

**SKRIPSI**

**KORELASI JUMLAH SEL CD4+ DAN CD8+ DENGAN  
*ABSOLUTE LYMPHOCYTE COUNT* (ALC) PADA  
PASIEN COVID-19 DI RSUP DR. MOHAMMAD  
HOESIN PALEMBANG**



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**PROGRAM STUDI PENDIDIKAN DOKTER  
FAKULTAS KEDOKTERAN  
UNIVERSITAS SRIWIJAYA  
2022**

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HOESIN PALEMBANG**

Diajukan untuk memenuhi salah satu syarat memperoleh gelar  
Sarjana Kedokteran (S.Ked)



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### KORELASI JUMLAH SEL CD4+ DAN CD8+ DENGAN *ABSOLUTE LYMPHOCYTE COUNT* (ALC) PADA PASIEN COVID-19 DI RSUP DR. MOHAMMAD HOESIN PALEMBANG

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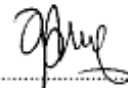
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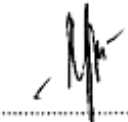
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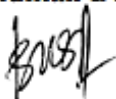
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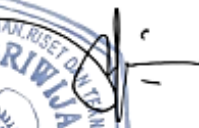
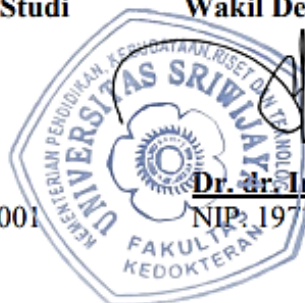
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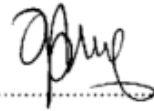
## HALAMAN PERSETUJUAN

Karya tulis ilmiah berupa Laporan Akhir Skripsi ini dengan judul “Korelasi Jumlah Sel CD4+ dan CD8+ dengan *Absolute Lymphocyte Count* (ALC) Pada Pasien COVID-19 Di RSUP Dr. Mohammad Hoesin Palembang” telah dipertahankan di hadapan Tim Penguji Karya Tulis Ilmiah Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Sriwijaya pada tanggal 15 Desember 2022.

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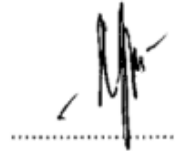
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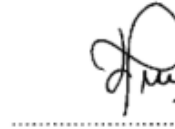
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Menyatakan bahwa skripsi saya merupakan hasil karya sendiri didampingi tim pembimbing dan bukan hasil penjiplakan/plagiat. Apabila ditemukan unsur penjiplakan/plagiat dalam skripsi ini, maka saya bersedia menerima sanksi akademik dari Universitas Sriwijaya sesuai aturan yang berlaku.

Demikian pernyataan ini saya buat dalam keadaan sadar dan tanpa ada paksaan dari siapapun.



Palembang, 14 Desember 2022



## HALAMAN PERSETUJUAN PUBLIKASI

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Memberikan izin kepada pembimbing dan Universitas Sriwijaya untuk mempublikasikan hasil penelitian saya untuk kepentingan akademik apabila dalam waktu 1 (satu) tahun tidak mempublikasikan karya penelitian saya. Dalam kasus ini saya setuju untuk menempatkan pembimbing sebagai penulis korespondensi (*corresponding author*)

Demikian, pernyataan ini saya buat dalam keadaan sadar dan tanpa ada paksaan dari siapapun.

Palembang, 15 Desember 2022



Aprilia Paskah Samosir

## ABSTRAK

### **Korelasi Jumlah Sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada Pasien COVID-19 di RSUP Dr. Mohammad Hoesin Palembang**

(Aprilia Paskah Samosir, 15 Desember 2022, 68 halaman)  
Fakultas Kedokteran Universitas Sriwijaya

**Latar Belakang:** Penyakit *Coronavirus* 2019 (COVID-19) adalah penyakit pernapasan menular yang menyebar secara global dan dinyatakan sebagai pandemi pada Maret 2020. Pemeriksaan laboratorium perlu dilakukan pada pasien yang terinfeksi COVID-19 untuk menegakkan diagnosis. Pada pemeriksaan laboratorium ditemukan hasil abnormal, yaitu limfopenia. Hasil tersebut sering dihubungkan dengan perubahan jumlah sel T yang signifikan, terutama sel T CD4+ dan sel T CD8+. Penelitian ini bertujuan untuk menganalisis korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19.

