pISSN: 2621-539X / eISSN: 2621-5470

Vol.7 No.2 | Juli 2024

JURNAL BIOMEDIKA DAN KESEHATAN

Publikasi dari Fakultas Kedokteran Universitas Trisakti

Editorial

Eyelid Infection(Blepharitis)Problem In The Elderly Husnun Amalia, Megawati Yuliawina Pratiwi, Ita Tazkiatul Izzati Mustopa

Original Article

Dietary Arrangements And Exercise Activities Were Associated With Glycemic Control In Diabetes Patients At Grogol Petamburan Subdistrict Public Health Center Sirly Hidhayanti Ramelan, Kartini

> Impact Of Cotrimoxazole On The Development Of Chicken Embryo Neural Tube Alifia shafa naurapamuji, Cutfauziah, Yanto sandy tjang et al

Enhancing Salivary Dna Preservation Via Dnase I Inactivation: Role Of Temperature And Edta Zulhamyamamoto, Nurul Sulviani, Sry Suryani Widjaja

The Relationship Between Spiritual Quotient With Stress Levels Onmedical Students In Semarang Nurahmat Yanisa Irfandi , Ratih Widayati , Wijayanti Fuad

Nuranmat ramsa manur, Natin Widayati , Wijayanti ruad

Massive Transfusion And Intensive Management After Hysterectomy In Placenta Accreta Alfi Marita Tristiarti, Eric Edwin Yuliantara.

The Relationship Between Self-Esteem And Emotional Disorders In Adolescents At Senior High School *Rifat Adi Hendrianto, Erita Istriana*

Rinal Aur Hendhanilo, Enila Islinano

The Analysis Of Work Fatigue And Proposed Improvement Using The Bourdon Wiersma Method And New Seventools Vera Devani, Abim Wahyu Maypando

The Effect Of Preoperative Oral Glucose Administration On Blood Glucose Levels In Diabetes Mellitus Patients In General Anesthesia Surgery Dhiny Yolanda Harahap, Achsanuddin Hanafie, Andriamuri Primaputra et al

Factors Affecting Stunted Status In Children Under-Two-Years At Karya Mulia Public Health Center2023 Dery Wahyudi, Namira Alifah Fahiratunnisa, Muhammad Wildan et al

The Effect Of Mung Bean Sprout Extract (Phaseolus Radiatus L.) On Catalase Levels In Male

Wistar Rats Induced Paraquat Herbicide Angga Pria Sundawa, Reza Adityas Trisnadi, Annisa Nurul Hikmah

Matos-Carvalho Index As A Comparison To Other Discriminant Indexes Ininitial Beta Thalassemia Mulyadi, Mulyati, Tri Ratnaningsih et al

Case Report

Eyelid Dermoid Cyst: A Case Report Riani Witjaksana, Husnun Amalia, Nany Hairunisa et al

Cholestatic Jaundice Due Tobiliary Atresia With Cytomegalovirus And Malaria Infection: Blood Transfusion-Transmitted Infection? Mario, Yasmine Mashabi, Nany Hairunisa

Review Article

Emerging Threats In The Age Of Pandemics: A Focus On COVID-19 And The Novel Sub-Variant EG 5 ("Eris"): Review Article Raghda Alsayed, Hamsa Thamer, Seenar Hameed et al

Microbiology Examination For Diagnosis Of Mycobacterium Other Than Tuberculosis (MOTT) Infection Arleen Devita, Ade Dharmawan

www.jbiomedkes.org

Dewan Redaksi



Ketua Penyunting (Editor-in-Chief) Dr. dr. Husnun Amalia, Sp.M Departemen Ilmu Penyakit Mata, Fakultas Kedokteran Universitas Trisakti, Indonesia

Wakil Ketua Penyunting (Deputy Editor-in-Chief)

Dr. Drs. ML. Edy Parwanto, M.Biomed Departemen Biologi Kedokteran, Fakultas Kedokteran Universitas Trisakti, Indonesia

Penyunting Ahli (Associate Editor)

dr. Nany Hairunisa, MCHSc Departemen Ilmu Kedokteran Kerja, Fakultas Kedokteran Universitas Trisakti, Indonesia

Dewan Penyunting (Editorial Boards)

Prof. Dr. dr. Adi Hidayat, MS (Indonesia) Dr. dr. Yenny, Sp.FK (Indonesia) dr. Laksmi Maharani, Sp.OG (Indonesia) dr. Monica Dwi Hartanti, M.Biomed, PhD (Indonesia) Dr. dr. Raditya Wratsangka, Sp.O.G, Subsp. Obginsos (Indonesia) Dr. Siti Sugih Hartiningsih, S.Si, M.Kes (Indonesia) dr. Dito Anurogo, M.Sc (Indonesia) Prof. Dr. Emad Yousif (Irak)

> Editor Produksi Afton Muhandis, S.I.Kom

Alamat Korespondensi

Fakultas Kedokteran Universitas Trisakti Jalan Kyai Tapa Np. 260 (Kampus B) Grogol, Jakarta 11440 Telp. 021-5672731 ext. 2502 | Fax. 021-5660706 www.jbiomedkes.org | E-mail: jbiomedkes@trisakti.ac.id

> **Penerbit** Fakultas Kedokteran Universitas Trisakti

Q n hairunisa 241 🔻

Jurnal Biomedika dan Kesehatan

Jurnal Biomedika dan Kesehatan (J Biomedika dan Kesehat) () is a peer-reviewed journal publish by Faculty of Medicine Universitas Trisakti. Starting in 2024, JBK is a fourthmonthly (March, July, November) medical journal that publishes new research findings on a wide variety of topics of importance to biomedical science and clinical practice (Biochemistry, Epidemiology, Health Profession, Occupational Therapy, medicine, Public Health).

Since 2019, JBK has been indexed and accreditated in the Science and Technology Index (SINTA) 3, by the Ministry of Research, Technology and Higher Education Indonesia.

Each manuscript will go through a review process.



