



Mortality among COVID-19 Patients- A Retrospective Study

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Abstract

Objectives: Since December 2019, COVID-19 is engulfing the whole world day by day. It has a wide range of clinical manifestations which are evolving daily. We reviewed the factors associated with mortality among admitted COVID-19 patients by analysing their clinical profile and lab parameters.

Methods: Case records of 50 COVID-19 cases admitted to a medicine unit at AIIMS, New Delhi from April to mid-June were analysed retrospectively after applying inclusion and exclusion criteria. The course of disease was compared among survivors and non survivors.

Results: Among 50 subjects, 86% were below 60 years of age and 14% were above 60, mortality was higher in elderly age group and was statistically significant ($p < 0.05$). Most patients were symptomatic; fever and dyspnoea being common presenting complain seen in 62% of patients followed by cough, myalgia, sore throat, diarrhoea and rash. Among patients who presented with all three symptoms at presentation (fever, cough & dyspnoea), 43% succumbed to disease. Looking at severity, 38% were mild, 42% were moderate and 20% were severe cases at admission. The mortality was highest in severe group (90%). Prior co morbidities were seen in 60% cases. Hypertension (24%) was the commonest followed by diabetes (18%) and CKD (6%). 66.7 % of patients with CKD died. Among non-survivors, 37.5% were anaemic and 72.7% had leucocytosis ($p < 0.05$). 53.8% patients with raised urea and 36.3% patients with raised creatinine also died.

Conclusion: Older age, anaemia, leucocytosis and deranged renal function at the presentation are significantly associated with mortality among admitted COVID-19 patients.

Keywords: COVID-19 Disease, Risk Factors, Mortality.

Introduction

At the end of year 2019, an outbreak of acute respiratory infection occurred in the Wuhan province of China that has wobbled the world. The virus is from the family of corona viruses and is labelled as SARS-Cov-2, because of its high similarity to SARS-CoV, which led to epidemic in

2002-2003. The disease has been labelled as COVID-19. The virus has spread worldwide leading to declaration of pandemic by WHO on 11th March 2020.^[1] Currently by 21 August 22, 925, 540 COVID-19 Cases along with 798,237 deaths occurred in 215 countries in the world. The United States of America is having the maximum

number of cases till date i.e. 5,757,888 followed by Brazil and India respectively^[2]. First case of COVID-19 in India was detected in Kerala, on 30 January 2020. At present here are about 692028 active cases in India, 2158946 cured and with 54849 deaths.^[3]

Human to Human transmission is the main route of transmission of SARS-Cov-2. Both symptomatic as well as those who are asymptomatic can transmit the virus thus isolating the patient is the best way to prevent it from spreading. The respiratory droplets (5-10 micrometre) generated from cough or sneeze transmit the virus from COVID positive patient to those who are in close contact. Individuals who are in pre-symptomatic stage lead to 80 % of transmission^[4]. The incubation period is 14 days. Most common symptoms of COVID-19 are fever, difficulty in breathing and dry cough. Other less common presenting features are diarrhoea, fatigue, myalgia, anorexia and vomiting^[5]. Many patients becomes critical due to multi-organ dysfunction and Acute Respiratory Distress Syndrome (ARDS). Still after 5 months of declaration of pandemic, the complete clinical picture of the COVID-19 is unclear^[6]. Thus, we planned a retrospective study to review the clinical as well as lab profile of the COVID-19 patients and analyse the significant factors associated with mortality.

Methodology

Study Design and Participants

This was a retrospective study wherein case records of confirmed COVID-19 adult patients admitted in Unit III of Department of Medicine at AIIMS New Delhi between 1st April to 15th June were analysed. The study was approved by institutes' ethical committee. Patients were followed up till discharged or death. Diagnosis was done as per the ICMR guidelines for COVID-19. Patients with incomplete records were excluded from the study.

Data Collection & Study Variables

The medical records of patients were obtained from hospital case records. All data was captured in a pre-designed Performa, filled in a excel sheet and analysed. Outcome of the patients, i.e. survivor or non-survivor were the two major groups in which the subjects were divided for analysis.

