CLINICAL PROFILE AND PREDICTORS OF MORTALITY IN PATIENTS ADMITTED WITH COVID-19 IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Hospitalization and survival rate in patients with coronavirus disease 2019 (COVID-19) is affected by pre-existing chronic medical conditions and the disease severity. The objectives of the study were to describe the baseline clinical profile, co-morbidities, disease severity and to assess the predictors of mortality in hospitalized adult patients with COVID-19 in a tertiary care hospital in Nepal. A cross-sectional study was conducted for two months on 168 adult COVID-19 patients admitted to Nobel Medical College Teaching Hospital Biratnagar. Demographics, comorbidities, disease severity, oxygen requirement, and treatment outcomes were studied. The mean age of the patients was 57.1 years and 56.5% were male. Out of 168, 16.7% and 10.1% of the participants had currently or in the past used alcohol or tobacco products respectively. Hypertension (28.6%) and chronic lung disease (16.1%) were the most common co-morbidities. The overall case-fatality rate was 17.9%, with 32.1% and 56.3% in the severe and critical COVID-19 subgroup respectively. The mortality rate for patients without co-morbidities was 2.4% which increased to 63.6% for those with three or more co-morbidities. Age, disease severity, and the number of co-morbidities were found to be associated with increased mortality ($P<0.05$), whereas gender was not. The pre-existing chronic diseases and increased severity of the disease were associated with increased mortality in hospitalized COVID-19 adult patients.

KEYWORDS

Comorbidity, COVID-19, Hospitalization, Mortality

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INTRODUCTION

An outbreak of unusual pneumonia caused by novel coronavirus was observed in hospitalized patients from Wuhan, China in December 2019. This virus spread to the rest of the world represented a great threat to global health.[1,2] The causative agent was identified and it was designated as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) based on the genomic sequences, phylogenetic relationship, and high sequences similarity with bat coronavirus (SARS-bat virus). The disease caused by it was named as COVID-19 in February 2020 and pandemic was declared on March 11, 2020.[3,4] This virus belongs to the family *Coronaviridae*, with positive sense, ssRNA virus with an approximately 26 to 32 kb genome. Currently, this virus has spread to more than 220 countries and territories with 210,212,244 cases, with 4,407,224 deaths and 188,306,903 recoveries. The clinical symptoms of COVID-19 varied from asymptomatic infection to severe acute respiratory syndrome (SARS), with high mortality rates of approximately 2–5%. Acute respiratory distress syndrome (ARDS) induced by viral pneumonia attributed the mortality caused by COVID-19 infections. ARDS represents the most serious complication of SARS-2 infection with a mortality rate ranging from 26-94% globally.[4,5] Based on the recent publications, an atypical manifestation of the disease characterized by an exaggerated inflammatory and increased incidence of shock and distinct phenotype characterized by higher respiratory compliance with extensive radiographic abnormalities have been described. There are limited treatment options for COVID-19 induced ARDS. The clinical features, death predictors, outcomes and factors associated with the progression of COVID-19 disease and mortality has been described in many recent publications.[5-14] The clinical presentation of COVID-19 can range from asymptomatic cases diagnosed during contact tracing, mild to moderately symptomatic patients managed at home, or those that require hospitalization. Several studies have reported alterations in various biochemical parameters among COVID-19 patients and they have been identified as important clinical predictors for the severity of SARS-CoV-2 infection. Currently, the management and treatment guidelines mainly focused on vaccination, prevention, control, and supportive intensive care involving oxygen supplementation and mechanical ventilation as required. Although the first case of COVID-19 was reported in Nepal on a student returning from the epicenter Wuhan, China, in January 2020,[15] there is a paucity of data regarding the clinical profile of the patients requiring hospitalization in the country. Despite only a small proportion of patients requiring admission, the knowledge regarding the clinical profile and predictors of mortality in hospitalized patients can help manage such cases.

This study focuses to investigate the baseline characteristics, their comorbidities, the requirement of supplemental oxygen therapy and treatment outcome of adult patients admitted to Nobel Medical College Teaching Hospital during the second peak of the COVID-19 pandemic.

MATERIALS AND METHODS

A cross-sectional study was conducted among adult patients admitted with a diagnosis of COVID-19 confirmed by real-time polymerase chain reaction (RT-PCR) on nasopharyngeal and/or oropharyngeal swab specimens from 1st May 2021 to 30th June 2021 in Nobel Medical College, Nepal. The relevant data were collected from the discharge summary and case files of the patients after taking the informed consent from the patient or their next of kin. The data included age, sex, co-morbidities, baseline characteristics, the severity of the disease, treatment including supplemental oxygen therapy and the outcome. The sample size was estimated as:

$n=Z^2 \times p \times (1-p) / e^2$
$=1.96^2 \times 0.11 \times (1-0.11) / (0.05)^2$
$=151$
where,
n= minimum required sample size
Z= 1.96 at 95% confidence interval
p= mortality rate in hospitalized patients, 0.11[16]
e= margin of error, 0.05

The required sample size was 151. Accounting for a non-response of 10% the minimum sample size needed was 166. The total number of participants in our study was 168.

