Original Article

A Study of the Clinico-demographic Profile and Clinical Outcomes of COVID-19 Patients in a Tertiary Care Hospital of India

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Background : The SARS-CoV-2-induced COVID-19 pandemic has presented substantial challenges to healthcare systems across the globe. This study aimed to investigate the clinico-demographic profile and clinical outcomes of COVID-19 patients in a tertiary care hospital in Barak Valley, Assam, India.

Methodology : A retrospective, single-center, hospital-based cross-sectional study was conducted, focusing on patients with laboratory-confirmed COVID-19 admitted between July, 2020 and December, 2020.

Results : A total of 353 patients were analyzed with 69% being male and 31% female. Patients were classified into three severity groups: mild, moderate and severe. The mean ages in the mild, moderate and severe groups were 41.58 years, 57.70 years and 59.54 years, respectively. Cachar district accounted for the majority of patients (68.83%), followed by Karimganj district (18%) and Hailakandi district (10%). The common presenting complaints included fever, cough and dyspnoea. Co-morbidities were present in 61.76% of patients, with diabetes and hypertension being the most prevalent. Pulmonary comorbidities showed a strong association with increased mortality rates. Vital signs and laboratory parameters worsened with disease severity with neutrophils increasing and lymphocytes decreasing. Ferritin and LDH levels also increased with severity, reflecting disease progression. Treatment involved remdesivir and convalescent plasma therapy, with the combination showing better outcomes compared to individual therapies.

Conclusion : Overall, the study provides valuable insights into the unique challenges and characteristics of COVID-19 patients in the low HDI region of Barak Valley, Assam. The findings can aid in targeted public health interventions, resource allocation and equitable healthcare delivery, ultimately mitigating the impact of the disease and improving patient outcomes in the region. However, the study has certain limitations and further prospective multi-center studies are needed to validate and expand upon these findings.

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Key words **: COVID-19, Co-morbidity, Clinico-demographic, Mortality, Treatment.**

The COVID-19 pandemic, as declared by WHO on March 11, 2020, has presented significant challenges to the health care system Worldwide. COVID-19 is a viral illness caused by SARS CoV-2, a virus of the Coronaviridae family. It was first identified in Wuhan city in Hubei province of China in December, 2019 and was later named as 2019 novel Corona Virus (2019-nCoV)[1]. Similar to the other two Corona Viruses of the family, SARS-CoV and MERS-CoV, which caused outbreaks in China (2003) and Saudi Arabia (2012), SARS-CoV-2 is also believed to have originated from bats that later spread to humans through an intermediate human host, although the exact origin is still being studied[1,2]. While the overall fatality rate of COVID-19 is lower than that of SARS or MERS[3], its high transmissibility has resulted in a significantly larger number of infections and deaths Worldwide.

Editor's Comment :

- This study highlights the importance of demographic factors, co-morbidities, and disease severity in determining COVID-19 outcomes in Barak Valley, Assam, emphasizing the need for targeted public health measures and equitable resource allocation. The findings indicate that older age, male gender and co-morbidities, particularly pulmonary conditions, significantly increase mortality risks. Enhanced clinical strategies, including the combination of Remdesivir and convalescent plasma therapy, could improve patient outcomes in severe cases.

It has become evident that the clinical outcome and manifestation of COVID-19 vary widely among individuals, influenced by a wide range of clinico-demographic factors such as age, co-morbidities, socio-economic status, access to health care, population density and the effectiveness of public health measures implemented by different countries and regions. Performing a clinico-demographic study of COVID-19 in Assam, a low Human Development Index (HDI) region, is essential for understanding the unique challenges and characteristics of the local

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population. This knowledge can inform targeted public health interventions, resource allocation and equitable healthcare delivery, ultimately helping to mitigate the impact of the disease and improve outcomes in the region. To the best of our knowledge, this is the first comprehensive study about the clinico-demographic profile of COVID-19 from Barak Valley, Assam. The primary objective of the study was to analyze the clinico-demographic profile of admitted COVID-19 patients and secondarily to correlate the association of age, sex and co-morbidities with mortality.

