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Original Research Article

Management of COVID-19 patients, with emphasis on limited resource setting: is less optimum?

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ABSTRACT

Background: There is scarcity of essential medications, medical talent and health care facilities to treat covid-19, at remote places. This study explores various modalities in resource-limited settings for the management of COVID-19 patients.
Methods: We retrospectively analysed data of 266 consecutive discharged and death Covid-19 patients from 26 December 2020 to 29 May 2021. All patients were admitted and received appropriate supportive care, regular clinical and laboratory monitoring.
Results: **Of total 266 patients t**he mean age of patients was 49.19 (SD 14.1) years and 185 (69.54%) of them were males. 99 (37%) cases were moderate, 83(31%)were severe cases remaining 84 (32%) were mild cases. 16 (6.01%) patients expired and remaining 250 patients were subsequently discharged. Median duration of stay in the hospital was 9 (37) days. Of total 266 admitted patients' mortality rate was only 6.01%.
Conclusions: We emphasize that even in healthcare facilities with limited resource, poor infrastructure and lack of ICU facilities, clinical observation-based managementt can help to reduce mortality considerably. Unique features of our study include; use of progesterone as an immunomodulator, use of dual antiviral agents, use of age-related lower limit of oxygen saturation.

Keywords: COVID-19, Limited resource, Treatment, Mortality, Minimal oxygen, Progesterone immunomodulator

INTRODUCTION

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a beta genus coronavirus spread everywhere in the world since its first episode in Wuhan, Hubei Province in December 2019. As of on 2 July 2021 more than 182 million people globally have been confirmed to be infected and 3.95 million people have died of COVID-19. At present many diagnostics, antiviral drugs, and vaccines have been developed and approved by a regulatory within one year after the virus was discovered.[1]

Few patients are asymptomatic, others with symptoms are mild cases (80%), 14% develops severe illness and remaining 5% are critical cases requiring ICU admission. Mild cases have good prognosis, but severe and critical patients are difficult to treat and have a high mortality rate. So regular clinical observation is important to predict the progress and management of the disease. The management of COVID-19 patients involves implementing COVID-19 guidelines which requires a resourceful set up with availability of radiological, laboratory and other important facilities like ventilator and other oxygen support. These guidelines have been summarized in COVID-19 clinical management: living guidance.[1] Here we are discussing the management of COVID-19 patients with a special focus on resource-limited settings. Aim of our study is to investigate outcome of treatment strategy, co-morbid status, and mortality rate of COVID-19 infection at dedicated COVID health centre (DCHC), Bokadvira, Uran. In this retrospective study we are presenting results of treatment strategy adopted by our dedicated COVID-19 hospital which is associated with significant reduction in mortality.

METHODS

In this single centre retrospective study, data of 266 consecutive discharged and death patients diagnosed with COVID-19 disease was included and analyzed. These patients were admitted at dedicated COVID health centre, Bokadvira, Uran from 26 December 2020 to 29 May 2021 and included all genders above age of 16. All these patients were confirmed COVID-19 positive by rRT-PCR (nucleic acid amplification) test. All patients below 16 years and RTPCR negative were excluded from the study. All patients received appropriate supportive care and regular clinical and laboratory monitoring. Patients' information inclusive of demographics (age, sex, nationality), saturation on air and saturation after 6 minutes' walk, data on clinical management, treatment regimens, admission and discharge date, patient mortality, nCoronavirus rRT-PCR and other laboratory results were extracted from medical records. The data parameters inclusive of age, gender, date of admission and discharge, COVID-19 rRT PCR test results, clinical features (presenting saturation on air and saturation after 6 min of walk), comorbidities (diabetes hypertension, ischaemic heart disease, asthma, renal disease, chronic obstructive pulmonary disease), bronchiectasis, blood routine parameter and outcome details (discharge/death) were collected for discharged/death patients.

Treatment protocol

Treatment protocol administered to patients is depicted in (Table 1). The protocol was followed in all patients from presenting saturation at 35-40% to 97-98%. Tablet favipiravir was given for 7 days for patients whose oxygen was off by fifth or sixth day and for 13 days for those patients whose oxygen was not off by seventh day. Besides the treatment protocol mentioned in (Table 1), patients were monitored for heart rate, respiratory rate, Spo2.

