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Demographic Characteristics, Laboratory Findings, Radiological Features, and Outcomes of Patients with COVID-19: A Single-center Descriptive Study

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Abstract

BACKGROUND: The coronavirus disease 2019 (COVID-19) has resulted in a global crisis, affecting hundreds of millions of individuals, with Indonesia reporting a significant increase in cases in July 2021.

AIM: This study aims to describe the clinical, laboratory findings, radiological features, and outcomes of hospitalized patients with COVID-19.

METHODS: This retrospective study was carried out using 606 hospitalized COVID-19 patients who were admitted to the isolation ward in a hospital in South Jakarta, Indonesia, from January 1 to April 30, 2021.

RESULTS: The median age of the patients was 45 years, 55.6% were male, and 85.5% had non-severe diseases, with the most common presenting symptoms being fever, cough, and gastrointestinal symptoms. Patients with severe disease were significantly older ($p < 0.001$), most of them have hypertension ($p < 0.05$) and diabetes ($p < 0.001$), have an increased CRP ($p < 0.001$), high ferritin ($p < 0.001$), and increased D-dimer ($p < 0.001$). Compared to patients who survived, patients who had died were older ($p < 0.001$), had hypertension ($p = 0.013$), increased CRP ($p < 0.001$), high ferritin ($p = 0.002$), and increased D-dimer ($p = 0.006$).

CONCLUSION: These results showed that older age, comorbidities, and a higher level of CRP, ferritin, and D-dimer increased the risk of severe disease and poor clinical outcomes in hospitalized COVID-19 patients.

Introduction

Coronavirus disease 2019 (COVID-19) was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 [1], with a global record of over 180 million confirmed cases and 3 million deaths in June 2021 [2]. Moreover, in July 2021, Indonesia reported 2.670.046 confirmed cases and 69.210 deaths. All provinces experienced a significant increase in the number of cases and hospitalizations, and it made the hospital bed occupancy rate (BOR) reach 75% nationwide. Some referral hospitals, including DKI Jakarta, reported a high BOR of more than 90% [3]. The emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) variants, such as delta variant (B.1.617.2) first reported in India at the end of 2020, has contributed to the spread of COVID-19. The delta variant has several mutations that can be responsible for its rapid transmission and high virulence [4]. This has led to a significant increase in COVID-19 cases in Indonesia 2 months after the crisis in India and became the country with the highest number of cases in July 2021, as well as the new pandemic epicenter as the delta variant spreads [5].

Several studies have reported the common clinical manifestations of COVID-19 infection, which included fever, shortness of breath, and cough, followed by myalgia, headache, nausea, diarrhea, and abdominal pain [6], [7]. Ground-glass opacities were the most common radiological findings known in COVID-19 patients [8]. The severity of COVID-19 infection is highly variable, from asymptomatic to critical disease. Moreover, the identified risk factor associated with severe disease and poor outcomes included increasing age, male gender, hypertension, and diabetes [9], [10].

There is still limited study on clinical manifestation, laboratory and radiological features, and outcomes of patients with COVID-19 during the

peak of the pandemic in private hospitals in Jakarta, Indonesia. Therefore, this study aims to describe the characteristics of hospitalized COVID-19 patients during the high peak of cases and identify the factors contributing to the severity and outcomes of patients.

Methods

Study design and population

The data used for this retrospective single-center descriptive study were obtained from 606 patients admitted to the isolation ward of Mayapada Hospital, South Jakarta, Indonesia, from January 1 to April 30, 2021. This involved all patients with COVID-19 infection confirmed by a positive polymerase chain reaction (PCR) with clinical data, radiology, and laboratory results. This study was approved by the Health Research Ethics, Faculty of Medicine, Universitas Indonesia (KET-1080/UN2.F1/ETIK/PPM.00.02/2021).

