Journal Of Cardiovascular Disease Research
ISSN: 0975-3583,0976-2833 VOL15, ISSUE5, 2024

Original Research

Impact of Covid-19 on Cardiovascular Outcomes: A Retrospective Study from a Tertiary Care Center

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Received: 26 April 2024 Accepted:24 May 2024

Abstract:
Introduction:COVID-19 has emerged as a considerable threat to cardiovascular health, especially in patients with pre-existing conditions. This retrospective study investigates the cardiovascular manifestations among COVID-19 patients and their impact on in-hospital outcomes at a tertiary care center.
Materials and Methods: Analyzing records from 2,577 patients diagnosed with COVID-19 via RT-PCR at Guru Gobind Singh Medical College & Hospital between March 2020 and August 2022, this study identifies cardiovascular complications and their correlation with patient outcomes. Demographic data, clinical characteristics, cardiovascular events, and comorbid conditions were collected and statistically evaluated.
Results: Cardiovascular complications were identified in a cohort with a majority of male patients (67.10%) and an average age of 57.31 years. Notable complications included ST and T changes (23.29%), QT prolongation (9.50%), heart failure (11%), and shock (7.15%). Common co-morbidities were hypertension (43.09%) and diabetes mellitus (42.10%). The in-hospital mortality rate was 5.30%, with an average stay of 3.81 days, indicating the severity of cardiovascular involvement.
Conclusions and Recommendations: The study confirms a substantial cardiovascular impact of COVID-19, with significant implications for in-hospital mortality and length of stay. These findings highlight the need for an integrated approach to manage COVID-19 patients, focusing on cardiovascular health. Future research should expand on these insights and the healthcare system must adapt to the evolving challenges of the pandemic.

Introduction

Since the emergence of the coronavirus disease 2019 (COVID-19) pandemic, its profound impact on cardiovascular health has become increasingly evident. Patients with existing cardiovascular diseases are at a heightened risk when infected with COVID-19, and the virus itself is capable of triggering a myriad of cardiovascular complications. These complications include myocarditis, acute coronary syndrome (ACS), various arrhythmias, heart failure, and thromboembolic events, all of which significantly contribute to the increased morbidity and mortality rates observed in patients with pre-existing cardiovascular conditions [1,2]. This underscores a complex, bidirectional risk scenario, where cardiovascular health can both influence and be influenced by COVID-19, highlighting the intricate interplay between the virus and cardiovascular diseases [3].

The need to understand the underlying mechanisms of these cardiovascular implications has never been more critical. Potential mechanisms suggested by global research include direct viral invasion of the myocardial cells, systemic inflammatory responses leading to widespread endothelial dysfunction, and a pronounced prothrombotic state contributing to cardiovascular complications [4,5]. Despite the wealth of global data and insights into these

pathophysiological mechanisms, there remains a notable lack of specific data within our country, pointing to a significant gap in our understanding of how COVID-19 affects cardiovascular health on a local scale.

In response to this glaring knowledge gap, we undertook an extensive study at our tertiary care hospital, focusing on the cardiovascular manifestations observed in patients admitted with COVID-19. Our investigation was comprehensive, aiming not just to ascertain the prevalence of cardiovascular complications among our local patient cohort but also to explore the implications of these findings on in-hospital outcomes. By providing localized data and insights, our study not only contributes to the broader understanding of COVID-19's cardiovascular effects but also offers critical information that can be used to enhance patient management protocols and care strategies specifically tailored to the needs of our healthcare system. Through this localized approach, we aim to better equip our healthcare professionals and improve the overall care for patients suffering from the cardiovascular impacts of COVID-19 within our community and potentially beyond.

Materials and Methods:

The study was conducted at the Department of Cardiology in collaboration with the Department of Internal Medicine, Guru Gobind Singh Medical College & Hospital, Faridkot, over a period from March 1, 2020, to August 31, 2022. This retrospective cohort analysis aimed to identify cardiovascular manifestations in COVID-19 patients and assess their impact on in-hospital outcomes by reviewing hospital records. It included patients aged 18 years and older, diagnosed with COVID-19 via a positive real-time polymerase chain reaction (RT-PCR) test, and having complete hospital records. To focus on mid-term outcomes, only those who survived 30 days or more post-discharge were included. Exclusion criteria were patients under 18, those with a positive antigen and negative RT-PCR test, incomplete, missing, or duplicate medical records, or death within 30 days post-discharge.

