Research Article

The Comparison of Laboratory Parameters of COVID-19 Patients in Universitas Indonesia Hospital Before and During Delta Variant Periode

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Abstract

There has been a change in the SARS-CoV-2 variant from the initial entry into Indonesia (March 2020) until now, and the Delta variant was discovered in March 2021. This study aims to evaluate the differences in clinical and laboratory characteristics between the initial period for the entry of COVID-19 and the Delta variant period at Universitas Indonesia Hospital, Depok, Indonesia. The study design was a retrospective cross-sectional conducted at Universitas Indonesia Hospital, Depok, using medical record data of COVID-19 patients who were admitted to the hospital from July 2020 to October 2021, which was divided into two periods, namely July 2020-February 2021, which was considered the initial period of the COVID-19 pandemic in Indonesia, and March-October 2021 which are considered as the period of the Delta variant. 100 patients were randomly selected in each period. There was a shift to older age with moderate to critical severity, more co-morbidities, longer length of stay in hospital, and higher mortality in the Delta period than the initial period of COVID-19. Laboratory parameters that gave significant differences were leukocytes, neutrophils, lymphocytes, aPTT, D-dimer, AST, urea, pCO_2, O_2 saturation, sodium, and CRP. During the Delta variant period, there was an increase in the levels of leukocytes, neutrophils, D-dimer, AST, urea, pCO2, and CRP. Conversely, lymphocyte counts decreased and the aPTT duration was shortened. The median oxygen saturation was also higher, although its minimal value was lower and sodium levels were reduced. The results of this study can be used as the basis for further research in the direction of pathogenesis, therapy, and prognosis of COVID-19.

Keywords: *COVID-19, Delta variant, laboratory characteristic, clinical characteristic.*

Perbandingan Parameter Laboratorium Pasien Covid-19 di RS Universitas Indonesia Sebelum dan Selama Periode Varian Delta

Abstrak

Terjadi perubahan varian SARS-CoV-2 dari awal masuknya ke Indonesia (Maret 2020) hingga saat ini dan varian Delta ditemukan mulai Maret 2021. Penelitian ini bertujuan untuk mengevaluasi perbedaan karakteristik klinis dan laboratoris antar dua periode, yaitu periode awal masuknya COVID-19 dan periode varian Delta di Rumah Sakit Universitas Indonesia, Depok, Indonesia. Desain penelitian adalah retrospektif potong-lintang, dilakukan di Rumah Sakit Universitas Indonesia, Depok, menggunakan data rekam medis pasien COVID-19 yang dirawat pada bulan Juli 2020 hingga Oktober 2021, yang dibagi menjadi 2 periode yaitu Juli 2020-Februari 2021 sebagai periode awal pandemi COVID-19 di Indonesia dan Maret-Oktober 2021 sebagai periode varian Delta. Sebanyak 100 pasien dipilih secara acak di setiap periodenya. Hasil penelitian menunjukkan peralihan ke demografi usia yang lebih tua, tingkat keparahan yang lebih berat, prevalensi penyakit penyerta yang lebih tinggi, durasi rawat inap yang lebih panjang, dan angka kematian yang lebih tinggi selama periode varian Delta. Parameter laboratoris yang memberikan perbedaan bermakna adalah leukosit, neutrofil, limfosit, aPTT, D-dimer, AST, urea, pCO_2, saturasi O_2, natrium, dan CRP. Pada periode varian Delta, terjadi peningkatan pada jumlah leukosit dan neutrofil, serta nilai D-dimer, AST, urea, pCO2, dan CRP. Di sisi lain, jumlah limfosit menurun dan waktu aPTT memendek. Selain itu, meskipun nilai minimumnya lebih rendah, median saturasi oksigen meningkat dan terdapat penurunan pada kadar natrium. Hasil penelitian ini dapat digunakan sebagai dasar penelitian selanjutnya terhadap arah patogenesis, terapi dan prognosis.

