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Clinico-epidemiological profile of COVID-19 patients admitted in a tertiary care center in Central India

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ABSTRACT

Introduction: India is the second country with the highest Coronavirus Disease-2019 (COVID-19) case burden in the world. In India, Maharashtra state has the highest number of cases. During September 2020, more than 37% of new fatalities reported are from Maharashtra. **Objective:** To study the clinic-epidemiological profile of COVID-19 patients admitted in a COVID-19 designated tertiary care centre in Central India. **Materials and Methods:** This is a record based cross-sectional study. The epidemiological, demographic, clinical, laboratory, radiological and treatment data of195Real Time-Polymerase Chain Reaction (RT-PCR) confirmed COVID-19 patients during September 2020 was collected. **Results:** Among the 195 laboratory confirmed COVID-19 patients, majority of the patients belonged to the age group of above 60 years. The most common co-morbid condition found was hypertension followed by diabetes mellitus. The most common symptoms were breathlessness and fever followed by cough. The mean time from the onset of symptoms to hospital admission for discharged is more than death cases. In summary, parameters such as lower SpO2, higher TLC, granulocyte percentage, inflammatory markers (CRP, ferritin), urea, creatinine, liver enzymes, and LDH were significantly associated with poorer outcomes in COVID-19 patients. Patients aged more than 60 years and patients associated with comorbidities are more prone for severe disease with Severe Acute Respiratory SyndromeCoronavirus 2 (SARS-CoV-2) pneumonia and this subset of patients requires urgent medical attention.

Keywords: COVID-19, Mortality, Urea, Comorbidities.

Introduction

COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a single-stranded RNA virus belonging to the coronaviridae family, with an incubation period ranging from 2 to 14 days.[1, 2] In December 2019, it was first detected in Wuhan, China and later spread to every corner of the globe.[3] Corona pandemic has been circulating in India since it reported its first case on 30th January 2020 from Kerala.[4] India is the second country with the highest Coronavirus Disease-2019 (COVID-19) case burden in the world.[5] In India, Maharashtra state has the highest number of cases. Nagpur in the Central India region saw the highest rise in cases and also mortality in September 2020.[6] Since the onset of the COVID-19 pandemic, the virus has undergone mutations, leading to the emergence of variants such as delta and omicron. Each new variant has contributed to fresh waves of COVID-19 cases.[7]

In addition to the evolution of SARS-CoV-2 into new strains, factors like vaccine effectiveness, adherence to COVID-19 safety measures, and herd immunity have influenced whether the number of new COVID-19 cases rises or falls in different regions.[8]

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COVID-19 has a wide spectrum of presentations. Numerous studies have highlighted global variation[9] and clear differences in the epidemiology and clinical profile of COVID-19 patients who presented at designated health centers during the first and second waves.[9,10,11,12]

A mid the emerging nature of the COVID-19 virus and gaps in the natural history, disease dynamics and population dynamics[13]

There are Indian population's unique vulnerabilities (e.g., health awareness, living conditions like overcrowding, affordability and favourable environmental conditions) and heterogeneous risk profiles (e.g., preventive practices like personal hygiene and etiquettes, undiagnosed or uncontrolled comorbid health conditions, and patients care seeking behaviour) which complicate the disease and its prognosis. A thorough analysis of the clinic-epidemiological profiles of patients presenting with COVID-19 can help to formulate evidence-based decisions and monitoring.

This data on the local population will help in great lengths for prioritizing patients needing medical attention and investigations in resource and time-limited situations. It will also help in planning and response preparedness, and predicting future trends.

Aim and Objectives

1. To assess the clinico-epidemiological profile of COVID-19 patients admitted in a COVID-19 designated tertiary care center in Central India.
2. To study any relation between clinic-epidemiological and Laboratory parameters with outcomes.

Material and Methods

Study design - This is a single centre, record based cross-sectional study.

Study population: The study population included the admitted patients visited during September 2020 at a GMC Nagpur (1st wave for Nagpur region 2nd half of August to 1st half of November) GMC Nagpur was declared a dedicated COVID-19 hospital during all waves of the COVID-19 pandemic.

Inclusion criteria: The study included all the documented RT-PCR confirmed IPD patients.

Exclusion criteria: All non-COVID patients.

Sample size: The sample size was calculated to be 194, using a margin of error of 7%, a confidence level of 95%, and a 44.79% prevalence of fever symptom from reference study.[14]

Data collection method and analysis: The data were collected from the case sheets which included the details on various clinic-epidemiological variables such as age, sex, co-morbidities, clinical symptoms, severity, respiratory rate, oxygen saturation, intensive care unit (ICU) admission, respiratory support, complications, laboratory, radiological and treatment data duration of hospital stay, and hospital deaths.

