



## Profile of Stroke Patients with COVID-19 at Rumah Sakit Islam Surabaya Jemursari, Indonesia

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ARTICLE INFO	ABSTRACT
Keywords: Profile, Stroke, Covid-19	<b>Background:</b> Stroke is the number one cause of death in Indonesia, in America stroke is also the number one cause of disability. In COVID-19, most patients experience mild to moderate respiratory symptoms, and need no specific treatment. However, in some patients with comorbidities such as cardiovascular, diabetes mellitus, chronic respiratory disease, and malignancy, it often gives serious manifestation.
Submitted: April 13 <sup>th</sup> 2023	<b>Objective:</b> This study aimed to profile of stroke patients with COVID-19 at Rumah Sakit Islam Surabaya Jemursari, Indonesia.
Reviewed: April 24 <sup>th</sup> 2023	<b>Method:</b> The type of this research was observational retrospective research. We used all the stroke patient hospitalized at Rumah Sakit Islam Surabaya Jemursari from April to December 2020 that confirmed the diagnosis of COVID-19. We used the general data, data of clinical symptoms, blood pressure, head CT-scan findings, and laboratory findings the data of participants was collected. The data showed as number (frequency) and percentage.
Accepted: May 31 <sup>th</sup> 2023	<b>Results:</b> The patient's average age of 57 years, male was common; patients with hypertension were often seen in the comorbidities; ischemic strokes were by far the most prevalent form; subcortical regions were the most frequent location of stroke based on the CT scan. The results of head CT showed that 91.7% of patients had an ischemic stroke and 8.3% of patients had a hemorrhagic stroke.
	<b>Conclusions:</b> The stroke patients with COVID-19 and hospitalized at Rumah Sakit Islam Surabaya Jemursari, Indonesia have an average age of 57 year, and most of the patient was male. Comorbid hypertension was commonly observed in this study. Based on the type of stroke, ischemic was the most common manifestation and subcortical regions were the most frequent location.

### Introduction

Stroke is an acute neurological emergency that manifests as focal or global neurologic deficits due to central nervous system vascular injury. Stroke can be caused by thrombus or emboli to the brain

vessels (ischemic stroke) or by a rupture of blood vessels (hemorrhagic stroke). Stroke become the major cause of mortality and disability in Indonesia.(Singh *et al.*, 2020)<sup>-</sup> (Sungkar, 2021)

Corona virus disease (COVID-19) is an infectious disease caused by the newly

discovered corona virus. Most people with COVID-19 will experience mild to moderate respiratory illness and need no specific treatment. Elderly patients and patients with other medical problems such as cardiovascular disease, diabetes, chronic respiratory disease, and malignancy often experience serious illness when infected with COVID-19.(Aisyah *et al.*, 2022) (Pane, Donastin and Al Hajiri, 2022)

According to the World Health Organization (WHO), the risk of an ischemic stroke during COVID-19 is 5%, while hemorrhagic stroke is less common. The median time for ischemic stroke diagnosis in one small, one-center study was 10 days. Patients with COVID-19 who have had a stroke are usually old and have high blood pressure and high D-dimer levels. A study in Wuhan, China, report that among 50 patients with ischemic stroke found any comorbidity, including lower platelet counts, lower leukocyte counts, high D-dimer levels, cardiac troponin I and T, pro-brain natriuretic peptide, and interleukin-6.(David Spence *et al.*, 2020) (Hidayat *et al.*, 2022)

In a systemic review study, 87.8% of stroke patients in COVID-19 were ischemic stroke, 5.2% of patients had an intracerebral hemorrhage, 1.7% of patients had an intracerebral and subarachnoid hemorrhage, 0.9% of patients had a subarachnoid

hemorrhage, 0.9% of patients with a transient ischemic attack (TIA), and 0.9% of patients with subarachnoid hemorrhage and ischemic stroke.(Bhatia *et al.*, 2020)

Rumah Sakit Islam Surabaya Jemursari is the one of secondary referral and academic hospital in Surabaya, East Java, Indonesia. The presence of local study about characteristics of stroke patients with COVID-19 can help alert health workers and provide effective communications between health workers themselves or between health workers and patient's families in the management of stroke and COVID-19. The purpose of this study was to profile the stroke patients with COVID-19 at Rumah Sakit Islam Surabaya Jemursari.

## **Methods**

This is a descriptive study with retrospective design.