Kata kunci: *COVID-19, varian Delta, karakteristik laboratorium, karakteristik klinis.*

Introduction

Since Indonesia confirmed its first case of COVID-19 on March 2, 2020, the trajectory of the pandemic has followed a pattern of fluctuating case numbers. The initial peak occurred on January 13, 2021, when the country recorded over 14,000 new cases in a single day. Following this peak, there was a significant decrease in cases, reaching a low on May 15, 2021. During this period, the daily death toll reached a maximum of 476. However, the emergence of the Delta variant led to a resurgence of cases beginning in June 2021. This resurgence peaked dramatically on July 17, 2021, with more than 57,000 cases recorded in one day. Although case numbers again followed a downward trend after this peak, fluctuations continued until November 2021. Throughout this later period, the death toll reached as high as 2,000 per day. An analysis of the official COVID-19 distribution map provided by the Government of Indonesia reveals that the impact of the Delta variant was approximately five times more severe than the initial outbreak in terms of both case numbers and mortality rates.[1]

The Universitas Indonesia Hospital (UI Hospital) is located in Depok. The Indonesian government appointed UI Hospital as a COVID-19 referral hospital in the Depok area. Until December 2021, it has treated almost 3,000 COVID-19 patients from within and outside the Depok area. The UI hospital laboratory is also a reference laboratory for COVID-19 examinations and has received over 3,000 samples for the SARS-CoV-2 test. Laboratory examinations are crucial for diagnosing, screening, epidemiological surveillance, therapeutic decisions, monitoring, and prognosis of COVID-19 patients. While numerous studies have concentrated on the clinical symptoms and the laboratory and radiological profiles of COVID-19, there has been limited focus on detailed laboratory analyses of patients at the onset of the pandemic and during the emergence of the Delta variant, particularly within Indonesia.[2] This study seeks to compare the laboratory profiles of COVID-19 patients treated at UI Hospital during the early stages of the pandemic and the period when the Delta variant was prevalent in Indonesia.

Methods

The research design was a retrospective cross-sectional study conducted at UI Hospital, utilizing medical records of COVID-19 patients admitted from July 2020 to October 2021. The study periods were divided based on the COVID-19 distribution map issued by the Indonesian government on the official website covid19.go.id/peta-sebaran. The first period, from July 2020 to February 2021, corresponded to the initial phase of the COVID-19 pandemic in Indonesia, while the second period, from March to October 2021, was defined by the predominance of the Delta variant.

Data were randomly selected for 100 patients from each period using a random number generator. The laboratory parameters analyzed included hematological profiles (hemoglobin, erythrocytes, leukocytes, neutrophils, lymphocytes, platelets, and estimated sedimentation rate), coagulation markers (prothrombin time/PT and activated partial thromboplastin time/aPTT), liver enzymes (aspartate aminotransferase/AAT and alanine aminotransferase), kidney function tests (urea and creatinine), arterial blood gas analysis (pH, partial pressure of oxygen, partial pressure of carbon dioxide, and oxygen saturation), electrolytes (sodium, potassium, chloride), and inflammation markers (C-reactive protein/CRP and procalcitonin/PCT). This study utilized data from the Laboratory Information System and electronic medical records from the Hospital Information System of UI Hospital, focusing on the earliest hospitalization records. The study received approval from the Ethics Committee of Universitas Indonesia Hospital (Approval No. 003/SKPE/KKO/2020/00).

Data Analysis

Data was analysed using IBM SPSS Statistics for Windows, version 22.0 (Armonk, NY). Distribution data were assessed with the Kolmogorov-Smirnov test; datasets adhering to a normal distribution ($p>0.05$) were described using means and standard deviations. Conversely, data exhibiting non-normal distributions were presented using medians, minimum-maximum values, and interquartile ranges (quartile1-quartile3). A student t-test was employed to compare laboratory parameters between the two study periods, with a significance threshold set at $p<0.05$, indicating a statistically significant difference between the periods. For non-parametric data, significant differences were determined using the Kruskal-Wallis test. The chi-square or Fisher's exact test was used to analyse categorical data.