A total of 4,207 patients were assessed for eligibility, with 2,577 meeting the inclusion criteria and being included in the analysis. The study employed consecutive sampling to ensure comprehensive coverage of all patients who met the inclusion criteria during the study period. Data collection was systematically carried out using a detailed case record form (CRF) that captured demographics, clinical characteristics, cardiovascular complications, co-morbidities, and in-hospital outcomes, with hospital records serving as the primary source. For data analysis, statistical software was used. Continuous variables were summarized with means and standard deviations, while categorical variables were presented as percentages. The analysis aimed to assess the impact of cardiovascular manifestations on in-hospital outcomes.

Results:

Our analysis encompassed 2,577 COVID-19 patients admitted to a tertiary care center, with a majority being male (67.10%, Table 1). The average age of the cohort was 57.31 years, indicating a predominantly middle-aged to elderly population, which aligns with known risk profiles for COVID-19 complications. Cardiovascular manifestations were a significant concern, reflecting the virus's impact beyond respiratory symptoms.

Heart rate and blood pressure readings revealed a trend towards higher values, with an average heart rate of 97 bpm and systolic/diastolic blood pressures of 121.51/77 mmHg, respectively (Table 1). These findings suggest a stress response, possibly related to infection severity or underlying cardiovascular conditions.

A notable proportion of patients experienced cardiac complications, with ST and T changes (23.29%, Figure 2) and QT prolongation (9.50%, Figure 2) being the most prevalent. These abnormalities underscore the potential for COVID-19 to affect cardiac electrophysiology. Furthermore, serious conditions such as heart failure and shock were observed in 11% and 7.15% of the patients, respectively (Figure 2), highlighting the critical nature of cardiovascular involvement in COVID-19.

Comorbidities were prevalent, with hypertension (43.09%, Figure 3) and type 2 diabetes mellitus (42.10%, Figure 3) being the most common. These conditions likely contributed to the observed cardiovascular complications and may have influenced the in-hospital outcomes. The mortality rate stood at 5.30% (Figure 3), reflecting the severity of COVID-19 in patients with significant cardiovascular involvement.

The average length of hospital stay was approximately 3.81 days, indicating a range of disease severity among the cohort. This duration provides insight into the healthcare burden and the necessity for efficient management strategies for COVID-19 patients with cardiovascular complications.

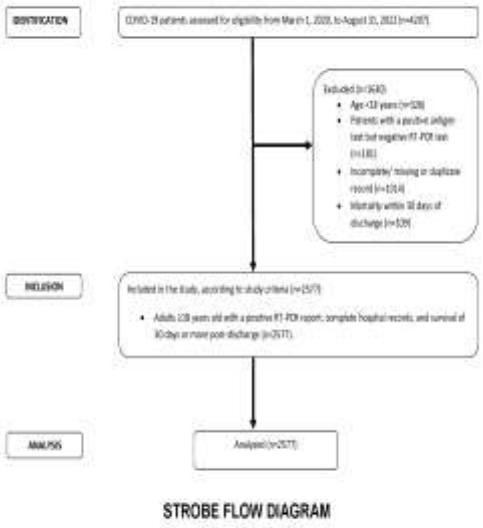


Figure-1

Table-1. Demographics and General Cardiac Parameters

Characteristic	Observed Value
Male	67.10%
Female	32.90%
Average Age	57.31 ± 14.71
Heart Rate	97 ± 19.57
Systolic BP (SBP)	121.51 ± 22.55
Diastolic BP (DBP)	77 ± 13.26