Data collection

Clinical characteristics, laboratory findings, radiological features, and outcomes of patients were obtained from their medical records. Demographic data, presenting symptoms, and history of comorbid conditions were also obtained from the paper-based medical records, while age was recorded as continuous data. The symptoms that were recorded included fever, cough, dyspnea, anosmia, sore throat, runny nose, gastrointestinal, myalgia, and headache. Data related to signs, symptoms, and the presence of comorbidity were recorded upon admission. Comorbidities including hypertension, diabetes, coronary artery disease (CAD), asthma, chronic kidney disease, autoimmune disorder, and malignancy were recorded based on patients' medical history. An initial laboratory test was defined as the first test result within 24 h of admission. Subsequently, the peripheral blood test was used to measure hemoglobin, hematocrit, leukocyte, white blood differential count, platelet count, urea, creatinine, alanine aminotransferase, aspartate aminotransferase, random blood glucose, C-reactive protein (CRP), ferritin, and D-dimer. SARS-CoV-2 was confirmed by real-time PCR assay for nasal and nasopharyngeal swab specimens. A non-contrast chest computed tomography (CT) scan was performed on admission and reported as normal, mild, moderate, and severe ground-glass opacities. Out of all 772 patients used in this study, only 606 patients met the inclusion criteria. The degree of severity at admission was categorized into asymptomatic, mild, moderate, and severe according to the COVID-19 National Guideline and National Institutes of Health (NIH) classification. These categories were further divided into two groups, namely non-severe (asymptomatic, mild, and moderate) and severe diseases. Asymptomatic infection was defined as a positive SARS-CoV-2 result without symptoms. Mild infection was defined as patients who have symptoms but without evidence of pneumonia or hypoxia. These symptoms included fever, cough, sore throat, malaise, headache, myalgia, nausea, diarrhea, anosmia, or dysgeusia, without any shortness of breath or abnormalities on chest CT scans and oxygen saturation of SpO_2 > 95% on room air. Furthermore, moderate infection was defined as patients with signs or symptoms of pneumonia such as fever, cough, and tachypnea. It was also described as evidence of lower respiratory tract infection on radiological imaging but without severe pneumonia (SpO_2 > 93%) on room air. The severe infection was defined as a patient with clinical signs of pneumonia (fever, cough, and tachypnea) plus one of the symptoms such as respiratory rate >30 breaths/minute, severe respiratory distress, and lung infiltrates of >50% or SpO_2 < 93% on room air. Critical infection was defined as patients with acute respiratory distress syndrome, sepsis, septic shock, or other conditions that need mechanical ventilation or vasopressor therapy. Clinical outcomes were classified into two categories, namely discharged or death during hospitalization.

Data analysis

Categorical variables were described as frequency rates and percentages, while continuous variables were described as mean, median, and interquartile range (IQR, defined by the 25^{th} and 75^{th} percentiles) values. An independent group t-test was used to compare means for continuous variables when data were normally distributed; otherwise, the Mann–Whitney test was used. Proportions for categorical variables were compared using the χ^2 test, while the Fisher's exact test was used when data were limited. A two-sided $p < 0.05$ was considered statistically significant for unadjusted comparisons. Comorbidities and laboratory findings that were statically significant were presented in tables and analyzed in the discussion. All statistical analyses were performed using SPSS (Statistical Package for the Social Sciences) version 26.0 software (SPSS Inc.) for Mac.

Results

The study population consisted of 606 hospitalized patients with COVID-19 confirmed by a positive PCR test, with a median age of 45 years (IQR, 33–56) and 55.6% of males. The most common symptoms at the onset of illness were fever with a proportion of 77.6%, followed by cough at 66.8% and gastrointestinal symptoms at 35.6%. Approximately 36.5% of patients had one or more comorbidities, with

hypertension and diabetes being the most prevalent. More than half of the patients in this study were categorized into moderate diseases with values of 57.3%. The overall characteristics of the patients are summarized in Table 1.

Table 1: Baseline characteristics of patients with COVID-19

Characteristics	No. (%)		
	Total (n = 606)	Non-severe (n = 518)	Severe (n = 88)
Age, median (IQR), years	45 (33–56)	42 (31–55)	55 (44–65.5)
Sex			
Male	337 (55.6)	237 (45.8)	32 (36.4)
Female	269 (44.4)	281 (54.2)	56 (63.6)
Comorbidities			
Hypertension	145 (23.9)	111 (21.4)	34 (38.6)
Diabetes	91 (15)	65 (12.5)	26 (29.5)
Coronary artery disease	31 (5.1)	23 (4.4)	8 (9.1)
Asthma	26 (4.3)	20 (3.9)	6 (6.8)
Chronic kidney disease	9 (1.5)	7 (1.4)	2 (2.3)
Autoimmune disease	2 (0.3)	2 (0.4)	-
Malignancy	2 (0.3)	2 (0.4)	-
Signs and symptoms			
Fever	470 (77.6)	387 (74.7)	83 (94.3)
Cough	405 (66.8)	329 (63.5)	76 (86.4)
Gastrointestinal symptoms	216 (35.6)	184 (35.5)	32 (36.4)
Anosmia	143 (23.6)	134 (25.9)	9 (10.2)
Myalgia	140 (23.1)	118 (22.8)	22 (25)
Sore throat	124 (20.5)	114 (22)	10 (11.4)
Headache	116 (19.1)	101 (19.5)	15 (17)
Dyspnea	105 (17.3)	55 (10.6)	50 (56.8)
Runny nose	87 (14.4)	83 (16)	4 (4.5)