Results

The total number of patient records analyzed spanned two distinct periods: July 2020-February 2021, representing the early COVID-19 phase

and March-October 2021, during the prevalence of the Delta variant, with each period comprising 100 cases. There were notable differences in the demographic and clinical characteristics of COVID-19 patients across these periods. In the early phase, the age distribution of patients predominantly ranged from 20-60 years, whereas during the Delta variant phase, there was a noticeable shift towards an older demographic, specifically 40-60+ years. Gender distribution remained consistent across both periods.

Most patients treated at UI Hospital were from the West Java region, with no available data regarding the routes of disease transmission. The severity of cases during the initial COVID-19 phase was primarily mild to moderate, whereas the Delta variant phase saw a predominance of moderate to critical cases. There was also an increase in the prevalence of concomitant diseases such as diabetes mellitus, hypertension, and cardiovascular disease during the Delta variant phase. Symptomatically, fever, cough, and shortness of breath were more common during the Delta period, with cough being the primary symptom in the early phase of the pandemic. Furthermore, the duration of hospital stays was longer during the Delta variant period, extending up to 15 days, and the mortality rate for this period reached 15%. Detailed characteristics of COVID-19 patients at UI Hospital are presented in Table 1.

Significant differences were observed in several laboratory parameters between the early COVID-19 period and the Delta variant phase (Table 2). These included leukocytes, neutrophils, lymphocytes, aPTT, D-dimer, AST), urea, partial pressure of carbon dioxide (pCO2), oxygen saturation, sodium, and C-reactive protein (CRP). During the Delta variant phase, there was an increase in leukocyte and neutrophil counts, whereas lymphocyte counts were decreased. The aPTT was shorter, indicating faster blood clotting, but levels of D-dimer, a marker of clot formation and breakdown, were elevated, with two subjects recording values exceeding 10,000 ng/mL. In contrast, one subject exhibited a D-dimer level above 35,200 ng/mL during the early period, and another recorded a below 190 ng/mL.

Further, AST, urea, and pCO2 levels were higher in the Delta variant period. Oxygen saturation displayed a higher median but a lower minimum value, and sodium levels were reduced during this period. CRP levels, indicative of inflammation, were also higher in the Delta variant phase. Specifically, during the early period, nine subjects had CRP levels below 2.50 mg/L, whereas, in the Delta variant phase, four subjects had CRP below 2.50 mg/L, and five subjects had levels exceeding 200 mg/L.

Discussion

SARS-CoV-2 is a beta-CoV belonging to the subgenus Sarbecovirus, subfamily Orthocoronavirinaes based on sequence analysis. To infect humans, SARS-CoV-2 binds to the same cell-entry receptor as SARS-CoV, namely angiotensin-converting enzyme 2 (ACE2). SARS-CoV-2 is between 50 and 200 nm in diameter and contains 29,881 bp (base pair). The SARS-CoV-2 genome encodes at least four structural proteins, which are called the nucleocapsid (N), spikes (S), envelope (E), and membrane (M). The N protein functions to wrap the viral genome, while the S, E, and M proteins build the viral envelope. Protein S also plays a role in mediating the entry of viruses into host cells. SARS-CoV-2 is mainly transmitted by contact, respiratory droplets, and potentially also by the fecal-oral route. The main site of viral replication is thought to occur in the mucosal epithelium of the upper respiratory tract (pharynx and nasal cavity) and subsequently multiply in the lower respiratory tract's and gastrointestinal tract's mucosa, causing mild viremia.[3]

Since the first case, various mutations in the SARS-CoV-2 virus have formed new variants. One of the new Delta variants was detected in early 2021, and it later became the dominant variant until the end of 2021. The emergence of these new variants caused several waves of increasing cases of COVID-19 with changes in transmission, clinical outcomes, and responses to vaccination.[4]

This study examines the demographic characteristics and laboratory parameters of COVID-19 patients treated at UI Hospital during the initial phase of the pandemic and the period dominated by the Delta variant. In the early COVID-19 period, the predominant age group was young adults (20-60 years), whereas during the Delta variant period, most patients were aged 40-60 years, with an observable increase in patients over 60 years of age. This finding contrasts with the study by Bhakta et al[5], which reported a younger demographic during the Delta period. The discrepancy may be attributed to the higher prevalence of comorbidities among the Delta variant subjects in this study. Furthermore, no significant gender-based differences in COVID-19 susceptibility were observed, aligning with findings by Lakbar et al[6] that also indicated no difference in susceptibility by gender. The study revealed