Statistical Analysis

Statistical analysis was carried out using STATA v15.1, STATA Corp. LLC, TX, and USA. For testing of hypothesis, two tailed tests were considered and p value of <0.05 was considered to be as statistically significant. Descriptive analysis was carried out first to summarise the study population. Data distribution was checked by normal probability plot and Kolmogorov - Simonov test. A continuous variable with no extreme values (normally distributed) was given by mean +- standard deviation. Continuous variables with extreme values (skewed) were given by Median (IQR) and number (%) was given for qualitative variables. For the comparison of two groups student's t-test was performed if it had normal distribution otherwise Mann Whitney U-test was used. Difference in proportion was assessed by using Pearson Chi- square test or Fisher's exact test.

Results

Data of 50 COVID-19 positive patients was analysed after applying inclusion and exclusion criteria. Mean age of the patients was 45.54±14.4 yrs. Three groups were made on the basis of age i.e. Group 1 (<45 yrs.) included 48 % patients, Group 2 (45-60yrs) included 38% patients and Group3 (> 60 yrs.) included 14% patients as shown in table 1. In group 3, 57.1% of patients could not survive whereas in group 1 and 2 only 20 % and 10 % were non-survivors respectively, depicting higher mortality in the elderly population (p <0.05). Overall 62 % patients were males and 38 % were females, 22.5% males and 21.0 % female patients did not survive but the difference was not statistically significant.

About 99% of the patients were symptomatic at presentation, with fever and dyspnoea being the most common symptoms, seen in 62% of patients followed by cough (58%), myalgia (28%), anorexia (12%), sore throat(10%), diarrhoea(4%), headache (4%) and rash(2%) as shown in table 2. 44% of the patients presented with fever and cough both, 40%, 36% with fever and dyspnoea combined and 32% patients presented with fever, dyspnoea and cough all three combined and maximum death (43.7 %) was seen among the patients who presented with all three symptoms. Anorexia was seen in 12 % of patients among which 50 % were non-survivors. 10 % of total patients presented with sore throat, in which no mortality was seen.

As per the latest guidelines of ICMR, COVID-19 patients can be divided into three groups i.e. mild, moderate and severe. Mild patients are defined as those with uncomplicated upper respiratory tract infection, have mild symptoms such as fever, cough, sore throat, nasal congestion without dyspnoea. Moderate patients are those who present with clinical features of dyspnoea and/or hypoxia, fever, cough, including SpO₂ (range 90-94%) on room air, respiratory rate more or equal to 24 per minute. All those patients with clinical sign of pneumonia along with SpO₂ <90% on room air or respiratory rate >30 are to be considered as severe cases^[7]. In our study, 38 % patients were mild, 42 % were moderate and 20 % patients were severe at presentation. Among these, 90% patients of severe category died whereas the mortality was less in mild and moderate category of patients.

In our study 60% of the total patients had comorbidities whereas death was seen in only 23.3% and majority of the patients (76.7%) survived. Hypertension was the most common comorbidity seen in 24% of total patients, followed by diabetes (18%), Chronic Kidney Disease (6%), past history of pulmonary Tuberculosis and Asthma (4% each), COPD (2%) and treated case of malignancy (2%).

66.7 % of the patients with chronic Kidney disease expired whereas only 11 % of diabetes patients and 25 % of patients with hypertension died.

As per the World Health Organization, Anaemia is defined as haemoglobin of less than 13 g/dL in male and 12 g/dL in non-pregnant females^[8]. In our patients, 48 % of the total patients had anaemia in which 37.5 % of anaemic patients died. In more analysis, 20% of total patients had haemoglobin <10g/dl and 50 % of these patients were non-survivors. The result was statistically significant. (p<.05)

As per our laboratory parameters reports, Total Leucocyte Count is considered normal in the range of 4000-110000. In our study,72 % of total patients had normal leukocyte count,6% had leukopenia and 22 % patients had leucocytosis. 72.7% of patients with leucocytosis were non-survivors whereas there was no death observed in patients with leukopenia. The result was statistically significant.(p<0.05). In our study 70% patients had normal platelet count,28% showed thrombocytopenia and only 2 % had raised platelet count.22.8 % of patients with normal platelets and 21.1 % of patients with thrombocytopenia died whereas no death was seen in patients with thrombocytosis. The result was not statistically significant. (p=0.81)

In our study, 26% of the total patients had raised serum urea levels and 53.8% of these patients couldn't survive. The results were statistically significant (p<0.05). 44% of the total population had raised serum creatinine at the time of presentation and 36.3% patients among this died. The result was also statistically significant (p<0.05). 90% of the total patients had normal bilirubin levels whereas only 10 % of the remaining patients had raised bilirubin levels.

