



A Step Today Can be a Giant Leap Tomorrow - COVID-19 Management Lesson From the Developing World

Sudhir Bhandari,¹ Mohnish Grover,¹ Shruti Bhargava¹

Abstract

Background: Although India is relatively better resourced as compared with other low middle income countries in several aspects, it shares several challenges and vulnerabilities like high population, resource constraints (limited number of hospital beds, skilled healthcare personnel, intensive care units) and socioeconomic milieu, and it is important that these resources are spent wisely to maximise lives saved and minimise disruption to health services for all COVID-19 patients. Hence for dealing with this pandemic quickly and efficiently, a centre which could be set up urgently at a low cost for efficient oxygen triage was needed and thus cater to the sudden enormous load of patients who were unnecessarily occupying oxygen beds in hospitals.

Methods: This study describes the setting up, management and outcome of seven hundred bedded COVID-19 care centre at Jaipur, India, within three days, at low cost, by multidisciplinary efforts of the Government of Rajasthan for efficient triage of patients and to share the excessive patient load of the biggest Government medical college of the state.

Results: More than 700 patients were successfully managed at the centre within a period of one month with a favourable outcome. The perceptions of patients assessed via questionnaire also establish the success of this endeavour in sharing the load of hospitals at the peak of the pandemic.

Conclusion: This paper describes the positive impact of setting up this COVID-19 care centre, and experience presented in this paper can be utilised as a novel and future oriented solution to address effectively the unprecedented pressure on the healthcare systems, created by the COVID-19 pandemic.

Key words: COVID-19; Resource limited setting; Triage; COVID-19 care centre.

(1) SMS Medical College, Jaipur, Rajasthan, India.

Correspondence:
SHRUTI BHARGAVA
E: shrutibhargavapath@gmail.com

ARTICLE INFO

Received: 26 June 2021
Revision received: 8 September 2021
Accepted: 8 September 2021

Introduction

The World Health Organization (WHO) declared the coronavirus disease (COVID-19) as a pandemic on 11 March 2020.¹ What arose from Wuhan City in China, is probably the worst pandemic in recent history and has led to panic and global public health emergency.²

After the reporting of the first case of COVID-19 in

India on 30 January 2020, cases started increasing in early March and the first wave peaked around September 2020.^{3,4} However, subsequently the COVID-19 case numbers started to drop after a high of around 100,000 daily infections and the country was fortunate in successfully crushing the first wave of COVID-19 due to strict contact tracing, institutionalised quarantine and

provision of care for all PCR-positive individuals. The current existing healthcare facilities in Jaipur include a Government sector medical college with 1,200 beds reserved for COVID-19 patients and the Government is responsible for the treatment of these patients.

The cases began to rise again in March 2021 and currently India is experiencing the second wave of COVID-19, which has hit India more like a tsunami, with a deadly toll. The available healthcare resources got overwhelmed due to the sudden and enormous rise of cases in April in the state. There arose a shortage of hospital beds and oxygen support as more and more patients with varying severity of the disease started filling up the already overwhelmed infrastructure of the health care services. Unnecessary admissions due to panic or some high-profile patients or mild lung involvement caught on a CT scan, some abnormal lab tests or the fear that beds would not be available later became rampant also. This scenario where there was immense shortage of oxygen was extremely heartburning as people started dying in necessity of oxygen cylinders.

As there was extreme shortage of beds in the hospitals for those actually needing them, a need was felt to urgently develop a low cost COVID-19 care centre, which could act as a connecting link between home and hospital and could cater the less serious patients thereby contributing to an efficient triage system wherein those actually needing ICU beds could get the same.

This paper presents authors' experience of developing and managing such a COVID-care centre in a resource limited setting, within a short span of just three days and suggests strategies which would aid in tiding over any future waves of this pandemic effectively in a resource limited setting.

Methods

This descriptive study was conducted for duration of one month from 28 April 2021 to 27 May 2021, during which 1846 COVID-19 patients reported in the outpatient department at the COVID-19 centre, and 740 of these were admitted for management in the inpatient department.

Keeping in view the increasing number of COVID-19 patients and the overwhelmed capacity of Government run COVID-19 hospitals, a seven hundred bedded facility for care of mild COVID-19 cases was set up in Jaipur within three days. The aim of opening this centre was to create a link between home and hospital and to decrease the panic driven unnecessary load on the Government hospitals. This facility was developed and managed as a multidisciplinary effort which involved various segments of the Government, namely the Jaipur development authority, municipal corporation, Police and the Department of Medicine and Health.

The temporarily created COVID-19 care facility was developed in an open area, which was composed of a roofed but open from sides premises in a one million square feet property owned by Radha Swami Satsang charitable trust and accommodated 768 beds. The heights of tents were approximately 6 to 9 feet so that there was enough open space above the tent wall and below the dome roof, which made the centre well ventilated. The entire tented area was divided into blocks. Each block had 4 wards of 16 beds each. One nursing station was set up for each block with round the clock trained and dedicated doctors, nursing and support staff working there. The beds were equipped with oxygen concentrators and cylinders. However, no ICU or ventilators were set up. An outpatient department and pharmacy were set up in another tent, 500 metres away from the isolation ward area. Arrangement was also made for attendants stay for people coming from remote areas.

