

Clinical Severity of Patients with COVID-19 Presenting to Nepal Armed Police Force Hospital: A Descriptive Cross-sectional Study

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ABSTRACT

Introduction: Coronavirus Disease 2019 (COVID-19), since its emergence, has spread rapidly as a pandemic causing massive loss of human life. This study aims to describe clinical severity of the disease in relation to age, mode of oxygen delivery and clinical outcome of patients admitted to a tertiary care center in Nepal.

Methods: This was a descriptive cross-sectional study of data records of 130 COVID-19 patients 18 years and above admitted in Nepal Armed Police Force Hospital from April 2021 to June 2021 with Severe Acute Respiratory syndrome SARS-CoV-2 Reverse Transcriptase Polymerase Chain Reaction positive status. Ethical approval was obtained from Nepal Health research Council. Data were collected using structured proforma and analyzed using SPSS version 23.

Results: Patients with severe illness (52/130) constituted 40% of the bulk of COVID-19 patients, 48 of them requiring intensive care. Among them, 38.5% required non-invasive ventilation and 32.7% were intubated during treatment. Severity of illness was variable among different age groups but mortality was high among severely ill patients, 19/52 (36.5%) and with increasing age. The overall mortality was 19/130 (14%) over the study period, all of which were among severely ill patients.

Conclusions: Most of the clinically severe cases required Intensive Care Unit admission, the majority receiving oxygen therapy via non-invasive or invasive mechanical ventilation, with a high mortality rate. The number of severely ill COVID-19 patients was variable in different age groups. Mortality, however, was observed in severely ill patients only and proportionately increased in COVID-19 patients with advancing age.

Keywords: Age; Mortality; Nepal; oxygen therapy; Severe COVID-19.

INTRODUCTION

In December 2019, a new respiratory tract-infecting agent known as the 2019 novel coronavirus emerged in Wuhan, China.¹ The virus, specifically called Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has, since then, caused the Coronavirus disease 2019 (COVID-19) which rapidly spread as a pandemic. The clinical spectrum of COVID-19 varies from asymptomatic

and moderate, to severe and critical illness with acute respiratory distress syndrome (ARDS), multi-organ dysfunction syndrome (MODS), and death.²

As of May 5, 2022, there are a total of 9,78,899 cases in Nepal with 11,952 confirmed deaths. The course of the disease may be severe, leading to hospitalization and even death in the elderly or those with comorbid conditions.^{3,4} Given the illness's novelty and high heterogeneity, it is critical to establish the clinical

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characteristics of the disease for appropriate triaging and treatment of the patients. It would aid in the proper allocation of medical resources for patient management in large numbers in future pandemic surges which is crucial to all healthcare systems around the world, more so, in developing countries.

The objective of this study was to describe the clinical severity of the COVID-19 patients in relation to age, mode of oxygen delivery and clinical outcome (mortality and recovery) of patients in Nepal Armed Police Force (APF) Hospital, a tertiary care center in Nepal.

METHODS

This was a cross-sectional descriptive study done in Nepal Armed Police Force (APF) Hospital, Kathmandu, Nepal among patients above 18 years admitted to the hospital from April 2021 to June 2021 who tested positive for SARS-CoV-2 on a throat and/or nasopharyngeal swab using a Real-time Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) assay. The study was approved by the Nepal Health Research Council (Ref. no.1476). Convenient sampling technique was used for this study. Data collection was done from electronic data records of COVID-19 patients which was corroborated with the corresponding data from the clinical record files and record keeping register at Nepal Armed Police Force Hospital. Patients diagnosed to have COVID-19 by Rapid Diagnostic Tests (RDT) were excluded from the study.

The sample size was calculated by using the formula:

$$\begin{aligned} n &= Z^2 \times p \times q / e^2 \\ &= 1.96^2 \times 0.5 \times (1-0.5) / 0.1^2 \\ &= 97 \end{aligned}$$

Where,

n= required sample size

Z= 1.96 at 95% Confidence Interval (CI)

p= prevalence taken as 50% for maximum sample size⁴

q= 1-p

e= margin of error, 10%

After adding for 20% non-response rate, sample size was calculated to be 121. However, we have taken 130 patients.