Compared to patients with non-severe disease, those with severe disease were significantly older with a median age of 55 years (IQR: 44–65.5) and 42 years (IQR: 3–55) ($p < 0.001$), respectively. Patients in the severe group were at higher risk of having underlying comorbidities (49 [55.7%] vs. 172 [33.2%], $p < 0.001$), including hypertension (43 [38.6%] vs. 111 [21.4%], $p = 0.001$) and diabetes (26 [29.5%] vs. 65 [12.5%], $p < 0.001$). Among patients with severe disease, the most common symptoms were fever with a proportion of 94.3%, followed by cough, shortness of breath, and gastrointestinal symptoms at 86.4%, 56.8%, and 36.4%, respectively. Meanwhile, in patients with non-severe disease, the most common symptoms were fever 74.7%, cough 63.5%, gastrointestinal symptoms 35.5%, and anosmia 25.9%. Patients in the severe group tended to have fever, shortness of breath, and cough (83 [94.3%] vs. 387 [74.7%]; $p < 0.001$; 50 [56.8%] vs. 55 [10.6%]; $p < 0.001$; 76 [86.4%] vs. 329 [63.5%]; $p < 0.001$) than in the non-severe group.

There were several differences in laboratory findings between patients with severe and non-severe diseases, as presented in Table 2. Patients with the severe disease showed a higher level of increased CRP with a median of 76.4 ([IQR: 41.25–135.9] vs. 6.15 [2.5–18.6], $p < 0.001$), increased ferritin had a median of 871.6 ([IQR: 474.39–1474.34] vs. 227.955 [IQR: 86.87–507.5], $p < 0.001$), while increased D-dimer had 0.68 ([IQR: 0.525–1.305] vs. 0.44 [IQR: 0.28–0.73], $p < 0.001$), as illustrated in Table 3.

Table 3: Comparison between patients with severe and non-severe diseases

Parameters	Median (IQR)	No. (%)		
	Total (n = 606)	Non-severe (n = 518)	Severe (n = 88)	p-value[a]
Age	45 (33–56)	42 (31–55)	55 (44–65.5)	<0.001
CRP	8.2 (2.9–36)	6.15 (2.5–18.6)	76.4 (41.25–135.9)	<0.001
Ferritin	267.45 (102.4–655.84)	227.955 (86.87–507.5)	871.6 (474.39–1474.34)	<0.001
D-dimer	0.48 (0.3–0.78)	0.44 (0.28–0.73)	0.68 (0.525–1.305)	<0.001
Hypertension	145 (23.9)	111 (21.4)	34 (38.6)	0.001
Diabetes	91 (15)	65 (12.5)	26 (29.5)	<0.001

[a]p-value indicates differences between patients with severe and non-severe diseases. $p < 0.05$ was considered statistically significant.

Based on the outcomes of the two groups summarized in Table 4, 95.2% of patients were discharged and 4.8% died. Patients who had died from the disease were significantly older with a median age of 56 years ([IQR: 45–67] vs. 44 [IQR: 32–56], $p < 0.001$). Furthermore, those with an increased CRP had a median age of 36.8 ([IQR: 9.5–91.4] vs. 7.7 [IQR: 2.7–32.7], $p = 0.001$), increased ferritin had a median age of 548.7 ([IQR: 227.715–1474.34] vs. 259.84 [IQR: 99.41–624.035], $p = 0.002$), and increased D-dimer had a median age of 0.65 ([IQR: 0.47–1.405] vs. 0.47 [IQR: 0.30–0.76], $p = 0.006$). Compared to patients who survived, those who died from the disease were also more likely to have hypertension ($p = 0.013$).

Table 4: Comparison between patients' outcome

Parameters	Median (IQR)	No. (%)		
	Total (n = 606)	Survived (n = 57)	Died (n = 29)	p-value[a]
Age	45 (33–56)	44 (32–56)	56 (45–67)	<0.001
CRP	8.2 (2.9–36)	7.7 (2.7–32.7)	36.8 (9.5–91.4)	<0.001
Ferritin	267.45 (102.4–655.84)	259.84 (99.41–624.035	548.7 (227.715–1474.34)	0.002
D-dimer	0.48 (0.3–0.78)	0.47 (0.30–0.76)	0.65 (0.47–1.405)	0.006
Hypertension	145 (23.9)	132 (25.5)	13 (44.8)	0.013

[a]p-value indicates differences between patients who died and patients who survived. $p < 0.05$ was considered statistically significant.

