

ISSN 1978-2071 (Print); ISSN 2580-5967 (Online)

JURNAL ILMIAH KEDOKTERAN

Vol. 13, No. 1, Maret 2024

Wijaya Kusuma

Diterbitkan oleh:
Universitas Wijaya Kusuma Surabaya
Jl. Dukuh Kupang XXV/54 Surabaya, 60225

Jurnal Ilmiah Kedokteran Wijaya Kusuma

Vol. 13, No. 1, March 2024

Journal Ilmiah Kedokteran Wijaya Kusuma (JIKW) is a journal published twice a year which contains various articles/manuscripts in the following type of research results, literature reviews, case reports, and short communications in the medical field focused on Biomedical Sciences, Clinical Medicine, Public Health Sciences and Medical Education

Editor in Chief : Dr. Budhi Setiawan, dr., M.Kes

Editor : 1. Ayu Cahyani N., dr., M.KKK
2. Putu Oky Ari Tania, S.Si., M.Si
3. Dr. Masfufatun, S.Si., M.Si
4. Noer Kumala Indahsari, S.Si., M.Si
5. Dr. Emillia Devi Dwi Rianti, S.T., M.Si

Assistant Editor : Rachel Nova Durita, S.Kom.

Reviewers :

1. Prof. Dr. Prihatini, dr. Sp.PK (K) (Patologi Klinik /FK Universitas Wijaya Kusuma Surabaya)
2. Prof. Sri Harmadji, dr. SP., THT-KL (THT/ FK Universitas Wijaya Kusuma Surabaya)
3. Prof. Dr. Ketut Suwiyoga, dr., Sp.OG (K) (Kebidanan & Penyakit Kandungan /FK Udayana)
4. Prof. H. Didik Sarudji, M.Sc (IKM/ FK Universitas Wijaya Kusuma Surabaya)
5. Pratika Yuhyi Hernanda, dr., M.Sc., Ph.D (Biomedik/ FK Universitas Wijaya Kusuma Surabaya)
6. Dr. Dra. Dorta Simamora, M.Si (Biomedik/ FK Universitas Wijaya Kusuma Surabaya)
7. Dr. Erny, dr., Sp.A (K) (Ilmu Kesehatan Anak/ FK Universitas Wijaya Kusuma Surabaya)
8. Dr. H. Artha Budi Susila Duarsa, dr., M.Kes (Ilmu Kesehatan Masyarakat FK Univ. Islam Al-Azhar Mataram)
9. Al Munawir, Ph.D., dr., M.Kes. (Patologi Anatomi/ FK Universitas Jember)
10. Prof. Win Darmanto, Ph.D., M.Si, (Biologi/ FST Universitas Airlangga)
11. Dr. Willy Sandhika, dr., M.Si., Sp.PA (K) (Patologi Anatomi/ FK Universitas Airlangga)

12. Ferry Efendi, Ph.D., S.Kep., Ns., M.Sc. (Fakultas Keperawatan/ Universitas Airlangga)
13. Joko Gunawan, Ph.D (Fakultas Keperawatan/ Chulalongkorn University, Bangkok)
14. Prof. Dr. Widji Soeratri, DEA., Apt. (Fakultas Farmasi/ Universitas Airlangga)
15. Erina Yatmasari, dr., M.Kes. (Parasitologi/ FK Universitas Hang Tuah Surabaya)
16. Fitri Handajani, dr., M.Kes. (Biokimia/ FK Universitas Hang Tuah Surabaya)
17. Dr. Handayani, dr., M.Kes (Farmakologi/ FK Universitas Nahdlatul Ulama Surabaya)
18. Assoc. Prof. Bhmaputra Marjadi, Ph.D., dr., MPH (FK Universitas Wijaya Kusuma Surabaya; School of Medicine, Western Sydney University, Australia)
19. Prof. Dr. dr. Basuki Supartono, Sp.OT., FICS, MARS (Fakultas Kedokteran UPN Veteran Jakarta, Indonesia)
20. Prof. Dr. dr. Suhartati, MS (Biokimia/ FK Universitas Wijaya Kusuma Surabaya)
21. Dr. Drs. Eko Suhartono, M.Si (Biokimia/ FK Universitas Lambung Mangkurat, Banjarmasin)
22. Dr. Harry Kurniawan Gondo, Sp. OG (K) (Kebidanan & Penyakit Kandungan/ FK Universitas Wijaya Kusuma Surabaya)
23. Dr. Damayanti, Sp. KK (Program Spesialis Dermatologi dan Venereologi/ FK Universitas Airlangga)
24. DR. dr. Ami Febriza, M.Kes (Biomedik/ FK Universitas Muhammadiyah Makassar)
25. Mudyawati Kamaruddin, dr., M. Kes., PhD, (Pascasarjana Ilmu Laboratory Medik/ FK Universitas Muhammadiyah Semarang, Indonesia)
26. Dr. Emilia Prakoso, MD, GradDipl (HIM) (USyd), Ph.D (USyd), FRACP (Faculty of Medicine and Health, Liverpool Hospital, Australia)
27. Dr. Andreas R. Suryawan, FRACP, MHSc (Gerontology, Royal Prince Alfred Hospital, Balmain District Hospital, Australia)
28. Ir. Ratna Chrismiari Purwestri, M.Sc., Dr.sc.agr (Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Czech Republic)