**Metode:** Jenis penelitian yang digunakan adalah observasional analitik dengan pendekatan *kohort retrospective*. Sampel pada penelitian ini adalah data rekam medis pasien yang terdiagnosis COVID-19 di RSUP Dr. Mohammad Hoesin Palembang pada bulan Maret 2022 hingga Mei 2022 yang memenuhi kriteria inklusi dan eksklusi. Pengambilan sampel dilakukan secara *total sampling*.

**Hasil:** Pada penelitian ini, terdapat 35 pasien yang memenuhi kriteria inklusi dan eksklusi. Hasil penelitian ini menunjukkan terdapat korelasi kuat yang signifikan ( $p < 0,05$ ) antara jumlah sel CD4+ dengan *absolute lymphocyte count* (ALC) pada saat MRS ( $r = 0,69$ ,  $p = 0,000$ ). Kemudian terdapat pula korelasi yang signifikan ( $p < 0,05$ ) antara jumlah sel CD8+ dengan *absolute lymphocyte count* (ALC) pada saat MRS ( $r = 0,543$ ,  $p = 0,001$ ).

**Kesimpulan:** Terdapat korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19.

**Kata Kunci:** Limfosit CD4+, Limfosit CD8+, *absolute lymphocyte count* (ALC), Covid-19

## ABSTRACT

### **The Correlation of CD4+ and CD8+ Cell Number with *absolute lymphocyte count* (ALC) in COVID-19 Patients at RSUP Dr. Mohammad Hoesin Palembang**

(Aprilia Paskah Samosir , 15 December 2022, 68 pages)  
Faculty of Medicine, Sriwijaya University

**Background:** Coronavirus Disease 2019 (COVID-19) is an infectious respiratory disease that spreads globally and was declared as a pandemic in March 2020. Laboratory examinations need to be carried out on patients infected with COVID-19 to establish a diagnosis. On laboratory examination, abnormal results were found, namely lymphopenia. Such results are often associated with significant changes in T cell counts, especially CD4+ T cells and CD8+ T cells. This study aims to analyze the correlation of CD4+ and CD8+ cell counts with *absolute lymphocyte count* (ALC) in COVID-19 patients.

**Method:** The type of research used is analytical observational with a *retrospective cohort* approach. The sample in this study is medical record data of patients diagnosed with COVID-19 at RSUP Dr. Mohammad Hoesin Palembang from March 2022 to May 2022 which meets the inclusion and exclusion criteria. Sampling is carried out by *total sampling*.

**Results:** In this study, there were 35 patients who met the inclusion and exclusion criteria. The results of this study showed that there was a strong significant correlation ( $p < 0.05$ ) between CD4+ cell count and *absolute lymphocyte count* (ALC) at MRS time ( $r = 0.69$ ,  $p = 0.000$ ). Then there was also a significant correlation ( $p < 0.05$ ) between CD8+ cell count and *absolute lymphocyte count* (ALC) at MRS time ( $r = 0.543$ ,  $p = 0.001$ ).

**Conclusion:** There was a correlation of CD4+ and CD8+ cell counts with *absolute lymphocyte count* (ALC) in COVID-19 patients.

**Keywords:** CD4+ lymphocytes, CD8+ lymphocytes, *absolute lymphocyte count* (ALC), Covid-19



## RINGKASAN

KORELASI JUMLAH SEL CD4+ DAN CD8+ DENGAN *ABSOLUTE LYMPHOCYTE COUNT* (ALC) PADA PASIEN COVID-19 DI RSUP DR. MOHAMMAD HOESIN PALEMBANG

Karya tulis ilmiah berupa Skripsi, 15 Desember 2022

Aprilia Paskah Samosir, Dibimbing oleh dr. Phey Liana, Sp.PK dan dr. Nurmalia Purnama Sari, Sp.PK., M.Si.Med