As the lab parameters and chest X-ray findings are dynamic and vary as the disease progresses, investigations conducted at admission were considered. Clinical severity was described as mild/moderate/severe or critical based on clinical signs, lab parameters, and radiological findings as laid down in the clinical management protocol: COVID-19 issued by the Government of India[15] and mentioned in Table 1.

Ethics approval: The study was approved by institutional ethics committee of concerned medical college **(Ref No-EC/Pharmac/GMC/NGP/3086)** in accordance with the ethical standards as laid down in 1964 Declaration of Helsinki and it's later amendments or comparable one.

Statistical analysis: The data were entered into MS Excel sheet. The continuous variable results were shown by descriptive statistics and the categorical variables by frequency and percentages. Group comparisons were done using the chi-square1 for categorical variables. Mann-Whitney U test was used for continuous variables with

non-normal distribution. The analysis was carried out in SPSS version 20.0 and $p<0.05$ was considered statistically significant

Results

A total of 195 laboratory confirmed adult COVID-19 patients' data admitted were included. The maximum number of patients belonged to the age group of above 60 years. The mean age was 53.3 (±14.3) years with age groups ranging from 16 to 89 years. Men were 130 (66.67%); Male to female ratio being 3:1.

Table 1: Clinical category classification (Adapted from Clinical Management Protocol: Corona virus disease 2019 of GoI issued in June, 2020)

Clinical category	Description	Parameter
Mild	Patients with uncomplicated upper respiratory tract infection	SpO_2 ≥94% in room air
		RR ≤24/m No evidence of hypoxia or breathlessness
Moderate	Pneumonia with no signs of severe disease	SpO_2 93%-90% in room air RR 25-30/ min
Severe	Severe pneumonia	SpO_2 <90 Room Air ; RR >30/m
Critical	ARDS	
	Septic shock	
	Shock	

SpO2 : Oxygen saturation, **RR:** Respiratory rate, **ARDS:** Acute respiratory distress syndrome, **GoI:** Government of India

Table- 2 shows the distribution of various characteristics among the Covid-19 patients. Highest co-morbidity found was hypertension in 42% people, followed by diabetes in 25% and renal disease in 10%. In terms of symptoms, breathlessness was the most frequently reported, affecting nearly half of the patients (46.66%). Fever followed closely, reported in 41.55% of the cases, and cough was noted in 35.89%.

Table-2: Distribution of various clinical characteristics among the Covid-19 patients

Characteristics		No.	%
Types of co-morbidities	Hypertension	82	42.05
	Renal disease	20	10.25
	Others	17	8.71
Symptoms	Breathlessness	91	46.66
	Fever	81	41.55
	Cough	70	35.89
	Weakness	37	18.97
	Vomiting	6	3.07
	Diarrhoea	4	2.05
Treatment	Antibiotics only	21	10.76
	Antiviral	105	53.84
	Oxygen supply	104	53.3
Intubation in Died (n=115)	---	42	36.52
Distribution of various clinical characteristics, treatment received and days of hospitalization of the COVID-19 patients			

Some patients experienced less common symptoms such as weakness (18.97%), vomiting (3.07%), and diarrhoea (2.05%). The prevalence of these symptoms highlights either the varied clinical presentation of COVID-19 or treatment side effects, ranging from respiratory to gastrointestinal manifestations.

Regarding treatment, over half of the patients received antiviral therapy (53.84%) and oxygen support (53.3%), indicating the need for respiratory management in severe cases. A smaller portion of the cohort of 21 (10.76%) required treatment of antibiotics only. For the subgroup of patients who died (n=115), intubation was performed in 42 cases (36.52%).

Table- 3: Association between clinic-epidemiological factors and outcomes

Characteristics		Outcome				Total	χ2 value & 'P' value
		Discharged		Died			
		No.	%	No.	%		
Gender	Male	47	36.15	83	63.85	130	χ2=3.80 P = 0.051
	Female	33	50.76	32	49.24	65	
Age group (years)	≤30	19	79.16	5	28.84	24	χ2=28.32 P <0.0001
	31-40	17	68.0	8	32	25	
	41-50	14	43.75	18	56.25	32	
	51-60	16	36.36	28	63.64	44	
	>60	14	20.0	56	80.0	70	
Co-morbidities	Present	43	29.65	102	70.34	145	χ2=30.06 P <0.0001
	Absent	37	74.0	13	26	50	
Symptoms	Present	69	39.65	105	60.34	174	χ2=1.24 P = 0.264
	Absent	11	52.23	10	47.61	21	
Clinical Classification on admission	Uncomplicated Pneumonia	12	30.0	28	70	40	χ2=31.83 P <0.0001
	Mild Pneumonia	47	87.03	7	12.97	54	
	Moderate Pneumonia	8	40	12	60	20	
	Severe pneumonia	13	17.33	62	82.67	75	
Place of admission during hospitalisation (n=191)	Ward	45	49.15	15	56.04	91	χ2=25.78 P <0.0001
	ICU	7	12.96	47	87.03	54	
	HDU	25	60.97	16	39.02	41	

[Table-3]: Demographic, co-morbidities, symptoms, clinical classification, place of admission during hospitalisation among patients discharged and died of SARS-CoV-2 pneumonia.