### ***Study population***

All of stinke patients who hospitalized at Rumah Sakit Islam Surabaya Jemursari from April to December 2020 with confirmed diagnosis of COVID-19 included to this study. We used the secondary data from electronic medical records of the patients.

### ***Study Data***

We used the general data, data of clinical symptoms, blood pressure, head CT-scan findings, and laboratory findings. The data of participants was collected. The data showed as number (frequency) and percentage. This study performed using the Statistical Package for the Social Sciences (SPSS) version 20.0 data to collect all of data (SPSS, Inc., Chicago, Illinois).

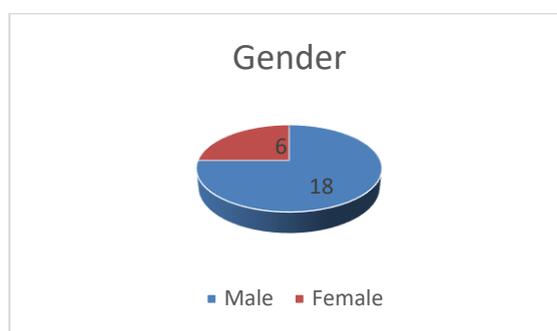
**Results and Discussion**

A total of 24 participants was included to this study. All of data study showed in Table 1. The mean age of the patients was 57.67±11.25 years.

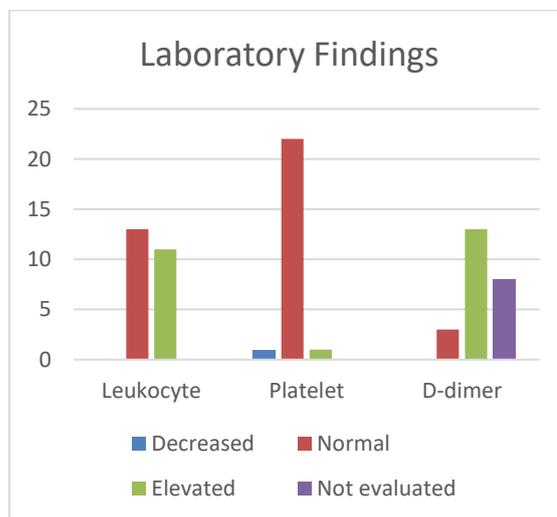
**Table 1. Profile of Stroke Patients with Covid-19**

Profile	Result
Clinical complaints	
Left hemiparesis	5 (20.8%)
Right hemiparesis	5 (20.8%)
Decreased consciousness	6 (25.0%)
Seizure	1 (4.2%)
Dysarthria	3 (12.5%)
Difficult communication	2 (8.3%)
Other	2 (8.3%)
Systolic blood pressure	
<140 mmHg	7 (29.2%)
140-159 mmHg	5 (20.8%)
>159 mmHg	12 (50%)
Diastolic blood pressure	
<90 mmHg	8 (33.3%)
90-99 mmHg	6 (25.0%)
>99 mmHg	10 (41.7%)
<i>Head CT-Scan Findings</i>	
Type of Stroke	
Infarct	22 (91.7%)
Bleeding	2 (8.3%)
Location	
Cortical	5 (20.8%)

Profile	Result
Sub-cortical	9 (37.5)
Cortical-subcrotical	5 (20.8%)
Punch	1 (4.2%)
Normal	1 (4.2%)
Others	3 (12.5%)
Side	
Left	7 (29.2%)
Right	6 (25.0%)
Bilateral	6 (25.0%)
Normal	1 (4.2%)
Others	4 (16.7%)



**Picture 1. Diagram of gender**



**Picture 2. Diagram of laboratory findings**

The most common gender of stroke with COVID-19 were 75% male and 25% female. A total of 4 male patients died, and

10 returned home while for women a patient died, and 5 patients returned home. A total of 4 patients had no discharge data. These results were in line with another study which states that the mortality rate increases in males than females. The major inflammatory storm of COVID-19 is more likely to occur in male patients. In terms of risk factors distribution, stroke subtype, severity, and outcome, women and men were different from one another. While women are more likely to get cardiogenic stroke, males are more likely to experience lacunar infarction. Male patients may also experience more severe new coronary pneumonia, which can worsen inflammation.(Trifan *et al.*, 2020) (Luo *et al.*, 2022)

