Original Research Article

Assessment of the mortality rates and associated risk factors in laboratory-confirmed cases of covid-19: An institutional study

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Abstract

Background: To decrease complications and mortality of COVID-19 infection, early diagnosis and severity prediction are the keys. **Aims and Objectives:** The present study was conducted to assess the clinical profile and outcomes of COVID-19 cases admitted to SMBT COVID care center. **Materials and Methods:**In 487 subjects from both genders within the age group of 19-89 years, demographics including gender, age, and socioeconomic status were recorded along with Neutrophils, lymphocytes, and NLR. Further, the severity and mortality were assessed based on age, comorbidities, and gender. The collected data were subjected to statistical evaluation and the results were formulated. **Results:** 61.60% (n=300) of subjects survived and were discharged. The mortality rate in subjects with comorbidities was 62.03% (n=116) and without comorbidities was 37.96% (n=71). Higher mortality rates were seen in males with 66.84% (n=125) deaths compared to females with 36.36% (n=62) deaths. Significantly higher deaths were seen in subjects older than 50 years with 66.31% (n=124) deaths, whereas, lesser deaths were seen in subjects who were aged 50 years or less with 33.68% (n=63) deaths. This difference was statistically significant with p<0.001. **Conclusion:** Within its limitations, the present study concludes that higher mortality rates are associated with male gender, presence of comorbidities, and older age in subjects with COVID-19.

Keywords: COVID-19, Mortality, mortality rates, comorbidities, Novel coronavirus

Introduction

COVID-19 is a disease caused by novel Betacoronavirus, also known as SARS-Cov-2 (Severe Acute Respiratory Syndrome Coronavirus-2). The new detected viral strain is contagious and deadly, compared to other already established strains. The infection is spread by aerosols, droplets, and contact leading to inflammatory alterations in the lungs of the affected individual. Since its first identification in 2019, the disease is being extensively studied globally. However, still the disease has varied pathogenesis and clinical presentations. Varied presentation is seen in subjects with multi-organ involvement, severe diseases, high mortality rates, long duration, severely ill subjects, and complicated situations. For mild infections, isolation, and severe infections, intensive care in the hospital is suggested[1].In India, the first case of novel beta coronavirus infection was identified in Kerala, in Jan 2020. With the high spread and contiguity of COVID-19, death tolls are expected to rise in the coming time in India. COVID-19 vaccines are expected to decrease the cases, however, vaccines efficacy is yet to be proved[2]. Early diagnosis and treatment improve the outcomes and decrease the death associated. Hence, to decrease complications and mortality of COVID-19 infection, early diagnosis and severity prediction are the keys. COVID-19 is associated with the inflammatory process, and fever being the most common presenting symptom. Assessing inflammatory alterations can help in predicting disease outcomes. However, one study showed that laboratory parameters such as thrombocytopenia, increase LDH, and lymphopenia may help in early diagnosis, however, they might not accurately predict the prognosis[3].Interleukins and CRP (C-reactive protein) are reliable biomarkers for assessing inflammation detected in blood within 6 hours of the inflammatory process initiation. The CRP levels start to fall after 20 hours. Also, CBC (Complete Blood Count) is used widely to detect systemic changes. CBC is a cost-effective, non-invasive, and reliable investigation. Active inflammatory processes, as seen in COVID-19, are detected with accuracy using parameters like CBC, CRP, and/or NLR (neutrophil to lymphocyte ratio)[4].In limited resources and developing countries like India, there is a growing need to find reliable, efficient, and effective biomarkers and indicators that can accurately detect the severity and outcomes in subjects with COVID-19. This will allow the early start of the needed intervention, identification of intensive care needs, and proper resources allocation[5]. However, owing to the dynamic nature of the SARS CoV-2 virus and limited work depicting the relationship of CRP, NLR, and lymphocytes to COVID-19, extensive research and data are needed to assess any existing relationship. The present study focuses on the clinical picture of COVID-19 in subjects reported and admitted to SMBT COVID care Centre, Maharashtra. Hence, the present study was conducted to assess the clinical profile and outcomes of COVID-19 cases admitted to SMBT COVID care center.

