Original Article

Determinants and Outcomes of COVID-19 during the Third Wave: A Cross Sectional Study

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Abstract

Aim: The threat of COVID-19 has been continuing as a recurring wave with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) since its outbreak in December 2019 with the virus changing its variant form frequently. This study was conducted with the aim to study the clinical profile, laboratory parameters, complications, and other outcomes of patients who were hospitalized with COVID-19 infection during the third wave in a tertiary care hospital in Manipur, India.

Materials and methods: This is a single-centre retrospective study. The data were collected from the medical record department of the Regional Institute of Medical Sciences (RIMS), Imphal. The case records of COVID-19 positive patients who were hospitalized in the RIMS Hospital from 1st January 2022 to 31st March 2022 have been collected. Corresponding data on demographic profile, clinical symptoms, laboratory findings, complications, and clinical outcome were also collected and were compared between patients classified as non-severe and severe cases.

Results: The analysis included 275 confirmed COVID-19 patients. Median age was 37 years and IQR (Inter quartile range) was 27-62 years. Of the 275 cases, 41.5% (n = 114) were male and severity is more among the male patients with 58.1%. Old age, duration of hospitalization and d-dimer were independent factors increasing the risk of death due to COVID-19 ($p<0.001$). Nevertheless, vaccination was significantly associated with the severity of disease among the older population.

Conclusion: In summary, vaccination and severity of disease were associated among the older population. Severity rate is more among the male patients. Old age, duration of hospitalization and d-dimer were independent factors increasing the risk of death due to COVID-19.

Key words: COVID-19, Pandemic, Specialized hospital, Third wave, d-dimer

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Introduction

The COVID-19 pandemic represents a significant global health emergency, rapidly disseminating worldwide since its initial identification in December 2019 in Wuhan, China. The World Health Organization (WHO) formally declared the outbreak a pandemic on March 11, 2020[1]. Therefore the world witnessed emergence of other variant with the emergence of omicron variance in November 2021 in South Africa[2,3] On 26th November 2021, WHO declared the omicron variant a variant of concern[4]. India witnessed the first case of new variant on 2nd December 2021 in Karnataka indicating its infectious and transmissibility as well as raised the concerns of severely affecting the children [5–9] .Subsequently, it spread to many other countries around the world, which came as no surprise given the characteristics of this particular variant. This indicated the high infectivity and transmissibility of this particular variant. The third dose of the COVID vaccine was rolled out in the beginning of 2022 on priority groups basis in India.[6,10] Hence, the COVID-19 cases during the third wave has been particularly chosen as a matter of study and contemplation for the purpose of creating a clinical profile, laboratory parameters, complications, and other outcomes.

Methods

As stated, this is a single-centre retrospective, observational study, where data has been collected from the medical record department of RIMS Hospital, Imphal. In this study, the case sheet records of COVID 19 positive patients who were admitted in the RIMS Hospital from 1st January 2022 to 30th March 2022 were collected. Corresponding data on demographic profile, clinical symptoms, laboratory findings, complications, and clinical outcome were collected and compared between patients classified as non-severe and severe cases. Cases with incomplete data were excluded.

Patients with severe dyspnoea, low oxygen saturation (SpO2 < 93%), respiratory distress, or requiring mechanical ventilation and ICU admission has been defined as severe cases. Patients with mild symptoms and/or not requiring any respiratory support or ICU admission has been categorised as non-severe cases[11].

The clinical and laboratory data of all the patients has been collected from the case sheets available in the Medical Record department (MRD) of the hospital. Two study investigators checked the collected data independently. Data abstracted includes age, gender, prior history of COVID-19 infection, vaccination history, history of underlying comorbidities (Hypertension(HTN), Diabetes(DM), cardiovascular disease, chronic pulmonary disease, Chronic Liver Disease(CLD), Chronic Kidney Disease(CKD), malignancy, etc.), symptoms (fever, cough, dyspnoea, backache etc.), vital signs at admission (heart rate, blood pressure, and respiratory rate) and laboratory parameters on admission [blood glucose level, CBC, KFT, serum electrolytes, chest X-ray, chest computed tomography (CT) scans (when indicated)]. Details like duration from the onset of symptoms to admission, the total length of stay in the hospital, development of any other complications, and mortality were also recorded and thus availed. A comprehensive comparison of the demographic profile, clinical characteristics, and other outcomes of patients with severe and non-severe cases has been conducted.

