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Clinical findings, laboratory, and imaging features of COVID-19 patients at Universitas Gadjah Mada (UGM) Academic Hospital, Yogyakarta, Indonesia

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ABSTRACT

Background: The SARS-CoV-2 infection has triggered a global health crisis. Early detection of COVID-19 infection using hematology and radiology examination is the fastest method to detect the infection. This study aims to evaluate the characteristics of sign and symptom, hematology, and radiology examination of COVID-19 patients at Universitas Gadjah Mada (UGM) Academic Hospital, Yogyakarta, Indonesia.

Methods: This is a retrospective study with quantitative descriptive methods and uses a total sampling technique. This study was conducted at UGM Academic Hospital, with a total sample of 147 patients diagnosed with COVID-19. Data were collected from medical records and were analyzed with Microsoft Excel for Windows.

Results: This study showed that the most signs and symptoms of COVID-19 patients were cough (46.26%) and cold (37.41%), followed by hypertension (31.97%). Hematology examination showed that the leukocyte count of patients was mainly higher than the normal level (82.99%). The data showed that 22.45% of patients had increased C-Reactive Protein (CRP) and 2.72% of patients had increased procalcitonin. The result of thorax x-ray (16.33%) and CT-scan (28.57%) examination of the COVID-19 patients indicates pneumonia.

Conclusions: This study illustrated that the symptoms of COVID-19 patients at UGM Academic Hospital, Yogyakarta were various. Respiratory problems such as cough and cold were the most common symptoms, followed by muscle fatigue and digestive disorders. Hematology and radiology test results of COVID-19 patients depend on the severity of the disease.

Keywords: Coronavirus Infection, COVID-19, Laboratory Findings, Radiology, Signs, Symptoms.
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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an acute respiratory infectious disease caused by SARS coronavirus-2, first discovered in December 2019 in Wuhan, Hubei, China. The incidence of this infection increased rapidly in China and, in a short time, was able to spread to various countries since the end of February 2020. On March 11, 2020, the World Health Organization (WHO) stated that COVID-19 had become world health threat.[1]

Based on several studies, the incubation period of this virus ranges from 1-14 days, with a half-life of 3-7 days, and can reach 24 days in some cases.[2] The viral shedding period was found to be up to 20 days and the most prolonged period found in patients was up to 37 days.[3] In severe cases, the average duration seen is up to 31 days from the onset of symptoms.[4] The symptoms were found to vary from asymptomatic to severe respiratory infections. In elderly patients, it was found that a high Sequential Organ Failure (SOFA) scores and increased D-dimer levels to more than 1 g/mL, which was associated with poor prognosis in these patients, neutrophil and D-dimer, creatinine-kinase and creatinine levels in COVID-19 patients admitted to the ICU.[5,6] Examination of albumin levels, lymphocyte and neutrophil percentages, lactate dehydrogenase, plasma angiotensin II levels, and C-Reactive Protein (CRP) are closely related to acute lung infections and can be used as tools to predict disease severity.[7]

CT-Scan examination in patients infected with SARS-CoV-2 shows the presence of Ground-Glass Opacity (GGO) or bilateral patchy shadows and rupture of the alveolar walls.[8,9] CT-Scan examinations in Indonesia are less frequently performed than X-Ray examinations due to the high costs and risks of airborne, so clinicians prefer X-Ray. However, a study showed that X-Ray examination results in patients infected with COVID-19 often did not find abnormalities; only 250 of the 6,523 X-ray films found typical COVID-19 readings.[9] Thus, it is a particular challenge for health workers to determine which patients need to be treated in isolation or general wards. Based on those mentioned above, this study aims to evaluate the clinical

findings, laboratory, and imaging features of COVID-19 patients at Universitas Gadjah Mada (UGM) Academic Hospital, Yogyakarta, Indonesia.

METHODS

This study is a retrospective, quantitative research with a descriptive approach by taking data from the medical records of confirmed COVID-19 patients. This study used a total sampling technique from patients in March-August 2020. The inclusion criteria in this study were all confirmed COVID-19 patients examined at the Academic Hospital UGM, both pediatric and adult patients. At the same time, the exclusion criteria were patients who were confirmed positive for COVID-19 but did not undergo laboratory and radiological examinations.