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xviii + 68 halaman, 6 tabel, 6 gambar, 7 lampiran

### Ringkasan

Penyakit *Coronavirus* 2019 (COVID-19) adalah penyakit pernapasan menular yang menyebar secara global dan dinyatakan sebagai pandemi pada Maret 2020. Pemeriksaan laboratorium perlu dilakukan pada pasien yang terinfeksi COVID-19 untuk menegakkan diagnosis. Pada pemeriksaan laboratorium ditemukan hasil abnormal, yaitu limfopenia. Hasil tersebut sering dihubungkan dengan perubahan jumlah sel T yang signifikan, terutama sel T CD4+ dan sel T CD8+. Penelitian ini bertujuan untuk menganalisis korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19. Jenis penelitian yang digunakan adalah observasional analitik dengan pendekatan *kohort retrospective*. Sampel pada penelitian ini adalah data rekam medis pasien yang terdiagnosis COVID-19 di RSUP Dr. Mohammad Hoesin Palembang pada bulan Maret 2022 hingga Mei 2022 yang memenuhi kriteria inklusi dan eksklusi. Pengambilan sampel dilakukan secara *total sampling*. Pada penelitian ini, terdapat 35 pasien yang memenuhi kriteria inklusi dan eksklusi. Hasil penelitian ini menunjukkan terdapat korelasi yang signifikan ( $p < 0,05$ ) antara jumlah sel CD4+ dengan *absolute lymphocyte count* (ALC) pada saat MRS ( $r = 0,69$ ,  $p = 0,000$ ) dan hari kesepuluh onset ( $r = 0,559$ ,  $p = 0,000$ ). Kemudian terdapat pula korelasi yang signifikan ( $p < 0,05$ ) antara jumlah sel CD8+ dengan *absolute lymphocyte count* (ALC) pada saat MRS ( $r = 0,543$ ,  $p = 0,001$ ) dan hari kesepuluh onset ( $r = 0,532$ ,  $p = 0,001$ ). Berdasarkan hasil penelitian ini didapatkan kesimpulan bahwa terdapat korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19.

**Kata Kunci:** Limfosit CD4+, Limfosit CD8+, *absolute lymphocyte count* (ALC), Covid-19

## SUMMARY

THE CORRELATION OF CD4+ AND CD8+ CELL NUMBER WITH *ABSOLUTE LYMPHOCYTE COUNT* (ALC) IN COVID-19 PATIENTS AT RSUP DR. MOHAMMAD HOESIN PALEMBANG

Scientific paper in the form of a Thesis, December 15, 2022

Aprilia Paskah Samosir; supervised by dr. Phey Liana, Sp.PK and dr. Nurmalia Purnama Sari, Sp.PK., M.Si.Med

Study Program of Medical Education, Faculty of Medicine, Sriwijaya University  
xviii + 68 pages, 6 tables, 6 pictures, 7 attachments

### Summary

*Coronavirus* disease 2019 (COVID-19) is a infectious respiratory disease that spreads globally and was declared as a pandemic in March 2020. Laboratory examinations need to be carried out on patients infected with COVID-19 to establish a diagnosis. On laboratory examination, abnormal results were found, namely lymphopenia. Such results are often associated with significant changes in T cell counts, especially CD4+ T cells and CD8+ T cells. This study aims to analyze the correlation of CD4+ and CD8+ cell counts with *absolute lymphocyte count* (ALC) in COVID-19 patients. The type of research used is analytical observational with a *retrospective cohort* approach. The sample in this study is medical record data of patients diagnosed with COVID-19 at RSUP Dr. Mohammad Hoesin Palembang from March 2022 to May 2022 which meets the inclusion and exclusion criteria. Sampling is carried out by *total sampling*. In this study, there were 35 patients who met the inclusion and exclusion criteria. The results of this study showed that there was a significant correlation ( $p < 0.05$ ) between CD4+ cell count and absolute lymphocyte count (ALC) at MRS time ( $r = 0.69$ ,  $p = 0.000$ ) and tenth day of onset ( $r = 0.559$ ,  $p = 0.000$ ). Then there was also a significant correlation ( $p < 0.05$ ) between CD8+ cell count with absolute lymphocyte count (ALC) at MRS time ( $r = 0.543$ ,  $p = 0.001$ ) and tenth day of onset ( $r = 0.532$ ,  $p = 0.001$ ). Based on the results of this study, it was concluded that there was a correlation of CD4+ and CD8+ cell counts with *absolute lymphocyte count* (ALC) in COVID-19 patients.

