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Original Research Article

Outcome of intensive care unit admitted COVID-19 patients with co-morbid conditions requiring ventilator support

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ABSTRACT

Background: The characterization of intensive care unit (ICU) admitted COVID-19 patients with co-morbid conditions requiring ventilator support can help investigators worldwide to prepare for emergency situation arising at the time of spread of disease. The objective of our study is to analyse the outcome of ICU admitted COVID-19 patients with co-morbid conditions.
Methods: Post ethics committee approval for multiple centers, data of 212 consecutive discharged and death COVID-19 confirmed ICU patients were included and analyzed. These patients of all age groups and genders were admitted in Bhaktivedanta Hospital and Research Institute, Mira Road, Mumbai, Maharashtra, India which is a dedicated COVID hospital from March 2020 to November 2020.
Results: Of the total 212 ICU patients, 17 (9%) cases were moderate, 195 (91%) were severe cases as per CT severity score grading, median duration of stay in the hospital was 9 (37%) days. Diabetes mellitus was the leading co-morbid condition with frequency of 27.8% followed by ischemic heart disease (IHD) (5.6%), chronic kidney disease (CKD) (5.1%), asthma (3.77%) and chronic obstructive pulmonary disorder (COPD) (0.94%).
Conclusions: Not all patients with co-morbid conditions progress towards poor lung function. IHD is the worst prognostic indicator for progressing towards poor lung function as compared to diabetes, CKD and COPD.

Keywords: COVID-19, Limited resource setting, Treatment strategy, Patient outcome, Mortality, Minimal use of oxygen, Progesterone as immunomodulator

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an acute respiratory disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), spread everywhere in the world since its first episode in Wuhan, Hubei Province in December 2019. As of 04 August 2021, more than 182 million people globally have been confirmed to be infected and 3.95 million people have died of COVID-19. COVID-19 patients exhibit wide range of symptoms ranging from mild to severe illness. While few are asymptomatic, 80% of patients have mild symptoms, 14% develop severe illness and the remaining 5% are critical cases requiring intensive care unit (ICU) admission. Mild cases have a good prognosis, however severe and critical patients are difficult to treat and have a high mortality rate. The percentage of patients requiring ICU admissions ranges between 6.1% to 41% of all admission. Non-invasive ventilation (NIV) is reported to be used in 11-62% of all patients COVID-19 admitted to intensive care units. Mortality rates within critically ill patients varies from 16% to 78%.[1] Recovery rates from COVID-19 patients in India and other developing countries is high but there is very less information

available on the outcomes among patients with moderate-severe illness requiring hospitalization.[2,3] The characterization of ICU admitted COVID-19 patients with co-morbid conditions requiring ventilator support can help investigators worldwide to prepare for emergency situation arising at the time of spread of disease. The objective of our study is to analyse the outcome of ICU admitted COVID-19 patients with co-morbid conditions.

METHODS

The study was initiated after obtaining approval from the institutional ethics committee and approval from the Ministry of Health (EC/NEW/INST/2019/245). This study was initiated in Bhaktivedanta Hospital and Research Institute, Mira Road, Mumbai, Maharashtra, India. In this multicentre retrospective study, data of 212 consecutive COVID-19 confirmed ICU patients was included and analyzed. These patients were admitted in a dedicated COVID hospital including all genders and age groups from 26 December 2020 to 29 May 2021. All patients received appropriate supportive care and regular clinical and laboratory monitoring. Patients' information inclusive of demographics (age, sex, and nationality), clinical features including severity based on saturation on air at the time of admission and CT severity score; co-morbid conditions, number of patients requiring BiPAP, date of admission and discharge, patient mortality rate, coronavirus reverse transcriptase-polymerase chain reaction (RT-PCR) and other laboratory results were extracted from medical records. Analyses were performed with the use of statistical package for the social sciences (SPSS) version 20.

Eligibility criteria

Inclusion criteria

The patients who were admitted in ICU for COVID-19 and the required data parameter were assessed as per the protocol were included.

Exclusion criteria

The patients who were not admitted in ICU were excluded.

RESULTS

Data of total of 212 ICU patients with laboratory confirmed COVID-19 test by RT-PCR at Bhakti Vedanta Hospital and Research Institute was analyzed. The mean age of patients was 49.19 (SD=14.1) years and 162 (76.41%) of them were males. A summary of demographic characteristics of the study participants is represented in Table 1.

Patients were categorized as mild, moderate, severe as per CT severity and SpO_2 was recorded at the time of admission, clinical guidance for management of adult COVID-19.[4]

Of total 212 ICU patients 17 (8.01%) cases were moderate, 195 (91%) were severe cases as per CT severity score grading. Of all patients 9 (4.24%) patients expired and the remaining 203 patients have subsequently recovered and were discharged. Median dduration of stay in the hospital was 9 (37) days. Patients had one or more co-morbidities.