The data were analyzed with Microsoft Excel for Windows version by grouping the data based on signs and symptoms, laboratory examination results (hematology and other parameters), and radiological examination results (thorax X-ray and CT-scan).

RESULTS

Swab examinations are carried out on symptomatic or asymptomatic patients but have close contact with patients who are confirmed to be infected with COVID-19. By the end of the study, we collected data from 147 subjects. Table 1 is the demographic data from all subjects, most COVID-19 patients are male, and the age is about 30-49 years. In this study, the most common symptom experienced by COVID-19 patients was cough (46.26%) followed by fever (37.41%). Table 1 below also describes the various symptoms and signs experienced by COVID-19 patients.

COVID-19 patients in this study receive different examinations. This is because the doctor in charge of the patient determines which assessments will be carried out on the patient according to the symptoms, complaints, and severity experienced by the patient. However, all confirmed patients will be screened for baseline data to look for comorbidities that may exacerbate COVID-19 infection. This study showed that 31.97% of the patients with confirmed COVID-19 had

Table 1. Demographic Characteristic, symptoms, and signs of COVID-19 Patients at UGM Academic Hospital, Yogyakarta.

Variables	Frequency (N=147)	Percentage (%)
Gender:		
Male	75	51.02
Female	72	48.98
Age:		
0-9 years	8	5.44
10-29 years	35	23.81
30-49 years	62	42.18
50-69 years	32	21.77
>=70 years	10	6.80
Symptoms		
Fever	55	37.41
Cough	68	46.26
Myalgia	19	12.93
Headache	15	10.20
Hemoptysis	0	0.00
Diarrhea	11	7.48
Dyspnea	27	18.37
Sore throat	33	22.45
Rhinitis	17	11.56
Anosmia/ageusia	7	4.76
Indigestion	22	14.97
Upset in chest	3	2.04
Signs		
Hypertension	47	31.97
Hyperthermia	9	6.12

Table 2. Laboratory findings of study subjects.

Category	Frequency (N=147)	Percentage (%)
Blood Glucose		
Hyperglycemia	7	4.76
Normal	140	95.24
Leucocytes		
Leucopenia	0	0.00
Normal	118	80.28
Leucocytosis	13	8.84
Not Assessed (NA)	16	10.88
Neutrophil (103/ul)		
Male (>4.97)	56	38.10
Female (>5)	69	46.94
Normal	22	14.97
Lymphocytes (103/ul)		
Male (>3.17)	56	38.10
Female (>2.87)	68	46.26
Normal	22	14.97
Thrombocytes (103/ul)		
Thrombocytopenia (< 150)	4	2.72
Normal (≥ 150)	143	97.28
Anemia (g/dL)		
Male (<13.2)	10	6.80
Female (<11.7)	13	8.84
Normal	124	84.35
Increasing AST Level (U/L)		
Male (>40)	9	6.12
Female (>30)	11	7.48

hypertension (47 patients). Only 7 patients (4.76%) experienced hyperglycemia and 9 patients (6.12%) experienced an increase in temperature when they came to the UGM Academic Hospital, Yogyakarta (Table 1).

Laboratory examination data found that most of the patients' leukocyte counts were in the normal range, but there was an increase in neutrophils and lymphocytes in most patients (Table 2). For some patients who experience severe symptoms, the doctor will check the level of procalcitonin in the patient. Only 4 of the 9 patients examined have an increased procalcitonin level.

Thorax X-ray examination was undergone in 114 patients (77.55%), and the results from COVID-19 patients were pneumonia (16.33%) and 74 patients (50.34%) were normal. CT-scan examination only underwent in 63 patients (42.86%) of COVID-19 patients, and 42 patients (28.57%) were pneumonia. Only 17 patients (11.56%) had a normal CT-scan (Table 3).

Category	Frequency (N=147)	Percentage (%)
Normal	127	86.39
Increasing ALT Level (U/L)		
Male (>40)	10	6.80
Female (>35)	7	4.76
Normal	130	88.44
Natrium (mmol/L)		
<135	11	7.48
135-145	129	87.76
>145	7	4.76
Kalium (mmol/L)		
<3.5	4	2.72
3.5 – 5.0	134	91.16
>5.1	9	6.12
Chloride (mmol/L)		
<95	19	12.93
95 - 155	128	87.07
>155	0	0.00
Uric Acid		
Hiperuremia	8	5.44
Normal	139	94.56
Creatinine		
High	9	6.12
Normal	138	93.88
C-Reactive Protein (CRP)		
High	33	22.45
Normal	65	44.22
NA	49	33.33
Procalcitonin		
High	4	2.72
Normal	5	3.40
NA	138	93.88

Table 3. Radiology evaluation of study subjects (n=147).