Materials and Methods

Study Setting and Duration :

This retrospective, single-center, hospital-based cross-sectional study was conducted in a tertiary care hospital situated in Barak Valley, Assam. The study focused on the population of patients who were admitted to the hospital with laboratory-confirmed COVID-19 between July, 2020 and December, 2020.

Sampling Method :

The sampling approach employed was non-probability convenience sampling, meaning all consecutive patients admitted during the specified study duration were included.

Inclusion and Exclusion Criteria :

All hospitalized patients with laboratory confirmed, COVID-19 (RAT or RTPCR) who consented to participate were included in the study. Duplicate samples, meaning repeat samples taken from patients who were already confirmed positive for COVID-19, were excluded from the study. Additionally, incompletely filled Surveillance Report Form (SRF) forms and/or incomplete inpatient hospital tickets were excluded from the analysis.

Data Analysis :

To gather the necessary data for analysis, clinico-demographic information about the patients was collected from the SRF forms and hospital bed tickets. This data was systematically entered into a pre-designed form and further uploaded into a Microsoft Excel® sheet for analysis. Statistical correlation was done using GraphPad Prism® version 8.

Results

This study involved the analysis of a total of 353 patients, comprising 246 Males (69%) and 107 Females (31%). The patients were categorized into three groups based on the severity of their condition: mild, moderate and severe, according to state protocol. 100 patients (28.3%) were classified as Mild, 169 (47.87%) as Moderate and 84 as severe (23.8%). The mean age of patients in the mild group was 41.58 years, while it was 57.7 years in the moderate group and 59.54 years in the severe group. Upon admission, 239 patients (67.7%) tested positive for Rapid Antigen Testing (RAT), while the remaining 114 patients (32.3%) tested positive for RT-PCR (Table 1).

The majority of patients seeking admission at Silchar Medical College were from Cachar district 68.83% (n=243), followed by 18% (n=65) from Karimganj and 10% (n=35) from Hailakandi district. The mortality of patients increased with increasing distance from the treating hospital (Table 2).

The most common presenting complaint among the patients was fever, reported by 61.76% (n=218) of patients, followed by cough in 53.82% (n=190) of patients. Other symptoms included dyspnoea in 42.78% (n=151) of patients, sore throat in 7.36% (n=26), diarrhoea in 4.25% (n=15), chest pain in 3.4% (n=12), headache in 3.68% (n=13), and loss of taste and smell in 0.28% (n=1) of patients (Fig. 1).

Table 1 — *Demographic profile of COVID-19 patients*

Parameter	Mild	Moderate	Severe
Total Patients	100	169	84
Male	65	122	59
female	35	47	25
Average Age (in years)	41.58	57.7	59.54
Rat positive	239		
RT-PCR positive	114		

Table 2 — *Demographic Distribution of cases and outcome comparison*

Place	Total Patients	Mortality	Mortality Percentage
Cachar	243	37	15.22
Hailakandi	35	7	20.00
Karimganj	65	19	29.2
Tripura	6	2	40.00
Others	4	2	50.00