Address : Fakultas Kedokteran UWKS
Gedung C, Lantai 2 (R. 216)
Jl. Dukuh Kupang XXV Surabaya, 60225
Telp (Fax) 031 5686531
Email: jurnalkedokteranuwks@gmail.com
Website: <http://journal.uwks.ac.id/index.php>

PREFACE

Praise and gratitude that the Jurnal Ilmiah kedokteran Wijaya Kusuma (JIKW) Vol. 13, No. 1, March 2024 edition published. This issue contains articles that discuss aspects of Surgery, Biomedical Sciences, Microbiology, Internal Medicine, Anatomy, Obstetrics and Gynecology, from Original research, Case Reports, as well as literature review.

Jurnal Ilmiah Kedokteran Wijaya Kusuma (JIKW) receive scientific articles from original research, reports or case studies, studies or literature reviews, as well as medical science, which are oriented to updating information in medical science and technology. It expected be the sources of scientific information and contributing in overcoming medical problems.

The editors invite various scientists from various higher education and research institutions to provide scientific contributions, both in the form of research results and scientific studies on various topics of Health and Medical Science. We welcoming for critics, inputs from readers, medical professionals, or those related to publishing, for the sake of increasing the quality of the journal as we all hope.

The editor hopes that the scientific articles published in the Jurnal Ilmiah Kedokteran Wijaya Kusuma (JIKW) will be useful for academics, researchers and professionals working in the medical world and network building for researchers.

Editor in Chief

Jurnal Ilmiah Kedokteran Wijaya Kusuma

Vol. 13, No. 1, March 2024

TABLE OF CONTENTS

Page

Laser Hemorrhoidoplasty Using Reusable Bare Fiber Combined Mucopexy on Grade IV Internal Hemorrhoid: A Case Report <i>Fadli Robby Amsriza, Rizka Fakhriani</i>	1-7
Effect of Ginger Extract to Decrease Blood Pressure in The Elderly with Hypertension <i>Ulkomah, Desridius Chalid, Aninda Dinar Widiantari, Farida Murtiani</i>	8-14
Isolation and Characterization of Lactic Acid Bacteria from Sago Wastewater as Antibacterial <i>Satwika Tri Rahmadana, Eka Astuty, Ony Wibriyono Angkejaya</i>	15-24
D-Dimer as A Parameter of Disease and Death of Covid-19 Patients in Islamic Hospital, Surabaya <i>Muzaijadah Retno Arimbi, Intan Nurani Indrajana, Pratika Yuhyi Hernanda</i>	25-37
Effectiveness of Facial Acupressure and Acupuncture on Musculus Facei <i>Ayly Soekanto, Putu Oky Ari Tania, Emillia Devi, Hardiyono</i>	38-47
Effect of Oatmeal on TNF-α of White Rats Exposed to Motor Vehicles Fumes <i>Sukma Sahadewa, Fara Disa Durry, Zulfan Febriawan, I Putu Agus Aris Wijaya Kusuma</i>	48-55
Routine hematology description and D-dimer COVID-19 patients at Sidoarjo Regional Hospital <i>Nugroho Eko Wirawan Budianto, Budhi Setiawan, Nugrahadi Dwi Pasca Budiono</i>	56-62
Role of Anemia and Leukocytosis as Severity Predictors of Coronary Artery Disease Stenosis: a Retrospective Cross-sectional Study <i>M Saugi Abduh, Muhammad Rizki Triono, Retno Widyastuti</i>	63-69
The Association between Vitamin D Intake in Expectant Women and Neonatal Birth Weight <i>Cindy Rolexa, Fathia Meirina</i>	70-77
Estrogen Levels in Female White Rats (<i>Rattus Norvegicus</i>) Wistar Strains <i>Cinthya Fitri Paramitha, Mita2 Herdiyantini, Eric Mayo Dagradi, Annisa Ullya Rasyida</i>	78-84