SEND ARTICLE



Current Issue

Vol. 7 No. 2 (2024)

Published: 2024-07-31

Editorial

Eyelid Infection (Blepharitis) Problem In The Elderly

Husnun Amalia; Megawati Yulia Wina Pratiwi, Ita Tazkiatul Izzati Mustopa

D PDF

Original Article

The Analysis of Work Fatigue and Proposed Improvement Using the Bourdon Wiersma Method and New Seven Tools Vera Devani

🔁 PDF

Dietary Arrangements and Exercise Activities were Associated with Glycemic Control in Diabetes Patients at Grogol Petamburan Subdistrict Public Health Center Sirly Hidhayanti, Kartini Kartini

🔁 PDF

The Effect of Preoperative Oral Glucose Administration on Blood Glucose Levels in Diabetes Mellitus Patients in General Anesthesia Surgery Dhiny Yolanda Harahap, Achsanuddin Hanafie, Andriamuri Primaputra Lubis, Rina Amelia

🖾 PDF

Factors Affecting Stunted Status in Children Under-Two-Years at Karya Mulia Public Health Center 2023

Lala Namira Alifah Fahiratunnisa

The Effect of Mung Bean Sprout Extract (Phaseolus radiatus L.) on Catalase Levels in Male Wistar Rats Induced Paraquat Herbicide

Angga Pria Sundawa, Reza Adityas Trisnasdi , Annisa Nurul Hikmah

🖾 PDF

MATOS-CARVALHO INDEX AS A COMPARISON TO OTHER DISCRIMINANT INDEXES IN INITIAL BETA THALASSEMIA SCREENING

Mulyadi Ong, Niken Satuti Nur Handayani, Mulyati, Tri Ratnaningsih, Nur Imma Harahap, Indra Lesmana



Impact of Cotrimoxazole on the Development of Chicken Embryo Neural Tube

Alifia Shafanaura Pamuji

🛆 PDF

DNase I Inactivation for Salivary DNA Preservation

Nurul Sulviani



The Relationship Between Spiritual Quotient And Stress Level Of S1 Students Of Medicine Faculty Of Muhammadiyah University Semarang Class Of 2021 Nurahmat Yanisa irfandi

🔁 PDF

Massive Tranfusion and Intensive Management after Hysterectomy in Placenta Accreta

Alfi Marita Trsitiarti, Eric Edwin Yuliantara

🖾 PDF

The Relationship Between Self-Esteem and Emotional Disorders in Adolescents at Senior High School

Rifat Adi Hendrianto, Erita Istriana

🖾 PDF

Case Report

Eyelid Dermoid Cyst: A Case Report

Riani Witjaksana, Husnun Amalia, Nany Hairunisa, Erlani Kartadinata, Anggraeni Adhiwardan, Noviani Prasetyaningsih

🔁 PDF

Cholestatic Jaundice Due To Biliary Atresia With Cytomegalovirus And Malaria Infection: Blood Transfusion-Transmitted Infection?

Mario Mario, Yasmine Mashabi, Nany Hairunisa

🖾 PDF

Review Article

 \checkmark

Emerging Threats in the Age of Pandemics: A Focus on COVID-19 and the Novel Sub-Variant EG 5 ("Eris"): Review Article

Raghda Alsayed, Hamsa Thamer, Seenar Hameed, Mohammed Kadhom, Nany Hairunisa, Husnun Amalia, Yasmine Mashabi, Dina Ahmed, Sarah Mahdi, Amani Husain, Israa Salman, Emad Yousif

DF 🖸

Microbiology Examination for Diagnosis of Mycobacterium other than Tuberculosis (MOTT) Infection

Arleen Devita, Ade Dharmawan

🖾 PDF

View All Issues >



Umal Biomedika dan Kesehatan (JBK) is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

175392 View My Stats

© Platform & Workflow by: Open Journal Systems Designed by Material Theme

 \checkmark



JURNAL BIOMEDIKA DAN KESEHATAN (JOURNAL OF BIOMEDIKA AND HEALTH)

Vol. 7 No. 2 (2024) pp. ***-***

e-ISSN: 2621-5470

REVIEW ARTICLE

Emerging Threats in the Age of Pandemics: A Focus on COVID-19 and the Novel Sub-Variant EG 5 ("Eris"): Review Article

Raghda Alsayed¹, Hamsa Thamer¹, Seenar Hameed¹, Mohammed Kadhom², Nany Hairunisa³, Husnun Amalia⁴, Yasmine Mashabi⁵, Dina Ahmed⁶, Sarah Mahdi¹, Amani Husain⁷, Israa Salman⁸, Emad Yousif¹

¹Department of Chemistry, College of Science, Al-Nahrain University, Baghdad, Iraq ²Department of Environmental Science, College of Energy and Environmental Sciences, Al-karkh University of Science, Baghdad, Iraq ³Department of Occupational Medicine, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia 4Departement of Opthalmology, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia *Sclinical Pathelary Department*, *Saculty of Medicine, Universita*, Trisakti, Jakarta, Indonesia

⁵Clinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia

⁶Department of Chemical Industries, Institute of Technology-Baghdad, Middle Technical University, Baghdad, Iraq ⁷Polymer Research Unit, College of Science, Mustansiriyah University, Baghdad 10052, Iraq

⁸College of Science, Al-Nahrain University, Baghdad, Iraq

Myasmine.mashabi@trisakti.ac.id

https://doi.org/10.18051/JBiomedKes.2024.v7.***-***

ABSTRACT

This paper draws attention to a recently identified sub-variant of SARS-CoV-2 known as EG 5, colloquially named "Eris," designated by the World Health Organization (WHO) as a variant of interest. The organization has urged nations to monitor and respond to the spread of this sub-variant since its identification on February 17, 2023. The discovery of the EG 5 variant, a sublineage of the Omicron variant, has introduced new challenges. Designated a "variant of interest" by the WHO, EG 5 carries distinctive genetic mutations, including an additional F456L amino acid mutation in the spike protein. Global prevalence has doubled, raising concerns about increased transmissibility. Although specific symptoms of EG 5 are not yet fully characterized, the variant has spread to 51 countries, with over 7,000 reported cases by August 15, 2023. The manuscript also explores the unique situation in Iraq, where, as of August 17, 2023, no EG 5 cases have been officially recorded. However, challenges such as self-treatment at. As the world grapples with the ongoing challenges of the COVID-19 pandemic, understanding the dynamics of emerging variants is crucial for effective public health responses and the development of targeted interventions.

