

BAB 7

SIMPULAN DAN SARAN

7.1 Simpulan

Berdasarkan hasil penelitian yang telah dilakukan dapat disimpulkan:

1. Didapatkan adanya hubungan yang signifikan dan korelasi yang kuat antara progresivitas kenaikan kadar *Neutrophil Lymphocyte Ratio* terhadap derajat keparahan pasien COVID-19 di Rumah Sakit Gotong Royong Surabaya dengan nilai $p=0,000$ dan $r=0,531$. Arah korelasi yang positif ini menandakan bahwa semakin tinggi progresivitas kenaikan kadar NLR seseorang, maka akan semakin parah derajat penyakit yang diderita.
2. Didapatkan adanya hubungan yang signifikan dan korelasi yang kuat antara progresivitas kenaikan kadar D-dimer terhadap derajat keparahan pasien COVID-19 di Rumah Sakit Gotong Royong Surabaya dengan nilai $p=0,000$ dan $r=0,510$. Arah korelasi yang positif ini menandakan bahwa semakin tinggi progresivitas kenaikan kadar D-dimer seseorang, maka akan semakin parah derajat penyakit yang diderita.

7.2 Saran

Saran yang ingin diberikan oleh peneliti untuk penelitian serupa yang akan dilakukan selanjutnya:

1. Penelitian dilakukan dalam skala yang lebih besar dikarenakan penelitian ini hanya dilakukan di satu rumah sakit yaitu Rumah Sakit Gotong Royong Surabaya.
2. Penelitian yang akan datang dapat menggunakan *cutoff* kadar NLR dan D-dimer pada pasien COVID-19 bila telah tersedia *guideline*.

DAFTAR PUSTAKA

1. Kumar A, Prasoon | Pranav, Kumari C, Pareek V, Muneeb |, Faiq A, et al. SARS-CoV-2-specific virulence factors in COVID-19. 2020;
2. Lu H, Stratton CW, Tang Y-W. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *J Med Virol* [Internet]. 2020 Apr 1 [cited 2021 Oct 1];92(4):401–2. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1002/jmv.25678>
3. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [Internet]. [cited 2021 Oct 1]. Available from: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
4. Coronavirus disease 2019 (COVID-19) Situation Report-70 HIGHLIGHTS. 2020 [cited 2021 Oct 1]; Available from: <https://www.who.int/publications-detail/covid-19-operational-guidance-for->
5. Kemenkes. Peta Sebaran | Covid19.go.id [Internet]. 2021 [cited 2022 Mar 9]. Available from: <https://covid19.go.id/peta-sebaran>
6. Han Y, Yang H. The transmission and diagnosis of 2019 novel coronavirus infection disease (COVID-19): A Chinese perspective. *J Med Virol*. 2020 Jun 1;92(6):639–44.
7. Zou L, Ruan F, Huang M, Liang L, Huang H, Hong Z, et al. SARS-CoV-2 Viral Load in Upper Respiratory Specimens of Infected Patients. *N Engl J Med*. 2020 Mar 19;382(12):1177–9.
8. Anderson EL, Turnham P, Griffin JR, Clarke CC. Consideration of the Aerosol Transmission for COVID-19 and Public Health. Vol. 40, Risk Analysis. Blackwell Publishing Inc.; 2020. p. 902–7.
9. PDPI, PERKI, PAPDI, PERDATIN, IDAI. Pedoman tatalaksana COVID-19 Edisi 3 Desember 2020 [Internet]. Pedoman Tatalaksana COVID-19. 2020. 36–37 p. Available from: <https://www.papdi.or.id/download/983-pedoman-tatalaksana-covid-19-edisi-3-desember-2020>