Table 1: Treatment given to patients.

Treatment	Dose	Frequency	Comments
Ivermectin	12 mg	STAT	-
Ivermectin	12 mg	OD 12 mg daily for 5 days	-
Doxycycline	200 mg	STAT	-
Doxycycline	100 mg	BD for 5 days	-
Tab. Favipiravir	1800 mg	BD on day 1	-
Tab. Favipiravir	800 mg	BD for 7 days or 13days	Given for 7days for patients whose oxygen support was off by fifth or sixth day and for 13days for patients whose oxygen support was not off by seventh day
Inj. Vitamin D3	6,00,000 IM	STAT	-
T. Zinc (elemental zinc)	50 mg	BD daily till discharge	-
T. Aspirin	75 mg	OD	From admission till 30 days post discharge.-
Inj. Dexamethasone	6 mg	OD for 10 days	Given to all patients showing drop in saturation
Inj. Ceftriaxone	1 g	BD for 7days	Given to patients with drop in saturation and having fever or WBC<4000 or >12000
T. Progesterone	200 mg	BD for 7 days	Given to all male and postmenopausal women

All patients after 7-10 days of illness and on 5 liters o2 or less were trained by a cardiorespiratory physiotherapist in breathing exercises which were mandatory to be performed 4 times per day. The exercises incorporated

were diaphragmatic breathing, thoracic expansion exercises and segmental expansion exercises.

Table 2: Age specific acceptable saturation.

Age (years)	Pao2 (mmHg)	Spo2/Sao2 (%)
10	95-103	97
20	91-99	97
30	87-95	95-97
40	83-91	94-97
	80	94
50	78-86	93-95
60	74-82	93-94
	70	92
70	70-78	92-93
80	66-74	91-93
90	62-70	90-92
	60	90
	50*	85
	45	80
	40	75

Clinical application: titrate exercise to maintain at least, 85% (Po2=50) in patients with good heart, 88% (Po2=55) in patients with bad heart.[33]

Breath holding and use of incentive spirometer were avoided. Along with the breathing exercises, all patients were asked to undertake walking as a form of aerobic activity starting with as less as 2-5 mins/session. The entire exercise schedule including breathing and walking were repeated at least 3-5 times/day. Apart from the exercise schedule, emphasis was also put on therapeutic positioning. Patients were clinically observed to explore most appropriate position in order to ensure optimal saturation. Various position viz sitting, standing, left lateral, right lateral, semi-prone, prone, head low, supine were assessed. Best and worst positions were documented. Best position was used whenever patient showed worsening of saturation. Age specific lower limit of acceptable oxygen saturation was followed as per respiratory care guide for clinical practice (Table 2).[2]

RESULTS

Data of total of 266 patients of laboratory confirmed COVID-19 test by RT-PCR at COVID care centre, Bokadvira, Uranwas analyzed. The mean age of patients was 49.19 (SD 14.1) years and 185 (69.54%) of them were males. A summary of demographic characteristics of the study participants are represented in (Table 3). Clinical severity of patients was assessed on the basis of SPO2 recorded at the time of admission. Patients were categorized as mild, moderate, severe as per clinical guidance for management of adult COVID-19.[3] 99 (37%) cases were moderate, 83 (31%) were severe and remaining 84 (32%) were mild cases (Figure 1). Of all patients 16 (6.01%) patients expired and remaining 250 patients have subsequently recovered and were discharged. Median duration of stay in the hospital was 9 (37) days. Patients had 1 or more co-morbidities. hypertension 33 (13.2 %), diabetes mellitus 26 (9.8%) and asthma 11 (4%) were the most common co-existing illnesses (Figure 2).

Table 3: Demographic characteristics of the study participants (n=266).

Variables	N (%)
Age (years)-mean (SD)	49.19 (14.1)
Gender (male)	185 (69.54)
Hypertension	33 (13.2)
Diabetes mellitus	26 (9.8)
Asthma	11(4)
Mild cases as per SPO2 level at admission	84 (31.57)
Moderate cases as per SPO2 level at admission	99 (37.21)
Severe cases as per SPO2 level at admission	83 (31.2)
Deaths	16 (6.01.)