The severity of the disease was based on the World Health Organization (WHO) COVID-19 disease severity categorization which includes: 1) critical COVID-19, defined by the presence of SARS, sepsis, septic shock, or other condition requiring life-sustaining therapies; 2) severe COVID-19, defined by oxygen saturation less than 90% on ambient air, increased respiratory rate, signs of severe respiratory distress or the presence of any danger signs; and 3) non-severe COVID-19, defined by cases not meeting the above definition.[17]

The data thus collected were entered in Microsoft Excel 2007 and subsequently analysed using IBM SPSS version 20. The categorical data were compared using Chi-square tests

and continuous data were compared using Student's t-test. A P-value <0.05 was considered significant with a 95% confidence interval. The ethical clearance was taken from the Institutional Review Committee of Nobel Medical College *(IRC NMCTH 507/2021)*.

RESULTS

A total of 168 adult patients were hospitalized with COVID-19 during the study period. The mean age of the patients was 57.1 years and 95 (56.5%) were male. Age of the patients ranged from 19-90 years. Seventeen patients (10.1%) were current/past tobacco users. Hypertension (28.6%) was the most common co-morbidity followed by chronic lung disease (16.1%) and diabetes mellitus (14.3%) (Table 1).

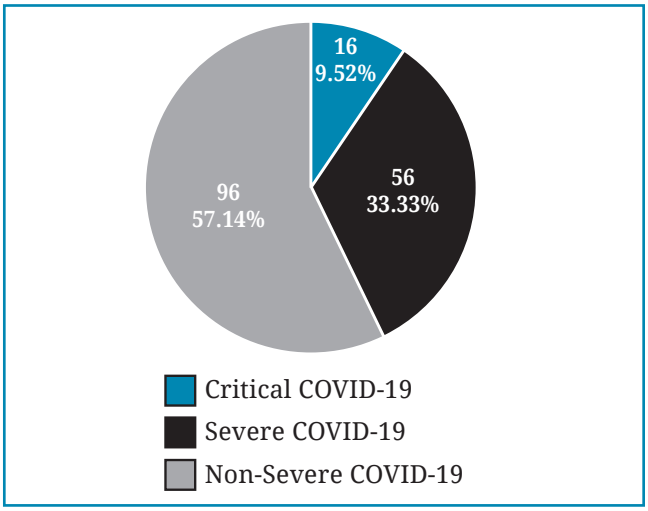

Fig. 1: The severity of COVID-19 in admitted patients (n=168)

Table 1: Baseline characteristics of the COVID-19 patients (n=168)

Variables		n (%)
Gender	Male	95 (56.5)
	Female	73 (43.5)
Age	Mean	57.1 years
	Range	19-90 years
Current/ Former use of	Alcohol	28 (16)
	Tobacco products	17 (10.1)
Co-morbidities	Hypertension	48 (28.6)
	Chronic lung diseases	27 (16.1)
	Diabetes Mellitus	24 (14.3)
	Renal disorder	16 (9.5)
	Cardiac disease	13 (7.7)

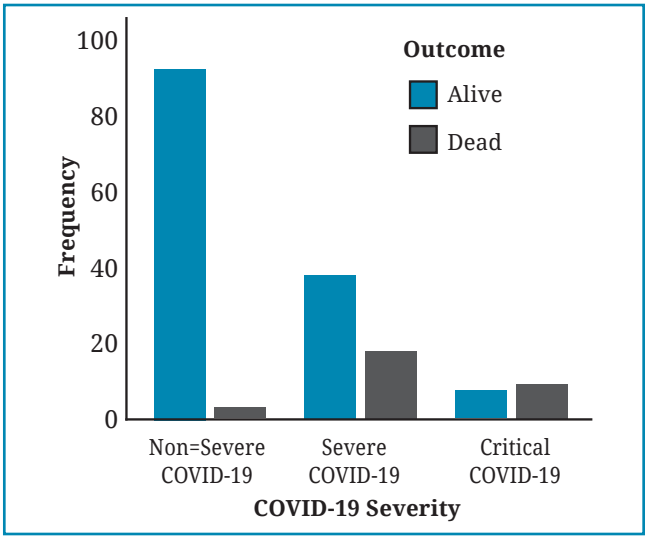

Fig. 2: Clustered bar chart showing the outcome of participants according to the disease severity (n=168)

Table 2: The mortality rate of COVID-19 patients (n=168)

