Vietnam Journal of Community Medicine, Vol. 65, English version, 2024, 21-24

A SCOPING REVIEW: COMPARISON OF COAGULATION PARAMETERS RESULTS IN DECEASED AND RECOVERED COVID-19 PATIENTS

Dinh Thi Thu Trang[1], Hoang Thi Ngoc Anh[1*], Nguyen Hoang Long[1], Tran Quoc Thang[1,2], Dao Van Dung[1], Pham Van Thao[1], Hoang Van Tuan[3], Bui Thi Mai An[3]

[1]*Phenikaa University - Yen Nghia Ward, Ha Dong District, Ha Noi*
[2]*Institude of Community Health - Thuy Khue Ward, Tay Ho District, Ha Noi*

Received: 08/10/2024
Revised: 18/10/2024; Accepted: 04/11/2024

ABSTRACT

Objective: Compare coagulation markers between deceased and recovered COVID-19 patients.

Methods: A search of PubMed was conducted to identify peer-reviewed articles published between January 1, 2022, and April 1, 2024. Articles were selected based on predefined inclusion and exclusion criteria. Data extraction focused on coagulation parameters, including platelet count, fibrinogen (Fib), D-Dimer, prothrombin time (PT), and activated partial thromboplastin time (APTT) across six selected studies involving a total of 7,052 patients.

Results: The findings indicated that recovered patients had significantly higher platelet counts compared to deceased patients ($p < 0.05$). D-Dimer and Fib levels were lower in recovered patients, while PT results were significantly prolonged in deceased individuals ($p < 0.05$). APTT results showed variability, with some studies reporting higher levels in deceased patients, while others indicated longer APTT in recovered patients, remaining within normal ranges.

Conclusion: Coagulation markers exhibit significant differences between deceased and recovered COVID-19 patients, suggesting their potential utility in predicting disease severity and guiding clinical management.

Keywords: coagulation parameters, deceased COVID-19 patients, recovered COVID-19 patients.

1. INTRODUCTION

COVID-19, caused by coronavirus-2, is a rapidly spreading acute respiratory syndrome with clinical presentations ranging from mild or asymptomatic cases to severe organ failure. Coagulation abnormalities are common and closely linked to disease severity.

Disturbances in hemostasis increase patient risk [1], and coagulation markers-such as fibrinogen (Fib), D-Dimer, prothrombin time (PT), activated partial thromboplastin time (APTT), and platelet count (PLT)—are crucial for monitoring treatment and predicting disease outcomes [2].

Despite numerous global studies documenting changes in coagulation markers in COVID-19 patients, there remains a lack of comprehensive pooled evidence comparing these markers between deceased and recovered patients. Thus, this study aims to review existing evidence from 2022 to 2024 to compare coagulation markers in deceased versus recovered COVID-19 patients, highlighting their clinical significance.

2. METHOD

2.1. Search strategy and selection criteria

A comprehensive search was conducted in PubMed to identify relevant peer-reviewed articles on coagulation parameters in deceased and recovered COVID-19 patients. The search used the following keywords: ((("COVID-19" [Mesh] OR "SARS-CoV-2" [Mesh]) AND (recovered patients OR recovered COVID-19 patients OR COVID-19 survivor OR COVID-19 survivors)) AND ((((("Fibrinogen"[Mesh] OR "fibrinogen D fragment" [Supplementary Concept] OR "Fibrin Fibrinogen Degradation Products"[Mesh]) OR "Prothrombin Time"[Mesh]) OR "Partial

*Corresponding author
Email: anh.hoangthingoc@phenikaa-uni.edu.vn **Phone:** (+84) 865770967 **Https:**//doi.org/10.52163/yhc.v65i13.1727

Thromboplastin Time"[Mesh]) OR "Blood Coagulation Tests"[Mesh]) OR "Blood Cell Count"[Mesh]) OR "Platelet Count"[Mesh]). The search was limited to articles published between January 1, 2022, and April 1, 2024. We excluded laboratory studies, animal trials, review articles, letters to the editor, or comments.