Keywords: COVID-19; Coronavirus; EG 5; Eris; Pandemic, SARS-CoV

ABSTRAK

Artikel ini membahas mengenai sub varian SARS-CoV-2 yang bernama EG 5, yang diidentifikasi sebagai "Eris" dan ditetapkan sebagai variant of interest oleh World Health Organization (WHO). Organisasi ini memaksa negara-negara untuk memantau dan menangani kejadian penyebaran sub varian yang telah diidentifikasi sejak 17 Februari 2023. Munculnya varian EG 5 yang merupakan *subline* dari Omicron menjadi tantangan baru pada dunia Kesehatan. Varian EG 5 sebagai *variant of interest* memiliki mutasi genetik, salah satunya yaitu mutasi pada *spike protein* berupa tambahan asam amino F456L. Secara global prevalensi meningkat dua kali lipat, hal ini menimbulkan kekhawatiran terhadap peningkatan jumlah infeksi. Varian ini belum memiliki gejala yang spesifik dan telah menyebar di 51 negara, dengan kejadian lebih dari 7000 kasus pada 15 Agustus 2023. Artikel ini mengeksplorasi situasi yang unik di Irak, karena sampai 17 Agustus 2023 tidak terdapat kasus EG 5 yang dilaporkan. Namun, ada tantangan berupa swamedikasi. Saat ini dunia masih berjuang dalam penanganan pandemik COVID-19, sangat penting untuk memahami dinamika munculnya varian-varian baru untuk efektivitas respon kesehatn masyarakat dalam pengembangan intervensi yang terarah.

Kata Kunci: COVID-19; Coronavirus; EG 5; Eris; Pandemi, SARS-CoV.

INTRODUCTION

The 21st century has witnessed the recurrent emergence of highly pathogenic and widespread coronaviruses, starting with the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002, followed by the Middle East respiratory disorder coronavirus (MERS-CoV) in 2012.¹ The most recent and impactful addition to this list is the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for the COVID-19 pandemic. Clinical symptoms of COVID-19 include fever, coughing, fatigue, and, in a subset of cases, gastrointestinal complications.² Vulnerable populations, particularly the elderly and those with underlying health conditions, face a higher risk of infection and severe outcomes.³ Recognizing the severity of the situation, the WHO declared COVID-19 a public health emergency of international concern on January 30, 2020. However, the virus continues to evolve, and new variants pose ongoing challenges. In March 2020, the WHO declared COVID-19 a global pandemic, signifying the widespread impact of the novel coronavirus, SARS-CoV-2. While the majority of individuals infected with the virus experience mild to severe respiratory symptoms and recover without special care, a subset faces severe illness, particularly older individuals and those with underlying health conditions such as cancer, diabetes, cardiovascular disease, or chronic respiratory diseases.⁴ COVID-19 poses a threat to individuals of all ages, emphasizing the need for comprehensive public health strategies.⁵ By October 2020, SARS-CoV-2 had spread to 235 countries, regions, or territories, infecting over 43 million people and resulting in approximately 1.15 million deaths, reflecting a 3% fatality rate. The urgent need for an effective vaccine to manage the pandemic became apparent given the virus's rapid transmission and high mortality.4,5

Efforts to develop a COVID-19 vaccine were underway, with at least nine alternative technological platforms being researched as of July 2020. Most vaccine candidates focused on the coronavirus spike protein (S protein) and its variants as the primary antigens, given their central role in COVID-19 infection.⁶ However, other coronavirus proteins, such as the nucleocapsid, were also under investigation due to their ability to trigger effective T-cell responses and their greater genetic stability.⁷ As of May 7, 2023, global vaccination efforts have administered 13.4 billion COVID-19 vaccine doses, with 67.9% of the global population having received at least one dose. The daily administration rate stood at 4.19 million vaccines.⁸

In February 2023, a new development emerged with the identification of the EG 5 variant in China, subsequently detected in the United States in April. This variant, named "Eris," was classified by the WHO as a variant of interest, prompting heightened surveillance and response measures worldwide.⁹ This paper delves into the implications of the EG 5 variant, examining its characteristics, spread, and potential impact on the ongoing global efforts to combat COVID-19. Understanding and addressing emerging variants is crucial for adapting vaccination strategies and maintaining effective public health measures in the face of evolving threats.

EPIDEMIOLOGY

The EG 5 variant is a sublineage of the Omicron variant of COVID-19, exhibiting distinct genetic characteristics that set it apart from other coronavirus strains. It is closely related to variants that have been circulating globally and is considered a mutated version of the virus. EG 5 is specifically identified as a descendent lineage of XBB.1.9.2, sharing the same spike amino acid profile as XBB.1.5.¹⁰

Virus characteristic

Distinguishing Features of EG 5

Amino Acid Mutation in Spike Protein

EG 5 carries an additional F456L amino acid mutation in the spike protein compared to its parent XBB.1.9.2 subvariant and XBB.1.5. This mutation in the spike protein is a key genetic distinction of the EG 5 variant.^{10,11}

Subvariant EG 5.1

Within the EG 5 lineage, a subvariant known as EG 5.1 has been identified, which has an additional spike mutation Q52H. Notably, EG 5.1 represents a significant portion, accounting for 88% of the available sequences for EG 5 and its descendent lineages.^{11,12} Given these genetic alterations, the World Health Organization has classified EG 5 as a "variant of interest." This designation implies that nations are advised to closely monitor EG 5 due to concerns that it may possess changes that could potentially make it more contagious or lead to more severe outcomes.^{12,13}

Vulnerability Concerns

There are particular concerns regarding the vulnerability of certain demographic groups, especially older individuals and those with pre-existing health conditions. People with conditions such as diabetes, high blood pressure, heart and lung diseases, and cancer are considered more susceptible to infection with the EG 5 variant.¹³⁻¹⁵ This heightened vulnerability underscores the importance of closely tracking and understanding the potential impact of EG 5 on public health, and it emphasizes the need for targeted protective measures for at-risk populations.^{13,15}

Symptomatic infection

As of now, there is insufficient clinical data specifically detailing the most common symptoms associated with the EG 5 variant of the SARS-CoV-2 virus.^{16,17} However, it's essential to note that the symptoms of COVID-19, including those potentially associated with new variants, can evolve over time. In general, as the SARS-CoV-2 virus has undergone mutations throughout the pandemic, certain symptoms have become more common, while others have become less prevalent. The Centers for Disease Control and Prevention (CDC) provides a list of symptoms to watch out for in the context of COVID-19. These symptoms include fever, fatigue, body chills, chronic cough, headache, sore throat, nasal congestion or runny nose shortness of breath, or difficulty breathing.