10. Oliveira P, Terra C, Camila |, Donadel D, Oliveira LC, Meneguetti MG, et al. Neutrophil-to-lymphocyte ratio and D-dimer are biomarkers of death risk in severe COVID-19: A retrospective observational study. *Heal Sci Reports* [Internet]. 2022 Mar 1 [cited 2022 Mar 21];5(2):e514. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1002/hsr2.514>
11. Jimeno S, Ventura PS, Castellano JM, García-Adasme SI, Miranda M, Touza P, et al. Prognostic implications of neutrophil-lymphocyte ratio in COVID-19. *Eur J Clin Invest*. 2021 Jan 1;51(1).
12. Favresse J, Lippi G, Roy PM, Chatelain B, Jacqmin H, ten Cate H, et al. D-dimer: Preanalytical, analytical, postanalytical variables, and clinical applications. *Crit Rev Clin Lab Sci* [Internet]. 2018 Nov 17 [cited 2022 Mar 24];55(8):548–77. Available from: <https://pubmed.ncbi.nlm.nih.gov/30694079/>
13. Gorog DA, Storey RF, Gurbel PA, Tantry US, Berger JS, Chan MY, et al. Current and novel biomarkers of thrombotic risk in COVID-19: a Consensus Statement from the International COVID-19 Thrombosis Biomarkers Colloquium. *Nat Rev Cardiol*. 2022;0123456789.
14. Klok FA, Kruip MJHA, van der Meer NJM, Arbous MS, Gommers DAMPJ, Kant KM, et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thromb Res* [Internet]. 2020;191(April):145–7. Available from: <https://doi.org/10.1016/j.thromres.2020.04.013>
15. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. Vol. 109, *Journal of Autoimmunity*. 2020.
16. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun* [Internet]. 2020 May 1 [cited 2022 Apr 28];109. Available from: <https://pubmed.ncbi.nlm.nih.gov/32113704/>
17. Wang MY, Zhao R, Gao LJ, Gao XF, Wang DP, Cao JM. SARS-CoV-2: Structure, Biology, and Structure-Based Therapeutics Development. *Front*

- Cell Infect Microbiol [Internet]. 2020 Nov 25 [cited 2022 Mar 22];10. Available from: <https://pubmed.ncbi.nlm.nih.gov/33324574/>
18. Jin Y, Yang H, Ji W, Wu W, Chen S, Zhang W, et al. viruses Virology, Epidemiology, Pathogenesis, and Control of COVID-19. 2020; Available from: www.mdpi.com/journal/viruses
 19. Araf Y, Faruqi NA, Anwar S, Hosen MJ. SARS-CoV-2: a new dimension to our understanding of coronaviruses. Int Microbiol [Internet]. 2021 Jan 1 [cited 2022 Mar 22];24(1):19–24. Available from: <https://pubmed.ncbi.nlm.nih.gov/33231780/>
 20. Lotfi M, Hamblin MR, Rezaei N. COVID-19: Transmission, prevention, and potential therapeutic opportunities. Clin Chim Acta. 2020 Sep 1;508:254–66.
 21. Rath H, Burman V, Datta SK, Rana SV, Mirza AA, Saha S, et al. Review on COVID-19 Etiopathogenesis, Clinical Presentation and Treatment Available with Emphasis on ACE2. Indian J Clin Biochem [Internet]. 2021 Jan 1 [cited 2022 Apr 28];36(1):3–22. Available from: <https://pubmed.ncbi.nlm.nih.gov/33424145/>
 22. Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, Prescott HC. Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review. JAMA - J Am Med Assoc. 2020;324(8):782–93.
 23. Rath H, Burman V, Datta SK, Rana SV, Mirza AA, Saha S, et al. Review on COVID-19 Etiopathogenesis, Clinical Presentation and Treatment Available with Emphasis on ACE2. Vol. 36, Indian Journal of Clinical Biochemistry. 2021. p. 3–22.
 24. Sanders JM, Monogue ML, Jodlowski TZ, Cutrell JB. Pharmacologic Treatments for Coronavirus Disease 2019 (COVID-19): A Review. Vol. 323, JAMA - Journal of the American Medical Association. 2020. p. 1824–36.
 25. World Health Organization. WHO COVID-19 Case definition. Updat Public

Heal Surveill COVID-19. 2020;(December 16):1.

