Epidemiological and Clinical Profile of Critical Covid-19 Patients in Bali, Indonesia During The First Year of Covid-19 Pandemic: A Cross-Sectional Study

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Abstract. COVID-19 had created chaos in global health systems all over the world. Albeit measures to control the number of cases, mortality and criticality were especially high in people with comorbidity and the elderly. This study aims to comprehensively report the epidemiologic profile of all critical patients admitted to Udayana University Academic Hospital, a tertiary COVID-19-referral hospital, during the first year of COVID-19 pandemic.This descriptive cross-sectional study uses secondary data from medical records of all critically-ill COVID-19 patients admitted to Udayana University Academic Hospital from March 2020-February 2021. We gathered demographic data, baseline symptoms, vital signs, laboratory profile, and treatment profile. This study was approved by the ethical committee of Faculty of Medicine, Udayana University. Patients admitted were mostly male (68.6%) and had a median (IQR) of 54 (23) years old. Though most had no comorbidity (33.6%), some had heart disease (32.1%), diabetes mellitus (26.4%), and hypertension (23.6%). Most patients had shown baseline symptoms of cough (88.6%), fever (86.4%), and chest tightness (75.0%). No abnormalities on baseline vital signs were recorded except for a median (IQR) respiration rate of 24 (10) breaths per minute. No abnormalities were found in baseline laboratory results. Hospitalization duration had a median (IQR) of 12 (10) days; and we recorded a 40.7% fatality rate.Understanding the epidemiological profile of critical COVID-19 patients is needed to help clinicians in preparing for future exponential case growth, and for academicians to assess the basic pathophysiologic mechanisms and its relations to comorbidities.

Keywords: COVID-19, critical, clinical features

WICSTH 2023, October 27-28, Denpasar, Indonesia

DOI 10.4108/eai.27-10-2023.2352790

1 Introduction

In December 2019, the emergence of a mysterious pneumonia-inducing disease, later known as COVID-19, was first reported in Wuhan, China.[1] This initial outbreak soon proved the world that it is not to be taken of so lightly. In matter of months, WHO (World Health Organization) declared that the world is now fighting a global pandemic.[2] Reports claimed that by the 1st of January, 2021; around one year since the virus' discovery, the pathogen had summed a total of 84 million cases and almost 2 million deaths.[3]

The existence of the virus had created chaos in global, regional, and national health systems all over the world. Antigen-based rapid testing and PCR (polymerase chain reaction) tests were deployed to maintain order and contain the number of cases in all regions.[4] Albeit measures to control the number of cases, mortality and criticality were especially high in people with comorbidity and the elderly.[5]

Studies had shown that patients with comorbidities such as cardiovascular diseases,[6–8] diabetes mellitus,[9–14] COPD,[15,16] and many more are more likely to develop severe and critical COVID-19 symptoms, namely ARDS (acute respiratory distress syndrome), sepsis, and/or septic shock.[17] These comorbidities accelerates progression of COVID-19 through specific mechanisms. For example, diabetes dysregulates and immunocompromises the immune system, setting up a way to 'bypass' the normal immunologic responses[12] while also increasing the pathogen's mechanisms of entry through the enzyme furin.[18] Putting into account that these comorbidities may come in all sorts of stages and numbers, the healthcare system must be aware about the potential of 'double burden' when caring for COVID-19 patients.

Therefore, papers which specifically reports the conditions of critical patients are needed to help clinicians in preparing for future exponential case growth, and for academicians to assess the basic pathophysiologic mechanisms and its relations to comorbidities. This study aims to comprehensively report the epidemiologic profile of all critical patients admitted to Udayana University Academic Hospital, a tertiary COVID-19-referral hospital, during the first year of COVID-19 pandemic. We hoped that through this comprehensive report, more knowledge about the fundamental methods to treat patients without prior immunity via COVID-19 vaccination could be found.

2 Methods

This descriptive cross-sectional study uses secondary data from medical records of confirmed COVID-19 patients showing critical symptoms: patients with acute respiratory distress syndrome (ARDS), sepsis, and/or septic shock which were admitted to Udayana University Academic Hospital. We performed total sampling on all patients admitted during the first year of COVID-19 pandemic in Indonesia (March 2020 – February 2021). We excluded patients with incomplete medical record examination and those <18 years old.

Data gathered were demographic profile (age, sex, comorbidity, blood type), baseline symptoms and vital signs (respiration rate, temperature, heart rate), laboratory profile (hemoglobin, hematocrit, leukocyte, neutrophil, basophil, eosinophil, monocyte, lymphocyte, platelet, AST, ALT, BUN, SC, and blood glucose), and treatment profile (ventilator usage, days from symptoms onset to hospitalization, duration of hospitalization, discharge condition). Laboratory profile was gathered during admission. From these data we were able to calculate the NLR.