Patients on admission were categorized into those having mild, moderate or severe disease or illness as per physician's diagnosis based on WHO interim guidance, May 7, 2020. According to the classification, mild COVID-19 was defined as the presence of respiratory symptoms without evidence of viral pneumonia or hypoxia. Moderate and severe disease in adolescents and adults was defined as the presence of clinical (fever, cough, dyspnea and fast breathing) evidence of pneumonia without additional radiological evidence. Moderate disease was distinguished from severe disease by a defining value of peripheral oxygen saturation (SpO₂) ≥90% on room air, while one of the following was required to define severe disease: respiratory rate >30 breaths/min or SpO₂ <90% on room air.⁵ The aim of our study was to describe the clinical characteristics of patients with severe disease which also includes all critically ill patients requiring Intensive Care Unit (ICU) or High Dependency Unit (HDU) admission in our hospital. The final outcome of patients (death or recovery/discharge) was also noted.

Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS version 23.0) and Microsoft Excel 2016. Data analysis was done using descriptive statistics such as mean with standard deviation (SD), median with interquartile range (IQR), percentages and frequency as per the type of variable analyzed and interpretation was done using tables, charts and bar diagrams.

RESULTS

Among the 130 patients included in the study, the minimum age was 18 years and maximum 89 years while 81 (62.3%) patients were males and 49 (37.7%) were females. Table 1 shows the baseline characteristics of the patients included in the study.

Table 1. Baseline characteristics of patients (N=130)

Variables	Minimum	Maximum	Mean ± SD	Median (IQR)
Age (years)	18	89	45.8 ± 17.4	45 (31.5 - 58)
SBP (mm of Hg)	83	160	117.3 ± 12.2	-
DBP (mm of Hg)	50	100	75.3 ± 9	-
Pulse (beats per minute)	64	128	84.1 ± 10.0	-
RR (breaths per minute)	14	42	21.3 ± 3.3	-
Temperature (°F)	95	102	97.7 ± 1.1	-
SpO ₂ (%)	65	98	91.9 ± 7.1	-
Duration of Stay (days)	1	27	9.9 ± 4.6	-

SD= Standard Deviation, SBP= Systolic Blood Pressure, DBP= Diastolic blood pressure, SpO₂= Peripheral oxygen saturation, IQR= Interquartile range

There were a total of 52 patients with severe illness comprising 40% of the bulk of hospital admitted patients. Most of the patients with severe illness 48/52 (92.3%), were admitted in the ICU while 4/52 (7.7%) were admitted in the HDU as shown in figure 1. Among those with severe illness, 35 (67.3%) patients were males and 17 (32.7%) were females. Out of 52 severely ill patients 19 (36.5%) died, showing that severely ill patients had a less favorable outcome. The overall ICU admission among total hospitalized patients was 36.9%. The in-hospital mortality was 14.6% all of which were among severely ill COVID-19 patients as shown in table 2.

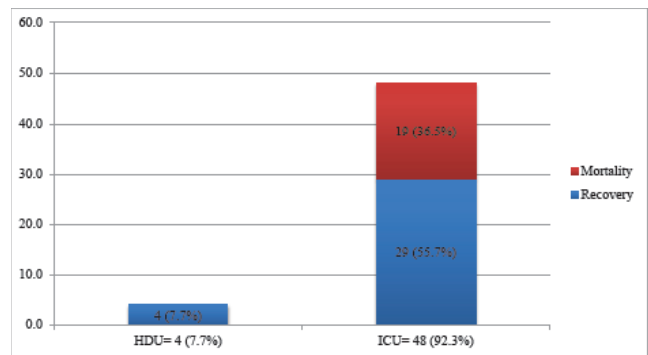


Figure 1. Place of admission and mortality among severely ill patients (n=52)