**Keywords:** CD4+ lymphocytes, CD8+ lymphocytes, *absolute lymphocyte count* (ALC), Covid-19

## KATA PENGANTAR

Puji dan syukur bagi Tuhan YME, karena berkat dan anugerah-Nya sehingga penulis dapat menyelesaikan skripsi yang berjudul Korelasi Jumlah Sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada Pasien COVID-19 di RSUP Dr. Mohammad Hoesin Palembang. Dalam penulisan skripsi terdapat hambatan dan kendala yang saya hadapi. Namun, saya mengucapkan syukur atas bantuan dan dukungan berbagai pihak yang terlibat. Saya berterima kasih kepada Tuhan YME atas kesehatan, kekuatan dan kelancaran yang diberikan kepada saya. Selain itu, saya ingin mengucapkan terima kasih sebesar-besarnya kepada:

1. Papa Firly R Samosir, Mama Natalia Emanuela, Kak Brigitta Movelia Samosir, Om Jimmy B, Tante Ika Kartika, Kak Nadia Berendhuysen serta keluarga besar yang selalu memberikan doa dan dukungan kepada saya.
2. dr. Phey Liana, Sp.PK dan dr. Nurmalia Purnama Sari, Sp.PK., M.Si.Med selaku dosen pembimbing yang telah bersedia untuk membimbing, memberi masukan, dan saran kepada saya selama penyusunan skripsi ini.
3. dr. R.A. Linda Andriani, Sp.PD-KP, FINASIM dan dr. Verdiansah, Sp.PK., MMRS selaku dosen penguji yang juga telah memberikan banyak saran dan masukan kepada saya.
4. Sahabat saya, Ebol, Imelda, Salsa, Zia, Riza, Dilla, Agung, dokter Nila, Om Yosef, dan sahabat lainnya yang tidak bisa disebutkan satu persatu. Terima kasih untuk semangat, canda tawa, dan selalu setia mendengar keluh kesah saya dalam proses penyusunan penelitian ini.

Saya menyadari skripsi ini jauh dari kata sempurna dan memiliki banyak kekurangan. Oleh karena itu, kritik, masukan, dan saran sangat diharapkan sebagai bahan perbaikan untuk kedepannya. Semoga skripsi ini dapat bermanfaat.

Palembang, 15 Desember 2022



Aprilia Paskah Samosir

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## DAFTAR SINGKATAN

SARS-CoV-2	: <i>Severe acute respiratory syndrome coronavirus 2</i>
CFR	: <i>Case Fatality Rate</i>
ARDS	: <i>Acute respiratory distress syndrome</i>
CRP	: <i>C-reactive protein</i>
LDH	: <i>Lactate dehydrogenase</i>
ESR	: <i>Erythrocyte sedimentation rate</i>
MERS	: <i>Middle east respiratory syndrome corona virus</i>
ACE2	: <i>Angiotensin converting enzyme 2</i>
ICTV	: <i>The International Committee on Taxonomy of Viruses</i>
RBD	: <i>Receptor binding domain</i>
NK	: <i>Natural killer</i>
IFN	: <i>Interferon</i>
APC	: <i>Antigen presenting cell</i>

# BAB 1

## PENDAHULUAN

### 1.1 Latar Belakang

Penyakit *Coronavirus* 2019 (COVID-19) adalah penyakit pernapasan menular yang disebabkan oleh virus corona kelas baru bernama *severe acute respiratory syndrome coronavirus 2* (SARS-CoV-2). SARS-CoV-2 menyebabkan epidemi COVID-19 yang cukup besar di China, kemudian menyebar secara global dan dinyatakan sebagai pandemi pada Maret 2020.<sup>1,2</sup>