Effect of Rambusa Fruit Extract (*Passiflora Foetida*) on the Growth of *Streptococcus Pyogenes* Bacteria 85-93

Gede Vito Chandra Pramana, Nugroho Eko Wirawan Budianto

Acknowledgement to Reviewers

The editors of Jurnal Ilmiah Kedokteran Wijaya Kusuma (JIKW) would like to sincerely thank the peer reviewers/Bestari Partners who have reviewed the articles published in the Wijaya Kusuma Medical Scientific Journal Vol. 13, No. 1, March 2024. The following Bestari partners include:

1. Dr. dr. Basuki Supartono, Sp.OT., FICS, MARS (Fakultas Kedokteran UPN Veteran Jakarta, Indonesia)
2. Dr. Erny, dr., Sp.A (K) (Ilmu Kesehatan Anak/ FK Universitas Wijaya Kusuma Surabaya)
3. Ferry Efendi, Ph.D., S.Kep., Ns., M.Sc (Fakultas Keperawatan/ Universitas Airlangga)
4. Prof. Win Darmanto, PhD., M.Si (Biologi/ FST Universitas Airlangga)
5. Dr. Willy Sandhika, dr., M.Si., Sp.PA (K) (Patologi Anatomi/ FK Universitas Airlangga)
6. Prof. Dr. dr. Suhartati, MS (Biokimia/ FK Universitas Wijaya Kusuma Surabaya)
7. Dr. H. Artha Budi Susila Duarsa, dr., M.Kes
8. Dr. Drs. Eko Suhartono, M.Si (Biokimia/ FK Universitas Lambung Mangkurat, Banjarmasin)
9. Dr. Harry Kurniawan Gondo, Sp. OG (K) (Kebidanan & Penyakit Kandungan/ FK Universitas Wijaya Kusuma Surabaya)
10. DR. dr. Ami Febriza, M.Kes (Biomedik/ FK Universitas Muhammadiyah Makassar)
11. Mudyawati Kamaruddin, dr., M. Kes., PhD, (Pascasarjana Ilmu Laboratory Medik/ FK Universitas Muhammadiyah Semarang, Indonesia)
12. Ir. Ratna Chrismiari Purwestri, M.Sc., Dr.sc.agr (Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Czech Republic)
13. Dr. Dra. Dorta Simamora, M.Si (Biomedik/ FK Universitas Wijaya Kusuma Surabaya)
14. Fitri Handajani, dr., M.Kes. (Biokimia/ FK Universitas Hang Tuah Surabaya)

ARTICLE INFO

AUTHOR'S AFFILIATIONS

Department of Pharmacology,
 Medical Faculty, Universitas
 Wijaya Kusuma Surabaya^{1,2}
 Faculty of Public Health,
 Universitas Muhammadiyah
 Gresik³

CORRESPONDING AUTHOR

Nugroho Eko Wirawan Budianto
 Department of Pharmacology,
 Medical Faculty, Universitas
 Wijaya Kusuma Surabaya.
E-mail:
nugrohoewb@uwks.ac.id

Article history

Received 13-01-2024
 Revised 08-03-2024
 Accepted 22-03-2024
 Available online

Please cite this article in APA 7th edition style as:

Budianto, N. E. W, Setiawan, B., Budiono, N. D. P. (2024). Routine hematology description and D-dimer COVID-19 patients at Sidoarjo Regional Hospital. *Jurnal Ilmiah Kedokteran Wijaya kusuma*, 13(1), XX-XXX
<https://doi.org/10.30742/jikw.v13i1.3537>

Routine Hematology Description and D-dimer COVID-19 Patients at Sidoarjo Regional Hospital

Nugroho Eko Wirawan Budianto^{1}, Budhi Setiawan², Nugrahadi Dwi Pasca Budiono²*

Abstract

Background: COVID-19, caused by the SARS-COV-2 virus, is a contagious and potentially fatal disease that is commonly diagnosed using real-time reverse polymerase chain reaction (RT-PCR) assay. Studies have shown that the D-dimer level and the features of hematological exams can offer important prognostic value of the patients. This study aimed to describe data about the routine hematology features and D-Dimer levels of hospitalized COVID-19 patients in Sidoarjo Regional Hospital. **Methods:** This study used a retrospective, cross sectional, observational approach with descriptive analysis. Medical records of 167 COVID-19 patient were collected based on the criteria. The outcomes of the D-dimer and complete blood count of the patients were summarized. **Results:** According to the findings, the number of the patients with COVID-19, 53 (31.7%) were between the ages of 31 and 35, and at least 36 (21.6%) were between the ages of 17 and 30. Prominent hematology routine outcomes were the number of patients with anemia (103 or 61.7%), neutrophilia (105 or 62.9%), and lymphocytopenia (129 or 77.2%). The D-dimer value increased by 93 (55.7%) patients among 167 COVID-19 patients. **Conclusion:** Therefore, monitoring the patient's routine hematological presentation and D-dimer level during treatment is essential for preventing mortality and morbidity.