The retrieved records were managed using Zotero 5.0 software, and study selection followed the PRISMA 2009 flow diagram. The selection process consisted of four steps: (1) record management, (2) screening titles and abstracts, (3) full-text review, and (4) data extraction. Two independent researchers reviewed the studies, with a third reviewer consulted in case of disagreement.

2.2. Data extraction

Information was extracted from each selected article, focusing on general characteristics, including the author(s), data collection period, sample size, study location, publishing journal, and publication year.

Specific coagulation parameters of COVID-19 patients were recorded, including platelet count, Fib levels, D-Dimer, PT, and APTT. The data was extracted separately for deceased and recovered COVID-19 patients.

2.3. Data analysis

The collected information was entered into a data table created in Microsoft Excel. Each study was described using variables related to general information and the coagulation parameter results of deceased and recovered COVID-19 patients.

3. RESULTS

3.1. Study Selection Process

A total of 39 search results were retrieved from MEDLINE via PubMed. After screening the titles and abstracts for relevance, 30 articles were excluded. During the full-text review for eligibility, an additional 3 articles were excluded due to incorrect study designs. Ultimately, 6 studies were included, and their data were extracted for analysis.

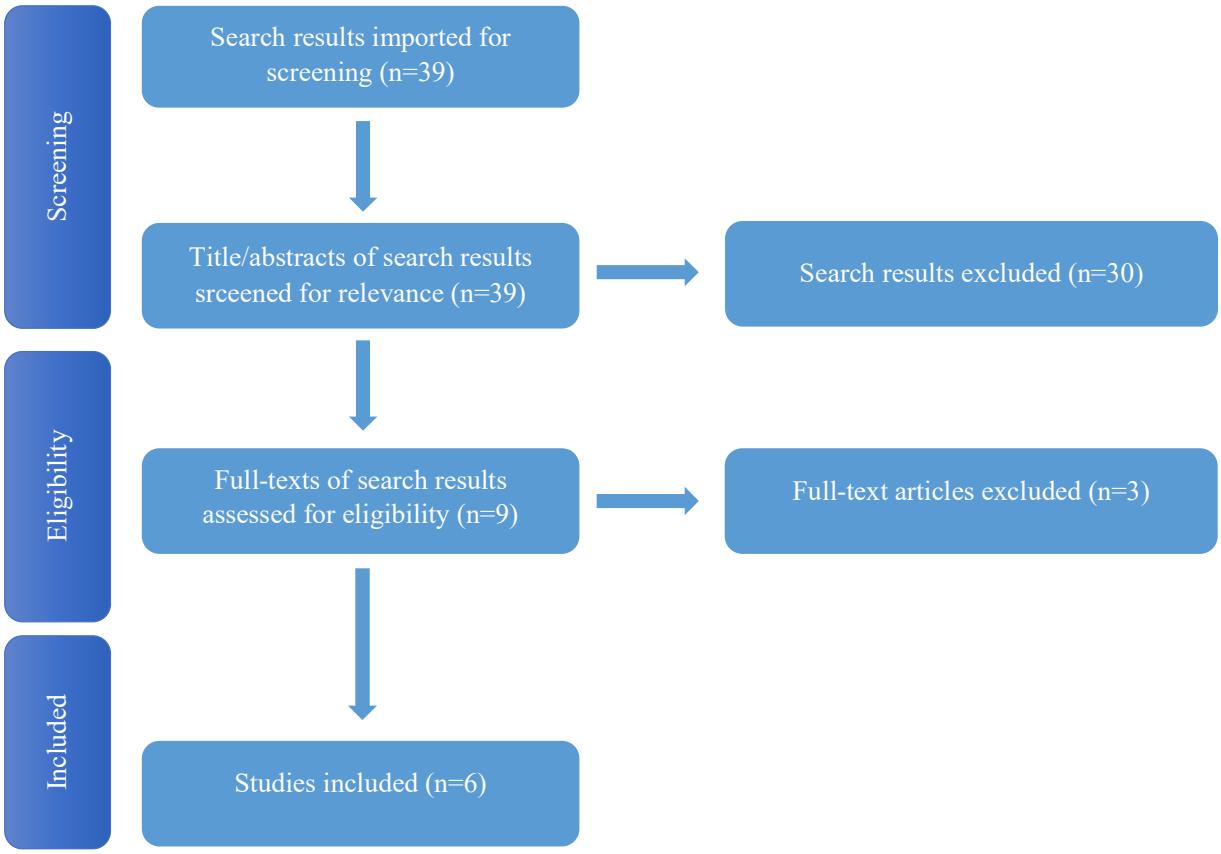

Figure 1. Flowchart of Study Selection and Exclusion Process

3.2. General Characteristics of the Studies

All the selected articles were published in 2022. Data collection occurred from December 2019 to June 2021 across five countries: Turkey, India, China, Iraq, and Belgium. Most studies employed a retrospective longitudinal design (5 articles), while one used a retrospective cohort design. The sample sizes of the studies ranged from 173 to 4,579 COVID-19 patients, with a total sample size of 7,052 patients (Median: 489, Interquartile Range: 239 - 995).

3.3. Coagulation parameters results in deceased and recovered COVID-19 patients

Four out of six studies reported on the PLT counts. These results consistently showed that the average PLT count at the time of hospital admission was significantly higher in recovered patients compared to deceased patients ($p<0.05$) [3-6]. In Mehmet Tahir Huyut's study, both the initial PLT measurement upon admission and the final measurement before discharge or death showed that the PLT count in