

Complications and Adverse Covid-19 Outcomes on Patients with Comorbidity

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Abstract. The aim of this study was to identify prognostic markers of complications in patients with severe COVID-19, focusing on comorbidities such as hypertension, coronary artery disease, and diabetes. The study was conducted on 189 patients in tertiary hospitals and divided patients into four groups based on the presence of comorbidities. The major complications identified included acute respiratory distress syndrome (ARDS), pulmonary embolism, and atrial fibrillation, which were more common in patients with two or more comorbidities. The study found that comorbidities significantly impacted mortality, with ARDS affecting 29.7% of patients. The results suggest the need for targeted interventions for high-risk patients, especially those with cardiovascular disease and obesity, to improve COVID-19 outcomes.

1 Introduction

The global outbreak of COVID-19 has resulted in a significant burden on healthcare systems, with comorbidities emerging as critical predictors of in-hospital mortality, particularly in patients with severe cases of COVID-19 pneumonia. One key issue remains the identification of prognostic markers for adverse outcomes in patients with underlying conditions. Studies have shown that hypertension, coronary artery disease, and diabetes are prevalent comorbidities among COVID-19 patients, contributing to higher mortality rates, with hypertension alone increasing mortality to as much as 6% [6, 7]. Cardiovascular diseases (CVD) have been recognised as significant predictors of poor prognosis, exacerbating the severity of COVID-19 and leading to complications such as pulmonary embolism and myocardial infarction [3]. Furthermore, disruptions in the hemostatic system, alongside CVD, have been reported as critical factors in the progression of complications in COVID-19 patients [2, 4]. Addressing these issues, the proposed study seeks to identify markers for predicting complications, which could ultimately enhance patient management and improve outcomes in the field of medical sciences.

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2 Materials and Methodology

The study aimed to identify prognostic markers for complications and adverse outcomes in patients with severe COVID-19. The study was conducted on 189 patients who received treatment in the specialised departments and intensive care units (ICUs) of the Republican Specialized Multidisciplinary Infectious Diseases Hospitals Zangiota No. 1 and Zangiota No. 2 in Tashkent, Uzbekistan, over a period from October 2020 to January 2022. The patients included in the study were those diagnosed with COVID-19-associated pneumonia, evidenced by lung damage (such as “ground glass” appearance on imaging), and exhibited severe clinical symptoms such as a respiratory rate greater than 24 breaths per minute and oxygen saturation levels below 92% at rest without supplemental oxygen. For extremely severe cases, conditions like acute respiratory distress syndrome (ARDS), sepsis, multiple organ failure, and oxygen saturation below 80% were also considered.

The 189 study patients were divided into four groups based on the presence of comorbidities. Group 1 (n=25) included patients without comorbidities, while group 2 (n=27) had one comorbidity (e.g., diabetes mellitus (DM), coronary artery disease (CAD), post-infarction atherosclerosis (PICS), history of stroke, or arterial hypertension (HTN)). Group 3 (n=82) included patients with two comorbidities, and group 4 (n=55) had three or more comorbidities. Obesity and hyperglycemia, although not considered comorbidities in this study, were considered important risk factors. Demographic data showed that the mean age was 49.2 ± 2.6 years in Group 1, 63.9 ± 2.4 years in Group 2, and 64.8 ± 1.3 years in Group 3. There was a significant difference in age between Groups 2–4 compared with Group 1 ($p < 0.05$), with older patients more likely to have multiple comorbidities.

Clinical data were gathered using various diagnostic tools, including blood tests, electrocardiograms (ECGs), and echocardiograms. These assessments tracked respiratory function, heart rhythm, and other vital parameters critical to identifying complications such as atrial fibrillation, acute respiratory distress syndrome (ARDS), pulmonary embolism, acute myocardial infarction (AMI), and multiple organ failure. For example, atrial fibrillation was noted in 9 patients, with a higher incidence in groups 3 and 4. ARDS was observed in 56 (29.7%) patients, most of whom were in groups 3 (39.0%) and 4 (30.9%). Other complications included pulmonary embolism and vascular thrombosis, which occurred in 16 patients, and myocardial infarction, which was more frequent in groups 3 and 4.

Inclusion criteria for the study required patients to have a confirmed diagnosis of COVID-19 and meet certain clinical markers of severity, such as respiratory failure or cytokine storm. Exclusions were made for patients with cancer, systemic diseases, obstructive lung diseases, blood or liver pathologies, heart defects, and patients with fewer than 10 observations for statistical reliability. The study results highlight that hypertension, obesity, and atrial fibrillation were significant predictors of adverse outcomes, including higher rates of pulmonary complications and mortality, especially in patients with two or more comorbidities.