The results of head CT showed that 91.7% of patients had an ischemic stroke and 8.3% of patients had a hemorrhagic stroke. This is in line with previous study that showed 87.8% patients have an ischemic stroke. A common characteristic of many people with severe COVID-19 infection is the activation of the coagulation cascade with high D-dimer and fibrinogen levels. In young adults without vascular risk factors, stroke from large vessels emboli may be caused by hypercoagulation, which may also cause venous thromboembolism and paradoxical embolism. Plaque rupture or in situ thrombosis may also be less

frequent in this situation.(Bhatia *et al.*, 2020) (Trifan *et al.*, 2020) (Nannoni *et al.*, 2021)

Based on head CT results, it was found that 20.8% of patients had a stroke in the cortical region, 37.5% in the subcortical, 20.8% in the cortical-subcortical, 4.2% in the pons, and 12.5% of CT results was not mentioned in the data. From the results of head CT imaging, it was also found that 29.2% of patients had a stroke on the left side of the brain, 25% on the right side of the brain, 25% bilaterally, and 16.7% was not mentioned. According to previous study, these findings were similar. Multifocal subcortical/cortical lesions were seen commonly on head CT imaging.(Nicholson, Alshafai and Krings, 2020) (Requena *et al.*, 2020)

The results of leukocyte examination showed that 54.2% of patients had normal leukocyte levels and 45.8% of patients had leukocytosis. The elevated white blood cell due to COVID-19 especially depend on the clinical severity. Another study showed a significant correlation between individuals with severe COVID-19 and stroke and higher rates of leukocytosis.(Katz *et al.*, 2021) The hyperinflammatory response to COVID-19 infection and additional bacterial infections is suggested to be the cause of leukocytosis. Leukocytosis generates into inflammatory biomarkers

that may be utilized to detect systemic inflammation.(Khorvash *et al.*, 2019)· (Gupta *et al.*, 2020)

From the total 24 patients, only 16 patients were tested for D-dimer, the results were 18.8% had normal D-dimer levels while 81.3% had elevated D-dimer levels. A previous case report showed that patients typically had D-dimer values >4 times normal and considerably elevated hypercoagulability indicators. Increased plasma prothrombotic factors such as von Willebrand factor (vWF), factor VIII, D-dimer, fibrinogen, anionic phospholipids, and inflammatory cytokines are indicative of hypercoagulability (cytokine storm). Coagulopathy in COVID-19 infection has been associated with D-dimer, a breakdown product of cross-linked fibrin that shows continuing activation of the coagulation cascade. In patients with COVID-19, an elevated D-dimer level has been found to be a good predictor of death.(Katz *et al.*, 2021)· (Iqbal *et al.*, 2021)· (Kim *et al.*, 2021)

The results of blood pressure observations showed systolic and diastolic pressures at the first evaluation in the emergency room: 29.2% of patients had normal systolic pressure; 20.8% hypertension grade I JNC VII; and 50% hypertension grade II JNC VII. Data on the patient's diastolic pressure concluded that 33.3% of patients had normal diastolic

pressure, 25% of JNC VII grade I hypertension, and 41.7% of patients had JNC VII grade II hypertension. In line with a previous study state that a greater incidence of hypertension was seen in COVID-19 individuals with acute ischemic stroke.(Requena *et al.*, 2020)· (Shakil *et al.*, 2022)

Angiotensin-converting enzyme 2 (ACE2) has been identified as a functional receptor for the coronavirus. Infection with SARS-CoV-2 is mediated by binding of the viral spine protein to ACE2 which is expressed on type II pneumocytes in the respiratory system. ACE2 commonly coexists with cardiovascular diseases and hypertension. ACE 2 receptors, as well as those in the respiratory tract, are also expressed in the cardiovascular system. Patients with a history of cardiovascular disease will have an increased risk of serious adverse events. Patients with COVID-19 may develop a thrombotic and coagulation abnormality, causing a hypercoagulable state thereby increasing thrombotic and thromboembolic events.(Ortega-Paz *et al.*, 2021)· (Shibata *et al.*, 2020)

### **Conclusion**

The profile observed in this study showed that the stroke patients who were confirmed to have COVID-19 and hospitalized at Rumah Sakit Islam Surabaya

Jemursari had an average age of 57 year, most of the patients were male. Comorbid hypertension was commonly observed in this study. Based on the type of stroke, ischemic was the most common manifestation. This supported by laboratory findings which showed increased at D-dimer levels, this was related to systemic hypercoagulable conditions in COVID-19. Location of stroke based on head CT findings showed the most common location was subcortical.

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