It's important to emphasize that the information provided by the CDC is based on general observations related to COVID-19 and may not specifically reflect the symptomatology of the EG 5 variant. Continuous monitoring of clinical data and research is crucial to better understand the specific characteristics and symptoms associated with emerging variants like EG 5. Individuals experiencing any of these symptoms, especially in areas where the EG 5 variant has been identified, should seek medical attention and follow public health guidelines for testing and quarantine.¹³

Transmission

As of August 15, 2023, the EG 5 variant of SARS-CoV-2 is exhibiting a moderate growth advantage, according to the WHO risk evaluation. The variant was first reported to the WHO in February, and its prevalence, as reflected in reported sequences, has steadily increased. Global prevalence more than doubled during the summer, rising from approximately 8% in the week ending June 25 to about 17% by the week ending July 23.¹⁹ The EG 5 variant has spread widely, with reported infections in 51 countries, including major nations such as China, the United States, the Republic of Korea, Japan, Canada, Australia, Singapore, the United Kingdom, France, Portugal, and Spain.¹²

As of the specified date, more than 7,000 cases of EG5 have been reported to the WHO, spanning across more than 60 countries. It's important to note that the actual number of cases and deaths related to EG 5 is likely higher due to underreporting in several countries. Within the last 28 days (from July 10 to August 6, 2023), there were about 1.5 million new reported cases of COVID-19 and over 2,500 deaths, indicating an 80% increase compared to the preceding 28 days.²⁰ This information underscores the rapid spread of the EG 5 variant and the potential challenges associated with monitoring and controlling its prevalence on a global scale. Continuous surveillance, reporting, and research are essential to understand the trajectory of EG 5 and to implement effective public health measures in response to its circulation.¹⁸

EG 5 in Iraq

As of August 17, 2023, the Ministry of Health in Iraq has officially confirmed that the country has not recorded any cases of infection with the new Corona mutant, EG 5, known as "Iris." This is noteworthy, especially considering that an infection with the EG 5 variant was recorded in Kuwait in the middle of July. However, the absence of recorded cases in Iraq does not necessarily imply that the country has been entirely spared from the variant. There are a few key factors to consider Self-treatment at Home and Medication Availability in Private Pharmacies.

Self-treatment at Home

The statement mentions that patients are opting to treat themselves at home rather than visiting hospitals. This behavior could contribute to underreporting cases, as individuals may not be getting tested or seeking medical attention, potentially leading to an incomplete picture of the true infection rate.¹⁶

Medication Availability in Private Pharmacies

The availability of medications in private pharmacies, accessible to everyone, might influence how people manage their symptoms. If individuals are obtaining over-the-counter medicines without a formal diagnosis, this could further contribute to a lack of documented cases.¹³

It's important to emphasize that the situation may evolve, and monitoring for potential cases, especially given the global circulation of the EG 5 variant, remains crucial. Efforts to encourage testing, accurate reporting, and appropriate medical care are essential components of managing the impact of COVID-19 and its variants. Public health authorities in Iraq may need to implement strategies to enhance testing, encourage reporting, and ensure that individuals with symptoms seek appropriate medical attention.²¹ Clear communication about the importance of early detection, testing, and treatment is crucial to managing the potential spread of the EG 5 variant within the country. The self-treatment culture at home in Iraq and the accessibility of medications in private pharmacies raise questions about the completeness of reported data. As the global community navigates the ongoing challenges posed by COVID-19 and its variants, vigilance, widespread testing, and transparent reporting are imperative.

CONCLUSION

With 13.4 billion COVID-19 vaccine doses administered worldwide as of May 7, 2023. However, the dynamic nature of the virus has led to the identification of new variants, including EG 5. The EG 5 variant, also known as "Eris," carries distinct genetic mutations, particularly in the spike protein, and has exhibited a moderate growth advantage globally. While there is a dearth of specific clinical data on EG 5 symptoms, the broader symptoms are associated with COVID-19. The variant has spread to 51 countries, and as of August 15, 2023, more than 7,000 cases have been reported in over 60 countries. However, underreporting challenges persist, with the true number of cases and deaths likely higher.

ACKNOWLEDGEMENT

The authors appreciate the support provided by the Department of Chemistry at Al-Nahrain University.

AUTHORS CONTRIBUTION

All authors contributed to this article.

FUNDING

None

CONFLICT OF INTEREST

There is no known conflict for this work.

REFERENCES

- 1. Alsayed R, Kadhom M, Yousif E, et al. An Epidemiological Characteristic of the COVID-19 Among Children. Lett. Appl. NanoBioScience. 2020;9(3):1156-64. https://doi.org/10.33263/LIANBS93.11561164.
- 2. Aldoori A N, Ahmed DS, Kadhom M, et al. Herbal medicine is an alternative method to treat and prevent COVID-19. Baghdad J Biochem Applied Biol Sci. 2021;2(01):1-20. https://doi.org/10.47419/bjbabs.v2i01.25
- 3. Fojnica A, Osmanovic A, Đuzic N, et al. COVID-19 vaccine acceptance and rejection in an adult population in Bosnia and Herzegovina. Plos one. 2022;17(2):e0264754. https://doi.org/10.1371/journal.pone.0264754.
- 4. Haas J W, Bender F L, Ballou S, et al. Frequency of Adverse Events in the Placebo Arms of COVID-19 Vaccine Trials: A Systematic Review and Meta-analysis. 2022;5(1):e2143955-e2143955. doi:10.1001/jamanetworkopen.2021.43955.