Materials and methods

The present clinical, record-based, and analytical study was conducted to assess the prognostic efficacy of Neutrophil Lymphocyte Ratio and

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baseline C- reactive protein in subjects with COVID-19 to predict the clinical outcomes in the rural population of North West Maharashtra. Also, the study aimed to strategies management protocols with available infrastructure and resources. The study was conducted at SMBT COVID care Centre, Maharashtra from 01/04/2021 to 31/05/ 2021 ,after obtaining clearance from the concerned Ethical committee. The data for the study were retrospectively extracted from the electronic database and file records of the subjects with confirmed COVID-19 infection admitted at the institution within a specified study period. The study included a total of 487 subjects with COVID-19. The inclusion criteria were subjects with confirmed RT-PCR for COVID-19, subjects of age 18 years or older, admitted within the mentioned study period, and the subjects with complete data as needed. The exclusion criteria were subjects with negative RT-PCR even with symptoms resembling COVID-19, subjects who left against medical advice, and subjects with incomplete records.

Based on the inclusion and exclusion criteria, the subjects were finally included. A total of 487 subjects from both genders within the age group of 19-89 years finally comprised the study population. For all 487 subjects, electronic records and physical data were retrospectively collected from the institution and analyzed to obtain needed data.

The data obtained were demographics including gender, age, and socioeconomic status. The investigation reports were collected for parameters including CRP and neutrophils, lymphocytes, and NLR. Further, the severity and mortality were assessed based on age and gender. Non-severe subjects were those managed without/ with oxygen and were discharged home. Severe group subjects were kept on ventilatory support/ subjects who succumbed to death.

The collected data were subjected to statistical evaluation and analyzed using software version 20 and the results were formulated. The data were expressed in percentage and number.

Results

The present study was conducted to assess the clinical profile and outcomes of COVID-19 cases admitted in SMBT COVID care center. A total of 487 subjects from both genders within the age group of 19-89 years finally comprised the study population. The demographic and disease characteristics of the study subjects are described in Table 1.

Table 1: Demographic and disease characteristics of the study subjects

Characteristic	Percentage (%)	Number (n)
Mean age (years)	52.14±14.62	
Age Range (years)	19-89	
Gender		
Males	63.65	310
Females	36.34	177
Associated Disease		
Obesity	6.36	31
Diabetes	16.01	78
Hypertension	21.56	105
Chronic Kidney disease	3.49	17
Chronic Lung disease	1.47	7
Presenting Symptoms		
Fever	68.99	336
Cough	45.17	220
Breathlessness	37.16	181
Myalgia	12.11	59
Laboratory parameters	**Mean±S.D**	
Neutrophils	75.68±12.12	
Lymphocytes 10^9/L	15.89±10.62	
CRP (mg/L)	99.28±63.95	
NLR	7.77±6.81	

It was seen that the mean age of the study subjects was 52.14±14.62 years. There were 63.65% (n=310) males and 36.34% (n=177) females in the present study. Associated medical conditions were obesity, diabetes, hypertension, chronic kidney disease, and chronic lung disease in 6.36% (n=31), 16.01% (n=78), 21.56% (n=105), 3.49% (n=17),and 1.47% (n=7) study subjects respectively. The presenting symptoms in COVId-19 subjects were fever in 68.99% (n=336), cough in 45.17% (n=220), breathlessness in 37.16% (n=181) subjects, and myalgia in 12.11% (n=59) study subjects. Concerning laboratory parameters, it was seen that mean neutrophil, lymphocytes, CRP, and NLR ratio were 75.68±12.12, 15.89±10.62, 99.28±63.95, and 7.77±6.81 respectively.On assessing the mortality rates, it was seen that 61.60% (n=300) of subjects survived and were discharged. These subjects were treated with/ without oxygen and were discharged after negative RT-PCR. The subjects that needed intensive care and ventilatory support were the ones who succumbed to death. The overall mortality in the present study was 38.40 % (n=187) subjects as shown in Table 2.

Table 2: Mortality rates in the study subjects

Treatment and Outcomes	Percentage (%)	Number (n)
Discharged and survived	61.60	300
Death	38.40	187

The present study also assessed the mortality rates based on age, gender, and associated comorbidities. It was seen that the mortality rate in subjects with comorbidities was 62.03% (n=116) and without comorbidities was 37.96% (n=71). The difference was statistically significant with p <0.001. The mortality in subjects with obesity was 8.55% (n=16), with diabetes was 20.85% (n=39), with hypertension was 26.73% (n=50), with chronic kidney disease was 3.20% (n=6), and with chronic lung disease was 2.67% (n=5). Concerning gender higher mortality rates were seen in males with 66.84% (n=125) deaths compared to females with 36.36% (n=62) deaths. This difference was statistically significant with p<0.001. For age, significantly higher deaths were seen in subjects older than 50 years with 66.31% (n=124) deaths, whereas, lesser deaths were seen in subjects who were less than/equal to 50 years of age with 33.68% (n=63) deaths. This difference was statistically significant with p<0.001 (Table 3).