Most of the patients admitted in the hospital were between 18 to 30 years (24.6% of 130) followed by those between 41 to 50 years (20%). However, the maximum proportion of patients with severe illness was observed in the age group between 51 to 60 years, 12/20 (60%) followed by those between 41 to 50 years, 13/26 (50%) as shown in Figure 2. Mortality, on the other hand, was observed to be highest in patients 70 years and above, 4/13 (30.8%) followed by those between 61 and 70 years, 4/14 (28.6%). Although the highest number of deaths was observed in the age group of 41 to 50 years, 5/26 (19.2%), it was proportionately less as compared to patients above 61 years as shown in Table 2.

Table 2. Severe illness and mortality in different age groups

Age group	Severe illness	Mortality among severely ill	Overall recovery and discharge	Overall mortality	Total (N)†
18-30 (n=32)	7 (21.9%)*	0	32 (100%)*	0	32 (24.6%)†
31-40 (n=25)	9 (36%)*	2 (22.2%) ‡	23 (92%)*	2 (8%)*	25 (19.2%)†
41-50 (n=26)	13 (50%)*	5 (38.5%) ‡	21 (80.8%)*	5 (19.2%)*	26 (20%)†
51-60 (n=20)	12 (60%)*	4 (33.3%) ‡	16 (80%)*	4 (20%)*	20 (15.4%)†
61-70 (n=14)	5 (35.7%)*	4 (80%) ‡	10 (71.4%)*	4 (28.6%)*	14 (10.8%)†
>70 (n=13)	6 (46.2%)*	4 (66.7%) ‡	9 (69.2%)*	4 (30.8%)*	13 (10%)†
Total (N=130)	52 (40%)†	19 (36.5%) ‡	111(85.4%)†	19 (14.6%)†	130

*Percentages are calculated out of the total of patients in respective age groups (n) in each row

† Percentages are calculated out of the total number of patients (N) =130

‡ Percentages are calculated out of the number of severely ill patients in each age group and total number of severely ill patients for final row

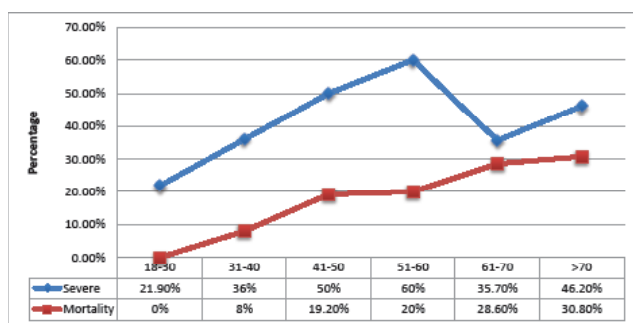


Figure 2. Line diagram showing age-wise distribution of severe cases and mortality

Forty patients (30.7%) were on oxygen support at presentation to the hospital. Total of 12 (9.2%) patients

did not require oxygen support, while 118 (90.8%) required oxygen support. Seventeen patients (13.1%) were intubated and required invasive ventilation as illustrated in Table 3.

The bulk of patients, 58/130 (44.7%) were treated with either nasal prongs/cannula or face mask oxygen. Patients having severe illness mostly required non-invasive, 20/52 (38.5%) or invasive, 17/52 (32.7%) ventilation as compared to other modes of oxygen therapy as shown in Table 3. Most of the deaths occurred in patients requiring either invasive, 9/19 (47.4% of total deaths) or non-invasive ventilation, 9/19 (47.4%) while one patient (5.3% of total deaths) treated on oxygen with a reservoir mask at the time of admission died later.