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

Reference number	Mean age (years)	Males (%)
4	55.59	67.9
5	39.8 9	78.3
6	50.7	68.1
7	35.42	60.91
8	40.1	93.1
9	45.15	68.71

DISCUSSION

We reported outcome of the 266 patients admitted to dedicate COVID-care centre in Bokadvira, Uran. Uran is a coastal town in Raigad district of Maharashtra and surrounded by sea on three sides. It is situated at the tip of peninsula. It main occupation is fishing and farming. It caters to population of 2 lakh people. There are 5 towns and 59 villages in Uran taluka. Panvel is nearest place for COVID care. This is 50 minutes away from Uran and is smallest municipal area catering to most of the Raigad district. Uran itself has no COVID centre, hence patients coming from any of the 59 villages or towns have to travel from their remote villages to Uran and from there further to Panvel. Most of the patients either succumbed to death in travel or deteriorated. As Uran does not have

any facility for isolation or primary treatment, a dedicated COVID care centre at Bokadvira was started.

Table 5: Summary of outcomes (hospital mortality) of various COVID-19 studies reported.

Reference number	Number of patient admitted in hospital	Hospital mortality (%)
23	86,356	31.2
24	429	26
25	-	10-15
26	-	26
27	-	26
28	-	30.1
29	-	25
30	-	25.1
31	565	30.4
32	463	40.4
Current study	266	6.01

Its main purpose is treatment and stabilizing patients with isolation facility. In the present study mean age of the patient was found to be 49.19 years. Our data shows that more males (69.5%) are infected as compared to females which ranges between cases reported in literature (60-93%) (Table 4).[4-9] Remote location of Uran with limited resource available prompted us for designing a treatment protocol which was easy to follow, required limited resources and dependent on clinical observation with patient centric management over investigation centric management. Back up like ICU (intensive care unit), HDU (high dependency unit), BiPAP, high flow nasal oxygen (HFNO), high flow meters above 15 l/min, syringe pumps, ventilators, cardiac monitors, access to central line were not available. Oxygen was given to patients using nasal prongs, simple face mask (low-flow oxygen equipment) or high concentration oxygen mask. Oxygen toxicity due to hyperoxia leads to harmful consequences like interstitial fibrosis, atelectasis and tracheobronchitis with increased mortality.[10] We minimized supplemental oxygen requirement by accepting age related lower limit of oxygen saturation from 84%-94% which helped us to avoid hyperoxia related lung damage.[2]

Oxygen was supplied to patients with maximum rate upto 15 litres per minute. Patient specific appropriate positioning was used to improve ventilation of patients whenever SPO2 dropped below 94 percent. Study conducted in Italy concluded that highest success rate is observed in prone positioning when compared with lateral position and further stated that improvement in saturation was changed when patients again went back to semi-seated position.[11] However, we assessed various position viz sitting, standing, left lateral, right lateral, semi-prone, prone, head low, supine and found that for different patients' different positions were appropriate for optimal saturation. Best position was used whenever patients showed drop of saturation. Studies also states that identifying optimal positions for COVID-19 patients is associated with significant benefit in oxygenation.[12] In similar lines we also observed that particular position yields more benefit in terms of oxygen saturation over other position. On further evaluation we could hypothesize that which part of lung is affected more. Unavailability of X-ray chest and HRCT was overcome by clinical observation of the patient in different position. Treatment options such as remdesivir, tocilizumab, baricitinib, LMHW, methylene blue were not available. All patents were given ivermectin and favipiravir in combination to reduce viral load. To our best knowledge as per literature review this combination has not been given for treatment of COVID-19 treatment till now. Favipiravir is an antiviral which prevents viral replication.[13] Ivermectin is antiparasitic agent which has been reported to eliminate viral RNA out of the cell.[14] Taking clues from literature progesterone is shown to have immunomodulator and anti-inflammatory properties.[15,16] Its level is low in males and post-menopausal women. Hence it was given to all men and post-menopausal women.[17,18] Another important component of the protocol was physiotherapy. All patients were trained in breathing exercise.