- 5. Al-mashhadani H, Alsayed R, Hussain Z, et al. An Overview of Possible Therapeutic Approaches Against Novel Coronavirus Disease 2019 Pandemic. Al-Nahrain J Sci Special Issue: COVID-19.2020;3:6-11. DOI: 10.22401/ANJS.00.3.02.
- Raheem R., Kadhom M., Alhashimie EZ., et al. A Clinical-Statistical Study on COVID-19 Cases in Iraq: A Case Study. Al-Nahrain Journal of Science. Special Issue: COVID-19.2021;5:6-12. DOI: 10.22401/ANJS.00.5.02.
- 7. Alsayed R., Zainulabdeen K., Salman I., Comparative Studies about vaccine development for COVID-19.
 J Biomed Kesehat. 2023;6(1):127-32. https://doi.org/10.18051/JBiomedKes.2023.v6.127-132.
- 8. Shekhar R, Muralidharan P, Hallur N, et al. Alternative biosimilar drugs impact on Global COVID-19 Pandemic and Regulatory approval Repurposed in Emergency periods (2020-2022). Res J Phar Tech. 2023;16(9):4042-8. http://dx.doi.org/10.52711/0974-360X.2023.00663.
- 9. Bennett C. The WHO has declared Eris a 'VARIANT OF INTEREST'. How is it different from other Omicron variants?. August, 2023. Available at: https://www.unsw.edu.au/newsroom/news/2023/08/the-who-has-declared-eris-a-variant-of-interest--how-is-it-diffe.
- 10. Mahase E. Covid-19: What do we know about XBB.1.5 and should we be worried? BMJ. 2023;380:153. https://doi.org/10.1136/bmj.p153.
- 11. Parsons RJ, Acharya P. Evolution of the SARS-CoV-2 Omicron spike. Cell reports. 2023;42(12). https://doi.org/10.1016/j.celrep.2023.113444
- 12. World Health Organization. EG 5 Initial risk evaluation. 9 August 2023.
- 13. Cóbar O, Cóbar S. EG 5 Family of SARS-CoV-2; Will Overcome XBB. 1.16 as the Most Prevalent Around the World? DOI: 10.13140/RG.2.2.12549.93922.
- 14. Savedchuk S, Raslan R, Nystrom S, et al. Emerging Viral Infections and the Potential Impact on Hypertension, Cardiovascular Disease, and Kidney Disease. Circulation Res. 2022;130(10):1618-41. https://doi.org/10.1161/CIRCRESAHA.122.320873
- 15. Bigdelou B, Sepand MR, Najafikhoshnoo S, et al. COVID-19 and preexisting comorbidities: Risks, synergies, and clinical outcomes. Frontiers in immunology. 2022;13: 890517. https://doi.org/10.3389/fimmu.2022.890517
- 16. Boccellino M. COVID-19 Pandemic: Therapeutic Strategies and Vaccines. Int J Mol Sci. 2023;25(1):556. https://doi.org/10.3390/ijms25010556
- 17. Islam KU, A-Elgadir TME, Afaq S, et al. Molecular and Clinical Aspects of COVID-19 Vaccines and Other Therapeutic Interventions Apropos Emerging Variants of Concern. Frontiers Phar. 2021;12:778219. https://doi.org/10.3389/fphar.2021.778219
- 18. Dyer O. Covid-19: Infections climb globally as EG. 5 variant gains ground. BMJ. 2023;382:1900. https://doi.org/10.1136/bmj.p1900
- 19. Looi MK. What do we know about the Arcturus XBB.1.16 subvariant? BMJ. 2023;381:1074.
- 20. COVID hospitalizations rising in some reporting countries News brief August 10, 2023, Lisa Schnirring. Available at: https://www.cidrap.umn.edu/covid-19/covid-hospitalizations-rising-some-reportingcountries.
- 21. Alsayed R, Kadhom M, Salman I, et al. Developing COVID-19's Vaccines: Short Review. Al-Nahrain J Sci. 2022;25(1):59-63. https://doi.org/10.22401/ANJS.25.1.10



This work is licensed under a Creative Commons Attribution Non-Commercial 4.0 International License

Emerging Threats in the Age of Pandemics

by yasmine mashabi

Submission date: 17-Sep-2024 11:58AM (UTC+0700) Submission ID: 2456639095 File name: Emerging_Threats_in_the_Age_of_Pandemics.pdf (230.03K) Word count: 2987 Character count: 16686



JURNAL BIOMEDIKA DAN KESEHATAN (JOURNAL OF BIOMEDIKA AND HEALTH)

Vol. 7 No. 2 (2024) pp. ***-***

e-ISSN: 2621-5470

REVIEW ARTICLE

Emerging Threats in the Age of Pandemics: A Focus on COVID-19 and the Novel Sub-Variant EG 5 ("Eris"): Review Article

Raghda Alsayed', Hamsa Thamer', Seenar Hameed', Mohammed Kadhom², Nany Hairunisa³, Husnun Amalia⁴, Yasmine Mashabi^{5™}, Dina Ahmed⁶, Sarah Mahdi', Amani Husain⁷, Israa Salman⁸, Emad Yousif¹

Department of Chemistry, College of Science, Al-Nahrain University, Baghdad, Iraq
 Department of Environmental Science, College of Energy and Environmental Sciences, Al-karkh University of Science, Baghdad, Iraq
 Bopartment of Occupational Medicine, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia 4Departement of Opthaln Sogy, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
 Sclinical Pathology Department, Faculty of Technology-Baghdad, Middle Technical University, Baghdad, Iraq
 Polymer Research Unit, College of Science, Mustansiriyah University, Baghdad 10052, Iraq
 Science, Al-Nahrain University, Baghdad, Iraq

⊠yasmine.mashabi@trisakti.ac.id

https://doi.org/10.18051/JBiomedKes.2024.v7.***-***

ABSTRACT

This paper draws attention to a recently identified sub-variant of SARS-CoV-2 knorphiles as EG 5, colloquially named "Eris," designated by the World Health Organization (WHO) as a variant of interest. The organization has urged nations to monitor and respond to the spread of this sub-variant since its identification on February 17, 2023. The discovery of the EG 5 variant, a sublineage of the Omicron variant, has introduced new challenge greesignated a "variant of interest" by the WHO, EG 5 carries distinctive genetic mutations, including an additional F456L amino acid mutation in the spike protein. Global prevalence has doubled, raising concerns about increased transmissibility. Although specific symptoms of EG 5 are not yet fully characterized, the variant has spread to 51 countries, with over 7,000 reported cases by August 15, 2023. The manuscript also explores the unique situation in Iraq, where, as of August 17, 2023, no EG 5 cases have been officially recorded. However, challenges such as self-treatment at. As the world grapples with the ongoing challenges of the COVID-19 pandemic, understanding the dynamics of emerging variants is crucial for effective public health responses and the development of targeted interventions.