Table 1. Characteristics of COVID-19 Patients at UI Hospital

Characteristics	Periods, n(%)		p Value
	Jul 2020–Feb 2021 (n=100)	Mar–Oct 2021 (n=100)	
Age (years)			<0.001[a]
0–1	0 (0)	0 (0)	
2–10	1 (1)	0 (0)	
11–19	1 (1)	1 (1)	
20–40	48 (48)	22 (22)	
41–60	42 (42)	45 (45)	
>60	8 (8)	32 (32)	
Gender			1.00[b]
Male	52 (52)	52 (52)	
Female	48 (48)	48 (48)	
Domicile			
Jakarta	24 (24)	20 (20)	
Banten	1 (1)	4 (4)	
West Java	69 (69)	72 (72)	
Others	6 (6)	4 (4)	
Transmission			
Contact history with confirmed cases	13 (13)	8 (8)	
History of visiting health facilities	9 (9)	0 (0)	
Long-distance travel history	1 (1)	0 (0)	
No data	77 (77)	92 (92)	
Severity degree			<0.001[a]
Asymptomatic	0 (0)	0 (0)	
Mild	51 (51)	1 (1)	
Moderate	42 (42)	44 (44)	
Severe	7 (7)	39 (39)	
Critical case	0 (0)	16 (16)	
Comorbid			
Pregnancy	1 (1)	1 (1)	
Obesity	4 (4)	10 (10)	
Diabetes	11 (11)	36 (36)	
Hypertension	17 (17)	46 (46)	
Cardiovascular disease	10 (10)	41 (41)	
Kidney disease	6 (6)	25 (25)	
Lung disease	37 (37)	24 (24)	
Autoimmune disease	0 (0)	0 (0)	
Neurological disease	0 (0)	13 (13)	
Heart disease	4 (4)	13 (13)	
Malignancy	0 (0)	3 (3)	
Others	41 (41)	39 (39)	
Clinical symptoms			
Fever	27 (27)	54 (54)	
Cough	73 (73)	79 (79)	
Dyspnea	33 (33)	78 (78)	
Cold	12 (12)	13 (13)	
Headache	35 (35)	17 (17)	
Myalgia	7 (7)	14 (14)	
Anosmia	15 (15)	16 (16)	
Gastrointestinal symptom	46 (46)	48 (48)	
Others	11 (11)	41 (41)	
Length of stay (days)			<0.001[b]
0–3	0 (0)	9 (9)	
4–6	6 (6)	4 (4)	
7–9	49 (49)	6 (6)	
10–12	44 (44)	26 (26)	
13–15	0 (0)	16 (16)	
>15	1 (1)	39 (39)	
Status at the end of treatment			<0.001[b]
Alive	99 (99)	84 (84)	
Died	1 (1)	16 (16)	

[a] Kruskal Wallis; [b] Chi-Square

Table 2. Description of Laboratory Parameters in COVID-19 Patients at UI Hospital