Data Collection

The data was collected from the medical record department of RIMS Hospital, Imphal. Patients condition has been deemed to be improved if they satisfy the criteria for discharge as recommended by the Ministry of Health and Family Welfare, government of India[12]. Data obtained were entered in Microsoft Excel and Statistical analysis was done by using IBM SPSS Version 22 for windows (IBM, Armonk, New York, USA). Continuous variables have been presented as mean ± standard deviation (SD) or median (IQR) according to the nature of data. Categorical variables are expressed as frequency (percentages, %). Univariate analysis was done using Chi-square test for categorical variables and independent t-test or Mann-Whitney U test for continuous variables. For all the statistical analyses, p-value < 0.05 was considered as statistically significant. Explanatory factors were incorporated into a multiple logistic regression if p values were less than 0.05 by univariate analysis.

Results

Demographic Profiles

A total of 275 patients were included with median age of 39 years and interquartile range (IQR) 27-62 years out of which 161(58.5%) were female. Of the 275 cases 114(41.5%) were from the age group 18-40 years while 72(26.2%) were from 60 years and above and only 29(10.5%) cases from the age group less than 18 years. Severe cases were 62 in number (22.5%) while 213 (77.5%) cases were labelled as non severe disease (table 1). The median age of the severe cases was 65(48.8-71.5) was significantly higher as compare with the non-severe cases 33(26-51.5). Significant association between severe and non-severe group in terms of smoking (p = 0.034) and alcoholic habit (p = 0.001) were observed. The median duration from symptom onset to admission was 2 days. Specifically, for non-severe cases, the median elapsed time from onset to hospitalization was also 2 days, with an interquartile range (IQR) of 1-2 days. In contrast, severe cases exhibited a median elapsed time of 3 days (with an IQR of 2-23 days). The P-value being less than 0.001 indicates a statistically significant difference in the time elapsed from onset to hospitalization between non-severe and severe cases.

Symptoms and laboratory findings

The most common symptoms on admission were fever ≥37.5^{0}C (22.9%), followed by cough (20.4%), weakness (18.9%), shortness of breath (16.0%) and loss of appetite (10.5%). It is observed that shortness of breath, general weakness, loss of appetite was significantly associated with severity of COVID-19. The most common comorbidities were hypertension (HTN), followed by diabetes mellitus (DM) (table 2). Also, it is observed that the prevalence of HTN, DM, Chronic kidney disease (CKD) and cerebrovascular accident (CVA) were significantly higher among those patients classified as severe as compared to that non-severe group.

The laboratory values/parameters were statistically significant between non-severe and severe groups in relation to haemoglobin [12.3(11.3-13.1)g/dl Vs 10.9(9.1-11.7)g/dl, p<0.001], WBC count [7.4(6.3-8.3) Vs 11.6(9.0-14.6), p<0.001], platelet count [2.7(2.2-3.3) Vs 1.8(1.4-2.5), p<0.001], d-dimer [427(314-493) Vs 619(470.3-1485.3), p<0.001], ALT[24(15-35) Vs 36(26.7-49.5)], AST[24(16.0-34) Vs 38(24-48.3)], RBS [109(100-118) Vs 181(139.0-248.4), p<0.001], urea [28.0(19.5-39.0) Vs 60.5(45-91), p<0.001], Serum creatinine [1.0(0.8-1.0) Vs 1.3(1.0-1.0), p<0.001], sodium [138(136.0-140.0) Vs 136(134-139), p<0.001] and potassium [3.8(3.6-4.4) Vs 4.5(3.6-5.0), p<0.001] (table.2).

Treatment and outcome

While comparing the median duration of hospital stay/hospitalization between the two groups: severe and non-severe groups, severe groups had significantly longer hospital stay compared to non-severe group (p<0.001)(Fig.1). Also, severe groups received more antiviral and steroid therapy as compared with the non-severe group, which was significantly high (Table.4). All the patients with severe condition required respiratory support. Of 62 patients with severe condition during treatment, 24(38.7%) were transferred to other ward after COVID negative for further management of post COVID 19 complications (Table.4). All the patients who were transferred to others wards for post COVID management have history of comorbidity. It is observed that vaccination and severity of the disease were associated among the older age group (Table.3). Whereas vaccination and severity of disease were not related among the younger population as severity was very less in both vaccinated and unvaccinated group and majority were asymptomatic.

Among those who improved during treatment/ hospital stay those with severe condition were significantly older, predominantly male sex having more comorbid conditions. Logistic multivariate analysis revealed that old age, length of hospital stay and d-dimer would be responsible for severity of the disease.