Keywords: COVID-19; Coronavirus; EG 5; Eris; Pandemic, SARS-CoV



ABSTRAK

Artikel ini membahas mengenai sub varian SARS-CoV-2 yang bernama EG 5, yang diidentifikasi sebagai "Eris" dan ditetapkan sebagai variant of interest oleh World Health Organization (WHO). Organisasi ini memaksa negara-negara untuk memantau dan menangani kejadian penyebaran sub varian yang telah diidentifikasi sejak 17 Februari 2023. Munculnya varian EG 5 yang merupakan subline dari Omicron menjadi tantangan baru pada dunia Kesehatan. Varian EG 5 sebagai variant of interest memiliki mutasi genetik, salah satunya yaitu mutasi pada *spike protein* berupa tambahan asam amino F456L. Secara global prevalensi meningkat dua kali lipat, hal ini menimbulkan kekhawatiran terhadap peningkatan jumlah infeksi. Varian ini belum memiliki gejala yang spesifik dan telah menyebar di 51 negara, dengan kejadian lebih dari 7000 kasus pada 15 Agustus 2023. Artikel ini mengeksplorasi situasi yang unik di Irak, karena sampai 17 Agustus 2023 tidak terdapat kasus EG 5 yang dilaporkan. Namun, ada tantangan berupa swamedikasi. Saat ini dunia masih berjuang dalam penanganan pandemik COVID-19, sangat penting untuk memahami dinamika munculnya varian-varian baru untuk efektivitas respon kesehatn masyarakat dalam pengembangan intervensi yang terarah.

Kata Kunci: COVID-19; Coronavirus; EG 5; Eris; Pandemi, SARS-CoV.

INTRODUCTION

The 21st certainly has witnessed the recurrent emergence of highly pathogenic and widespread coronaviruses, starting with the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002, followed by the Middle East respirator and isorder coronavirus (MERS-CoV) in 2012.¹ The most recent and impactful addition to this list is the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for the COVID-19 pandemic. Clinical symptoms of COVID-19 include fever, coughing, fatigue, and, in a subset of cases, gastrointestinal complications.² Vulnerable populations, particularly the elderly and those with underlying health conditions, fare higher risk of infection and severe outcomes.³ Recognizing the severity of the situation, the WHO declared COVID-19 a public health emergency of international concern on January 30, 2020. However, the virus continues to evolve, and new variants pose ongoing challenges. In March 2020, the WHO declared COVID-19 a global pandemic, signifying he widespread impact of the novel coronavirus, SARS-CoV-2. While the majority of individuals infected with the virus experience mild to severe respiratory symptoms and recover without special care, a subset faces severe ibress, particularly older individuals and those with underlying health conditions such as cancer, diabetes, cardiovascular disease, or chronic respiratory diseases.⁴ COVID-19 poses a threat to individuals of all ages, emphasizing the need for comprehensive public health strategies.⁵ By October 2020, SARS-CoV-2 had spread to 235 countries, regions, or territories, infecting over 43 million people and resulting in approximately 1.15 million deaths, reflecting a 3% fatality rate. The urgent need for an effective vaccine to manage the pandemic became apparent given the virus's rapid transmission and high mortality.4.5

Efforts to develop a COVID-19 vaccine were underway, with at least ni14 alternative technological platforms being researched as of July 2020. Most vaccine candidates focused on the coronavirus spike protein (S protein) and its variants as the primary antigens, given their central role in COVID-19 infection.⁶ However, other coronavirus proteins, such as the nucleocapsid, were also under investigation due to their ability to trigger effective T-cell responses and their greater genetic stability.⁷ of May 7, 2023, global vaccination efforts have administered 13.4 billion COVID-19 vaccine doses, with 67.9% of the global population having received at least one dose. The daily administration rate stood at 4.19 million vaccines.⁸

Mashabi et. al

In February 2023, a new development emerged with the identification of the EG 5 variant in China, subsequently detected in the United States in April. This variant, named "Eris," was classified by the WHO as a variant of interest, prompting heightened surveillance and response measures worldwide.⁹ This paper delves into the implications of the EG 5 variant, examining its characteristics, spread, and potential impact on the ongoing global efforts to combat COVID-19. Understanding and addressing emerging variants is crucial for adapting vaccination strategies and maintaining effective public health measures in the face of evolving threats.

EPIDEMIOLOGY

The EG 5 variant is a sublineage of the Omicron variant of COVID-19, exhibiting distinct genetic characteristics that set it apart from other coronavirus strains. It is closely related to variants that have been circlating globally and is considered a mutated version of the virus. EG 5 is specifically identified as a descendent lineage of XBB.1.9.2, sharing the same spike amino acid profile as XBB.1.5.¹⁰

Virus characteristic

Distinguishing Features of EG 5

Amino Acid Mutation in Spike Protein

EG 5 carries an additional F456L amino acid mutation in the spike protein compared to its parent XBB.1.9.2 subvariant and XBB.1.5. This mutation in the spike protein is a key genetic distinction of the EG 5 variant.^{10,11}

Subvariant EG 5.1

Within the EG 5 lineage, a subvariant known as EG 5.1 has been identified, which has an additional spike mutation Q52 H. Notably, EG 5.1 represents a significant portion, accounting for 88% 24 the available sequences for EG 5 and its descendent lineages.^{11,12} Given these genetic alterations, the World Health Organization has classified EG 5 as a "variant of interest." This designation implies that nations are advised to closely monitor EG 5 due to concerns that it may possess changes that could potentially make it more contagious or lead to more severe outcomes.^{12,13}

Vulnerability Concerns

There are particular concerns regarding the vulnerability of certain demographic groups, especially older individuals and those with pre-existing health conditions. People with conditions such as diabetes, high blood pressure, heart and lung diseases, and cancer are considered more susceptible to infection with the EG 5 variant.¹³⁺⁵ This heightened vulnerability underscores the importance of closely tracking and understanding the potential impact of EG 5 on public health, and it emphasizes the need for targeted protective measures for at-risk populations.¹³⁺⁵

Symptomatic infection

As of now, there is insufficient clinical data specifically detailing the most common symptoms associated with the EG 5 variant of the SARS-CoV-2 virus.^{16,17} However, it's essential to note that the symptoms of COVID-19, including those potentially associated with new variants, can evolve over time. In general, as the SARS-CoV-2 virus has undergone mutations throughout the pande 18, certain symptoms have become more common, while others have become less prevalent. The Centers for Disease Control and Prevention (CDC) profiles a list of symptoms to watch out for in the context of COVID-19. These symptoms include fever, fatigue, body chills, chronic cough, headache, sore throat, nasal congestion or runny nose shortness of breath, or difficulty breathing.

Mashabi et al.