Table 3. Mode of oxygen delivery in patients with severe illness and overall outcome

		Mode of O2 supply						Total (N=130)	
		Room air	NP	FM	RM	VM	NIV		InV
Severe illness (n=52)		0	0	4 (7.7%)*	9 (17.3%)*	2 (3.8%)*	20 (38.5%)*	17 (32.7%)*	52 (40%)†
Overall Outcome	Discharge (n=111)	12 (10.8%)*	30 (27.1%)*	28 (25.2%)*	14 (12.6%)*	6 (5.4%)*	13 (11.7%)*	8 (7.2%)*	111 (85.4%)†
	Mortality (n=19)	0	0	0	1 (5.3%)*	0	9 (47.4%)*	9 (47.4%)*	19 (14.6%)†
Total		12 (9.2%)†	30 (23.1%)†	28 (21.6%)†	15 (11.5%)†	6 (4.6%)†	22 (16.9%)†	17 (13.1%)†	130

Definition of table abbreviations: NP= nasal prongs, FM= face mask, RM= reservoir mask, VM= venturi mask, NIV= non-invasive ventilation, InV= invasive ventilation

*Percentages are calculated out of the total number of patients in each row (n)

† Percentages are calculated out of the total number of patients (N)=130

DISCUSSION

SARS-CoV-2 is the causative agent of COVID-19 and since its recognition in December 2019, millions of people worldwide have been infected.⁶ This descriptive cross-sectional study has included 130 RT-PCR confirmed COVID-19 patients admitted to Nepal APF Hospital over a period of three months during the surge of the pandemic in Nepal from April to June 2021. As described in our methods, the category of 'severe' disease in our study also encompasses critically ill patients requiring intensive care and having respiratory or other coexistent organ dysfunction.

Among 130 patients studied over the defined period, the minimum age was 18 and maximum was 89 years with a median age of 45 years. Similar studies have demonstrated comparable median age for hospitalized patients with COVID-19.⁷ The highest proportion of patients with severe illness was observed in patients between 51 to 60 years (12/20= 60%) followed by the age group of 41 to 50 years (13/26= 50%) and then, by the age group above 70 years (6/13= 46.2%) followed by 61 to 70 years (5/14= 35.7%). Thus, the increase in the percentage of severe disease did not show a proportionate rise with increasing age group in our study. Similar findings were reported in a multicenter study in China by Feng et al where the maximum proportion of patients with severe and critical illness were observed to be in the age group of 40 to 64 years.⁷

Mortality, on the other hand, was observed to rise progressively with increasing age groups and highest in patients above 70 years (30.8%) followed by those between 61 and 70 years (28.6%) in our study. All the patients who died had severe illness. Thus, increased number of deaths were observed in patients of advancing age with severe illness. In contrast,

patients between 18 to 30 years exhibited full recovery followed by home discharge. Increased complications and mortality rates among COVID-19 patients of older age groups have also been shown by other authors.^{8,9} Older age has also been identified as a risk factor and a major predictor of COVID-19 mortality.¹⁰ Feng et al have even suggested a value of age ≥ 75 years to be the age above which significant COVID-19 mortality has been observed while Neves et al have suggested that mortality increases significantly above 60 years with a great majority above 80 years of age.^{7,8} A higher percentage of comorbidities have also been observed in the elderly, possibly increasing the risk of death.⁷ The isolated effect of age on COVID-19 mortality, excluding the effect of concurrent comorbidities was studied in a systematic review with meta-analysis by Starke et al where the risk of in-hospital and case mortality was shown to increase per age year by 5.7% and 7.4%, respectively. In the research, however, no increased risk was observed for ICU admission and intubation by age year. There was also no evidence of a specific age threshold at which the mortality risk accelerated considerably.⁹

In our study, most of the patients among the total, 111/130 (85.4%) were discharged after recovery. Severely ill patients were admitted to the ICU and HDU out of which there were 19 deaths. This was 14.6% of the total number of patients in the study reflecting the overall in-hospital mortality due to COVID-19, while it was 36.5% among patients with severe illness. The finding showed that patients with severe illness had a less favorable outcome. In Feng et al's multicentric study, the overall mortality was 8% while it was 41.1% among critically ill patients which are comparable to our findings.⁷ The proportion of deaths to recovery and discharge, however, has been found to vary in different studies with mortality as high as 21.3% in hospitals.¹¹