Table 1: Baseline demographic and clinical characteristics of COVID 19 patients

Characteristics	Total (n=275)	Non Severe cases (n=213)	Severe Cases (n=62)	P-value
Age, Median(IQR)	39(27-62)	33(26.0-51.5)	65(48.75-71.5)	<0.001
Age Distribution				
Less than 18	29(10.5%)	25(11.7%)	4(6.5%)	
18-40yrs	114(41.5%)	108(50.7%)	6(9.7%)	
41-60 yrs	60(21.8%)	41(19.2%)	19(30.6%)	
Above 60 yrs	72(26.2%)	39(18.3%)	33(53.2%)	
Gender				0.003
Male	114(41.5%)	78(36.6%)	36(58.1%)	
Female	161(58.5%)	135(63.4%)	26(41.9%)	
Personal habit				
Smoker	19(6.9%)	11(5.2%)	8(12.9%)	0.034
Alcoholic	22(8.0%)	11(5.2%)	11(17.7%)	0.001
Elapsed time from onset to hospitalization ([IQR], range)	2(1-2)	2(1-2)	3(2-3)	<0.001
Symptoms				
Fever	63(22.9%)	50(23.5%)	13(21.0%)	0.679
Cough	56(20.4%)	33(15.5%)	23(37.1%)	0.001
Generalised weakness	52(18.9%)	30(14.1%)	22(35.5%)	0.001
SOB	44(16.0%)	22(10.3%)	22(35.5%)	0.000
Loss appetite	29(10.5%)	21(9.9%)	8(12.9%)	0.137
Nausea vomiting	26(9.5%)	21(9.9%)	5(8.1%)	0.671
Headache	10(3.6%)	7(3.3%)	3(4.8%)	0.615
Sore throat	7(2.5%)	6(2.8%)	1(1.6%)	0.596
Co morbidity	110(40.0%)	62(29.1%)	48(77.4%)	<0.001
HTN	56(20.4%)	33(15.5%)	23(37.1%)	<0.001
DM	34(12.4%)	16(7.5%)	18(29.0%)	<0.001
CKD	15(5.5%)	7(3.3%)	8(12.9%)	0.003
CLD	15(5.5%)	10(4.7%)	5(8.1%)	0.340
CVA	10(3.6%)	3(1.4%)	7(11.3%)	<0.001

Table 2: laboratory findings among hospitalize COVID 19 patients between severe and non-severe cases

Parameters	Normal range	Non severe (n=213)	Severe (n=62)	P-value
Haemoglobin	(12-15)gm/dl	12.3(11.3-13.1)	10.9(9.1-11.7)	<0.001
WBC $\times 10^3$(cells/µL)	4-11	7.4(6.3-8.3)	11.6(9.0-14.6	<0.001
Platelet count$\times 10^5$	1.5-4	2.7(2.2-3.3)	1.8(1.4-2.5)	<0.001
D.dimer	<500 ng/mL	427.0(314.0-493.0)	619.5(470.3-1485.3)	<0.001
ALT	5-50U/L	24.0(15.0-35.0)	36(26.7-49.5)	<0.001
AST	5-40 U/L	24.0(16.0-34.0)	38(24.0-48.3)	<0.001
Albumin	3.4-5.4 gm/dL	3.9(3.3-4.4)	3.75(3.1-4.7)	0.804
RBS	80-120	109.0(100-118)	181(139.0-248.4)	<0.001
Urea	10-50 mg%	28.0(19.5-39.0)	60.5(45-91)	<0.001
Creatinine	0.5-1.2 mg/dL	1.0(0.8-1.0)	1.3(1.0-1.9)	<0.001
Sodium	135-145 mEq/L	138.0(136.0-140.0)	136(134-139)	<0.001
potassium	3.5-5 mEq/L	3.8(3.6-4.4)	4.5(3.6-5.0)	<0.001

Data are expressed as median (interquartile range, IQR)

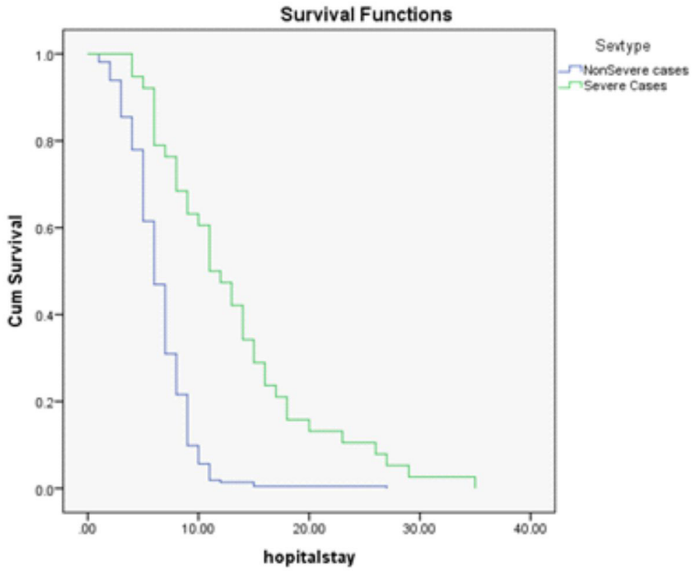

Fig.1. Kaplan Meier curve showing differences in hospital stay of COVID-19 patients on the basis of severe and non severe group (p<0.001)