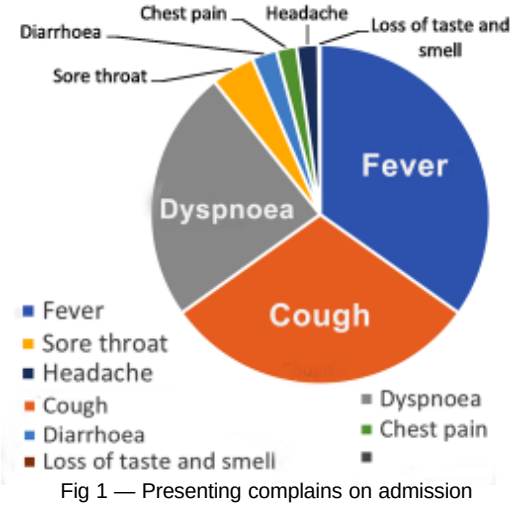

Fig 1 — Presenting complains on admission

Co-morbidities were present in 218 (61.76%) patients, out of which 48 (22%) expired. 19 (15.97%) patients expired who had no co-morbidities. Out of 14 patients with pulmonary co-morbidities, 6 (42.86%) expired. The mortality in patients with diabetes, hypertension (HTN), or both as co-morbidities was 19.09% (n= 21). In patients with diabetes, HTN or both along with additional comorbidities was 19.72% (n=14). In patients without diabetes or HTN but with other co-morbidities, the mortality was 30.43% (n=7). (Fig 2).

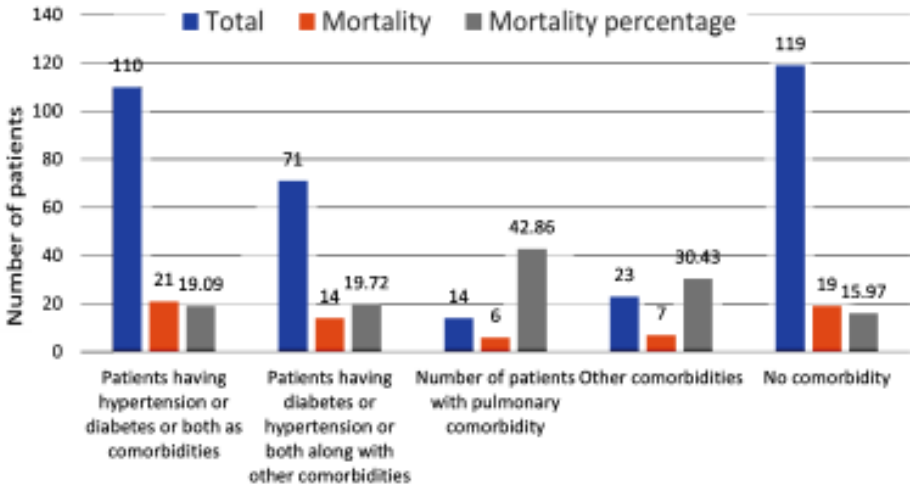

Fig 2 — Association between co-morbidities and mortality

Among patients with severe disease, 20.96% (n=74) patients were having age more than 40 and 2.83% (n=10) patients were less than 40. The mortality among patients with an age more than 40 was 17% (n= 60) and mortality at age below 40 was 1.98% (n=7). The percentage of Males in severe group was 70.23% (n=59) and Females 29.77% (n=25) while 21.14% (n=52) were males as compared to 22.39% (n=15) females out of the total mortality (n=67) (Table 3).

The vital signs and laboratory parameters varied across the three severity categories. In the mild category, patients had an average respiratory rate of 19.56 breaths per minute, oxygen saturation (SpO2) of 96.8%, heart rate of 92.7 beats per minute, and a mean blood pressure of 75 mm Hg. In the moderate category, the average respiratory rate was 23.75 breaths per minute, SpO2 was 92%, heart rate was 101.3 beats per minute and mean blood pressure was 70 mm Hg. In the severe category, the average respiratory rate was 25.86 breaths per minute, SpO2 was 72.8%, heart rate was 125.8 beats per minute, and mean blood pressure was 50 mm Hg (Table 4).

The average Hb levels were 12.46 gm%, 11.8 gm% and 11.39 gm% in mild, moderate and severe group respectively. The total count increased with severity from 6281/ microliters in mild group to 14329/ microliters in severe group with neutrophilia progressively increasing from 62.82% per mm^3 in mild group to 85% per mm^3 in severe group. Lymphocytes progressively decreased with severity from 25.5% per mm^3 in mild group to 8.12% per mm^3 in severe group. Furthermore, the severity of the patients' conditions was reflected in their ferritin and LDH levels, as well as the findings from Chest X-rays. In the mild group, ferritin levels averaged at 129.7 ng/mL, while LDH levels were 391 IU/L. Among the patients in this group, 47 individuals had abnormal Chest X-ray findings. In the moderate group, ferritin levels increased to an average of 330 ng/mL and LDH levels rose to 436 IU/L. The number of patients with abnormal chest X-ray findings also increased to 107. In the severe group, ferritin levels further increased to an average of 416 ng/mL and LDH levels were notably elevated at 594 IU/L. The number of patients with abnormal Chest X-ray findings remained significant, with 33 individuals displaying such findings (Table 5).

