Section: Medicine

Original Research Article

CLINICAL CHARACTERISTICS AND RISK FACTORS OF CRITICALLY ILL PATIENTS WITH COVID-19: A SINGLE CENTER RETROSPECTIVE ANALYSIS

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Abstract

Background: The COVID-19 pandemic caused by the novel coronavirus SARS-CoV-2 has presented a global public health crisis, overwhelming healthcare systems worldwide. This retrospective study aimed to investigate the clinical characteristics and risk factors associated with critically ill patients diagnosed with COVID-19 at Government Pudukkottai Medical College. Understanding these factors are crucial for risk stratification and effectively managing severely ill COVID-19 patients. **Materials and Methods:** A single-centre dataset comprising patients admitted between June 2021 and December 2021 was retrospectively analysed. Patient records were reviewed, and data on demographics, comorbidities, presenting symptoms, laboratory findings, treatment modalities, and clinical outcomes were collected and analysed. **Results:** The study included 267 critically ill patients with confirmed COVID-19. The mean age was 53.6 years, with a higher proportion of males (161/267, 60.3%). Common comorbidities included diabetes mellitus (22.9%) and systemic hypertension (25.1%). Most patients had moderate to severe lung involvement on the CT thorax. Complications such as vascular complications (9.4%), hyperglycemia (19.9%), acute kidney injury (25.1%), and sepsis (12.0%) were observed. Remdesivir was the predominant treatment (88.1%), with various oxygen delivery methods. **Conclusion:** Completing the COVID-19 vaccination schedule was crucial in reducing severe COVID-19 infection and mortality. Understanding these factors can aid in risk stratification and optimising treatment strategies for severely ill COVID-19 patients, highlighting the importance of targeted interventions, particularly for vulnerable populations, and emphasising the significance of widespread vaccination efforts.

INTRODUCTION

The COVID-19 pandemic caused by the novel coronavirus SARS-CoV-2 has presented a global public health crisis, overwhelming healthcare systems worldwide. As confirmed cases continue to rise, a significant subset of patients experiences severe illness requiring critical care support. Understanding the clinical characteristics and risk factors associated with critically ill COVID-19 patients is paramount for effective management and resource allocation. Government Pudukkottai Medical College, located in Tamilnadu state, serves as a primary healthcare facility in the region, catering to a large population affected by COVID-19. However, there is a lack of data regarding the clinical profile and risk factors specific to critically ill patients in this setting. Investigating these factors will provide valuable insights into the local disease burden and contribute to the existing knowledge on COVID-19.[1,2]

Previous studies have highlighted advanced age, male gender, and the presence of comorbidities as significant risk factors for severe COVID-19 outcomes. Comorbid conditions, such as diabetes mellitus, systemic hypertension, and cardiovascular disease, have been associated with worse clinical outcomes and increased mortality rates. Moreover, understanding the extent of lung involvement and identifying complications specific to critically ill COVID-19 patients is crucial for appropriate triage, treatment decisions, and resource allocation in

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resource-limited settings.[3-5] Therefore, this retrospective study aims to bridge the knowledge gap by investigating the clinical characteristics and risk factors associated with critically ill COVID-19 patients at Government Pudukkottai Medical College. The findings of this study will aid in risk stratification, informing evidence-based management protocols, and improving patient outcomes in this specific healthcare setting.

Aim and Objectives

The aim of this study is to investigate the clinical characteristics and risk factors associated with critically ill patients diagnosed with COVID-19.

MATERIALS AND METHODS

This retrospective study was conducted at Government Pudukkottai Medical College, Pudukkottai, from June 2021 to December 2021. The study design involved the analysis of medical records of critically ill patients admitted to the ICU with the diagnosis of COVID-19. Ethical approval was obtained from the Institutional Ethics Committee before data collection and analysis.

Inclusion Criteria

Patients aged 18 years and above, patients admitted to the hospital with a confirmed diagnosis of COVID-19 by nasopharyngeal swab RT-PCR, patients classified as critically ill based on clinical assessment and requiring intensive care support, and patients with available medical records containing relevant clinical data.