Table-2. Cardiac Complications

Complication	Observed Value
Heart Failure	11%
Shock	7.15%
Intra cardicThrombosis by ECHO	3.75%
Arrythmia	6%
QT Prolongation	9.50%
ST and T Changes	23.29%
Tachycardia	37%
Bradycardia	7.67%
Atrial Fibrillation (AF)	6.33%

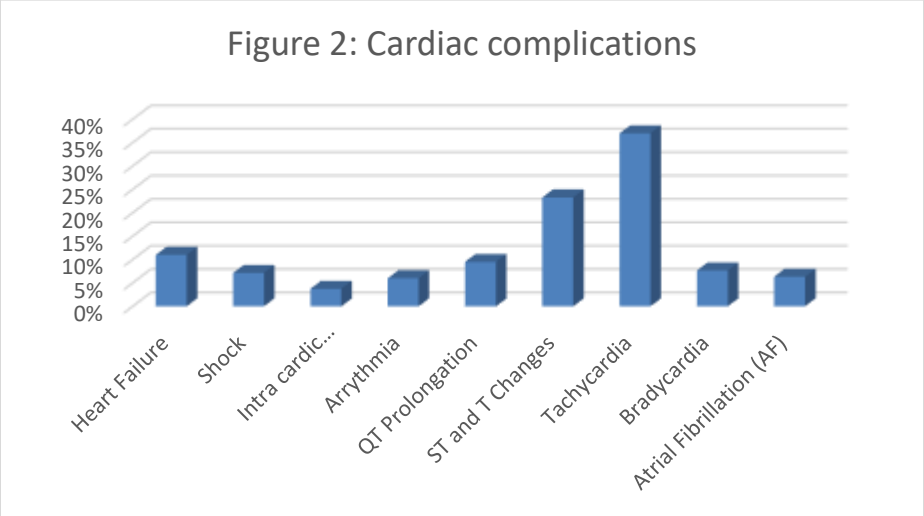
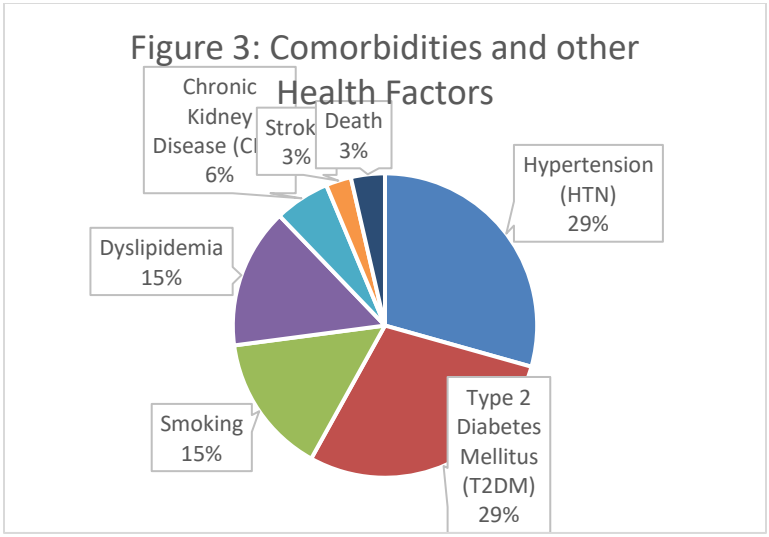


Table-3. Co-morbidities and Other Health Factors

Factor	Observed Value
Hypertension (HTN)	43.09%
Type 2 Diabetes Mellitus (T2DM)	42.10%
Smoking	21.80%
Dyslipidemia	21.87%
Chronic Kidney Disease (CKD)	8.63%
Stroke	3.95%
Death	5.30%



Additional Information:

- Days Admitted: 3.81 ± 2.90 days

Discussion

The integration of our research findings with the broader literature on COVID-19's impact on cardiovascular health offers a nuanced understanding of the complex interplay between the novel corona virus and cardiovascular disease. Our study, which meticulously examined cardiovascular manifestations in COVID-19 patients and their subsequent influence on in-hospital outcomes, is in concordance with global research that underscores the pandemic's significant cardiovascular toll.