deceased patients was lower than in recovered patients. Additionally, PLT counts at discharge in recovered patients were significantly higher compared to admission levels [6]. Blomme et al. further highlighted that among recovered patients, those who required ICU treatment had higher platelet counts than those who did not ($p<0.0001$). Deceased COVID-19 patients had lower PLT counts compared to recovered ICU patients, with the difference being statistically significant ($p=0.001$), although PLT counts remained within the normal reference range [4].

The results across studies also showed that D-Dimer and Fib levels were lower in recovered patients compared to deceased COVID-19 patients, with statistically significant differences ($p<0.05$). However, according to Mehmet Tahir Huyut et al., while Fib levels were significantly higher in recovered patients upon admission, deceased patients had higher Fib levels than those who recovered. Additionally, a decrease in Fib levels was observed over time in recovered patients [6].

When comparing prothrombin time (PT) and activated partial thromboplastin time (APTT) between the two groups, the studies indicated that PT results were significantly prolonged in deceased COVID-19 patients compared to recovered patients ($p < 0.05$). APTT levels also differed between the groups, showing significantly higher levels in deceased COVID-19 patients compared to those who recovered [5]. Conversely, Mehmet Tahir Huyut et al. found that recovered patients had longer APTT compared to deceased patients, although the values remained within normal ranges [6].

4. DISCUSSION

This study aimed to compare coagulation markers between deceased and recovered COVID-19 patients to elucidate their clinical significance. Our findings reveal notable differences in several coagulation parameters, emphasizing their potential role in disease severity and patient outcomes.

The results consistently demonstrated that PLTs were significantly higher in recovered patients compared to those who deceased to the disease. This aligns with previous research indicating that lower PLT counts may be associated with severe disease outcomes in COVID-19 patients. The trend of increasing PLT counts in recovered patients over time suggests a recovery of hemostatic function, which may play a critical role in patient prognosis. Notably, the data also indicated that among recovered patients requiring ICU treatment, PLT were even higher, reinforcing the notion that adequate platelet levels may be linked to better clinical outcomes [3-6].