Keywords: COVID-19, D-dimer, SARS-CoV-2, routine hematology

Original Research Article

INTRODUCTION

COVID-19 infection is a fatal respiratory disease if untreated. The initial name of betacoronavirus disease was SARS-COV-2 Coronaviruses (COV) and the 2019 Coronavirus Novel (2019-nCov). Nevertheless, the World Health Organization (WHO) changed its name to COVID-19, or Coronavirus Disease 2019, instead. The number of cases continues to increase since it first appeared in the city of Wuhan, China, at the end of 2019. It is estimated that the first person infected in Indonesia on March 2, 2020, was a tourist (Handayani et al., 2020).

Studies have demonstrated the prognostic significance of D-dimer levels, which have emerged as a key predictor in COVID-19 patients. discovered a relationship between hsCRP and D-dimer levels in COVID-19 patients, specifically in relation to inflammatory markers (Y. Li et al., 2021; Naymagon et al., 2020; Yu et al., 2020). D-dimmer is a sign of coagulopathy that is often found in COVID-19 patients and is related to the severe condition of the disease (Ardiani et al., 2023). This is because the patient's

D-dimer can increase because of the innate disease carried by the patient (Rostami & Mansouritorghabeh, 2020). D-dimer is known as a strong indicator of morbidity and mortality among COVID-19 patients (Gungor et al., 2021).

The RT-PCR assay and routine hematological profile screening are particularly useful tools for physicians in identifying COVID-19. Numerous COVID-19 studies have employed these tests for disease screening and surveillance (Fitriani, 2020; Susilo et al., 2020; Wu et al., 2020). Leucopenia, lymphopenia, and increased neutrophil counts are a few hematological presentations that may raise the possibility of COVID-19, as well as the quantity of atypical leukocytes (Sabatudung et al., 2023).

Decreased albumin level and increased lactate dehydrogenase (LDH), SGOT, blood sedimentation rate (LED), and C-reactive protein (CRP) levels are also some laboratory abnormalities found in COVID-19 patients. Therefore, the purpose of this study was to assess the D-dimer levels and routine hematologic characteristics of hospitalized COVID-19 patients at Sidoarjo Regional Hospital.

MATERIALS AND METHODS

This study was a retrospective cross-sectional secondary data collection study using a quantitative descriptive approach. Secondary data were retrieved from the paper medical record database of the Sidoarjo Regional Hospital, Sidoarjo, Indonesia. Paper-based medical records of patients older than 18-year who were clinically diagnosed with COVID-19 were purposefully selected for further analysis. Administrative, physical examination, and laboratory data of the patients were collected in the excel spreadsheet template. Data on hospitalized COVID-19 patients were collected between May and August 2021. Inclusion criteria involved the COVID-19 patient's medical records that showed positive PCR assay and had both, the results of D-dimer test and routine hematology examination. The exclusion criteria were pregnancy and severe comorbidities such as renal impairment, hepatic diseases, and cardiovascular disorders.

RESULTS

Table 1. Characteristics of Patients Based on Age and Gender

Age (year)	Male	Female	%
17-30	18	18	21.6
31-45	25	28	31.7
46-59	20	17	22.1
≥60	24	17	24.6
TOTAL	87	80	100

Table 1 shows the 167 COVID-19 patients who fulfilled the requirements for inclusion. According to table 1, 52.1% of all patients (87 individuals) were male. The highest percentage of patients was 53 (31.7%) in the age group 31 to 45 years, and the lowest percentage was 36 (21.6%) in the age group 17 to 30 years.

Table 2. Patient's Routine Hematology Parameters

Parameter	Results	Total (n)	Percentage (%)
Erythrocyte (RBC)	Decrease	22	13.2
	Normal	143	85.6
	Increase	2	1.2
Hemoglobin (HGB)	Decrease	103	61.7
	Normal	64	38.3
	Increase	0	0

Leucocyte (WBC)	Leukopenia	19	11.4
	Normal	122	73
	Leukocytosis	26	15.6
Monocyte	Monocytopenia	6	3.6
	Normal	106	63.5
	Monocytosis	55	32.9
Neutrophil	Neutropenia	13	7.8
	Normal	49	29.3
	Neutrophilia	105	62.9
Lymphocyte	Lymphocytopenia	129	77.2
	Normal	26	15.6
	Lymphocytosis	12	7.2
Eosinophil	Eosinopenia	0	0
	Normal	160	95.8
	Eosinophilia	7	4.2
Thrombocyte (PLT)	Thrombocytopenia	24	14.4
	Normal	122	73
	Thrombocytosis	21	12.6