Category	Frequency (N=147)	Percentage (%)
X-Ray Thorax		
Pneumonia	24	16.33
Infiltrates	9	6.12
Edema	3	2.04
Bronchitis	2	1.36
TB	2	1.36
Parenchymal band	1	0.68
Normal	74	50.34
NA	33	21.77
CT-Scan		
Pneumonia	42	28.57
Emphysema	3	2.04
Bronchitis	1	0.68
Normal	17	11.56
Not Assessed (NA)	84	57.14

DISCUSSION

From 147 COVID-19 patients, male and female COVID-19 patients were almost the same numbers. As for age, most of them are of productive age in the age range of 30-49 years. It could be caused by them still interacting with the outside environment to do some work, even though there are health protocols that must be obeyed so that this age group remains at the highest risk of exposure. The description of this age group is similar to the study, which stated that in Wuhan, China, the highest number of patients were in the productive age (25-49 years).[10]

The most common symptoms experienced by patients are cough, fever, and sore throat, followed by symptoms of dyspnea and indigestion. A retrospective study conducted in Wuhan at the beginning of the pandemic also reported almost the same symptoms, but the fever was the most common symptom, followed by cough and fatigue.[5] A previous study also reported that fever was the main symptom, followed by cough, weakness, phlegm production, and breathing difficulty.[11] Another study conducted by Huang S et al., also reported that the most common symptom was fever and then cough.[12] In addition, another study stated that some of the clinical manifestations found in COVID-19 patients were fever, lethargy, dry cough, and in severe cases to organ failure, as well as atypical symptoms including myalgia and diarrhea.[13]

Results of laboratory examination showed that most of the patients had leukocyte levels in the normal range.

However, in this study, 84.36% of patients showed a high lymphocyte count. This result contrasts with other studies that reported that lymphocytopenia was present in the majority of COVID-19 patients.[5,12,14,15] The lymphocytopenia occurs in 40% of hospitalized COVID-19 patients reported in Wuhan, China.[5] Lymphocytopenia is an essential hematological parameter related to the prognosis and severity of the disease.[16] Patients who died showed a significant decrease in lymphocyte counts when compared to patients who recovered. Other blood test predictors used to determine the severity of COVID-19 are leukocyte, neutrophil, eosinophil, platelet, and CD-8 counts.[16]

SARS COV-2 infection in liver cells cannot be ruled out in 2-10% of patients with diarrhea and viral RNA is found in blood and feces, indicating the possibility of infection in the liver.[16] However, this could not be explored further in this study because the examination was not carried out. The viability of SARS-CoV and MERS-CoV in several environmental conditions and can be transmitted through fecal-oral transmission can be considered in SARS Cov-2 is also transmitted through this route, especially in areas with poor sanitation; therefore, fecal handling with vigilance and hand hygiene is required.[17]

C-Reactive Protein (CRP) and procalcitonin examination were also carried out on COVID-19 patients with severe symptoms. CRP is an acute-phase protein, increase in inflammatory conditions, such as a severe acute respiratory syndrome (SARS), it is also associated with respiratory dysfunctions and death of the patients.[18] Meanwhile, procalcitonin is a peptide compound and increased in some conditions such as bacterial infection, it is also used to assess disease progression.[19] In this study, not all patients underwent CRP examination, only 66.67% (98 patients). Patients who underwent procalcitonin examination were 6.12% (9 patients). The results showed that 22.45% (33 patients) had an increase in CRP level and 2.72% (4 patients) had an increase in procalcitonin. A previous study showed a strong relationship between increased CRP and the severity and prognosis of COVID-19 patients.[20] Furthermore, patients who recovered had a mean level of CRP of about 40 mg/L, while patients with poor outcomes had a mean CRP of 125 mg/L.