In contrast, D-Dimer and Fib levels were found to be significantly lower in recovered patients compared to deceased individuals. Elevated D-Dimer levels have been widely documented in severe COVID-19 cases, reflecting increased thromboembolic risk and contributing to disease [7,8]. The observation that Fib levels were initially higher in recovered patients upon admission but later exceeded those of recovered patients suggests that while Fib levels can indicate the severity of coagulation disturbances, they may also fluctuate during the disease course, particularly as patients approach discharge or experience deterioration [3, 5, 6]

PT results were significantly prolonged in deceased COVID-19 patients compared to those who recovered, indicating that coagulation function may be impaired in more severe cases. Additionally, APTT levels presented a complex picture, with some studies showing prolonged APTT in deceased patients while others found longer APTT in recovered patients, albeit within normal ranges. These discrepancies highlight the variability in coagulation responses among patients, suggesting that different hemostatic pathways may be influenced by the overall disease trajectory and clinical management [5, 6].

Overall, the findings of this study underscore the importance of monitoring coagulation parameters as part of the clinical management of COVID-19 patients. The significant differences in coagulation markers between deceased and recovered patients point to their potential utility in predicting outcomes and tailoring treatment strategies. Given the critical role of hemostatic disturbances in COVID-19, further research is warranted to explore the underlying mechanisms of coagulation abnormalities and their implications for patient management and recovery.

5. CONCLUSION

This study highlights the significant differences in coagulation markers between deceased and recovered COVID-19 patients, underscoring their potential role in predicting disease severity and patient outcomes. Elevated D-Dimer and fibrinogen levels, prolonged prothrombin time, and variations in platelet counts were consistently associated with worse clinical outcomes, indicating that monitoring these parameters may be crucial for assessing patient risk and tailoring treatment strategies. The findings emphasize the importance of coagulation markers as essential tools in the clinical management of COVID-19, warranting further research to better understand their mechanisms and implications in patient care.

REFERENCES

[1] Abd El-Lateef AE IM, Thabet G, Cabrido NA. Complete blood cells count abnormalities in COVID-19 patients and their prognostic significance: Single center study in Makkah, Saudi Arabia. Saudi Med J. 2022;43(6):572-8.

[2] Quintana-Díaz M A-EE, Ramírez-Cervantes KL, Olivan-Blázquez B, Juárez-Vela R, Gea-Caballero V. Coagulation Parameters: An Efficient Measure for Predicting the Prognosis and Clinical Management of Patients with COVID-19. J Clin Med. 2020;9(11):3482.

[3] Celikkol A DM, Guzel EC, Erdal B, Yilmaz A. A novel combined index of D-dimer, fibrinogen, albumin, and platelet (FDAPR) as mortality predictor of COVID-19. Niger J Clin Pract. 2022;25(9):1418-23.

[4] Blomme S SL, Van Ranst M, Boeckx N, Van Laer C. The influence of COVID-19 on routine hematological parameters of hospitalized patients. Acta Clin Belg. 2022;77(2):241-6.

[5] Peng F YQ, Zhang Q, Deng J, Li C, Xu M, Wu C, Zhong Y, Wu S. Performance of D-dimer to lymphocyte ratio in predicting the mortality of COVID-19 patients. Front Cell Infect Microbiol. 2022;12:1053039.

[6] Tahir Huyut M HZ, İlkbahar F, Mertoğlu C. What is the impact and efficacy of routine immunological, biochemical and hematological biomarkers as predictors of COVID-19 mortality? Int Immunopharmacol. 2022;105:108542.

[7] Ahirwar AK TR, Sakarde A, Rathod BD, Jha PK, Kumawat R, Gopal N. The study of serum hsCRP, ferritin, IL-6 and plasma D-dimer in COVID-19: a retrospective study. Horm Mol Biol Clin Investig. 2022;43(3):337-44.

[8] Ali AM RH, Fatah MH, Noori CM, Ali KM, Tawfeeq HM. Serum troponin, D-dimer, and CRP level in severe coronavirus (COVID-19) patients. Immun Inflamm Dis. 2022;10(3):e582.