Table 1 Age and sex characteristics of COVID-19 patients

CHARACTERISTIC	TOTAL(N= 50) (%)	NON-SURVIVORS (%)	SURVIVORS (%)
AGE			
• <45	48	20	80
• 45-60	38	10.5	89.5
• >60	14	57.1	42.9
SEX			
• Male	62	22.5	77.5
• Female	38	21.0	79

Table 2 Clinical Profile, Severity and Co-morbidities in COVID-19 patients

CHARACTERISTIC	TOTAL, N= 50In %(100)	NON -SURVIVORS (%)	SURVIVORS (%)
SYMPTOMS			
• Fever	62	25.8	74.2
• Dyspnoea	62	32.2	67.8
• Cough	58	31	69
• Fever +Cough	44	36.3	63.7
• Dyspnoea + Cough	40	40	60
• Fever +Dyspnoea	36	38.8	61.2
• Fever +Dyspnoea+ Cough	32	43.7	56.3
• Myalgia	28	21.4	78.5
• Anorexia	12	50	50
• Sore throat	10	0	100
• Headache	4	0	100
• Diarrhoea	4	50	50
• Rash	2	0	100
SEVERITY			
• Mild	38	5.2	94.8
• Moderate	42	4.7	95.3
• Severe	20	90	10
COMORBIDITY			
Total	60	23.3	76.7
• Hypertension	24	25	75
• Diabetes	18	11.1	88.9
• CKD	6	66.7	33.3
• Old Pulmonary TB	4	50	50
• Asthma	4	0	100
• COPD	2	100	0
• Carcinoma Thyroid(Treated)	2	0	100

CKD (Chronic Kidney Disease), TB (Tuberculosis), COPD (Chronic Obstructive Pulmonary Disease)

Table 3 Laboratory values at the admission of COVID-19 patient

CHARACTERISTICS	Total(N- 50)%	NON-SURVIVORS (%)	SURVIVORS(%)
Hb			
• Normal(13-15 g/dl)	52	7.6	92.4
• Low(Male <13 Female<12)	48	37.5	62.5
• Very Low(<10)	20	50	50
TLC			
• Normal(4.0-11.00)x10 ³ /μL	72	8.3	91.7
• Low(< 4.0 x10 ³ /μL)	6	0	100
• High(>11 x10 ³ /μL)	22	72.7	27.3
PLATELET			
• Normal(150-400) x10 ³ /μL	70	22.8	77.2
• Low(<150 x10 ³ /μL)	28	21.4	78.6
• High(>400 x10 ³ /μL)	2	0	100
Urea			
• Normal(10-40)mg/dL	74	10.8	89.2
• High(>40 mg/dL)	26	53.8	46.1
CREATININE			
• Normal(0.50-1.00) mg/dL	56	10.7	89.3
• High(>1.0 mg/dL)	44	36.3	63.7
BILIRUBIN			
• Normal(0.2-1.20) mg/dL	90	24.4	75.6
• High(>1.20 mg/dL)	10	0	100

Hb (Hemoglobin), TLC (Total Leucocyte Count),

Discussion

COVID-19 pandemic is ongoing and it seems, will remain with us for a considerable amount of time. There are a limited number of studies describing clinical as well as laboratory finding of COVID-19 patients along with their mortality. There were about 50 patients whose data was analysed in present study out of which 39 were survivors and 11 non-survivors. In our study age was significantly associated with mortality in COVID-19 patients. Senior citizens or patients who were more than 60 year of age had a high risk of mortality. More than 50 % of our patients with age above 60 succumbed to illness. Similar results were seen in the study done by **Hongdou Li et.al** in which among 76 non-survivors, most patients were older with an average age of 71.47 and death was rare in younger population.^[9]

In present study majority of the patients were symptomatic with fever and dyspnoea being the most common symptoms followed by cough, myalgia, anorexia, sore throat, diarrhoea, headache and rash. We observed that patients who presented with combined three symptoms of fever, cough and dyspnoea had high mortality. More than 40 % of these patients did not survive although the results were not statistically significant. A study done by **Wang et.al.** on 107 COVID patients also showed that fever was the most common symptom present in 104 patients, fatigue was 2nd most common, followed by cough and dyspnoea. Majority of non survivors had dyspnoea as the presenting symptom^[5]. Thus, dyspnoea at presentation is an indicator of poor prognosis, though study on large no of patients will be required to validate it.