3 Results

The study evaluated the presence of complications in 189 patients admitted with severe COVID-19, with a focus on identifying prognostic markers for adverse outcomes. Among these patients, 131 (69.3%) experienced complications, including pulmonary edema, multiple organ failure, acute myocardial infarction (AMI), acute cerebrovascular accidents (ACVA), septic shock, acute respiratory distress syndrome (ARDS), pulmonary embolism (PE), vascular thrombosis, and atrial fibrillation (AF). Table 1 presents the breakdown of these complications across four groups, categorized based on the number of comorbid conditions.

Table 1. Structure of Complications in COVID-19 Patients Categorised by Comorbidity Groups.

Complication	All patients (n=189)	Group 1 (n=25)	Group 2 (n=27)	Group 3 (n=82)	Group 4 (n=55)
Pulmonary edema	19	1	0	7	11
Multiple organ failure	17	0	2	11	4
AMI	9	0	1	4	4
ACVA	4	0	0	2	2
Septic shock	2	0	1	1	0
ARDS	56	1	6	32	17
PE	7	0	1	1	5
Thrombosis	9	0	0	2	7
AF	9	0	1	7	1
Grand total	131	2	12	67	50

ARDS was the most frequent complication, affecting 56 (29.7%) patients. This condition was particularly prevalent in groups 3 and 4, affecting 39.0% and 30.9% of patients, respectively. Other significant complications included pulmonary embolism, diagnosed in 16 patients (with a higher occurrence in group 4), AMI in 9 patients (more frequent in groups 3 and 4), and multiple organ failure, which affected 17 patients (8.9%).

The study also recorded heart rhythm disturbances in 54 patients (28.5%), with AF identified as the most unfavourable type of arrhythmia, occurring in 9 patients. These patients were older (average age 67.6±4.3 years) and had severe outcomes, with an average hospital stay of 15.6±4.49 days.

Table 2. Development of AF in the Examined Groups.

Criteria	All patients (n=9)	Group 2 (1/27)	Group 3 (7/82)	Group 4 (1/55)
Persistent form of AF	4	1	2	1
Development of paroxysmal AF	5	0	5	0
CHD	9	1	7	1
AH	8	0	7	1
DM	1	0	0	1
PICS	4	1	2	1
AMI	1	1	0	0
Obesity	6	1	4	1
PE	1	1	0	0
Multiple organ failure	1	1	0	0

The bar chart below visualizes the distribution of Acute Respiratory Distress Syndrome (ARDS) across the four patient groups. The highest occurrence of ARDS was observed in groups 3 and 4, with 39.0% and 30.9% of patients affected, respectively, indicating a correlation between the number of comorbid conditions and the severity of complications.

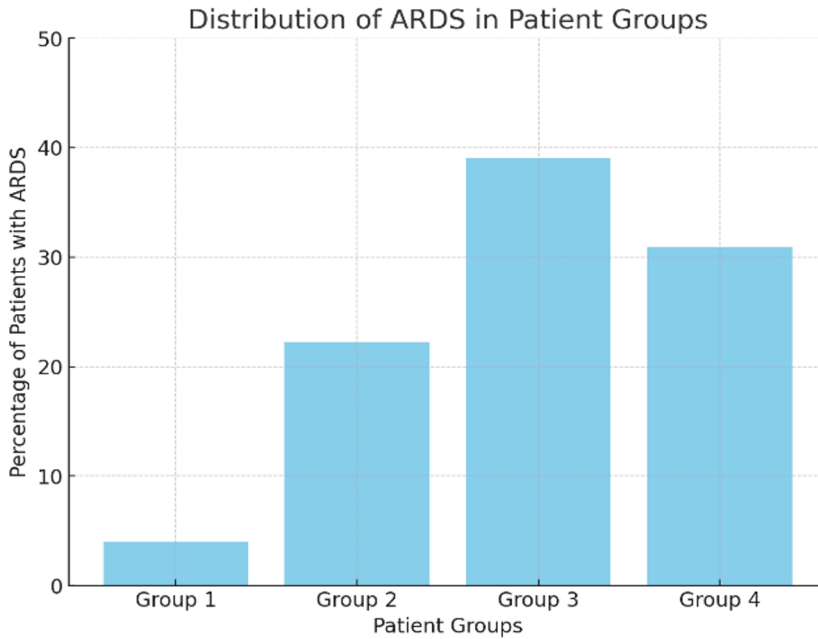


Fig. 1. Percentage Distribution of Acute Respiratory Distress Syndrome (ARDS) Across Patient Groups Based on the Number of Comorbid Conditions.