By delving deeper into the cardiovascular repercussions of COVID-19, our research highlights several critical complications, including myocardial injury, various arrhythmias, instances of heart failure, and thromboembolic events. These findings are consistent with those documented in previous studies [6], [7], [8], and [9], all highlighting the occurrence of acute cardiac injury and the aggravation of pre-existing cardiovascular conditions amidst the COVID-19 crisis. Notably, study [9] further details how COVID-19 significantly affects patients with pre-existing cardiovascular disease, increasing their risk of severe outcomes. This study also examines complications such as arrhythmias, myocardial injury, myocarditis, and thromboembolism, underscoring the significant inflammatory burden related to cytokine release, which can elevate morbidity and mortality rates. This underscores the necessity for a cardiovascular-focused approach in managing infected patients.

The subsequent analyses in studies [10] and [11] further illuminate the pervasive impact of the virus on global health across diverse populations, emphasizing the critical challenges posed to heart healthcare systems and the need for an agile and effective response to mitigate these cardiovascular threats. Recommendations in study [12] for early detection and proactive intervention mirror our conclusions, emphasizing the importance of vigilant monitoring and robust management strategies for COVID-19 patients, especially those with underlying cardiovascular conditions.

Our study adds to this global dialogue by offering a localized lens through which to view these cardiovascular implications, presenting data and insights that are specifically relevant to our healthcare context. By doing so, we not only contribute to the collective understanding of COVID-19's cardiovascular effects but also highlight specific areas where our healthcare practices can be optimized to address these challenges more effectively. This localized approach ensures that our findings are directly applicable to improving patient outcomes and tailoring care strategies to meet the unique needs of our population, reinforcing the global call for a nuanced, patient-centric approach to managing the cardiovascular aspects of COVID-19.

Conclusion

This retrospective study conducted at a tertiary care center has elucidated the substantial cardiovascular complications associated with COVID-19, highlighting a pronounced impact on in-hospital outcomes, particularly in patients with pre-existing conditions such as hypertension and diabetes mellitus. Our findings reveal a significant prevalence of arrhythmias, myocardial injury, heart failure, and thromboembolic events, underscoring the systemic nature of COVID-19 and its direct and indirect effects on the cardiovascular system. These insights emphasize the necessity of integrated care approaches, combining vigilant cardiovascular monitoring with comprehensive management of COVID-19, to mitigate morbidity and mortality. Moreover, our study underscores the critical need for ongoing research and adaptation of healthcare systems to address the cardiovascular challenges posed by COVID-19, thereby improving patient outcomes in this vulnerable cohort.

Ethical approval

Before its commencement, the study received ethical approval from the Institutional Ethics Committee, as evidenced by the issued letter number GGS/IEC/63

Consent To Participate

This retrospective study was conducted following the ethical guidelines of Guru Gobind Singh Medical College, Faridkot, and received approval from the Institutional Review Board (IRB). Given the retrospective nature of the analysis, the IRB granted a waiver for informed consent. To uphold the highest standards of confidentiality and privacy, all patient data were anonymized and securely managed.

Acknowledgments

The authors acknowledge with gratitude the dedicated staff of the Cardiology and Internal Medicine departments at Guru Gobind Singh Medical College, Faridkot. Their invaluable support, expertise, and collaborative spirit were

instrumental to the successful completion of this study. This acknowledgment highlights the essential role these departments play in facilitating research and advancing the field of medical science.

Author Contributions

Navdeep Singh Sidhu, Sumit Kumar, and Himanshu Khutan were instrumental in the conceptualization and design of the study and contributed significantly to the review and editing of the manuscript. Ravinder Garg, Ritu Bala, and Amit Jain provided valuable insights and made critical revisions that enhanced the intellectual content of the manuscript. Kanav Mehta and Navreet Kaur were responsible for the acquisition and curation of the study's data. Additionally, they played a key role in the drafting, reviewing, and editing of the original manuscript.

Conflict Of Interest Disclosure

Neither of the authors has any conflict of interest to disclose.

Funding Statement

This study received no financial support.

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