The data in this study showed that most of the patients had electrolyte test results in the normal range. Even so, electrolyte disturbances, especially sodium, are a common laboratory test used as a marker of disease severity and increased mortality in COVID-19 patients.[6] The virus that causes COVID-19 infects human cells by attaching to Angiotensin I-Converting Enzyme 2 (ACE-2), one of the anti-regulatory factors of the Renin-Angiotensin System (RAS), which plays an important role in regulating blood pressure and electrolyte balance.[14] In addition, COVID-19 patients also experience digestive tract disorders such as diarrhea and vomiting, so that viral infections are very likely to disrupt electrolyte homeostasis in the body. A study conducted by Zimmer MA et al. stated that hypernatremia is a further manifestation of COVID-19 and most of these patients' hypernatremia cannot be corrected with standard therapy.[21]

Various studies have shown that hypertension is the most common comorbid disease in COVID-19 patients.[5,12,14] This study also found that 31.00% of COVID-19 patients had hypertension. It is explained in a previous study that high blood pressure can appear as a symptom in COVID-19 patients as an effect of disturbances in the RAS system, which results in increased blood pressure.[22] Diabetes mellitus is the second most common comorbid after hypertension. Hyperglycemia conditions will cause a mismatch of cytokine responses and exacerbate the pro-inflammatory process. Impaired liver function as indicated by an increase in alanine aminotransferase (ALT) and aspartate aminotransferase (AST) in this study only occurred in 11.56% (17 patients) and 13.60% (20 patients), respectively. Based on the previous study, patients with impaired liver function were more common in patients with high severity or patients admitted to the ICU.[6] This is due to a cytokine storm accompanied by hypoxia due to pneumonia in critically ill patients.

The chest X-ray examination data showed that 74 patients (50.34%) who underwent X-ray examination showed normal results, followed by 24 patients (16.33%) with pneumonia. This result is different from the previous studies that reported that most confirmed COVID-19 patients showed abnormal features on baseline chest X-rays.[23,24] The research of Yuen et al., added a chest X-ray of a COVID-19 patient with a normal picture, in a short time showing an abnormal picture when a follow-up chest X-ray was performed.[24] Consolidation is the most frequently seen, followed by ground-glass opacities. For the distribution of consolidation, the periphery and bottom of the lung are the most common locations, and most patients have bilateral abnormalities.[24] Wong HYF et al., stated that in a study conducted in Wuhan, 31.00% of patients were found to be normal, 69.00% of patients were found to have abnormal results on chest X-rays. The abnormalities found were consolidation or opacity in the lung parenchyma.[24]

CT-scan data of the lungs showed that 42 patients (28.57%) have pneumonia. Ground-glass images and consolidation not detected on a chest X-ray can be seen more clearly on a CT-scan. This shows that CT-scan modalities are more sensitive to be used in identifying COVID-19. Baseline chest X-rays have a sensitivity of about 60% in cohort studies, so they can be used to identify COVID-19.[24] However, the results are less effective when compared to a pulmonary CT-scan.[24,25] Of all patients who underwent CT-scan of the lungs, as much as 43% of them, 67% obtained a picture of pneumonia. It was found that CT-scanning is not a routine procedure that is performed but can be used to monitor the clinical condition of patients who are experiencing the severity.[24]

CONCLUSION

This study illustrates that the symptoms experienced by patients infected with COVID-19 are very diverse, but respiratory problems are the most common symptoms experienced by patients, followed by muscle fatigue and digestive disorders. The results of this study will provide an overview for health workers to improve their understanding and be aware of the clinical findings,

laboratory and radiology examinations in patients suspected of COVID-19 and make judgments for further examination, therapy, and prognosis. However, further study with different sites and the larger population is necessary to generalize the recent findings.

CONFLICT OF INTEREST

There is no competing interest regarding the manuscript.

ETHICS CONSIDERATION

This study has received ethical clearance from the Medical and Health Research Ethics Committee (MHREC), Faculty of Medicine, Public Health, and Nursing, Universitas Udayana, Dr. Sardjito General Hospital, Yogyakarta, Indonesia, with number KE/FK/0981/EC/2020 prior to the study being conducted.

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AUTHOR CONTRIBUTIONS

All authors equally contribute to the study from the study concepts, study designs, literature search, data acquisition, data analysis, manuscript preparation, manuscript editing, and manuscript review until reporting the study results through publication.

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