4 Discussion

The findings from this study demonstrate that the development of severe complications in COVID-19 patients is closely related to the presence of multiple comorbid conditions. The most frequent complication, ARDS, was significantly more common in patients from groups 3 and 4, who had two or more comorbidities. This suggests that patients with a higher number of underlying health issues are more susceptible to severe outcomes such as ARDS, pulmonary embolism, and multiple organ failure. Atrial fibrillation (AF), which was associated with an increased risk of mortality, was also prevalent in groups 3 and 4. AF was often found in patients with a history of coronary heart disease (CHD), arterial hypertension (AH), and obesity, highlighting the role of cardiovascular conditions in exacerbating the course of COVID-19. These findings align with other studies that suggest comorbidities such as CHD and hypertension are significant predictors of adverse outcomes in COVID-19 patients. The mortality rate in this cohort was 14.3%, with older patients and those with comorbidities like obesity and hypertension being at higher risk. Obesity was strongly correlated with poor outcomes, which is consistent with previous research indicating that it contributes to complications such as respiratory failure and multiple organ dysfunction. The study emphasizes the need for targeted interventions and close monitoring of high-risk patients, particularly those with cardiovascular comorbidities and obesity, to improve outcomes in severe COVID-19 cases.

5 Conclusion

In conclusion, this study identified key prognostic markers for complications in patients with severe COVID-19, highlighting the significant role of comorbidities in worsening patient outcomes. Acute respiratory distress syndrome (ARDS) was the most common

complication, especially in patients with two or more comorbidities such as hypertension, coronary artery disease, and diabetes. Additionally, atrial fibrillation (AF) was associated with an increased risk of mortality, highlighting the critical need for monitoring cardiovascular health in patients with COVID-19. The study findings indicate a strong correlation between multiple comorbidities and severe outcomes such as pulmonary embolism, myocardial infarction, and multiorgan failure.

Recommendations from this study include the need for close monitoring and targeted interventions for high-risk patients, especially those with cardiovascular comorbidities and obesity. Future research should focus on developing early intervention strategies and therapeutic approaches that address these high-risk factors. This may improve survival rates and reduce severe complications in similar patient groups. Further research into long-term recovery outcomes from COVID-19 is also warranted, particularly in patients with multiple comorbidities.

References

1. Akhmerov, A., & Marban, E. (2020). COVID-19 and the heart. *Circulation*. <https://doi.org/10.1161/CIRCRESAHA.120.317055>
2. Aripov, A. N., Aripov, A. N., Kayumov, U. K., Inoyatova, F. K., & Khidoyatova, M. R. (2021). Role of lungs in the hemostasis system (review of literature). *Klinicheskaia Laboratornaia Diagnostika*, 66(7), 411–416. <https://doi.org/10.51620/0869-2084-2021-66-7-411-416>
3. Driggin, E., Madhavan, M. V., Bikdeli, B., Chuich, T., Laracy, J., Bondi-Zoccai, G., et al. (2020). Cardiovascular considerations for patients, health care workers, and health systems during the coronavirus disease 2019 (COVID-19) pandemic. *Journal of the American College of Cardiology*. <https://doi.org/10.1016/j.jacc.2020.03.031>
4. Khidoyatova, M. R., & Kayumov, U. K. (2021). The relationship between the degree of lung damage and indicators of the hemostasis system in patients with cardiovascular diseases against the background of COVID-19. *Annals of the Romanian Society for Cell Biology*, 6111–6117. <http://annalsofrscb.ro/index.php/journal/article/view/775>
5. Khidoyatova, M. R., Kayumov, U. K., Inoyatova, F. K., Fozilov, K. G., Khamidullaeva, G. A., & Eshpulatov, A. S. (2022). Clinical status of patients with coronary artery disease post COVID-19. *International Journal of Health & Medical Sciences*, 5(1), 137–144. <https://doi.org/10.21744/ijhms.v5n1.1858>
6. Li, B., Yang, J., Zhao, F., Zhi, L., Wang, X., Liu, L., Bi, Z., & Zhao, Y. (2020). Prevalence and impact of cardiovascular metabolic disease on COVID-19 in China. *Clinical Research in Cardiology*, 109(5), 531–538. <https://doi.org/10.1007/s00392-020-01626-9>
7. Wu, Z., & McGoogan, J. M. (2020). Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72,314 cases from the Chinese Center for Disease Control and Prevention. *JAMA*. <https://doi.org/10.1001/jama.2020.2648>
8. Molochkov, A. V., Karateev, D. E., Ogneva, E. Y., Zulkarnaev, A. B., Luchikhina, E. L., Makarova, I. V., & Semenov, D. Y. (2020). Comorbid diseases and prognosis of COVID-19 outcomes: Results of observations of 13,585 patients hospitalised in Moscow Oblast. *Almanac of Clinical Medicine*, 48(S1), 1–10.