Table 2 displays the percentage of COVID-19 patients who had hemoglobin and lymphocyte test results that are higher than normal: 103 (61.7%) and 129 (77.2%), respectively. Furthermore, a substantial number of 129 (77.2%) COVID-19 patients had neutrophil test values that were greater than normal. The results of the tests for erythrocytes, leucocytes, monocytes, eosinophils, and thrombocytes among all the patients indicated that the percentage of patients with normal values was higher than that with abnormal values.

According to table 3, there were 93 patients (55.7%) whose D-dimer level was abnormal or higher than 500 ng/dL. Male and female distributions were comparable, based on D-dimer concentration findings.

Table 3. Gender Overview Based on D-dimer's examination

Gender	Normal	Abnormal (>500 ng/dL)
Male	40	47
Female	34	46
Total	74	93

Table 4. Overview of the results of D-dimer's examination based on age

Age (year)	Abnormal (>500 ng/dL)	Normal
17-30	18	18
31-45	24	29
46-59	20	17
≥60	31	10
Total	93	74

Table 4 shows that out of 167 COVID-19 patients, 93 patients (55.7% of the total) had D-dimer concentrations greater than 500 ng/dL, whereas 74 patients had normal D-dimer levels. Patients who were 60 years of age or older had the highest number (31 or 18.6%), while those in the 17–30 age range had the lowest (18 or 10.8%).

DISCUSSION

D-dimer analysis and routine complete blood counts (CBC) are crucial for the risk classification of COVID-19 patients. In a similar vein, the significance of hematological findings in COVID-19 was highlighted by the systemic effect of the virus on the hematopoietic system and hemostasis (Terpos et al., 2020). Laboratory results of COVID-19 patients with severe symptoms showed an increase in CRP, increased D-dimer, prothrombin time extension, lymphocytopenia, procalcitonin, neutrophilia, albumin, leukopenia, and LDH. In addition, several studies have shown that patients with COVID-19 can experience anemia and thrombocytopenia (Christensen et al., 2020; Shama et al., 2023).

The study findings indicated that while the proportion of COVID-19 patients with anemia was quite high (103, or 61.7%), the majority of patients (143, or 85.6%) had normal erythrocyte counts. The difference in the normal range of the parameters and incidence rate between males and females may be the cause of this inconsistency. In addition, if most of the patients had mild anemia and were only marginally different from the cutoff value, this specific condition might be possible (Bergamaschi et al., 2021).

The interaction between the Sars-COV-2 virus and hemoglobin molecules can occur via erythrocyte receptors, specifically CD147 and CD26. Hemoglobinopathy, which results from this interaction, leads to hemolysis and hemoglobin malfunction. Moreover, ferroportin, which produces hyperferritinemia, and ferroptosis, which causes iron dysmetabolism, are inhibited by the viral hepcidin mimetic effect (Cavezzi et al., 2020). The interpretation of RBC, HGB, and MCV can be normal or slightly lowered in the case of a corona virus infection. The average volume of the corpuscular (MCV), also referred to as the average volume of erythrocytes and hemoglobin, and the number of erythrocytes, or red blood cells (RBC), are known to be correlated (C. Li et al., 2020). Hemolysis, or a drop in hemoglobin, may result from the virus's attack on the heme in the 1-beta hemoglobin chain. This could lead to anemia (Al-kuraishy et al., 2022). Patients with severe COVID-19 disease have a considerably lower hemoglobin values than those with milder variants (Lippi & Mattiuzzi, 2020).

In this study, the number of patients with neutrophilia (105, or 62.9%), and lymphocytopenia (129, or 77.2%) were the prominent outcomes for routine hematology. The neutrophil-to-lymphocyte ratio (NLR) characteristics are derived from the number of neutrophils and lymphocytes. Individuals with a mild prognosis have lower NLR scores than those who are terminally ill and cannot survive. The strength of inflammatory responses is shown by the increase in neutrophils, and immune system damage is indicated by the decline in lymphocytes (Prozan et al., 2021). The controlled immune cell response modifies the virus's inflammatory level. Consequently, the inflammatory level may be predicted using the NLR value. It is feasible to evaluate the COVID-19 risk variables using the greater value of the NLR (Liu et al., 2020). Although lymphocytes are only a risk factor for the disease, the value of NLR shows good performance, which can be used for diagnosis and disease prognosis (Asghar et al., 2022; Peng et al., 2020). If the immune system is weak, the virus can enter the body and cause a decrease the number of lymphocytes. Because a reduction in lymphocyte count may indicate immune system harm, the COVID-19 virus may disrupt the immune system (Mus et al., 2021).