Table 3 — *Association of Age and sex with mortality*

	Severity	Percentage	Mortality	Percentage
Age >40	74/353	20.96	60/353	17.00
Age <40	10/353	2.83	7/353	1.98
Male	59/84	70.23%	52/67	77.61
Female	25/84	29.77%	15/67	22.39

Table 4 — *Vital parameters of admitted patients*

	Mild	Moderate	Severe
RR	19.56	23.75	25.86
SPO2%	96.8	92	72.8
HR (bpm)	92.7	101.3	125.8
Mean BP (mmHg)	75	70	50

RR - Respiratory Rate (breaths per minute); HR - Heart Rate; BP - Blood Pressure

Treatment for the patients followed the state protocol, which included symptomatic care. Two major modalities were employed: Pharmacotherapy with Remdesivir and experimental Convalescent Plasma Therapy (CPT). Different treatment combinations were administered based on the severity of the

disease. Specifically, 11 patients received only convalescent plasma therapy and 6 of them (54.54%) did not survive. Remdesivir alone was administered to 126 patients, of whom 31 (24.60%) expired. Among those who received both CPT and Remdesivir (91 patients), the mortality rate was 21.90% with 20 patients expiring. 25 patients did not receive either CPT and Remdesivir of whom 10 patients (40%) expired (Table 6).

Table 5 — *Laboratory and Radiology Parameters in different groups*

Parameters	Hb gm%	TLC per microliters	Lymphocytes per mm^3	Neutrophils per mm^3	Ferritin ng/mL	LDH IU/L	Positive Chest x-ray
Mild	12.46	6281	25.55	62.82	129.7	391	47
Moderate	11.87	8918	16.26	75.88	330	436	107
Severe	11.39	14329	8.12	85	416	594	33

Hb - Haemoglobin; TLC - Total Leucocyte Count

Table 6 — *Outcome comparison after experimental therapies CPT- Convalescent Plasma Therapy*

CPT		Remdesivir		CPT+ Remdesivir		No CPT No Remdesivir	
Total Patients	Expired (%)	Total Patients	Expired (%)	Total Patients	Expired (%)	Total Patients	Expired (%)
11	6(54.54)	126	31(24.60)	91	20(21.98)	25	10(40)

In terms of outcome, within the mild group, 90 patients were successfully cured, 7 remained admitted at the time of data collection and 3 were discharged against medical advice. There were no deaths in the group. In the moderate group, 23 individuals expired, while 123 patients recovered. Additionally, 17 patients were still admitted and 4 patients left against medical advice. Within the severe group, 44 patients expired while 32 were successfully cured, additionally, 5 patients remained admitted and 1 patient left against medical advice (Fig 3).

Discussion

Demographically, the study revealed that the majority of patients seeking admission to Silchar Medical College were Male (69%) compared to Female patients (31%). This observation aligns with previous studies that have also shown a higher susceptibility of males to COVID-19[4-6]. The underlying reasons for this gender disparity are not fully understood and may involve biological such as the higher expression of ACE2 receptor[7], behavioural such as smoking, excessive alcohol consumption and less adherence to preventive measures like wearing mask and social distancing and societal factors such as occupation and workplace exposure and traditional social roles like sharing the majority of outdoor responsibility[5,8-10]. The severity and mortality of the illness also had a male preponderance in our study. However, there is disparity in observations with few studies showing positive correlation between severity as well as mortality and male gender like[6,11-17] and others showing negative or no correlation with male gender[8]. It is important for future research to investigate the mechanisms behind this disparity to form targeted interventions and public health strategies