Table 3: Vaccination status between severe and non severe groups

Younger Age Group (18-60 Yrs)	**Total n=174**	**Non-Severe cases n=149**	**Severe Cases n=25**	**P-value**
Unvaccinated	108(29.9%)	95(63.76%)	13(52.0%)	0.479
Only One Dose	17(9.2%)	13(8.72%)	4(16.0%)	
Only Two Dose	46(18.4%)	38(25.50%)	8(32.0%)	
3rd Dose	3(0.0%)	3(2.01%)	00.0	
Vaccination Status for Older Age Group (Above 60 Yrs)	**Total n=72**	**Non-Severe cases n=39**	**Severe Cases n=33**	
Unvaccinated	36(96.8%)	13(33.33%)	23(69.7%)	0.005
Only One Dose	9(16.8%)	5(12.82%)	4(12.1%)	
Only Two Dose	27(25.3%)	21(53.85%)	6(18.2%)	

Table 4: Treatment and outcome between severe and non severe groups

Treatment	**Total (%) n=275**	**NonSevere cases (%) n=213**	**Severe Cases (%) n=62**	**P-value**
O2 support	97(35.3%)	361(6.9%)	62(100.0%)	<0.001
NIV	20(7.3%)	2(0.9%)	18(29.0%)	<0.001
Mechanical Ventilation	12(4.4%)	0(0.0%)	12(19.4%)	<0.001
Steroid	88(32.0%)	35(16.4%)	53(85.5%)	<0.001
Inotropes	13(4.7%)	1(0.5%)	12(19.4%)	<0.001
Antibiotic	275(100.0%)	213(100.0%)	62(100.0%)	
Outcome Death	24(8.7%)	1(0.5%)	23(37.1%)	<0.001
Transferred	102(37.1%)	0(0.0%)	24(38.7%)	<0.001
Home Isolation	78(28.4%)	76(35.7%)	2(3.2%)	<0.001

Table 5: Multivariate logistic model for mortality in COVID during hospitalization

Model	Exp(B)	95% C.I.for EXP(B)		Sig.
		Lower	Upper	
Age	1.066	1.021	1.113	.003
Hospital stay	1.328	1.168	1.511	.000
D-dimer	1.016	1.009	1.023	.000

Discussion

From this retrospective study, it is observed that a different pattern of clinical characteristics and outcomes were seen in the third wave of COVID-19. Of 275 COVID-19 positive patients, 213 had non-severe (mild) and remaining 62 had severe condition. Approximately 45.8% patients were asymptomatic and 54.2% were symptomatic. The median age of the study was 39 years which is similar to the other studies done by mitra et al. 2023 in India; kim et al. 2022 in South Korea; Maslo ey al. 2022 in South Africa.[9,13,14]

The median duration from symptom onset to admission was around two days. It was also notably shorter than the 6-7 days reported in a large cohort study in Japan, indicating a rapid deterioration of respiratory condition despite prompt admission following symptom onset[15,16] Commonly observed symptoms include fever, cough, and fatigue, consistent with findings from prior studies[9]. Hypertension (HT) and diabetes mellitus (DM) were notable representative comorbidities. Vaccination stands as a promising strategy for both preventing COVID-19 infection and mitigating its severity, and it has been widely implemented worldwide[17]. In this study vaccination is significantly associated with the severity of the disease among the older population. Despite the shortened time from symptom onset to admission, the mortality rate was lower compared to the second wave[16].

Conclusion

In summary, vaccination and severity of disease has been associated among the older population. It is observed that patients having history of comorbiditysuch as HTN, DM, CKD and CVA have more chance of severity. Severity rate is more among the male patients. Age, duration of hospital stay and d-dimer were responsible for mortality due to COVID 19 disease.

Limitations

This study was conducted using data from the medical record department. This study may provide a glimpse into the virus's dynamics during the specified period. However, lack of genomic information limits our ability to discern the specific variants involved. Furthermore, because of the small sample size, the results may not be representative of the entire population. Therefore, while the study contributes to our understanding of the third wave, its conclusions should be considered preliminary and may benefit from further investigation with larger and more diverse datasets.

Data management: Patient data was used ethically. Personal indentifiers were removed from the data before analysis.

Source of Funding: Self

Conflict of Interest: There was no conflict of interest.

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