Laboratory Parameters (n in A period; n in B period)	Mean ± SD or Median (Min–Max) (Q1–Q3)		p Value	Reference Value
	A Period (July 2020 – February 2021)	B Period (March – October 2021)		
Haematology				
Haemoglobin (99;100)	13.7 (4.7–16.6) (12.6–14.6)	13.40 (5.2–17.3) (12.2–14.68)	0.275	Male: 13–17 g/dL Female: 12–15 g/dL
Erythrocytes (99;100)	4.75 ± 0.57	4.76 (1.7–7.71) (4.39–5.15)	0.917	Male: 4.5–5.5 x10^6/µL Female: 3.8–4.8 x10^6/µL
Leukocytes (99;100)	6.82 (1.65–17.2) (5.44–8.57)	8.58 (2.01–40.25) (5.65–11.44)	0.005	4–10 x10^3/µL
Neutrophile (99;100)	65.49 ± 11.8	74.7 (37.6–95.1) (64.40–85.48)	<0.001	52–76 %
Lymphocyte (99;100)	24.88 ± 10.58	15.25 (1.9–44.9) (9–25.8)	<0.001	20–40 %
Thrombocyte (99;100)	271(66–697) (210–348)	282.01 ± 104.61	0.817	150–410 x10^3/µL
ESR (29; 30)	41.69 ± 30.21	55.93 ± 34.01	0.095	0–15 mm
Haemostasis				
PT(73;92)	10.2 (8.8–29) (9.9–10.45)	10 (8.9–12.1) (9.8–10.4)	0.266	9.8–12.6 seconds
aPTT(75;94)	36 (10–77.5) (32.5–39.1)	30.2 (20.2–138.2) (25.5–36.05)	<0.001	21.8–28 seconds
D-dimer(73;98)	620 (190–35200) (360–1375)	1064.92 (151.31–10000) (652.8–2578.92)	<0.001	<500 ng/mL
Chemical				
AST (71;99)	27 (2–293) (19–38)	40 (9–541) (26–61)	<0.001	5–34 U/L
ALT (71;99)	27 (1–182) (18–45)	34 (6–528) (20–53)	0.143	0–55 U/L
Urea (67;99)	24 (6–264) (20–32)	30 (10–307) (22–44)	0.002	15–40 mg/dL
Creatinine (68;99)	0.82 (0.5–25.17) (0.68–1.04)	0.93 (0.37–15.79) (0.68–1.22)	0.184	0.5–1 mg/dL
Blood gas analysis				
pH (69;87)	7.42 ± 0.46	7.44 (7–7.69) (7.39–7.48)	0.176	
pO_2 (69;87)	127.2 (49.2–205.4) (96.4–172.25)	128.6 (40.9–287.6) (83.3–179.1)	0.483	75–100 mmHg
pCO_2 (69;87)	28.17 ± 6.27	30.4 (15.5–76.7) (27.1–36.3)	<0.001	35–45 mmHg
O_2 Saturation (69;87)	98.5 (83.1–99.9) (96.55–99.3)	99.2 (59.9–99.9) (96.7–99.9)	0.011	95–98 %
Electrolyte				
Natrium (54;98)	140 (109–146) (134.75–143)	133.72 ± 6.11	<0.001	132–147 mEq/L
Kalium (54;98)	4 ± 0.59	3.83 (2.4–8.45) (3.39–4.35)	0.421	3.3–5.4 mEq/L
Chloride (54;98)	106.62 ± 3.91	105.58 ± 6.29	0.199	94–111 mEq/L
Infection Marker				
CRP (93;98)	14.3 (2.5–245.5) (6–44.1)	56.65 (2.5–278.1) (19.73–123.68)	<0.001	<5 mg/L
Procalcitonin* (75;86)	0.05 (0.02–5.58) (0.04–0.1)[#]	0.2 (0.2–8.83) (0.2–0.2)[##]	0.619	<0.36 ng/mL

*Procalcitonin value differs due to a change of instrument at the time of study. Calculation of p-value based on categorical
[#]Data category: Normal = 27 data; Above reference = 39 data data.
[##]Data category:Normal = 57 data; Above reference = 9 data

significant differences in the severity of COVID-19 cases between the early pandemic period and the Delta variant period. Specifically, 55% of cases were categorized as severe to critical during the Delta period, compared to only 7% during the initial period. Conversely, the proportion of mild cases dropped drastically from 51% in the early period to just 1% during the Delta period, indicating a marked shift in disease severity from mild-moderate to severe-critical.

This shift in severity was consistent with other outcomes, such as length of stay and mortality rates. In the Delta period, the proportion of subjects with a hospital stay exceeding 15 days was 39%, a substantial increase from only 1% in the initial period. Similarly, the mortality rate during the Delta period escalated to 16%, compared to just 1% during the early period. Supporting these findings, Bast et al[7] reported that infection with the Delta variant in unvaccinated individuals led to a twofold increase in hospitalization risk, alongside heightened risks of ICU admission and death.