It's important to emphasize that the information provided by the CDC is based on general observations related to COVID-19 and may not specifically reflect the symptomatology of the EG 5 variant. Continuous monitoring of clinical data and research is crucial to better understand the specific characteristics and symptoms associated with emerging variants like EG 5. Individuals experiencing any of these symptoms, especially in areas where the EG 5 variant has been identified, should seek medical attention and follow public health guidelines for testing and quarantine.¹³

Transmission

As of August 15, 2023, the EG 5 variant of 27RS-CoV-2 is exhibiting a moderate growth advantage, according to the WHO risk evaluation. The variant was first reported to the W210 in February, and its prevalence, as reflected in reported sequences, has steadily increased. Global prevalence more than doubled during the summer, rising from approximately 8% in the week ending June 25 to about 17% by the week ending July 23.¹⁹ The EG 5 variant has spread widely, with reported infections in 51 countries, including major nations such as China, the United States, the Republic of Korea, Japan, Canada, Australia, Singapore, the United Kingdom, France, Portugal, and Spain.¹²

As of the specified date, more than 7,000 cases of EG5 have been reported to the WHO, spanning across more than 60 countries. It's important to note that the actual number of pases and deaths related to EG 5 is likely higher due to underreporting in several countries. Within the last 28 days (from July 10 to August 6, 2023), there were about 1.5 million new reported cases of COVID-19 and over 2,500 deaths, indicating an 80% increase compared to the preceding 28 days.²⁰ This information underscores the rapid spread of the EG 5 variant and the potential challenges associated with monitoring and controlling its prevalence on a global scale. Continuous surveillance, reporting, and research are essential to understand the trajectory of EG 5 and to implement effective public health measures in response to its circulation.¹⁸

EG 5 in Iraq

As of August 17, 2023, the Ministry of Health in Iraq has officially confirmed that the country has not recorded any cases of infection with the new Corona mutant, EG 5, known as "Iris." This is noteworthy, especially considering that an infection with the EG 5 variant was recorded in Kuwait in the middle of July. However, the absence of recorded cases in Iraq does not necessarily imply that the country has been entirely spared from the variant. There are a few key factors to consider Self-treatment at Home and Medication Availability in Private Pharmacies.

Self-treatment at Home

The statement mentions that patients are opting to treat themselves at home rather than visiting hospitals. This behavior could contribute to underreporting cases, as individuals may not be getting tested or seeking medical attention, potentially leading to an incomplete picture of the true infection rate.¹⁶

Medication Availability in Private Pharmacies

The availability of medications in private pharmacies, accessible to everyone, might influence how people manage their symptoms. If individuals are obtaining over-the-counter medicines without a formal diagnosis, this could further contribute to a lack of documented cases.¹³

Mashabi et. al

It's important to emphasize that the situation may evolve, and monitoring for potential cases, especially given the global circulation of the EG 5 variant, remains crucial. Efforts to encourage testing, accurate reporting, and appropriate medical care are essential components of managing the impact of COVID-19 and its variants. Public health authorities in Iraq may need to implement strategies to enhance testing, encourage reporting, and ensure that individuals with symptoms seek appropriate medical attention.²¹ Clear communication about the importance of early detection, testing, and treatment is crucial to managing the potential spread of the EG 5 variant within the country. The self-treatment culture at home in Iraq and the accessibility of medications in private pharmacies raise questions about the completeness of reported data. As the global community navigates the ongoing challenges posed by COVID-19 and its variants, vigilance, widespread testing, and transparent reporting are imperative.

CONCLUSION

With 13.4 billior 20 OVID-19 vaccine doses administered worldwide as of May 7, 2023. However, the dynamic nature of the virus has led to the identification of new variants, including EG 5. The EG 5 variant, also known as "Eris," carries distinct genetic mutations, particularly in the spike protein, and has exhibited a moderate growth advantage globally. While there is a dearth of specific clinical data on EG 5 symptoms, the broader symptoms are associated with COVID-19. The variant has spread to 51 countries, and as of August 15, 2023, more than 7,000 cases have been reported in over 60 countries. However, underreporting challenges persist, with the true number of cases and deaths likely higher.

ACKNOWLEDGEMENT

The authors appreciate the support provided by the Department of Chemistry at Al-Nahrain University.

AUTHORS CONTRIBUTION

All authors contributed to this article.

FUNDING

None

CONFLICT OF INTEREST

There is no known conflict for this work.

REFERENCES

- Alsayed R, Kadhom M, Yousif E, et al. An Epidemiological Characteristic of the COVID-19 Among Children. Lett. Appl. NanoBioScience. 2020;9(3):1156-64. https://doi.org/10.33263/LIANBS93.11561164.
- Aldoori A N, Ahmed DS, Kadhom M, et al. Herbal medicine is an alternative method to treat and prevent COVID-19. Baghdad J Biochem Applied Biol Sci. 2021;2(01):1-20. https://doi.org/10.47419/bjbabs.v2i01.25
- Fojnica A, Osmanovic A, Đuzic N, et al. COVID-19 vaccine acceptance and rejection in an adult population in Bosnia and Herzegovina. Plos one. 2022;17(2):e0264754. https://doi.org/10.1371/journal.pone.0264754.
- Haas J W, Bender F L, Ballou S, et al. Frequency of Adverse Events in the Placebo Arms of COVID-19 Vaccine Trials: A Systematic Review and Meta-analysis. 2022;5(1):e2143955-e2143955. doi:10.1001/jamanetworkopen.2021.43955.

Mashabi et al.