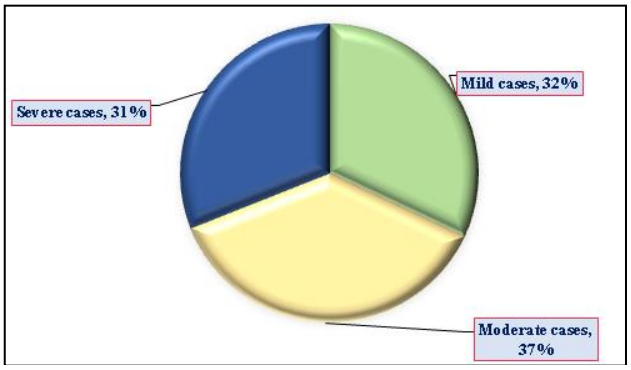

Figure 1: Clinical severity of patients on the basis of SPO2 level at the time of admission.

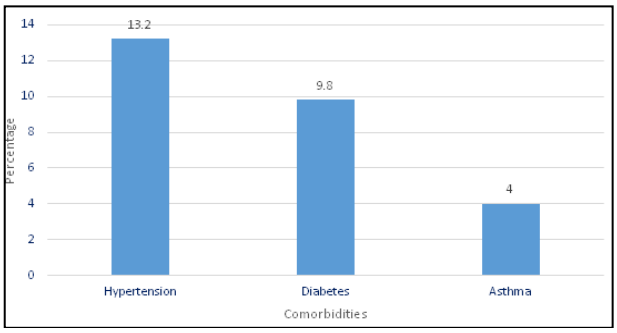

Figure 2: Comorbidities in the admitted patients.

Respiratory rehabilitation post COVID-19 has contributed tremendously in the restoration of the lung function.[19] It has been recommended that in acute stage wherein the dependency on external oxygen supply is more or when the saturation drops below 90%,

incorporating breathing exercises or incentive spirometer might have detrimental effect on the patients as it may lead to over exertion to the body.[20] Thus, we started respiratory rehabilitation in patients after they were on less than 5 litres oxygen supply. The cardio respiratory physiotherapy regime was started in the post-acute phase of COVID-19 to avoid increase the chances of lung injury.[19] Due to remote location, a cardio respiratory physiotherapist was incorporated in the team via tele-consultation. Acute sequelae of COVID-19 cause early fatigue and less recruitment of diaphragm and hence patients were asked to focus on diaphragm activation.[21] Thoracic expansion and segmental expansion exercises along with pursed lip breathing helps to achieve targeted lung expansion of the lung segments. Pursed lip breathing along with generation of positive end expiratory pressure (PEEP) also helps to reduce dyspnea. To maintain their cardiopulmonary endurance, they were recommended to walk 3-5 minutes after every breathing exercise session and to continue after discharge and gradually increase the duration.[22] Laboratory tests which help to identify risk of disease with greater severity, and other complication with worst prognosis (C-reactive protein (CRP), D-dimer, clotting tests, ferritin, Interleukin-6 (IL6), arterial blood gas analysis and procalcitonin) and primary imaging tests chest X-ray and computed tomography (CT) for diagnosis of SARS-CoV-2 pneumonia and detection of complications were not available. Only routine blood investigations were available at our set up. This study highlights the treatment of COVID-19 patients in limited resource setting with a unique management strategy. In our cohort with 37% and 31% of moderate and severe cases respectively, mortality rate was only 6.01% of total positive patients admitted at our hospital. This is quite low as compared to other studies reported in literature with mortality rate ranging between 10-40% (Table 5).[23-32]

Limitations

As the study is retrospective in nature authors were dependent on availability of existing data.

CONCLUSION

In this study we have described outcome of treatment strategy adopted by our hospital in availability of limited resources. Unique features of our study include use of progesterone as an immunomodulator, dual antiviral agents and age-related lower limit of oxygen saturation. We emphasize that even in healthcare facilities with limited resource and poor infrastructure and lack of ICU facilities, clinical observation-based management can help to reduce mortality considerably.

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