We then performed Kolmogorov-Smirnov test to examine the normality of distribution. Due to the numerical values not assuming normal distribution, we reported these data using median (interquartile range). Additionally, we performed binomial test to look for possible differences in number of deaths towards the general population in March 1, 2021. All analyses were done using IBM SPSS Statistics version 25. This study was approved by the ethical committee of Faculty of Medicine, Udayana University.

3 Results

A complete report which comprises the demographic profile, baseline symptoms and vital signs, laboratory profile, and treatment profile of critical patients in Udayana University Academic Hospital could be seen on table 1.

Table 1. Demographic Profile, Baseline Symptoms and Vital Signs, Laboratory Profile, and Treatment Profile of Critical Patients in Udayana University Academic Hospital (N = 140)

Parameters	
Age (years); Med (IQR)	54 (23)
Sex; N (%)	
Male	96 (68.6)
Female	44 (31.4)
Comorbidity; N (%)	
Heart Disease	45 (32.1)
Diabetes Mellitus	37 (26.4)
Hypertension	33 (23.6)
Malignancy	1 (0.7)
Kidney	1 (0.7)
HIV	1 (0.7)
Others	9 (6.4)
No Comorbidity	47 (33.6)
Number of Comorbidity; Med (IQR)	4 (2)
Blood Type; N (%)	
A	26 (18.6)
B	43 (30.7)
AB	8 (5.7)
O	63 (45.0)
Baseline Symptoms; N (%)	
Cough	124 (88.6)

Fever	121 (86.4)
Chest Tightness	105 (75.0)
Altered Mental Status	52 (37.1)
Sore Throat	51 (36.4)
Myalgia	30 (21.4)
Flu	19 (13.6)
Headache	13 (9.3)
Dizziness	9 (6.4)
Anosmia	7 (5.0)
Diarrhea	6 (4.3)
Total Baseline Symptoms; Med (IQR)	1 (1)
Baseline Vital Signs; Med (IQR)	
Respiration Rate (/min)	24 (10)
Temperature (°C)	37.3 (2.1)
Heart Rate (/min)	89 (20)
Baseline Laboratory Results; Med (IQR)	
Hemoglobin (g/dL)	14.65
Hematocrit (%)	(2.12)
Leukocyte ($\times 10^9$ cells/L)	43.60
Neutrophil ($\times 10^9$ cells/L)	(6.40)
Basophil ($\times 10^9$ cells/L)	7.05
Eosinophil ($\times 10^9$ cells/L)	(4.00)
Monocyte ($\times 10^9$ cells/L)	4.27
Lymphocyte ($\times 10^9$ cells/L)	(3.13)
NLR	0.02
Platelet ($\times 10^9$ cells/L)	(0.02)
AST (U/L)	0.11
ALT (U/L)	(0.13)
BUN (mmol/L)	0.57
SC (mg/dL)	(0.31)
Blood Glucose (mg/dL)	1.92
	(1.12)
	0.65
	(8.39)

	262.50 (117.00)
	38.00 (33.00)
	39.00 (44.00)
	14.00 (4.25)
	0.75 (0.17)
	113.00 (68.00)
Ventilator Usage; N (%)	
Yes	70 (50.0)
No	70 (50.0)
Symptoms Onset to Hospitalization (days); Med (IQR)	5 (4)
Hospitalization (days); Med (IQR)	12 (10)
Discharge Condition; N (%)	
Deceased	57 (40.7)
Recovered	83 (58.3)

We found that the median (interquartile range) of critical patients in Udayana University Academic Hospital being 54 (23) years old, which were mostly comprised of male (68.6%). Though most of the patients had no comorbidity (33.6%), a sizable portion had heart disease (32.1%), diabetes mellitus (26.4%), and hypertension (23.6%). Critical patients' blood type was mostly O (45.0%), followed by B (30.7%), A (18.6%), and AB (5.7%).

Most critical patients had shown a baseline symptom of cough (88.6%), followed by fever (86.4%), and chest tightness (75.0%). These are the typical symptoms of someone with pneumonia. A sizable portion had some sort of altered mental status (37.1%), sore throat (36.4%), myalgia (21.4%), flu (13.5%), headache (9.3%), dizziness (6.4%), anosmia (5.0%), and diarrhea (4.3%). Total baseline symptoms, measured in median (interquartile range) is 1 (1). Baseline vital signs reported in median (interquartile range) include a respiration rate of 24 (10) breaths per minute, temperature of 37.3 (2.1) °C, and a heart rate of 89 (20) beats per minute.