- Al-mashhadani H, Alsayed R, Hussain Z, et al. An Overview of Possible Therapeutic Approaches Against Novel Coronavirus Disease 2019 Pandemic. Al-Nahrain J Sci Special Issue: COVID-19.2020;3:6-11. DOI: 10.22401/ANJS.00.3.02.
- Raheem R., Kadhom M., Alhashimie EZ., et al. A Clinical-Statistical Study on COVID-19 Cases in Iraq: A Case Study. Al-Nahrain Journal of Science. Special Issue: COVID-19.2021;5:6-12. DOI: 10.22401/ANJS.00.5.02.
- 7. Alsayed R., Zainulabdeen K., Salman I., Comparative Studies about vaccine development for COVID-19.
 J Biomed Kesehat. 2023;6(1):127-32. https://doi.org/10.18051/JBiomedKes.2023.v6.127-132.
- Shekhar R, Muralidharan P, Hallur N, et al. Alternative biosimilar drugs impact on Global COVID-19 Pandemic and Regulatory approval Repurposed in Emergency periods (2020-2022). Res J Phar Tech. 2023;16(9):4042-8. http://dx.doi.org/10.52711/0974-360X.2023.00663.
- Bennett C. The WHO has declared Eris a 'VARIANT OF INTEREST'. How is it different from other Omicron variants?. August, 2023. Available at: https://www.unsw.edu.au/newsroom/news/2023/08/the-who-has-declared-eris-a-variant-of-interest-how-is-it-diffe.
- Mahase E. Covid-19: What do we know about XBB.1.5 and should we be worried? BMJ. 2023;380:153. https://doi.org/10.1136/bmj.p153.
- 11. Parsons RJ, Acharya P. Evolution of the SARS-CoV-2 Omicron spike. Cell reports. 2023;42(12). https://doi.org/10.1016/j.celrep.2023.113444
- 12. World Health Organization. EG 5 Initial risk evaluation. 9 August 2023.
- Cóbar O, Cóbar S. EG 5 Family of SARS-CoV-2; Will Overcome XBB. 1.16 as the Most Prevalent Around the World? DOI: 10.13140/RG.2.2.12549.93922.
- 14. Savedchuk S, Raslan R, Nystrom S, et al. Emerging Viral Infections and the Potential Impact on Hypertension, Cardiovascular Disease, and Kidney Disease. Circulation Res. 2022;130(10):1618-41. https://doi.org/10.1161/CIRCRESAHA.122.320873
- Bigdelou B, Sepand MR, Najafikhoshnoo S, et al. COVID-19 and preexisting comorbidities: Risks, synergies, and clinical outcomes. Frontiers in immunology. 2022;13: 890517. https://doi.org/10.3389/fimmu.2022.890517
- Boccellino M. COVID-19 Pandemic: Therapeutic Strategies and Vaccines. Int J Mol Sci. 2023;25(1):556. https://doi.org/t0.3390/ijms25010556
- Islam KU, A-Elgadir TME, Afaq S, et al. Molecular and Clinical Aspects of COVID-19 Vaccines and Other Therapeutic Interventions Apropos Emerging Variants of Concern. Frontiers Phar. 2021;12:778219. https://doi.org/10.3389/fphar.2021.778219
- Dyer O. Covid-19: Infections climb globally as EG. 5 variant gains ground. BMJ. 2023;382:1900. https://doi.org/10.1136/bmj.p1900
- 19. Looi MK. What do we know about the Arcturus XBB.1.16 subvariant? BMJ. 2023;381:1074.
- 20. COVID hospitalizations rising in some reporting countries News brief August 10, 2023, Lisa Schnirring. Available at: https://www.cidrap.umn.edu/covid-19/covid-hospitalizations-rising-some-reporting-countries.
- Alsayed R, Kadhom M, Salman I, et al. Developing COVID-19's Vaccines: Short Review. Al-Nahrain J Sci. 2022;25(1):59-63. https://doi.org/10.22401/ANJS.25.1.10

This work is licensed under a Creative Commons Attribution Non-Commercial 4.0 International License

Emerging Threats in the Age of Pandemics

| ORIGINALITY REPORT | | |
|--------------------|--|-----------------------------|
| 1 SIMIL | 9% 16% 14% PUBLICATIONS | 7% STUDENT PAPERS |
| PRIMA | RY SOURCES | |
| 1 | www.downtoearth.org.in | 2% |
| 2 | Jennifer Abbasi. "What to Know Abou the Latest SARS-CoV-2 "Variant of Inf JAMA, 2023 Publication | ut EG.5, terest"", 2% |
| 3 | afludiary.blogspot.com | 1% |
| 4 | 4 Hussein H. Mujbil, Layla A. Al Jebur, Emad Yousif, Mohammed Kadhom, Alaa Mohammed, Dina S. Ahmed, Muataz Ali, Hassan Hashim. "Utilization of Metal Oxides Nanoparticles in Modulating Polyvinyl Chloride Films to Resist Ultraviolet Light", Metals, 2022 Publication | |
| 5 | Submitted to Fakultas Kedokteran Gi Universitas Trisakti Student Paper | igi 1 % |
| 6 | Submitted to University of Derby Student Paper | 1 % |

| 7 | wikimili.com Internet Source | 1% |
|----|---|-----|
| 8 | Deasyka Yastani, Novi Silvia H, Sri Widia A Jusman. "The Role of Cytoglobin in Cancer", Jurnal Biomedika dan Kesehatan, 2023 Publication | 1 % |
| 9 | afemaireporters.com.ng | 1 % |
| 10 | saharareporters.com Internet Source | 1 % |
| 11 | par.nsf.gov Internet Source | 1% |
| 12 | Fira Thiodorus, Claraiva Mayung, Desie Yuliani. "Stroke Iskemik pada Pasien Hemodialisis : Laporan Kasus", Jurnal Biomedika dan Kesehatan, 2023 Publication | 1 % |
| 13 | www.eurasiantimes.com | 1% |
| 14 | scadta.co Internet Source | 1% |
| 15 | www.goodhousekeeping.com | 1% |
| 16 | Rafid Arraq, Angham Hadi, Mohammed Kadhom, Salam Mohammed et al. "Enhancing | 1 % |

photostability of poly(vinyl chloride) through additives: diorganotin (iv)-tyrosine complexes design", Journal of Polymer Research, 2023

Publication

| 17 | Submitted to unikal Student Paper | 1% |
|----|--|-----|
| 18 | www.silvercloudhealth.com | 1% |
| 19 | www.igi-global.com | 1% |
| 20 | Esmaeilzadeh Abdolreza, Ebrahimi Fereshteh, Jahani Maleki Armin, Siahmansouri Amir. "EG.5 (Eris) and BA.2.86 (Pirola) two new subvariants of SARS-CoV-2: a new face of old COVID-19", Infection, 2024 Publication | <1% |
| 21 | brightideas.houstontx.gov | <1% |
| 22 | WWW.qeios.com Internet Source | <1% |
| 23 | www2.mdpi.com Internet Source | <1% |
| 24 | thenationonlineng.net Internet Source | <1% |

Exclude quotes On Exclude bibliography On Exclude matches < 10 words

Emerging Threats in the Age of Pandemics

| GRADEMARK REPORT | | |
|------------------|------------------|--|
| FINAL GRADE | GENERAL COMMENTS | |
| /0 | | |
| PAGE 1 | | |
| PAGE 2 | | |
| PAGE 3 | | |
| PAGE 4 | | |
| PAGE 5 | | |
| PAGE 6 | | |