Discussion

This retrospective single-center study assessed the demography, clinical characteristics, laboratory findings, radiological features, and outcomes of 606 patients with confirmed hospitalized COVID-19 patients from

Table 2: Laboratory findings of patients with COVID-19 on admission to hospital

Laboratory parameters	Normal range	Median (IQR)		
		Total (n = 606)	Non-severe (n = 518)	Severe (n = 88)
Hemoglobin, g/dL	13.00–17.00	14.2 (13–15.3)	14.2 (13–15.3)	14.15 (12.65–15.3)
Leukocyte, $\times10^3/\mu L$	5–10	6.2 (5.0–7.9)	6.2 (5.0–7.5)	7.05 (5.05–10.15)
Absolute lymphocyte count, $\times10^3/\mu L$	1.6–3.4	1.6 (1.1–2.1)	1.7 (1.2–2.1)	1.1 (0.8–1.4)
Relative lymphocyte count, %	23–50	26 (18–34)	27 (19–25)	15 (9–23)
Platelet count, $\times10^3/\mu L$	150–400	237 (195–287)	240.5 (198–287)	211.5 (173.5–282)
Urea, mg/dL	20-50	24 (19–30)	23 (19-28)	29 (22–37.5)
Creatinine, mg/dL	0.7-1.2	0.88 (0.72–1.09)	0.87 (0.71-1.09)	0.915 (0.75–1.115)
Alanine aminotransferase, U/L	<34	26 (20–38)	24 (20–35)	41.5 (29.5–65.5)
Aspartate aminotransferase, U/L	<31	27 (17–41)	25 (16–38)	37 (27–70.5)
Random blood glucose, mg/dL	70-200	110 (96–133)	107 (95–126)	135.5 (116.5–185.5)
CRP, mg/L	<5	8.2 (2.9–36)	6.15 (2.5–18.6)	76.4 (41.25–135.9)
Ferritin, ng/mL	22-322	267.45 (102.4–655.84)	227.955 (86.87–507.5)	871.6 (474.39–1474.34)
D-dimer, ug/mL	0.06–0.70	0.48 (0.3–0.78)	0.44 (0.28–0.73)	0.68 (0.525–1.305)

January 1 to April 30, 2021. The clinical characteristics of severe cases were compared to those of non-severe COVID-19, and the factors associated with severity and poor outcomes were analyzed. The median age at diagnosis was 45 years (IQR: 33–56), and there were more male than female patients, which was similar to a previous report in Wuhan, China. According to Wang *et al*., the median age was 44 years with a proportion of males and females of 52.9% and 47.1%, respectively [7]. The higher proportion of patients who were in their productive age was because of high mobility in everyday activities, making them more susceptible to contracting COVID-19 infection.

In this study, more than half of the patients were categorized into moderate disease (57.3%), followed by mild and severe diseases, respectively. However, a previous investigation conducted in Wisma Atlet Kemayoran Jakarta, Indonesia, by Susanto *et al*. [8] reported that 46% of most cases were asymptomatic. This can be due to the national emergency facility, intended for non-severe cases of COVID-19. The proportion of moderate disease was high because the hospital was a type B hospital, intended to treat moderate, severe, or critical cases of COVID-19. Patients with severe diseases were more likely to be older compared to those with non-severe diseases. Similarly, patients who had died also were more likely to be older than those who survived, which was in line with previous studies [7], [11], [12], [13].

The two most common comorbidities were hypertension and diabetes, as illustrated in Table 2, which was consistent with previous studies [7], [13]. Patients in the severe group were at higher risk of hypertension ($p < 0.05$) and diabetes ($p < 0.001$) compared to the non-severe group. Meanwhile, patients who died during hospitalization also tended to have hypertension ($p < 0.05$) compared to those who survived. This was in line with previous studies where certain comorbidities were associated with higher mortality rates and poor outcomes. Pranata *et al*. [14] reported that hypertension was associated with poor outcomes, including the severity of infection, acute respiratory distress syndrome (ARDS), and mortality in COVID-19 patients. According to Abu Ruz *et al*. [15], the majority of patients who died during hospitalization were previously diagnosed with comorbidities, such as hypertension and diabetes. Huang *et al*. [16] also reported that COVID-19 patients with hypertension tended to develop severe pneumonia, excessive inflammatory reactions, longer hospital stays, and ICU admission.