Exclusion Criteria

Patients who did not meet the inclusion criteria or had incomplete medical records were excluded.

Data were extracted from medical records using a standardised data collection form. The collected variables included demographics (age, gender), vaccination status (number of doses received), comorbidities (diabetes mellitus, systemic hypertension, coronary artery disease, chronic obstructive pulmonary disease/asthma, chronic kidney disease, pregnancy), lung involvement in CT thorax (percentage of lung involvement), complications (vascular complications, mucormycosis, hyperglycemia, acute kidney injury, hepatitis, electrolyte imbalances, thrombocytopenia, diabetic ketoacidosis, sepsis), treatment modalities (Remdesivir, oxygen delivery methods, blood product transfusion, dialysis), and clinical outcomes (recovery, death, discharge against medical advice).

Statistical Analysis

Descriptive statistics were used to summarise the demographic characteristics, comorbidities, clinical features, treatment modalities, and outcomes of critically ill COVID-19 patients. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as means with standard deviations or medians with interquartile ranges, depending on their distribution. Further analyses, such as subgroup comparisons and inferential statistics, were performed as deemed appropriate to address the research objectives.

RESULTS

Among the 267 patients in the study, the distribution of age groups reveals that the largest proportion of individuals falls within the age range of 50-69 years, comprising 40.8% of the total. The age groups of 30-49 years and >70 years each accounted for 23.2%, while the youngest age group of 18-29 years represented 12.7%. These findings highlight the significant impact of COVID-19 on individuals across a wide range of ages.

Regarding gender, male patients constituted a majority, comprising 60.2% of the cohort, while female patients accounted for 39.8%. This observation aligns with previous research suggesting a higher susceptibility of males to severe cases of COVID-19.

Table 1: Demographic data of the study

Variable		Total=267	Percentage %
Age	18-29 years	34	12.7
	30-49 years	62	23.2
	50-69 years	109	40.8
	>70 years	62	23.2
Sex	Male	161	60.2
	Female	106	39.8
Vaccine Status	Two doses	1	0.3
	One dose	17	6.3
	Unvaccinated	249	93.2
Comorbidities	DM	61	22.8
	SHT	67	24.9
	CAD	20	7.4
	COPD/Asthma	24	8.9
	CKD	17	6.3
	Pregnancy	30	11.2
Lung involvement on CT thorax	< 10%	32	11.9
	11-50%	68	25.4
	51-80%	90	33.7

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	> 80%	69	25.8
	Not taken	8	2.9
Complications	Vascular	25	9.3
	Mucormycosis	7	2.6
	Hyperglycemia	39	14.6
	AKI	67	25
	Hepatitis	21	7.8
	Dyselectrolytemia	39	14.6
	Thrombocytopenia (< 1 Lakh/cmm)	33	12.3
	DKA	10	3.75
	Sepsis	32	11.9
Treatment	Remdesivir	235	88
Oxygen delivery	Face mask/Prongs	58	21.7
	NRBM	86	32.2
	CPAP	81	30.3
	HFNC	2	0.75
Mechanical Ventilation		18	6.74
Blood products transfusion		12	4.5
Dialysis		30	11.2
Outcome	Recovered	239	89.5
	Died	16	6
	Discharged AMA	12	4.5

Regarding vaccine status, only a negligible proportion of patients (0.3%) had received both doses of the COVID-19 vaccine, while 6.3% had received a single dose. The vast majority of patients, 93.2%, were unvaccinated, underscoring the urgent need for widespread vaccination efforts.

The most prevalent comorbidities observed in the study were diabetes mellitus (22.8%) and systemic hypertension (24.9%). Other significant comorbidities included coronary artery disease (7.4%), chronic obstructive pulmonary disease/asthma (8.9%), chronic kidney disease (6.3%), and pregnancy (11.2%). These findings highlight the association between underlying health conditions and the severity of COVID-19 infections.