Cough was the most prevalent clinical symptom observed in both the initial and Delta variant periods of COVID-19, affecting approximately 70% of subjects. During the Delta period, the subsequent most frequent symptoms included shortness of breath, fever, and gastrointestinal issues. In contrast, the early period was characterized by gastrointestinal symptoms, headache, and shortness of breath, the most common symptoms. Additionally, the prevalence of comorbidities was notably higher during the Delta period compared to the initial phase of the pandemic. There were significant increases in the proportions of patients with obesity, diabetes, hypertension, cardiovascular diseases, and kidney diseases during the Delta period. Conversely, comorbid lung disease was more prevalent during the early COVID-19 period. These findings align with the research conducted by Hu et al.[8]

Laboratory Parameter Overview

Routine laboratory tests that are often requested for COVID-19 patients, in addition to PCR examinations, are complete blood counts, hemostasis tests (PT, aPTT, and D-dimer), and inflammation-related parameters (CRP, ferritin, and procalcitonin). SARS-CoV-2 has the potential to damage several vital organs, such as the heart, liver, and kidneys. Thus, biochemical tests are often used to evaluate the functional activity of these organs.[2] This study highlighted significant differences in laboratory findings during the Delta variant period compared to the early COVID-19 phase, with increased levels of leukocytes, neutrophils, ESR, D-dimer, serum glutamic-oxaloacetic transaminase (SGOT), and CRP. These findings align with the research by Hu et al[9] which noted that patients with the Delta variant exhibited elevated counts of leukocytes and neutrophils alongside higher levels of CRP, serum glutamic-pyruvic transaminase (SGPT), and D-dimer. Leukocytosis and neutrophilia in COVID-19 patients may result from leukocyte activation due to increased cytokine production, secondary bacterial infections, or redistribution of leukocytes to peripheral tissues. In severe COVID-19 cases, bacterial infections are common, often indicated by a marked rise in procalcitonin (PCT).[9]

Additionally, lymphopenia, often accompanied by increased neutrophil counts, is frequently reported and varies among patients, indicating either a predominance of lymphopenia or neutrophilia. The most prevalent hematological abnormalities include a reduction in lymphocytes and mild thrombocytopenia.[2] Lymphopenia may arise from the selective destruction, functional exhaustion, or direct viral infection of lymphocytes, leading to a diminished T lymphocyte response. This impairment in viral clearance can trigger macrophage activation syndrome, potentially leading to a cytokine storm, as evidenced by elevated interleukin levels in patients.[10] In both phases of COVID-19, some patients exhibited prolonged prothrombin time (PT) along with extended aPTT, with increased D-dimer levels further supporting the presence of coagulopathy, an essential marker of disease progression.[6] Patients displayed shorter aPTT values during the Delta variant than the baseline period. This shortening of aPTT is commonly observed in COVID-19 due to the increased release of factor VIII and von Willebrand factor (vWF), both acute-phase reactants that rise with increased inflammation.

Elevated D-dimer levels were a consistent finding across both COVID-19 periods, but notably higher median values were recorded during the Delta period, and this difference was statistically significant. The heightened D-dimer levels in the Delta period could be attributed to enhanced fibrinolysis pathways and activation of the plasmin pathway.[12] Moreover, the increased D-dimer levels correlate with inflammatory conditions characterized by elevated cytokine levels, which correspond to increased CRP levels, serving as an inflammatory marker. Although inflammation was

present in both periods, more severe inflammation was observed during the Delta period, with median CRP values being four times higher than in the initial period. Inflammation-related markers are notably elevated during the acute phase of illnesses, including COVID-19. Parameters such as ESR, CRP, and PCT are commonly found to increase in a patient's serum. In research conducted by Sigaroodi et al[2] it was observed that while CRP has superior diagnostic value over PCT, PCT potentially holds greater significance for predicting the progression of the disease. Further illustrating the impact of inflammation, Li et al[14] reported elevated ferritin levels in 49 out of 54 (90.7%) COVID-19 patients. Their findings indicate that ferritin levels began to decrease concurrently with high-sensitivity CRP (hs-CRP) reductions yet remained significantly above the upper reference range for five days after hs-CRP normalized.