Baseline laboratory results, reported in median (interquartile range) include hemoglobin of 14.65 (2.12) g/dL, hematocrit of 43.60% (6.40%), leukocyte of 7.05 (4.00) x 10^9 cells/L, neutrophil of 4.27 (3.13) x 10^9 cells/L, basophil of 0.02 (0.02) x 10^9 cells/L, eosinophil of 0.11 (0.13) x 10^9 cells/L, monocyte of 0.57 (0.31) x 10^9 cells/L, lymphocyte of 1.92 (1.12) x 10^9 cells/L, NLR of 0.65 (8.39), platelet of 262.50 (117.00) x 10^9 cells/L, AST of 38.00 (33.00) U/L, ALT of 39.00 (44.00) U/L, BUN of 14.00 (4.25) mmol/L, SC of 0.75 (0.17) mg/dL, and blood glucose of 113.00 (68.00) mg/dL. Exactly 50% of critical patients admitted had used ventilator

at any point within hospitalization. Median (interquartile range) of hospitalization was 12 (10) days. Most patients recovered (58.3%); therefore, we recorded a 40.7% fatality rate within critical patients admitted to Udayana University Academic Hospital.

Reports from Our World in Data (2022) found that the cumulative fatality rate in March 1, 2021 was 2.3%. We performed a binomial test to compare the case fatality rate and found a statistically significant difference ($p < 0.001$).

Understanding the epidemiological profile of critical COVID-19 patients is needed to help clinicians in preparing for future exponential case growth, and for academicians to assess the basic pathophysiologic mechanisms and its relations to comorbidities. We found that the median (interquartile range) of critical patients in Udayana University Academic Hospital being 54 (23) years old, which were mostly comprised of male (68.6%). This number is notably higher than the median age of Indonesian population, at 29.7 years old.[19] It was understood that age significantly affects COVID-19 severity.[5]

Though most of the patients had no comorbidity (33.6%), a sizable portion had heart disease (32.1%), diabetes mellitus (26.4%), and hypertension (23.6%). The progression towards severe and critical COVID-19 may also be attributed to these comorbidities. A study done on mice found that diabetic mice had fewer inflammatory monocyte, macrophages, and CD4+ T cells, which suggested there might be a dysregulation in immune response, resulting in a more severe and prolonged lung pathology.[20] Patients with hypertension or heart disease might be affected by thrombosis due to systemic hyperinflammation.[21] Coagulopathy in vital coronary arteries is may accelerate disease progression and inhibit further rehabilitation.[22]

Most critical patients had shown a baseline symptom of cough (88.6%), followed by fever (86.4%), and chest tightness (75.0%). Cough, fever, and chest tightness are the classic symptoms of pneumonia. Though further examinations such as chest x-ray is needed to graphically determine the extent of infiltrate distribution, altered mental status (37.1%) was quite frequently seen. This indicates that a sizable portion of patients admitted were already experiencing the advanced state of the disease. Inflammation within alveolus induced by the infiltration of pro-inflammatory leukocytes through inter-pneumocyte junctions bring about thickening of respiratory membrane, inhibiting the process of gas exchange. This condition, if left unattended, may cause alveolar collapse, inducing hypoxia, respiratory acidosis, and ARDS. This is shown by chest tightness and altered mental status, as the brain doesn't receive the adequate amount of oxygen needed.

Baseline vital signs reported in median (interquartile range) include a respiration rate of 24 (10) breaths per minute, temperature of 37.3 (2.1) °C, and a heart rate of 89 (20) beats per minute. Though the median baseline temperature and heart rate was generally normal, an increased respiration rate was recorded. This may be attributed to the chest tightness and hypoxia, inducing tachypnea.

4 Conclusion

Most patients admitted were mostly older male, with a sizable portion having heart disease, diabetes mellitus, and hypertension. Most patients had shown a baseline symptom of cough, fever, and chest tightness. A sizable portion had also experienced altered mental status. Baseline temperature and heart rate were generally normal; however, an increased respiration rate was noted. Baseline blood count, liver and renal function test, and random blood glucose were generally normal. Median hospitalization stay was about 2 weeks, and fatality rate was notably

higher than those of the general case in population. Understanding the epidemiological profile of critical COVID-19 patients is needed to help clinicians in preparing for future exponential case growth, and for academicians to assess the basic pathophysiologic mechanisms and its relations to comorbidities.

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