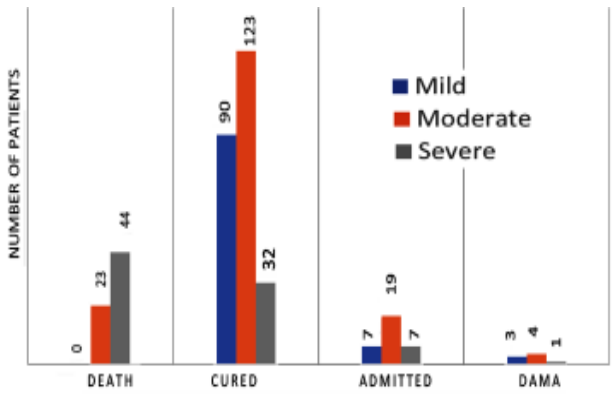

Fig 3 — Outcome comparison among different groups

Our study confirms previous findings that increased age is linked with higher disease severity and mortality[19]. This population requires particular focus on prevention, early detection and management strategies.

Furthermore, the study reported that the majority of patients seeking admission were from Cachar district (68.83%), followed by Karimganj (18%) and Hailakandi (10%) districts. It was also seen that both the disease severity and mortality were higher among cases from Karimganj and Hailakandi. These regional variations might be influenced partly by factors such as population density, accessibility to healthcare facilities and the level of awareness about COVID-19 in different regions and also because most of the cases from these two districts were referred. The study provides important regional data that can aid in resource allocation and public health planning at the local level though further studies with particular focus on these factors are awaited.

The common presenting complaints in our study were fever, cough and dyspnoea in the descending order of presentation followed by sore throat, diarrhoea, chest pain, headache and loss of taste and smell the last being the least frequent symptom. These findings are consistent with the typical

symptoms associated with COVID-19, as reported by various studies[6,20,21].

Co-morbidities were found to be present in a significant proportion of the patient, among which diabetes and hypertension were the most prevalent. It was also observed that Pulmonary Co-morbidity was strongly associated with increased mortality rates, surpassing other Co-morbidities in terms of mortality risk. These findings are consistent with previous studies that have highlighted the association between these Co-morbidities and increased morbidity and mortality in COVID-19[5,17,22,23]. It is thus crucial for healthcare providers to be aware of and address these underlying Co-morbidities in the management of COVID-19 patients.

Increasing disease severity correlates with escalating abnormalities in vital signs particularly increase in respiratory rate, SpO2 and blood pressure reflecting respiratory distress and multiorgan dysfunction in severe COVID-19. A progressive decrease in the lymphocyte count and an increase in the neutrophil count, LDH and ferritin levels with increasing disease severity was also observed as a finding that aligns with previous studies[21,24].

The outcome in terms of mortality was seen to be favourable in patients who received a combination of plasma therapy and Remdesivir as compared to those receiving either of the two therapies though outcome was slightly better in Remdesivir group as compared to Plasma therapy alone. This finding of ours was in accordance with another study by Diaz G[25]. Further focussed Randomized controlled trials are required to establish the efficacy and safety of these treatment modalities.

It was observed that the severe group had the highest mortality rate which highlights the critical need for timely and appropriate management of severe COVID-19 cases to improve patient outcomes.

It is important to acknowledge the limitations of this study. First, the study design was retrospective, which introduces inherent biases and limitations in data collection. Prospective studies with larger sample sizes and control groups are needed to further validate and expand upon these findings. Second, the study was conducted at a single centre, which may limit the generalizability of the results to other settings. Multi centre studies involving diverse populations are necessary to obtain a more comprehensive understanding of COVID-19 characteristics and outcomes.

Conclusion

This study at Silchar Medical College and Hospital highlights the impact of factors like demographics, Co-morbidities, vital signs and treatment outcomes on COVID-19 severity and mortality in the population of Barak valley. The findings can inform Government policies for improved clinical management and public health interventions. Further research is needed to validate and explore additional factors influencing COVID-19 outcomes.

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