The most common abnormal biochemical findings found in COVID-19 patients are elevated levels of lactate dehydrogenase (LDH), alanine aminotransferase (ALT), aspartate aminotransferase (AST), total bilirubin, and decreased albumin levels. Elevated creatine kinase (CK) and elevated creatinine were also found in several studies. The main site of SARS-CoV-2 infection is the lower respiratory tract, and LDH is an essential marker of lung damage, so this enzyme was found to be elevated in most COVID-19 patients.[2]

Injury to organs other than the lung can also trigger abnormal values of biochemical parameters related to the kidneys and liver. Guan et al[11] reported that ALT and AST levels in COVID-19 patients were elevated in 21.3% and 22.2% of cases, respectively, which may reflect virus-mediated liver damage. The results of other studies also revealed that 2–11% of COVID-19 patients had liver disease as comorbidity, and 14–53% of patients had abnormal ALT and AST levels. Analysis of creatinine in 149 cases showed that 28.8% of COVID-19 patients had elevated creatinine levels, indicating the ability of SARS-CoV-2 to cause kidney injury. The results of several studies suggest that these biochemical parameters are not only of specific diagnostic significance in this infection but are also helpful in assessing the prognosis of COVID-19 patients.[2]

This study observed that patients during the Delta period exhibited higher SGOT values, although the increase was mild (less than twice the normal value). This elevation could be attributed to liver damage or inflammation linked to decreased liver functional integrity in COVID-19, which may result from viral invasion, cytokine storms, and the administration of drugs with hepatotoxic effects.[8] Additionally, patients in the Delta period demonstrated increased urea and creatinine levels; however, only the rise in urea levels reached statistical significance. This finding aligns with the research conducted by Liu et al[15] which indicated that dynamic increases in creatinine and blood urea nitrogen (BUN) levels from early admission were associated with the severity of COVID-19 and poor prognosis.

The blood gas analysis conducted in this study revealed that during the Delta period, patients exhibited higher pH, partial pressure of oxygen (pO2), partial pressure of carbon dioxide (pCO2), and oxygen saturation (SO2) compared to the initial period. This increase is thought to be related to the greater incidence of shortness of breath experienced by patients in the Delta period, necessitating oxygen therapy, which resulted in elevated SO2 and pO2 values. The higher pCO2 levels observed may be attributed to CO2 retention caused by the patient's shortness of breath. Nonetheless, in both the early and Delta periods, patients displayed a slightly alkaline pH with a low pCO2 level, indicative of compensated respiratory alkalosis, likely due to hyperventilation as a compensatory response to hypoxic conditions stemming from pulmonary pathologies associated with COVID-19.[16]

Significant differences were also observed in sodium levels between the two periods, with the average sodium level during the Delta period being 133.72, indicative of hyponatremia. The potential mechanism for this hyponatremia in COVID-19 could be related to inflammation, causing the syndrome of inappropriate antidiuretic hormone secretion (SIADH) and gastrointestinal symptoms. However, the proportion of subjects experiencing gastrointestinal symptoms was similar in both periods–48% in the Delta period and 46% in the initial period–suggesting that inflammation may play a more significant role in the pathogenesis of hyponatremia in this patient population.[17]

Given that this study is based on medical records, it is subject to the limitation of incomplete data. However, the findings highlight notable differences in the clinical and laboratory characteristics of COVID-19 patients across the early and Delta periods. These differences can be instrumental in guiding therapeutic approaches and further research, particularly within the context of Indonesia.

Conclusion

From this study, it can be concluded that there are significant differences in age, symptoms, comorbid diseases, and laboratory parameters, such as the number of leukocytes, neutrophils, lymphocytes, aPTT, d-Dimer, AST, urea, pCO_2, O_2 saturation, sodium, and CRP between the initial period and the Delta variant period of COVID-19 in Indonesia.

Conflict of Interest

All authors declare no conflict of interest.

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