In our study the majority of the population presented with mild to moderate illness. 38 % patients were mild, 42 % patients were moderate and 20 % patients were severe. Only 5.2 and 4.7 % of the patients were non-survivors in mild and moderate groups respectively. All patients who died in mild and moderate groups had age of more than 65 years along with comorbidity. Thus age is a non-modifiable factor and has a great effect on

the mortality. About 90% of patients who presented with severe illness died. **J. Zhang et.al.** in their study on 663 COVID-19 divided patients in four groups., where 0.5% of the patients were diagnosed with mild COVID-19, while 37.8%, 47.5%, and 14.2% were in moderate, severe, and critical conditions, respectively. In this study also patients presenting with severe illness had high mortality but was not statistically significant^[10].

Hypertension was the most common comorbidity followed by diabetes and chronic kidney disease. In our study, 66.7% of patients who had prior comorbidity of Chronic Kidney Disease died whereas only 25 % of those with hypertension and 11 % with diabetes died. In a study done by **Rong-Hui Du et.al.** on 179 patients of COVID, 32.4 % of patients had hypertension as the most common comorbidity followed by diabetes in 18.4%. Chronic Renal insufficiency was seen in only 2.2% of the patients. Hypertension was significantly associated with high mortality in contradiction to present study. Similar to our study Rong-Hui Du et.al. also showed no significant difference in survivors and non survivors groups among diabetic patients^[11].

In present study, low haemoglobin was significantly associated with mortality in COVID-19 patients. 37.5% of patients with anaemia were died in comparison to normal haemoglobin group in which only 7.5 % of patients died. The difference was statistically significant. **Huang et al.** have reported reduction in haemoglobin levels in 38.2% of patients admitted for COVID-19^[12]. Another study by **L Wang et al.** also reported low haemoglobin level in 19.23% of the study population admitted to hospital^[13]. **Petek Eylul Taneri et.al.** did a systematic review and meta-analysis on anaemia and iron metabolism in COVID-19 and compared haemoglobin levels in moderate to severe cases where it was seen that haemoglobin was low in severe cases of COVID-19, but the difference was not statistically significant.^[14]

Among patients with leucocytosis, 72.7% of the patients were non- survivors, the result was

statistically significant. A retrospective cohort study by **Fei ZhouTing et.al.** had also shown that out of 191 patients more than 60% of patients who had leucocytosis were non-survivors, the result was also statistically significant. Thus raised leucocyte at the presentation predicts a worse outcome^[15].

In our study, only 28 % of the total patients had thrombocytopenia out of which 21.4% of patients were non survivors but the result was not statistically significant. The result was contradictory to the similar studies by **Fei ZhouTing et.al.** in which there was significant thrombocytopenia among non-survivor patients compared to survivors^[15]. The study by **Wang, D et.al.** also shown that thrombocytopenia was significantly present in non-survivor groups than in survivors group.^[5]

More than 50 % of the patients with raised serum urea and 36.3% of patients with raised serum creatinine were non-survivors and the difference was statistically significant. A study by **Lang Wang et.al.** in which 339 patients were analysed, Serum urea and creatinine were higher in non-survivor group than in survivor group and results were statistically significant.^[13]

In our study 90% of patients had normal bilirubin and in only 10% of patients, bilirubin was high. No mortality was seen in patients with raised bilirubin levels. **Rong-Hui Du et.al.** Also showed that there was no significant difference in bilirubin among survivors and non survivors.^[11]

Conclusion

Age is a non-modifiable risk factor and strongly associated with mortality in COVID-19 cases. Anaemia, raised TLC and deranged renal function at the presentation are associated with poor outcome in patients and thus need to be taken into account while triaging patients.

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