Some differences observed in the overall mortality percentage across various studies may be due to the varying clinical severity of COVID-19 in different time periods of the pandemic which has been studied by other authors in different countries.^{12,13} Roth et al, however, have shown that this temporal variation in mortality rates in different waves of the pandemic was observed even after adjusting mortality for age, sex, medical history and disease severity.¹⁴

Most of the patients received oxygen therapy via nasal prongs (23.1% of total 130) and then by face mask (21.5% of total) in our study. This was followed by patients requiring non-invasive ventilation (16.9% of total) and then by those requiring invasive ventilation (13.1% of total). These findings resemble those of a South African study where earlier pandemic waves caused by various COVID-19 variants have been compared to that caused by the Omicron-dominant fourth wave.¹¹ Among patients having severe illness, most of them, either required non-invasive, 20/52 (38.5%), or invasive, 17/52 (32.7%) ventilation as compared to other modes of oxygen therapy. Feng et al's study also showed a similar pattern of oxygen therapy requirement with the 'severe' and 'critical' group being comparable to the 'severe illness' group of our study.⁷ Most of the deaths occurred in patients requiring either invasive, 9 (47.4% of total deaths) or non-invasive ventilation, 9 (47.4%) which, again, reflects high mortality in patients with severe illness. The percentage of patients receiving invasive ventilation is also similar to the study conducted in three large London hospitals.¹⁵

Male predominance was seen in this study as 62.3% of the total number of patients were males. Also, among patients with severe illness, 67.3% were males. This finding is consistent with other contemporary studies.^{4,7,16} Higher male predominance possibly points towards increased mortality in males due to a higher prevalence of cardiopulmonary disease and smoking.^{6,17} Studies have also shown that male sex is independently associated with COVID-19 severity.¹⁰ Also, in this study, most of the infected people were between 18 to 50 years of age as shown in other studies.⁷ A similar study conducted in mid-western Nepal, however, revealed that most infected people were in the relatively younger age group.¹⁷ Since young and middle-aged adult males are the predominantly active age group working outside the household in the context of Nepal, it could also possibly explain the age and gender propensity of SARS-CoV-2 infection. Also, during the specified period of our study, COVID-19 vaccination was in progress mostly in the general population above 55 years of age which could have, additionally, influenced the age predilection of the infection.

Length of hospital stay is an important indicator of the utilization of medical services. A shorter duration of hospital stay has been associated with decreased risk

of opportunistic infection.¹⁵ Length of stay of admitted patients ranged from 1 to 27 days with mean duration of stay being 9.9 days. Similar findings were noted in different studies conducted in a COVID dedicated hospital in northern India and in South Africa.^{11,18} Length of hospital stay was also found to be relatively longer in patients with severe and critical illness.⁷

Acknowledging the limitations of the study, this was a single-centered study with small sample size. Thus, it would be difficult to generalize the findings of the study. Conducting a multi-centered study with a larger number of patients would probably provide information of high discriminatory value. Including the investigational parameters such as complete blood count, renal function test, liver function test, erythrocyte sedimentation rate, C-reactive protein, d-dimer, chest x-ray and high-resolution CT scan of chest and analyzing patient outcomes with treatment modalities in future studies would help understand the disease and its manifestations in greater depth.

CONCLUSIONS

Clinically severe cases required admission either to the ICU or the HDU mostly requiring non-invasive or invasive mechanical ventilation for oxygen therapy with a significantly high mortality rate among them. The number of severely ill COVID-19 patients was not observed to increase proportionally with increasing age groups. However, the mortality of COVID-19 patients was observed to proportionately increase in patients with advancing age, all of them having severe disease. Resource-poor countries need to upgrade and strengthen their human resource and logistics in order to manage the large bulk of severely ill COVID-19 patients so as to maximize recovery and minimize morbidity and mortality.

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CONFLICT OF INTEREST

None

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