Table 3: Mortality rates based on age, gender, and comorbidities in the study subjects

Mortality parameters (n=187)	Percentage (%)	Number (n)	p-value
Based on comorbidities			
With comorbidities	62.03	116	

Obesity	8.55	16	<0.001
Diabetes	20.85	39	
Hypertension	26.73	50	
Chronic Kidney disease	3.20	6	
Chronic Lung disease	2.67	5	
Without comorbidities	37.96	71	
Based on Gender			
Females	36.36	62	<0.001
Males	66.84	125	
Based on Age (years)			
≤50	33.68	63	<0.001
>50	66.31	124	
Laboratory parameters	**Total**		
Neutrophils	75.68±12.12		
Lymphocytes 10^9/L	15.89±10.62		
CRP (mg/L)	99.28±63.95		
NLR	7.77±6.81		

Discussion

In the present study, a total of 487 subjects from both genders within the age group of 19-89 years finally comprised the study population. It was seen that the mean age of the study subjects was 52.14±14.62 years. There were 63.65% (n=310) males and 36.34% (n=177) females in the present study. Associated medical conditions were obesity, diabetes, hypertension, chronic kidney disease, and chronic lung disease in 6.36% (n=31), 16.01% (n=78), 21.56% (n=105), 3.49% (n=17), and 1.47% (n=7) study subjects respectively. The presenting symptoms in COVId-19 subjects were fever in 68.99% (n=336), cough in 45.17% (n=220), breathlessness in 37.16% (n=181) subjects, and myalgia in 12.11% (n=59) study subjects. Concerning laboratory parameters, it was seen that mean neutrophil, lymphocytes, CRP, and NLR ratio were 75.68±12.12, 15.89±10.62, 99.28±63.95, and 7.77±6.81 respectively. These demographics were comparable to those suggested by Huang C et al[6] in 2020 and Qian GQ et al[7] in 2020 where authors depicted similar clinical features in subjects with COVID-19.On assessing the mortality rates, it was seen that 61.60% (n=300) of subjects survived and were discharged. These subjects were treated with/ without oxygen and were discharged after negative RT-PCR. The subjects that needed intensive care and ventilatory support were the ones who succumbed to death. The overall mortality in the present study was 38.39% (n=187) subjects. These mortality rates were comparable to the results reported by the studies ofZhou F et al[8] in 202and Toyoshima Y et al[9] in 2020 where comparable mortality rates were depicted by the authors.

The present study also assessed the mortality rates based on age, gender, and associated comorbidities. It was seen that the mortality rate in subjects with comorbidities was 62.03% (n=116) and without comorbidities was 37.96% (n=71). The difference was statistically significant with p <0.001. The mortality in subjects with obesity was 8.55% (n=16), with diabetes was 20.85% (n=39), with hypertension was 26.73% (n=50), with chronic kidney disease was 3.20% (n=6), and with chronic lung disease was 2.67% (n=5). Concerning gender higher mortality rates were seen in males with 66.84% (n=125) deaths compared to females with 36.36% (n=62) deaths. This difference was statistically significant with p<0.001. For age, significantly higher deaths were seen in subjects older than 50 years with 66.31% (n=124) deaths, whereas, lesser deaths were seen in subjects who were less than/equal to 50 years of age with 33.68% (n=63) deaths. This difference was statistically significant with p<0.001. These results were consistent with the results by the studies of Jin JM et al[10] in 2020 and Bonanad C et al[11] in 2020 where similar age, gender, and comorbidity effect was seen on mortality in COVID-19 subjects.

Conclusion

Within its limitations, the present study concludes that higher mortality rates are associated with male gender, presence of comorbidities, and older age in subjects with COVID-19. Hence, such patients should be given more care to reduce associated mortality. However, the study had few limitations including smaller sample size, shorter monitoring period, geographical area biases, and single-institutional nature. Hence, further longitudinal studies with larger sample size and longer monitoring period are required to reach a definitive conclusion.

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