The results of the D-dimer examination in table 3 and table 4 show that 167 patients with COVID-19, there were 93 (55.7%) patients who had abnormal outcomes (higher than 500 ng/dL). According to previous studies, poor radiological imaging and elevated clinical severity are linked to elevated D-Dimer levels (Rostami & Mansouritorghabeh, 2020). Higher D-dimer levels upon hospital admission have been linked to a higher risk of illness and mortality in SARS-COV-2 infected patients (Amelia et al., 2022). Elevated D-dimer levels, illness severity, and mortality were also substantially correlated with older adult age and diabetes (Soni et al., 2020). Furthermore, patients with severe COVID-19 frequently have elevated D-dimer levels, which can indicate the occurrence of ARDS (acute respiratory distress syndrome) will occur (Ryadi et al., 2022).

The result of laboratory examinations in this study showed that the number of the patients with thrombocytopenia was 24 (14.4%). This result differed from that of research done in China in 2020 by Guan et al., who discovered that leukopenia affects 33.7% of patients, thrombocytopenia affects 36.2%

of patients, and lymphocytopenia affects 83.2% of patients (Guan et al., 2020). According to several studies (Guan et al., 2020; Huang et al., 2020; Liu et al., 2020; Zhou et al., 2020), compared with non-severe cases, patients with severe COVID-19 have lower platelet counts. Patients with thrombocytopenia COVID-19 may have disseminated intravascular coagulation (DIC), vascular coagulopathy, significant organ injury, or physiological decompensation as contributing factors (Kaiafa et al., 2022).

This preliminary study was limited in a few ways. Initially, a significant portion of medical records did not fit the inclusion requirements of the study because the patients had various laboratory tests. Second, the study's tiny sample size of medical records and third, the incomplete nature of the test results precluded drawing firm conclusions. This means that more research, including statistical analysis, is required.

CONCLUSION

In summary, data from hospitalized COVID-19 patients revealed a notable presence of anemia, neutrophilia, and lymphocytopenia. It was found that more than 50% of COVID-19 patients had elevated D-dimer concentrations. D-dimer assay and routine hematological examinations are essential components of all-encompassing care for COVID-19 patients.

CONFLICT OF INTEREST

All authors declare that there is no conflict of interest in this study.

ACKNOWLEDGEMENTS

The author would like to thank the research and community service institution to the University of Wijaya Kusuma Surabaya (LPPM) in Surabaya, Indonesia, which supports this work through an internal grant scheme (No. 85/LPPM/UWKS/IV/2022).

REFERENCES

- Al-kuraishy, H. M., Al-Gareeb, A. I., Kaushik, A., Kujawska, M., & Batiha, G. E.-S. (2022). Hemolytic Anemia in COVID-19. *Annals of Hematology*, 101(9), 1887–1895. <https://doi.org/10.1007/s00277-022-04907-7>
- Amelia, R., Anissa, D. F. N., & Luhulima, D. E. J. (2022). Perbedaan Peningkatan Kadar D-Dimer pada Dewasa dan Lansia Yang Terkonfirmasi COVID-19 di RS Swasta Bintaro. *Journal of Research and Education Chemistry (JREC)*, 4(1), 1–8.
- Ardiani, S., Tursinawati, Y., & Wahab, Z. (2023). Hubungan D-Dimer dengan Ketahanan Hidup Pasien Covid-19 Derajat Berat-Kritis di RSUD Tugurejo Semarang. *Health and Medical Journal*, 5(1), 44–49.
- Asghar, M. S., Akram, M., Yasmin, F., Najeeb, H., Naeem, U., Gaddam, M., Jafri, M. S., Tahir, M. J., Yasin, I., Mahmood, H., Mehmood, Q., & Marzo, R. R. (2022). Comparative Analysis of Neutrophil to Lymphocyte Ratio and Derived Neutrophil to Lymphocyte Ratio with Respect to Outcomes of in-Hospital Coronavirus Disease 2019 Patients: A Retrospective Study. *Frontiers in Medicine*, 9. <https://doi.org/10.3389/fmed.2022.951556>
- Bergamaschi, G., Borrelli de Andreis, F., Aronico, N., Lenti, M. V., Barteselli, C., Merli, S., Pellegrino, I., Coppola, L., Cremonese, E. M., Croce, G., Mordà, F., Lapia, F., Ferrari, S., Ballesio, A., Parodi, A., Calabretta, F., Ferrari, M. G., Fumoso, F., Gentile, A., ... Stefani, D. (2021). Anemia in Patients with COVID-19: Pathogenesis and Clinical Significance. *Clinical and Experimental Medicine*, 21(2), 239–246. <https://doi.org/10.1007/s10238-020-00679-4>
- Cavezzi, A., Troiani, E., & Corrao, S. (2020). COVID-19: Hemoglobin, Iron, and Hypoxia Beyond Inflammation. A Narrative Review. *Clinics and Practice*, 10(2), 1271. <https://doi.org/10.4081/cp.2020.1271>