Among the patients, males had a higher mortality rate, with 63.85% of male patients (83 out of 130) succumbing to the disease, while 36.15% were discharged. In contrast, females showed a better outcome, with 50.76% (33 out of 65) discharged and 49.24% dying. The chi-square value was 3.80, with a p-value of 0.0511, suggesting that gender differences approached statistical significance but were not definitively conclusive.

The age distribution indicated that younger patients had better survival outcomes. Patients aged ≤30 had the highest discharge rate of 79.16%, with only 28.84% dying. As age increased, the discharge rates dropped; notably, only 20% of patients over 60 were discharged, while 80% died. The chi-square value was 28.32, with a p-value <0.0001, demonstrating a highly significant association between age and outcomes.

Table -4: Comparison of Laboratory parameters between Discharged and Died.

Parameters (n)		Discharged		Died		p-value	
		Median	IQR	Median	IQR		
Hospital stay		8.5	4-13	4	2-7	<0.0001	HS
Duration of symptoms		4	2-7	4	3-6	0.7174	NS
SPO_2		96	92-97	85	70-91	<0.0001	HS
TLC	149	6.3	4.85–8.25	8.7	5.8–11.5	0.0011	HS
Lymphocyte	114	1.5	1.2–1.91	1.3	0.97–1.86	0.1105	NS
Ly%	114	23	20-34.25	15.7	11.4–21.3	<0.0001	HS
Gr%	95	68.2	54.02–73.25	76.7	69.8-82	<0.0001	HS
Platelet Count		183	121–244	159	80–208	0.1261	NS
Hb%	140	12	10.8–13.6	11.3	9.45–12.55	0.0205	S
D-Dimer	48	142.7	98.37–290	213	9.65-491	0.3307	NS
CRP	96	31.48	2.13–60.85	55.7	29.2–66.9	0.0161	S
Urea	145	25	19–38	62	37-124	<0.0001	HS
Creatinine	145	0.90	1–0.8	1.6	1–3.33	<0.0001	HS
BSL	56	164.5	134–192	148	121-225	0.5255	NS
LDH	82	258	225–391.6	529.2	393.7-827	<0.0001	HS
ALT/SGPT	120	24	14–41	33	20-49	0.0356	S
AST/SGOT	120	28	20–40	48	33-78	<0.0001	HS
Total Bilirubin		0.6	0.4–0.80	0.62	0.1–0.4	0.1172	NS
Na	136	135	131–137.8	135	132-139	0.1513	NS
K	136	4.2	4–5	4.2	3.7–4.65	0.1191	NS
Ferritin	78	125	79.89–303.3	662.5	343–1214.5	<0.0001	HS

The presence of co-morbidities was linked to a higher mortality rate, with 70.34% of patients with co-morbidities dying, compared to only 26% of patients without co-morbidities. The chi-square value of 30.06 and p <0.0001 further confirmed the significant impact of co-morbid conditions on patient outcomes. Although 60.34% of symptomatic patients died, there was no statistically significant difference in outcomes based on symptom presence, as the chi-square value was 1.24 with a p-value of 0.2640.

The severity of pneumonia at admission was a strong predictor of outcomes. Mild pneumonia cases had the highest discharge rate (87.03%), whereas severe pneumonia cases had a markedly higher mortality rate (82.67%). This association was statistically significant, with a chi-square value of 31.83 and a p-value <0.0001.

The location of care significantly influenced outcomes. Patients in the Intensive Care Unit (ICU) had the highest mortality rate (87.03%), while those in the High Dependency Unit (HDU) had a higher likelihood of being discharged (60.97%). The chi-square value was 25.78, with a p-value <0.0001, indicating a significant correlation between the place of admission and patient outcomes.

In summary, factors such as older age, presence of co-morbidities, severe pneumonia at admission, and ICU admission were significantly associated with poorer outcomes in COVID-19 patients.

Mean days for hospital stay in discharged (8.5) is higher as compared to died patients.(5.4).The table no. 4 shows the comparison of various clinical parameters between patients who were discharged and those who died, highlighting the statistical significance of the differences. The median hospital stay for discharged patients was 8.5 days (IQR: 4-13),

compared to 4 days (IQR: 2-7) for those who died. This difference was highly significant (p < 0.0001), indicating shorter hospital stays for non-survivors.

