography of the group with DM, the alveolar infiltrate in the lower zone is also dominant. In group with DM there was an increase in proinflammatory cytokines, especially IL-1, IL-6, and TNF-α, as well as other markers such as C-Reactive Protein, D-dimer, and Fibrinogen. This can prolong the cytokine storm in patient’s lung.

This is in line with research conducted by Redy Ayu Triutari et al (P value = 0.015), namely there is a significant difference in thoracic radiography using the Brixia score for groups without DM and with DM (18).

CONCLUSION

A significant difference exists in the Brixia score of moderate-degree COVID-19 patients without DM and with DM. The group with DM has a higher Brixia Score than those without DM. The thoracic radiography of the lower zone of the group with DM is dominantly alveolar infiltrate. In the group with DM, there was an increase in proinflammatory cytokines, which means it can prolong the cytokine storm in the patient's lung.

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CONFLICT OF INTEREST

Authors do not have a conflict of interest and do not have affiliations or relationships with any organization or entity that could raise biased questions or statements in the discussion and conclusion sections of the paper.

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