- Christensen, B., Favalaro, E. J., Lippi, G., & Van Cott, E. M. (2020). Hematology Laboratory Abnormalities in Patients with Coronavirus Disease 2019 (COVID-19). *Seminars in Thrombosis and Hemostasis*, 46(07), 845–849.
- Fitriani, N. I. (2020). Tinjauan pustaka covid-19: Virologi, Patogenesis, dan Manifestasi Klinis. *Jurnal Medika Malahayati*, 4(3), 194–201.
- Guan, W., Ni, Z., Hu, Y., Liang, W., Ou, C., He, J., Liu, L., Shan, H., Lei, C., & Hui, D. S. C. (2020). Clinical Characteristics of Coronavirus Disease 2019 in China. *New England Journal of Medicine*, 382(18), 1708–1720.
- Gungor, B., Atici, A., Baycan, O. F., Alici, G., Ozturk, F., Tugrul, S., Asoglu, R., Cevik, E., Sahin, I., & Barman, H. A. (2021). Elevated D-Dimer Levels on Admission are Associated with Severity and Increased Risk of Mortality in COVID-19: A Systematic Review And Meta-Analysis. *The American Journal of Emergency Medicine*, 39, 173–179. <https://doi.org/10.1016/j.ajem.2020.09.018>
- Handayani, D., Hadi, D. R., Isbaniah, F., Burhan, E., & Agustin, H. (2020). Corona Virus Disease 2019. *Jurnal Respirologi Indonesia*, 40(2), 119–129.
- Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., ... Cao, B. (2020). Clinical Features of Patients Infected with 2019 Novel Coronavirus in Wuhan, China. *The Lancet*, 395(10223), 497–506. [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5)
- Kaiafa, G., Savopoulos, C., Karlafti, E., Pantazi, K., Paramythiotis, D., Thomaidou, E., Daios, S., Ztriva, E., Gionis, M., Fyntanidou, V., Argiriadou, H., & Didangelos, T. (2022). Coagulation Profile of COVID-19 Patients. *Life*, 12(10), 1658. <https://doi.org/10.3390/life12101658>
- Li, C., Zhao, C., Bao, J., Tang, B., Wang, Y., & Gu, B. (2020). Laboratory Diagnosis of Coronavirus Disease-2019 (COVID-19). *Clinica Chimica Acta*, 510, 35–46.
- Li, Y., Deng, Y., Ye, L., Sun, H., Du, S., Huang, H., Zeng, F., Chen, X., & Deng, G. (2021). Clinical Significance of Plasma D-Dimer in COVID-19 Mortality. *Frontiers in Medicine*, 8. <https://doi.org/10.3389/fmed.2021.638097>
- Lippi, G., & Mattiuzzi, C. (2020). Hemoglobin Value May be Decreased in Patients with Severe Coronavirus Disease 2019. *Hematology, Transfusion and Cell Therapy*, 42(2), 116–117. <https://doi.org/10.1016/j.htct.2020.03.001>
- Liu, W., Tao, Z.-W., Wang, L., Yuan, M.-L., Liu, K., Zhou, L., Wei, S., Deng, Y., Liu, J., & Liu, H.-G. (2020). Analysis of Factors Associated with Disease Outcomes in Hospitalized Patients with 2019 Novel Coronavirus Disease. *Chinese Medical Journal*, 133(09), 1032–1038.
- Mus, R., Thasliifa, T., Abbas, M., & Sunaidi, Y. (2021). Studi Literatur: Tinjauan Pemeriksaan Laboratorium pada Pasien COVID-19. *Jurnal Kesehatan Vokasional*, 5(4), 242.
- Naymagon, L., Zubizarreta, N., Feld, J., van Gerwen, M., Alsen, M., Thibaud, S., Kessler, A., Venugopal, S., Makki, I., Qin, Q., Dharmapuri, S., Jun, T., Bhalla, S., Berwick, S., Christian, K., Mascarenhas, J., Dembitzer, F., Moshier, E., & Tremblay, D. (2020). Admission D-Dimer Levels, D-Dimer Trends, and Outcomes in COVID-19. *Thrombosis Research*, 196, 99–105. <https://doi.org/10.1016/j.thromres.2020.08.032>
- Peng, J., Qi, D., Yuan, G., Deng, X., Mei, Y., Feng, L., & Wang, D. (2020). Diagnostic Value of Peripheral Hematologic Markers for Coronavirus Disease 2019 (COVID-19): A Multicenter, Cross-Sectional Study. *Journal of Clinical Laboratory Analysis*, 34(10). <https://doi.org/10.1002/jcla.23475>
- Prozan, L., Shusterman, E., Ablin, J., Mitelpunkt, A., Weiss-Meilik, A., Adler, A., Choshen, G., & Kehat, O. (2021). Prognostic Value of Neutrophil-To-Lymphocyte Ratio in COVID-19 Compared with Influenza and Respiratory Syncytial Virus Infection. *Scientific Reports*, 11(1), 21519. <https://doi.org/10.1038/s41598-021-00927-x>
- Rostami, M., & Mansouritorghabeh, H. (2020). D-Dimer Level in COVID-19 Infection: A Systematic Review. *Expert Review of Hematology*, 13(11), 1265–1275.