Previous studies suggested that diabetes was associated with disease progression and poor outcomes in COVID-19 patients, but the underlying mechanisms remain unclear. Meanwhile, the identified mechanisms were overactivated inflammation and imbalanced immune response, expression, as well as activity of angiotensin-converting enzyme (ACE) 2, and vascular dysfunction and thrombotic complication [17]. Guo *et al*. [18] reported that diabetic patients were at higher risk for developing severe disease, as indicated by organ damage, hypercoagulability, and excessive inflammatory response. Wu *et al*. [19] also reported that patients with ARDS tended to have comorbidities, such as diabetes and hypertension.

Several laboratory findings were significantly increased in patients with severe COVID-19 infection, including the levels of CRP, ferritin, and D-dimer. CRP is an acute marker of inflammation that plays an important role in the inflammatory process and host response to infection. The process of inflammation and host response to infection mediated by CRP included the complement pathway, apoptosis, phagocytosis, nitric oxide (NO) release, and cytokine production [20]. The level of CRP may be used in predicting the likelihood of disease progression [21]. A previous investigation in China reported an increased level of CRP and interleukin-6 in severe COVID-19 patients compared to non-severe patients, suggesting a high diagnostic value for clinical severity [22]. Similarly, this study showed significantly higher CRP levels in severe cases ($p < 0.001$) than in non-severe cases, indicating that CRP may be a marker of disease severity in COVID-19 patients.

Higher serum ferritin level was found to be associated with more severe disease and poor outcomes in COVID-19 [23]. According to a study by Alroomi *et al*. [24]. in Kuwait, a higher level of ferritin was found to be an independent predictor of inhospital mortality. This is because ferritin is a major mediator of immune dysregulation contributing to the cytokine storm, particularly in cases of excessive hyperferritinemia through its pro-inflammatory effects [25]. A high level of D-dimer was also discovered to be a useful predictor of disease progression, mortality, and outcomes [26]. A previous report in India discovered a higher D-dimer (≥0.50 μg/dL) in 80.1% of hospitalized patients and 96% of cases with fatal outcomes. D-dimer level of ≥2.01 was reported as a significant predictor of subsequent deaths [27].

Based on the results, the mortality rate during hospitalization was 4.8% (29/606), lower than the overall COVID-19-related mortality in Jakarta, which was 12% [28]. The overall inhospital mortality in this study was lower than reported in other studies due to younger age distribution and a lower proportion of severe disease. Meanwhile, a large cohort study in the United Kingdom recorded a mortality rate of 26%, with an older median age of 73 years and a higher proportion of patients with comorbidities [10]. Another investigation in New York also reported a higher mortality rate among hospitalized patients (25.9%) and a proportion of severe disease [12].

This study is among the first to report the clinical characteristics and outcomes of hospitalized COVID-19 patients at a private hospital in Jakarta,

Indonesia. However, the limitations included comorbidities, which were often self-reported by the patients upon admission and can be underdiagnosed, leading to the underreported prevalence of those conditions. The data on management, follow-up laboratory, radiological findings, the presence of secondary infections or other complications, and ICU admissions were not available. There were also incomplete medical records in more than 20% of all COVID-19 patients during the experiment. This condition might have affected the selection of the subjects, but the incompleteness was assumed to be random and did not influence the validity of the results.

Conclusion

In this single-center retrospective study of 606 hospitalized COVID-19 patients in Jakarta, Indonesia, the median age was 45 years and 55.6% of patients were male. The results showed that the most common comorbidities were hypertension, diabetes, and coronary artery disease. The majority of patients, namely 85.5%, had non-severe diseases and 14.5% of patients had severe diseases. Those with severe disease tended to be older and had comorbidities such as hypertension and diabetes, with a higher level of CRP, ferritin, and D-dimer compared to those with non-severe diseases. The mortality rate during hospitalization was 4.8% and those who did not survive were older, and had hypertension, with a higher level of CRP, ferritin, and D-dimer, compared to those who survived. For future investigation, asymptomatic patients and those with mild diseases who do not require hospitalization are advised to self-isolate at home to accommodate hospital beds for moderate, severe, and critically ill patients.

Ethics Approval and Consent to Participate

This study was approved by the Medical Ethical Committee of the Faculty of Medicine Universitas Indonesia (KET-1080/UN2.F1/ETIK/PPM.00.02/2021).

Availability of Data and Materials

All data are available upon reasonable request to the corresponding author.

Authors' Contribution

WR designed the study, analyzed the data, did the literature study, had full access to all data in this study, and took full responsibility for the accuracy and analysis. PP, HT, DLG, RASH, and NPT prepared the samples. VC collected and analyzed the data. RSWM provides radiological data.

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