Variable		Frequency (%)	P-value
Age group	<40 years	1 (4)	0.02
	40-60 years	9 (13.8)	
	>60 years	20 (25.6)	
Gender	Male	15 (15.8)	0.42
	Female	15 (20.5)	
Supplemental oxygen requirement	Not required	0 (0)	0.04
	Required	30 (20.0)	
Severity of COVID-19	Non-severe COVID-19	18 (32.1)	0.001
	Severe COVID-19	9 (56.3)	
	Critical COVID-19	3 (3.1)	
Number of co-morbidities	None	2 (2.4)	0.001
	One Co-morbidity	9 (16.7)	
	Two Co-morbidities	12 (57.1)	
	Three Co-morbidities	7 (63.6)	

Out of 168, 16 (9.5%) patients had critical COVID-19 whereas 56 (33.3%) had severe COVID-19 as defined by the WHO COVID-19 severity criteria.[17] One hundred and fifty (89.3%) patients required supplemental oxygen therapy (Fig. 1).

The case fatality rate for the hospitalized patients was 17.9%. The mean age of the participants that died was 63.4 years as compared to 55.7 years of the recovery group. Furthermore, it was observed that participants with increased age had decreased survival with a mortality rate of 4% in participants below 40 years compared to 25.6% in those above 60 years of age. There were significant differences in the case fatality rate for various severity of the disease. Nine patients (56.3%) with critical COVID-19 expired whereas only three (3.1%) non-severe COVID-19 patients died (Fig. 2).

Similarly, the presence of co-morbidities in the form of previous illness also increased the likelihood of death as evidenced by 63.6% of the patients with three diseases dying compared to the mortality rate of only 2.4% in patients without any prior comorbidity (Table 2). The clinical predictors of mortality in hospitalized adult patients with COVID-19 were age, disease severity, oxygen requirement and the presence of co-morbidities.

DISCUSSION

The COVID-19 disease has become more challenging for low income countries with poor healthcare facility including Nepal. We have presented the clinical and outcome data for 168 hospitalized and confirmed COVID-19 participants based on cross-sectional study looked at the relationship between the presence of co-morbidities, the severity of the disease, and outcome at Nobel Medical College Teaching Hospital Biratnagar, Nepal. The average age of the participant was 57.1 years with majority of male patients. This finding was similar to the one reported in a tertiary cardiovascular center in the country.[16] The co-morbidities reported in this study were also similar to the findings of Gold *et al*[18] and Bajgain *et al*[19] in which hypertension, diabetes mellitus, chronic obstructive pulmonary disease and renal disorder were also the most common comorbidities. Hypertension made up the most common co-morbidity in this study at 27.4%, similar to our finding (28.4%). The number of participants with multiple comorbidities was higher in our study as compared to a study done in hospitalized Indian patients by Padmaprakash *et al*.[20] Moreover, it was noted in our study that patients with an increased number of comorbidities had a poorer outcome. Surendra *et al* also reported similar findings in hospitalized patients in Indonesia.[21]

The overall mortality rate noted in our study was 17.9% which was higher than that reported in other studies. However, a direct comparison could not be made due to the heterogeneity in the severity of COVID-19 patients in our study when compared to other reports. A similar study done in Mexico City by Olivas-Martínez *et al* found the mortality rate for severe COVID-19 patients to be 30.1%.[22] The combined mortality rate for the severe and critical COVID-19 patients was 37.5% in our study. This variation in the mortality rate could be explained by older patients in the study, multiple co-morbidities in the participants, study being conducted during the peak of the second wave where the resources were constrained. A similar observation was also made in the study by Olivas-Martínez *et al*.[22] In many another reports, the mortality rate was higher than the European population and in Chinese cohorts study the overall cases were higher in men than women.[9-12,23-25] The COVID-19 infection also induces the cytokine storm and lymphopenia, resulting into high cytokine levels (IL-2 receptor, IL-6, IL-8, IL-10) and necrosis factor (TNF α) which explains the result of multi-organ failure.[26]

The clinical predictors of mortality noted in the study viz, age, oxygen requirement, disease severity, and the number of chronic diseases were also corroborated by an Indian study.[20] However, unlike the finding of that study, gender was not a predictor of mortality in our study. But there are some studies from China, UK, USA, and Spain have reported the male gender was predominant predictor of mortality.[9-12, 23-25]

Limitations: The present study has some limitations. It was conducted over two months during the peak of the COVID-19 pandemic, so the findings in this study could have been affected by resources constraint. As it was a single-centerd study, the finding of which needs to be concurred by other studies in a similar setting. This study also did not look at the participants requiring ICU admission and ventilatory support separately to account for their impact on survival. A detailed and comprehensive study may be necessary to understand the COVID-19 patients in other regions with a greater number of samples so that a significant difference with patients can be established in other regions.

This study highlighted the clinical profile of hospitalized COVID-19 patients and demonstrated the impact of age, pre-existing disease conditions and COVID-19 severity as predictors of mortality in these patients.

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