Kejadian kasus COVID-19 di Indonesia pertama kali dikonfirmasi tepatnya pada tanggal 2 Maret 2020. Angka morbiditas dan mortalitas di Indonesia menunjukkan peningkatan dan akhirnya menjadi yang terburuk di wilayah Asia Tenggara. Per 1 Maret 2021, 1.341.314 orang di Indonesia telah dikonfirmasi positif, dengan pemulihan 85,9% dan *Case Fatality Rate* (CFR) sebesar 2,7%.<sup>3</sup> Di Provinsi Sumatera Selatan, pemerintah setempat melaporkan kasus positif COVID-19 sebanyak 80.621 dan angka kematian 3.348 pada tanggal 09 Juli 2022.<sup>4</sup>

Pasien yang terbukti positif COVID-19, dapat menunjukkan gejala dan ada pula yang tidak bergejala. Di antara pasien bergejala, semua memiliki salah satu dari tiga gejala utama berikut: demam (80%), batuk (84%), dan sesak napas (82%), dengan 45% pasien bergejala memiliki ketiga gejala ini. Namun, tingkat keparahan penyakit di antara pasien SARS bervariasi dari infeksi tanpa gejala hingga *acute respiratory distress syndrome* (ARDS) yang berakibat fatal.<sup>5</sup>

Pemeriksaan laboratorium perlu dilakukan pada pasien yang terinfeksi COVID-19 untuk menegakkan diagnosis. Beberapa penelitian telah melaporkan adanya perubahan hematologi dan kimia darah pada pasien yang terinfeksi oleh SARS-CoV-2. Temuan laboratorium pada pasien COVID-19 yang diidentifikasi melalui meta-analisis termasuk leukopenia, penurunan kadar albumin, peningkatan kadar *C-reactive protein* (CRP), *lactate dehydrogenase* (LDH), *creatin kinase*, dan bilirubin, serta *erythrocyte sedimentation rate* (ESR) yang tinggi.<sup>6</sup>

Hasil pemeriksaan laboratorium abnormal lainnya yaitu limfopenia. Diketahui bahwa limfopenia, yang didefinisikan sebagai *absolute lymphocyte count*

(ALC)  $<1000$  sel/ $\mu$ L ialah jumlah limfosit yang berkurang dan diketahui mampu menunjukkan nilai prognostik pada pasien COVID-19. Limfopenia adalah manifestasi sistemik umum dari banyak penyakit virus khususnya *severe acute respiratory syndrome corona virus* (SARS-CoV) dan *middle east respiratory syndrome corona virus* (MERS-CoV). Temuan ini terkait dengan ekspresi reseptor *angiotensin-converting enzyme 2* (ACE2) pada permukaan limfosit dan sel-sel langsung terkena infeksi oleh virus.<sup>7,8</sup>

Sistem kekebalan inang akan mengenali virus SARS-CoV-2 yang masuk di dalam sel target kemudian muncul respons imun bawaan dan imun adaptif.<sup>9</sup> Imunitas adaptif melibatkan koordinasi respon imun sel T dan sel B. Dalam hal ini, kekebalan adaptif bertanggung jawab untuk kekebalan yang tahan lama dan mungkin mensterilkan virus. Respon imun terhadap *severe acute respiratory syndrome corona virus* yang parah terjadi dalam 7-10 hari pertama setelah infeksi.<sup>10</sup> Respon sel T adalah komponen kunci dari respon imun adaptif terhadap infeksi virus. Sel T CD8<sup>+</sup> penting karena sitotoksitasnya yang spesifik untuk sel yang terinfeksi, sedangkan sel T CD4<sup>+</sup> penting karena membantu dalam aktivasi sel CD8<sup>+</sup> dan sel B dan juga memproduksi sitokin.<sup>11</sup>