26. Liu Y, Du X, Chen J, Jin Y, Peng L, Wang HHX, et al. Neutrophil-to-lymphocyte ratio as an independent risk factor for mortality in hospitalized patients with COVID-19. *J Infect* [Internet]. 2020 Jul 1 [cited 2022 Mar 29];81(1):e6–12. Available from: <https://doi.org/10.1016/j.jinf.2020.04.002>
27. Li J, Tang M, Liu D, Wang F, Yang Y. Combined Indexes of Serum NLR, CRP, LDH, IL-6 and D-Dimer Levels are a Biomarker of Disease Severity and Prognostic Predictor in Patients with Coronavirus Disease 2019. *ResearchSquare* [Internet]. 2021; Available from: <http://www.epistemonikos.org/documents/38fa1f595be2fbc450c984919022ca6888026dd3>
28. Thachil J, Lippi G, Favaloro EJ. D-Dimer testing: Laboratory aspects and current issues. *Methods Mol Biol*. 2017;1646:91–104.
29. Long H, Nie L, Xiang X, Li H, Zhang X, Fu X, et al. D-Dimer and Prothrombin Time Are the Significant Indicators of Severe COVID-19 and Poor Prognosis. 2020 [cited 2022 Jun 6]; Available from: <https://doi.org/10.1155/2020/6159720>
30. Singh R, Kang A, Luo X, Jeyanathan M, Gillgrass A, Afkhami S, et al. COVID-19: Current knowledge in clinical features, immunological responses, and vaccine development. *FASEB J* [Internet]. 2021 Mar 1 [cited 2022 Mar 30];35(3). Available from: <https://pubmed.ncbi.nlm.nih.gov/33577115/>
31. Vabret N, Britton GJ, Gruber C, Hegde S, Kim J, Kuksin M, et al. Immunology of COVID-19: Current State of the Science. *Immunity* [Internet]. 2020 Jun 16 [cited 2022 Mar 30];52(6):910–41. Available from: <https://pubmed.ncbi.nlm.nih.gov/32505227/>
32. Diao B, Wang C, Tan Y, Chen X, Liu Y, Ning L, et al. Reduction and Functional Exhaustion of T Cells in Patients With Coronavirus Disease 2019 (COVID-19). *Front Immunol*. 2020 May 1;11:827.

33. Sherwood L. Human physiology from cells to systems Ninth Edition. Elsevier. 2016.
34. Guyton AC, Hall JE. Guyton dan Hall Buku Ajar Fisiologi Kedokteran. 13th ed. Elsevier, Singapore. 2016.
35. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* (London, England) [Internet]. 2020 Feb 15 [cited 2022 Oct 27];395(10223):497–506. Available from: <https://pubmed.ncbi.nlm.nih.gov/31986264/>
36. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA* [Internet]. 2020 Mar 17 [cited 2022 Oct 27];323(11):1061–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/32031570/>
37. Bwire GM. Coronavirus: Why Men are More Vulnerable to Covid-19 Than Women? Available from: <https://doi.org/10.1007/s42399-020-00341-w>
38. Zhao Y, Zhao Z, Wang Y, Zhou Y, Ma Y, Zuo W. Single-cell RNAexpression profiling of ACE2, the receptor of SARS-CoV-2. *BioRxiv Prepr.* 2020.
39. Hu X, Hu C, Yang Y, Chen J, Zhong P, Wen Y, et al. Clinical characteristics and risk factors for severity of COVID-19 outside Wuhan: a double-center retrospective cohort study of 213 cases in Hunan, China. *Ther Adv Respir Dis.* 2020;14(April):1–15.
40. Petrovic V, Radenkovic D, Radenkovic G, Djordjevic V, Banach M. Pathophysiology of Cardiovascular Complications in COVID-19. *Front Physiol.* 2020;11(October):1–11.
41. Yang AP, Liu J ping, Tao W qiang, Li H ming. The diagnostic and predictive role of NLR, d-NLR and PLR in COVID-19 patients. *Int Immunopharmacol.* 2020 Jul 1;84.

42. Zhu Y, Chen X, Liu X. NETosis and Neutrophil Extracellular Traps in COVID-19: Immunothrombosis and Beyond. *Front Immunol.* 2022;13(March):1–11.
43. Zhang L, Yan X, Fan Q, Liu H, Liu X, Liu Z, et al. D-dimer levels on admission to predict in-hospital mortality in patients with Covid-19. Vol. 18, *Journal of Thrombosis and Haemostasis*. 2020. p. 1324–9.