The median duration of symptoms was similar for both groups, with 4 days in discharged patients (IQR: 2-7) and 4 days in those who died (IQR: 3-6), showing no significant difference (p = 0.7174).Discharged patients had a median SpO2 of 96% (IQR: 92-97), whereas those who died had a significantly lower median SpO2 of 85% (IQR: 70-91), with a highly significant p-value (<0.0001).The median TLC was higher in non-survivors at 8.7 (IQR: 5.8-11.5) compared to 6.3 (IQR: 4.85-8.25) in discharged patients, showing a significant difference (p = 0.0011).There was no significant difference in lymphocyte count between groups (p = 0.1105). However, the median lymphocyte percentage was significantly lower in non-survivors (15.7%, IQR: 11.4-21.3) compared to discharged patients (23%, IQR: 20-34.25), with p <0.0001.Non-survivors had a higher median granulocyte percentage of 76.7% (IQR: 69.8-82), while discharged patients had 68.2% (IQR: 54.02-73.25), which was highly significant (p<0.0001). The median platelet count showed no significant difference, with discharged patients at 183 (IQR: 121-244) and non-survivors at 159 (IQR: 80-208) (p = 0.1261). Discharged patients had a higher median haemoglobin level of 12 (IQR: 10.8-13.6) compared to 11.3 (IQR: 9.45-12.55) in non-survivors, showing a significant difference (p = 0.0205).

In case of inflammatory Markers C-Reactive Protein (CRP) and Ferritin values were observed. The median CRP level was significantly higher in non-survivors (55.7, IQR: 29.2-66.9) compared to discharged patients (31.48, IQR: 2.13-60.85) (p = 0.0161).Non-survivors had a markedly higher median ferritin level (662.5, IQR: 343-1214.5) than discharged patients (125, IQR: 79.89-303.3), with a p-value <0.0001.

Both urea and creatinine levels were significantly higher in non-survivors, with p-values <0.0001 for both, indicating worsened kidney function. No significant differences were found in sodium (p = 0.1513) or potassium levels (p = 0.1191).

Both liver enzymes were significantly higher in non-survivors, with p-values of 0.0356 for ALT and <0.0001 for AST. There was no significant difference in bilirubin levels between the groups (p = 0.1172).The median LDH was significantly elevated in non-survivors (529.2, IQR: 393.7-827) compared to discharged patients (258, IQR: 225-391.6), with a p<0.0001.

In summary, parameters such as lower SpO_2, higher TLC, granulocyte percentage, inflammatory markers (CRP, ferritin), urea, creatinine, liver enzymes, and LDH were significantly associated with poorer outcomes in COVID-19 patients.

Discussion

This study is focused on analysing and identifying the demographic, clinical and laboratory parameters of 413 COVID-19 patients admitted in a tertiary care centre.

A study done by Patel C et al.[14] most common co-morbid condition found was diabetes mellitus {102 (24.69%)}. while in present study it was hypertension. The most common symptoms were fever {185 (44.79%)} cough and breathlessness. Similar findings observed in the studies conducted globally.[16, 17] and present study also report breathlessness in 91 (46.66%) fever and cough as most common symptoms. There was a strong association between increasing age which is similar to the present study findings. The maximum number of deaths i.e., 31 patients (58.49%, n=53) occurred in the age group of more than 60 years of age. Present study also shows that number of death increases with the increasing age and highest in above sixty years category. Along with that presence of co-morbidity, symptoms, severity of clinical symptoms and place of admission found to be statistically significant with the outcome while the present study all the above parameters except presence of symptoms found to be significant.

In Sherwal et al.[18] study men to women ratio was 3.4:1 with a statistically significant difference (P < 0.001) while in present study it is 3:1 with no significant association. It also shows significant association of age and outcome,

fever cough most common symptoms, most common morbidities being Diabetes and hypertension similar to the present study findings.

Ghosh J et al.[19] found that fever in 92.4% of patients. The average duration of hospitalization was 14.17 ± 5.48 days which is higher that present study. Abnormal X-ray findings, elevated levels of C-reactive protein, D-dimer, and erythrocyte sedimentation rate had a significant positive association with severity similarly present study found , lower SpO2, higher TLC, granulocyte percentage, inflammatory markers (CRP, ferritin), urea, creatinine, liver enzymes, and LDH were significantly associated with poorer outcomes in COVID-19 patients. Patel C et al.[14] also reported higher levels of serum LDH and urea affected the mortality rate after running multivariate logistic regression.

Conclusion

Age, co-morbid condition and severity of pneumonia are significant variables affecting the outcome. As age increases mortality proportion also increases. Presence of co-morbidities on admission contributed to progression of the disease. Laboratory values other than inflammatory markers can be alternative lab values for the prognosis which will need further extensive studies.

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