Penelitian yang dilakukan oleh Wang dkk., menyatakan pasien COVID-19 kasus berat memiliki tingkat limfosit total, sel T CD4<sup>+</sup>, sel T CD8<sup>+</sup>, dan sel B yang lebih rendah daripada kasus ringan. Studi ini menemukan bahwa limfopenia pada pasien COVID-19 dengan tingkat keparahan berat berhubungan dengan penurunan jumlah sel T, terutama sel T CD4<sup>+</sup> dan sel T CD8<sup>+</sup>.<sup>12</sup>

Penelitian Sun dkk di Cina mendapatkan 35 pasien terkonfirmasi COVID-19 mengalami penurunan jumlah limfosit darah tepi, terutama bermanifestasi sebagai penurunan jumlah sel T CD4<sup>+</sup>, penurunan jumlah sel T CD8<sup>+</sup>, dan penurunan rasio limfosit CD4<sup>+</sup>/CD8<sup>+</sup>. Hal ini secara signifikan berkorelasi dengan tingkat keparahan penyakit.<sup>13</sup>

Pemeriksaan *absolute lymphocyte count* (ALC) merupakan pemeriksaan sederhana yang dapat dikerjakan di seluruh fasilitas kesehatan. Pemeriksaan ALC adalah pemeriksaan hematologi rutin dengan biaya yang tergolong rendah.

Sementara, pemeriksaan jumlah sel CD4+ dan CD8+ relatif mahal dan hanya dapat dilakukan oleh fasilitas kesehatan tertentu. Apabila didapatkan korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) maka pemeriksaan yang lebih sederhana dapat digunakan serta menjadi sumber dalam menilai tingkat keparahan pada pasien COVID-19. Di Indonesia belum ditemukan publikasi mengenai korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19. Berdasarkan latar belakang yang telah dibahas, perlu diteliti korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC). Penelitian ini bertujuan untuk menganalisis korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19.

## **1.2 Rumusan Masalah**

Bagaimana korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19?

## **1.3 Tujuan Penelitian**

### **1.3.1 Tujuan Umum**

Menganalisis korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19.

### **1.3.2 Tujuan Khusus**

1. Mengidentifikasi usia, jenis kelamin, jumlah sel CD4+, jumlah sel CD8+, dan *absolute lymphocyte count* (ALC) pada pasien COVID-19 di RSUP Dr. Mohammad Hoesin Palembang.
2. Menganalisis perbedaan *absolute lymphocyte count* (ALC) pada saat MRS dan hari kesepuluh onset di RSUP Dr. Mohammad Hoesin Palembang.
3. Menganalisis perbedaan jumlah sel CD4+ dan CD8+ pada saat MRS dan hari kesepuluh onset di RSUP Dr. Mohammad Hoesin Palembang.
4. Menganalisis korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pasien COVID-19 pada saat MRS di RSUP Dr. Mohammad Hoesin Palembang.

5. Menganalisis korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pasien COVID-19 pada hari kesepuluh onset di RSUP Dr. Mohammad Hoesin Palembang.

#### **1.4 Hipotesis**

Terdapat korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19.

#### **1.5 Manfaat Penelitian**

##### **1.5.1 Manfaat Teoritis**

Hasil penelitian ini diharapkan dapat menjadi bahan informasi mengenai korelasi jumlah sel CD4+ dan CD8+ dengan *absolute lymphocyte count* (ALC) pada pasien COVID-19 serta diharapkan menjadi bahan referensi untuk penelitian serupa atau mendalam di masa yang akan datang.

##### **1.5.2 Manfaat Kebijakan**

Hasil penelitian ini dapat dijadikan sumber rujukan bagi klinisi dalam menggunakan *absolute lymphocyte count* (ALC) dibandingkan dengan pemeriksaan jumlah sel CD4+ dan CD8+ dalam memprediksi tingkat keparahan pasien COVID-19.

##### **1.5.3 Manfaat Subjek**

Bila ditemukan korelasi pada penelitian ini, pemeriksaan *absolute lymphocyte count* (ALC) dapat menjadi pemeriksaan alternatif dari pemeriksaan jumlah sel CD4+ dan CD8+ untuk meningkatkan pemantauan pasien COVID-19 di fasilitas kesehatan terbatas.

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