- Ryadi, Y., Rahardjo, S. S., & Ichsan, B. (2022). Meta-Analysis: The Effect of D-Dimer on Mortality in Patients with COVID-19. *Journal of Epidemiology and Public Health*, 7(4), 552–561. <https://doi.org/10.26911/jepublichealth.2022.07.04.11>
- Sabatudung, C., Bia, M. B., & Kambuno, N. T. (2023). Gambaran Hematologi Rutin dan D-Dimer Pasien COVID-19 Kota Kupang. *Journal of Indonesian Medical Laboratory and Science (JoIMedLabS)*, 4(1), 14–24.
- Shama, Mahmood, A., Mehmood, S., & Zhang, W. (2023). Pathological Effects of SARS-CoV-2 Associated with Hematological Abnormalities. *Current Issues in Molecular Biology*, 45(9), 7161–7182. <https://doi.org/10.3390/cimb45090453>
- Soni, M., Gopalakrishnan, R., Vaishya, R., & Prabu, P. (2020). D-Dimer Level is a Useful Predictor for Mortality in Patients with COVID-19: Analysis of 483 Cases. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 14(6), 2245–2249. <https://doi.org/10.1016/j.dsx.2020.11.007>
- Susilo, A., Rumende, C. M., Pitoyo, C. W., Santoso, W. D., Yulianti, M., Herikurniawan, H., Sinto, R., Singh, G., Nainggolan, L., & Nelwan, E. J. (2020). Coronavirus Disease 2019: Tinjauan Literatur Terkini. *Jurnal Penyakit Dalam Indonesia*, 7(1).
- Terpos, E., Ntanasis-Stathopoulos, I., Elalamy, I., Kastritis, E., Sergeantanis, T. N., Politou, M., Παλτοπούλου, Θ., Gerotziapas, G. T., & Dimopoulos, M. A. (2020). Hematological Findings and Complications of COVID-19. *American Journal of Hematology*, 95(7):834-847 <https://doi.org/10.1002/ajh.25829>
- Wu, S. Y., Yau, H. S., Yu, M. Y., Tsang, H. F., Chan, L. W. C., Cho, W. C. S., Shing Yu, A. C., Yuen Yim, A. K., Li, M. J. W., & Wong, Y. K. E. (2020). The Diagnostic Methods in the COVID-19 Pandemic, Today and in the Future. *Expert Review of Molecular Diagnostics*, 20(9), 985–993.
- Yu, B., Li, X., Chen, J., Ouyang, M., Zhang, H., Zhao, X., Tang, L., Luo, Q., Xu, M., Yang, L., Huang, G., Liu, X., & Tang, J. (2020). Evaluation of Variation in D-Dimer Levels Among COVID-19 and Bacterial Pneumonia: a Retrospective Analysis. *Journal of Thrombosis and Thrombolysis*, 50(3), 548–557. <https://doi.org/10.1007/s11239-020-02171-y>
- Zhou, P., Yang, X.-L., Wang, X.-G., Hu, B., Zhang, L., Zhang, W., Si, H.-R., Zhu, Y., Li, B., Huang, C.-L., Chen, H.-D., Chen, J., Luo, Y., Guo, H., Jiang, R.-D., Liu, M.-Q., Chen, Y., Shen, X.-R., Wang, X., ... Shi, Z.-L. (2020). A Pneumonia Outbreak Associated with a New Coronavirus of Probable Bat Origin. *Nature*, 579(7798), 270–273. <https://doi.org/10.1038/s41586-020-2012-7>