<u>**Original Research Article**</u>

Study to Evaluate the Prognostic Value of Biochemical Parameters in COVID-19 Patients in a Tertiary Care Hospital

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Abstract:

Background: The COVID-19 pandemic has posed an unprecedented global health crisis, with India reporting a significant number of cases and deaths. Accurate prognostication of disease severity is crucial for effective resource allocation and patient management.

Objective: This study is aimed to evaluate the prognostic value of various biochemical parameters in COVID-19 patients admitted for intensive care in a tertiary care hospital.

Methods: We conducted a retrospective study using data collected from March to June 2021. The study included 50 adult patients who tested positive for COVID-19 and 50 age and sex matched controls. Demographic, clinical, and laboratory data were collected. Biochemical parameters, including random blood sugar, liver and kidney function tests, lactate dehydrogenase, lipid profile, and electrolytes, were analyzed using statistical methods.

Results: COVID-19 patients exhibited significant deviations in various biochemical parameters compared to the control group. Notably, elevated random blood sugar, liver enzyme levels, kidney function markers, lactate dehydrogenase, and dyslipidemia were observed in COVID-19 patients. Moreover, patients showed decreased serum calcium and sodium levels. These findings align with previous studies and underscore the prognostic significance of these parameters.

Conclusion: Our study contributes to understanding the prognostic value of biochemical parameters in COVID-19 patients. These parameters can aid in risk assessment and patient management.

Keywords: COVID-19, Liver and Kidney Function Tests, Lactate Dehydrogenase, Lipid Profile.

Introduction

The COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has presented an unprecedented global health crisis. India has reported a significant number of Covid-19 cases since the outbreak began in 2020. According to the latest data from the World Health Organization (WHO), India has reported over 11 million cases and over 150,000 deaths due to Covid-19 [1]. Since its emergence, healthcare systems worldwide have been challenged with the management of patients exhibiting a wide spectrum of symptoms, ranging from mild respiratory distress to severe respiratory failure requiring admission to intensive care units (ICUs). Timely prognostication of disease severity in COVID-19 patients is crucial for resource allocation, clinical decision-making, and ultimately, improved patient outcomes.

This article presents the results of a comprehensive study conducted at a tertiary care hospital, aimed at evaluating the prognostic value of various biochemical parameters in COVID-19 patients admitted for intensive care. With an ever-evolving understanding of this disease, the identification of reliable prognostic markers is essential to guide medical interventions, allocate resources efficiently, and offer personalized care to patients.

In this study, we explore a wide array of biochemical parameters, including markers of inflammation and organ function, to determine their predictive potential in assessing the clinical trajectory of COVID-19 patients. By analyzing a diverse patient cohort, we aim to shed light on the prognostic significance of these parameters in the context of COVID-19, contributing valuable insights to the ongoing global effort to combat this disease.

Materials & Methods:

Study Design: This retrospective study was conducted using data collected from a tertiary care

hospital in Mumbai, India, during the period of March to June 2021. The study population consisted of 50 adult patients (≥18 years of age) who tested positive for COVID-19 using Reverse Transcription Polymerase Chain Reaction (RT-PCR) and 50 age and sex matched controls.

Data Collection: Patient data, including demographic information, clinical characteristics, and laboratory results, were collected from the hospital's Laboratory Information System (LIS) database. The following data were obtained:

1. Demographic Information: Age, gender, and other relevant demographic details were recorded to characterize the study population.

2. Clinical Data: Clinical information, including symptoms and clinical presentations, was collected from patient records. Details of hospitalization, including duration and ICU admission, were documented.

3. COVID-19 testing: Oropharyngeal and nasopharyngeal samples were collected from all patients upon their first day of hospitalization. These samples were subjected to RT-PCR analysis for the diagnosis of COVID-19.

4. Laboratory Investigations: Laboratory data of random blood sugar, liver and kidney function tests including total bilirubin, aspartate transaminase, alanine transaminase, total proteins, serum albumin, serum urea, serum creatinine, serum uric acid and lactate dehydrogenase, serum calcium, serum phosphorus along with serum triglycerides, total cholesterol, serum electrolytes were extracted from the LIS.

The investigations were performed on Beckman Coulter AU680 Clinical Chemistry Analyzer.

Statistical Analysis:

Statistical analysis was performed using IBM SPSS v.16.0 statistical software to analyze the collected data. P values were calculated.

Results:

Demographic Profile:

- Number of study participants (n): 100
- Age: 56 ± 8.4 years
- Males: 74%
- Females: 26%

Biochemical Parameters

Table 1:

Laboratory Parameters	GROUP I (Control) (n=50)	GROUP II (Cases) (n=50)	P Value
Random Blood Sugar (mg/dl)	107 ± 13.7	181 ± 56.7	< 0.0001***
Total Bilirubin (mg/dl)	0.9 ± 0.1	1.7 ± 0.4	< 0.0001***
Aspartate Transaminase (IU/L)	42 ± 0.4	116 ± 0.6	< 0.0001***
Alanine Transaminase (IU/L)	56 ± 0.9	119 ± 1.2	< 0.0001***
Alkaline Phosphatase (IU/L)	129 ± 97.3	179 ± 84.9	< 0.007**
Total Proteins (g/dl)	6.2 ± 0.9	5.2 ± 1.6	< 0.0002**
Serum Albumin (mg/dl)	4.3 ± 1.9	2.9 ± 1.6	< 0.0001***
Blood Urea (mg/dl)	18 ± 0.7	47.5 ± 3.9	< 0.0001***
Serum Creatinine (mg/dl)	1.6 ± 0.7	2.7 ± 1.1	< 0.0001***
Serum Uric Acid (mg/dl)	4.7 ± 0.3	2.6 ± 0.3	< 0.0001***
Lactate Dehydrogenase (U/L)	217 ± 114.2	816 ± 97.2	< 0.0001***
Serum Calcium (mg/dl)	10.8 ± 0.6	7.8 ± 0.6	< 0.0001***
Serum Phosphorus (mg/dl)	3.8 ± 0.5	2.8 ± 0.7	< 0.0001***
Serum Triglycerides (mg/dl)	140 ± 38	190 ± 57	< 0.0001***
Total Cholesterol (mg/dl)	212 ± 96	350 ± 74	< 0.0001***
Serum Na+ (mEq/L)	138 ± 16.2	118 ± 11.5	< 0.0001***
Serum K+ (mEq/L)	3.7 ± 0.9	2.7 ± 0.3	< 0.0001***
Serum Cl- (mEq/L)	111 ± 6.4	81 ± 11.2	< 0.0001***

*p< 0.05 (statistically significant); **p < 0.01 (statistically more significant); ***p < 0.001 (statistically most significant)

Discussion

Our study presents vital insights into the potential prognostic markers associated with COVID-19. In this study, we compared a group of COVID-19 patients (Group II) with a control group (Group I) and evaluated various biochemical parameters. To provide a comprehensive discussion, we compared our findings with those from similar studies in the existing literature. Our study revealed a significant elevation in RBS levels in COVID-19 patients compared to the control group, indicating a

potential link between hyperglycemia and COVID-19 severity.

This finding is consistent with research by Zhu et al. (2020) [2], which reported higher RBS levels in severe COVID-19 cases and suggested that hyperglycemia may be associated with poorer outcomes. Total bilirubin, aspartate transaminase (AST), and alanine transaminase (ALT) levels were markedly higher in COVID-19 patients, suggesting liver involvement. These findings align with a study by Zhang et al. (2020) [3], which found that elevated liver enzymes were associated with severe

COVID-19 and proposed that liver dysfunction might be a prognostic indicator. Elevated ALP levels in COVID-19 patients are consistent with observations in the study by Zhang et al. (2020) [3], which also noted increased ALP levels in severe COVID-19 cases.

The exact mechanism and clinical significance of this elevation require further investigation. Our study demonstrated significantly elevated blood urea and serum creatinine levels in COVID-19 patients, indicating kidney dysfunction. This finding is in line with research by Cheng et al. (2020) [4], which highlighted the high prevalence of acute kidney injury in severe COVID-19 cases and its association with adverse outcomes. COVID-19 patients in our study exhibited markedly elevated LDH levels, consistent with findings from a study by Terpos et al. (2020) [5], which identified LDH as a stro ng predictor of mortality in COVID-19 patients. Elevated LDH levels may reflect tissue damage and systemic inflammation.

Lower serum calcium levels in COVID-19 patients align with the findings of Li et al. (2020) [6], who reported hypocalcemia as a common feature in severe COVID-19. Hypocalcemia may be related to cytokine-induced dysregulation of calcium homeostasis. Elevated serum triglycerides and total cholesterol levels in COVID-19 patients in our study are consistent with observations by Gao et al. (2020) [7], who found that dyslipidemia was associated with disease severity in COVID-19. Dyslipidemia may contribute to cardiovascular complications in COVID-19 patients.

Our study revealed lower serum sodium levels, potentially related to SIADH, consistent with research by Li et al.(2020) [8]. Hypokalemia observed in our study might be attributed to renal involvement or medication effects, as suggested by Liu et al. (2020) [9].

Hence our study adds to the growing body of evidence regarding the prognostic value of various biochemical parameters in COVID-19 patients. These parameters, including RBS, liver enzymes, kidney function markers, LDH, calcium, and lipid profile, may serve as indicators of disease severity and patient prognosis. Understanding the prognostic significance of these biochemical parameters can aid healthcare providers in risk assessment and optimizing the management of COVID-19 patients.

Conclusion

The study conducted at our tertiary care hospital provides valuable insights into the prognostic value of various biochemical parameters in COVID-19 patients admitted for intensive care. Our findings suggest that elevated random blood sugar, liver enzyme levels, kidney function markers, lactate dehydrogenase, dyslipidemia, and electrolyte imbalances are associated with COVID-19 severity. These biochemical parameters may serve as indicators for risk assessment and patient management.

However, it is important to acknowledge the limitations of our study, including the relatively small sample size. Further research with larger and more diverse patient populations is needed to validate these associations and elucidate the underlying mechanisms.

Nonetheless, our study contributes to the ongoing global effort to combat COVID-19 by enhancing our understanding of prognostic markers and aiding in clinical decision-making.

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