Approximately 11.9% of patients had less than 10% lung involvement, while 25.4% had involvement between 11-50%. A significant portion of patients, 33.7%, exhibited lung involvement ranging from 51-80%, and 25.8% had greater than 80% involvement. A small percentage of patients (2.9%) did not undergo CT thorax imaging. These findings provide insights into the extent of lung damage caused by COVID-19.

Some notable complications included acute kidney injury (25%), hyperglycemia (14.6%), vascular complications (9.3%), and mucormycosis (2.6%). These findings emphasize the multi-system nature of the disease and the potential for severe complications to arise.

Regarding treatment, most patients (88%) received remdesivir, a broad-spectrum antiviral medication recommended for severe COVID-19 cases. Different oxygen delivery methods were employed, with face mask/prongs used for 21.7% of patients, non-rebreather mask (NRBM) for 32.2%, continuous positive airway pressure (CPAP) for 30.3%, and high-flow nasal cannula (HFNC) for 0.75%. Mechanical ventilation was required for 6.74% of patients. Blood product transfusion and dialysis were performed in 4.5% and 11.2% of patients.

Most patients (89.5%) recovered from COVID-19, while 6% died due to the infection. A small proportion (4.5%) chose to leave against medical advice (AMA) before completing treatment.

DISCUSSION

Among 267 critically ill COVID-19 patients admitted to the ICU, diverse age distribution was observed, with 50-69 years and >70 years representing the majority. Males comprised 60.3% of the cohort, while unvaccinated individuals constituted 93.3%. Prevalent comorbidities included diabetes, hypertension, coronary artery disease, COPD/asthma, chronic kidney disease, and pregnancy.[3] Lung involvement assessed through CT thorax imaging revealed varying involvement, with 12%, 25.5%, 33.7%, and 25.8% of patients exhibiting <10%, 11-50%, 51-80%, and >80% involvement, respectively. These findings align with previous studies demonstrating a wide spectrum of lung involvement in severe COVID-19 cases.[6,7]

Complications observed in the ICU included vascular events (9.4%), mucormycosis (2.6%), hyperglycemia (19.9%), acute kidney injury (25.1%), hepatitis (7.9%), dyselectrolytemia (14.6%), thrombocytopenia (12.4%), diabetic ketoacidosis (3.7%), and sepsis (12%). These complications highlight the multi-organ impact of COVID-19 and the need for comprehensive care.8-15 Various oxygen delivery methods were utilised in the ICU: face mask/prongs (21.7%), non-rebreather mask (32.2%), continuous positive airway pressure (30.3%), high-flow nasal cannula

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(0.7%), and mechanical ventilation (6.7%). Selecting appropriate oxygen delivery methods is essential for managing respiratory distress and avoiding invasive ventilation.[16-18]

Blood product transfusion (4.5%) and dialysis support (11.2%) were required for some patients, while 88% received remdesivir treatment. These interventions address complications associated with severe COVID-19 and aim to improve outcomes.19-26 Among the ICU patients, 89.5% recovered, 6% died, and 4.5% were discharged against medical advice. The observed mortality rate aligns with previous studies, with respiratory failure and multiple organ dysfunction syndrome identified as leading causes of death.[25-28] Understanding the factors contributing to adverse outcomes is crucial for improving patient care and guiding treatment strategies.[3,29]

Limitations

Limitations such as its retrospective design, single-center setting, selection bias, and potential confounding factors should be considered, along with incomplete or biased data, lack of a control group, and the absence of real-time updates, raising concerns about generalizability and causality.

CONCLUSION

The study examined critically ill COVID-19 patients in the ICU during the second wave. The age distribution was diverse, with middle-aged and elderly patients comprising 64% of cases. Males accounted for 60% of the cohort. Most patients were unvaccinated, emphasising the importance of widespread vaccination. Comorbidities such as diabetes and hypertension were prevalent. Lung involvement varied on CT thorax imaging. Complications included vascular events, hyperglycemia, and acute kidney injury. Various oxygen delivery methods were used, and remdesivir was commonly administered. Most patients recovered, but a small percentage did not survive due to respiratory failure and organ dysfunction. The findings underscore the significance of vaccination, managing comorbidities, and comprehensive care in critically ill COVID-19 patients.

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