Diabetes mellitus was the leading co-morbid condition with frequency of 27.8% followed by ischemic heart disease (IHD) (5.6%), chronic kidney disease (CKD) (5.1%), asthma (3.77%), and chronic obstructive pulmonary disorder (COPD) (0.94%) (Table 2).

Patients with different co-morbid conditions requiring BiPAP support and the outcome is shown in Table 1.

Table 1: Demographic characteristics of the study participants (N=1049).

Parameters	N (%)
Age (years)-mean (SD)	49.19 (14.1)
Gender (male)	162 (76.41)

Table 2: Comorbid conditions.

Variables	No of patients (%)	No of patients requiring BiPAP /NIV support (%)	Patient with co-morbidities discharged	Total death in co-morbid condition
Ischemic heart disease (IHD)	12 (5.6)	1 (8.3)	11	2
Diabetes	59 (27.8)	6 (10.16)	53	6
Chronic kidney disease (CKD)	11 (5.1)	2 (16.6)	10	1
Asthma	8 (3.77)	1 (12.5)	8	0
COPD	2 (0.94)	1 (50)	2	0
Moderate cases as per SpO_2 level at admission	17 (8.01)	-		
Severe cases as per SpO_2 level at admission	195 (91)	-		

Statistical analysis

All statistics are descriptive only. Descriptive statistics were reported as mean (SD) or median for continuous variables and as counts and percentages for categorical variables. No imputation was made for missing data. Analyses were performed with the use of SPSS version 20.

Table 3: Summary of outcomes (hospital mortality) of various COVID-19 studies reported.

Study	No of patient admitted in hospital	ICU mortality (%)
Divatia et al[13]	4038	729 (18.1)
Oliveira[14]	131	26 (19.84
Goyal et al[15]	130	19 (15)
Bhatraju et al[16]	24	12 (50)
Wang et al[17]	344	133 (39)
Yang et al[18]	52	32 (62)
Zhou et al[19]	50	39 (78)
Current study	212	9 (4.24)

Table 4: Mean age and percentage of males in other published studies.

Study	Mean age (years)	No. of males (%)
Chen[20]	55.59	67.9
Kumar et al[21]	39.89	78.3
Kayina[22]	50.7	68.1
Bhandari[23]	35.42	60.91
Mohan[24]	40.1	93.1
Bairwa[25]	45.15	68.71

DISCUSSION

In the present study we reported outcome of 212 ICU admitted COVID-19 patients with different co-morbid conditions. The main challenge during the rapid spread of COVID-19 infection has been severe cases requiring supplemental oxygen in addition to advanced respiratory support (NIV and IMV). To meet this challenge, every hospital expanded their plans for intensive care units as per local guidelines formulated to cope up with emergency situations. Co-morbid conditions in COVID-19 have been reported to contribute to the severity with progressive respiratory failure with worse outcomes.[5,6] Different studies reported earlier shows that all ICU admitted COVID-19 patients require ventilatory support.[7-12] Results of present study are contradictory showing need of NIV support in only 8.3%, 10.16%, 16.6%, 50%, 12.5%of IHD, diabetes, CKD, COPD, asthma patients respectively.

At Bhaktivedanta Hospital we decided to step up our critical care services by converting our community services unit to a COVID Unit with a full-fledged ICU unit, thereby increasing the scope of critical care services

Our second intervention was to admit moderate and severe cases of COVID 19 with co morbidities directly to the ICU in order to improve monitoring and prompt interventions (like initiating, escalating or stepping down the dose of steroids or stepping up support from non-rebreather mask to NIV or invasive ventilation) especially in co morbid conditions like CKD, IHD, diabetes and COPD. In addition, we followed a holistic approach to include Ayurvedic interventions and Homeopathy in our patients.

In our cohort of total 212 ICU patients 8.01% and 91% of moderate and severe cases respectively, mortality rate was only 4.24% of total positive patients admitted at our hospital. This is quite low as compared to other studies reported in literature with ICU mortality ranging between 15-78% (Table 2).[13-19]

Results of our study shows that more males (76.41%) are infected as compared to females which are consistent with the results of other studies reported in literature ranging between 60-93%.[20-25]

Limitations

The study was conducted only at one centre and so was lacking the various treatment approaches for COVID-19.

CONCLUSION

In this study we have described the outcome of ICU admitted COVID-19 patients with co morbid conditions and frequency of requirement of NIV support. With the treatment protocol adapted for management of covid 19 patients we noted that firstly, not all patients with co-morbid conditions progress towards poor lung function. Secondly, IHD is the worst prognostic indicator for progressing towards poor lung function as compared to diabetes, CKD and COPD. Results of our study have huge scope for emergency situation preparedness for hospital authorities and investigators to cope up with spread of COVID-19 disease.

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