Local guidelines were developed for different aspects of COVID-19 management keeping in view the latest available evidence, national and international recommendations. These included guidelines for patient management workflow, PPEs, staff roster, sampling, admission criteria, isolation, treatment of cases, bed allocation and management, disinfection, transport of referred patients and dead body management. Policy for bed allocation and management of patients was ensured.

Standard disinfection guidelines were followed and standard operating procedures (SOPs) for isolation, personal protection and patient information brochures were created and distributed.

All patients reporting to the outpatient depart-

ment at the main entrance were screened. Hand sanitisers were provided at main gate and at entrances of all blocks. There was open and rapid communication between the administration and the clinical staff.

Strict criteria were laid down for admission in the COVID-19 care centre. This included a symptomatic RTPCR positive / negative COVID-19 patient with high resolution computed tomography (HRCT) score of less than 13 and peripheral oxygen saturation (SpO₂) ranging between 85 and 92 % on room air. This was done to ensure that seriously ill patients, who needed ventilator support were excluded, since this centre was acting as a link between home and hospital but did not have facility to manage serious patients.

The patients reporting to outpatient department, who could not maintain their oxygen saturation at room temperature and fit into the above admission criteria, were admitted. The patients who were admitted from the outpatient department were received by trained staff working in full personal protective equipment (PPE). They were examined by the doctor on duty and put on the type of oxygen support needed.

About 150 health care workers were catering to these patients round the clock. An inhouse laboratory was set up in the centre premises with facilities for routine investigations like complete blood count, blood sugar, renal function tests, liver function tests and special investigations like D-dimer assay, serum ferritin and C-reactive protein, which are required for proper management of the COVID-19 cases. Facility for collection of RTPCR sample of attendants and staff was also given.

A two-way referral system was developed where this centre was linked to the biggest Government run COVID-19 dedicated hospital in the city. Bidirectional transfer of patients, as per requirement was ensured between the COVID-19 care centre and the tertiary care COVID-19 dedicated hospital, so that the hospital burden of less serious patients could be shared by the care centre while the patients who developed a need of higher centre treatment during their stay could easily get it. Efficient and timely transport of the patients was ensured.

The charitable organisation employees served as helpers for the admitted patients and round the clock food and water was provided by the organisation.

For spiritual and mental wellbeing of the patients, light music in the form of bhajans was played in the inpatient area, and the ambient temperature was kept pleasant with the use of sprinkler system on the dome.

Majority of the patients managed in this centre were earlier previously managed with oxygen lines or cylinders in various hospitals. However, in this care centre, they were being managed by 5 and 10 L oxygen concentrators. Wise use of oxygen cylinders was done for patients who could not maintain their saturation levels on concentrators and actually needed them, to combat the current oxygen shortage.

On discharge, the perception of patients was assessed using a pre-validated questionnaire and scoring was done on a five-point Likert scale. The questionnaire comprised of questions related to the facilities and treatment provided at the centre and the overall satisfaction of the patients, and it was pre-validated by getting it filled and checked by other doctors of the team. All participants gave written consent for participation in the study and this was cleared by institutional Ethics Committee.

Results

Out of the 740 admitted patients, there were 502 (67.8 %) men and 238 (32.2 %) women, of age group ranging from 21 years to 84 years (Table 1), average age of the patients was 50.1 years. The biggest number of patients were from the age group of 41 – 60 years (n = 338; 45.7 %).

Among these patients, the lowest HRCT score encountered was 4 and the highest HRCT score was 13 (out of 25).

Out of these 740 admitted patients, majority (73.9 %) were managed on 5 to 10 L oxygen concentrators while only 9.3 % required oxygen cylinders

Table 1: Age- and sex-wise distribution of the admitted patients (n = 740)

Age group	No of male	No of female	Total	Percentage of all patients
21-40 years	144	72	216	29.2
41-60 years	230	108	338	45.7
61-80 years	121	53	174	23.5
> 80 years	7	5	12	1.6
Total patients	502	238	740	100

Table 2: Mode of oxygen support in admitted patients (n = 740)

Type of oxygen support	No of patients	Percentage
Oxygen concentrators	547	73.9
Oxygen cylinders	69	9.3
None	124	16.8
Total	740	100.0

Table 3: Outcome of admitted patients (n = 740)

Outcome	No of patients	Percentage
Discharged	578	78.1
Referred to higher centre	135	18.3
Death	27	3.6
Total	740	100.0

Table 4: Feedback of discharged patients (n = 578)

S. no	Parameter	Score 1: strongly disagree (%)	Score 2: disagree (%)	Score 3: neutral (%)	Score 4: agree (%)	Score 5: strongly agree (%)
1	I am totally satisfied by the ambience of the centre	2 (0.3 %)	3 (0.5 %)	27 (4.7 %)	319 (55.2 %)	227 (39.3 %)
2	I am totally satisfied by the treatment given at the centre	2 (0.3 %)	4 (0.7 %)	24 (4.2 %)	315 (54.5 %)	233 (40.3 %)
3	I am totally satisfied by the behaviour of the staff at the centre	2 (0.3 %)	4 (0.7 %)	26 (4.5 %)	345 (59.7 %)	201 (34.8 %)
4	I am totally satisfied by facilities (promised on arrival) provided, at the centre	1 (0.2 %)	3 (0.5 %)	29 (5.0 %)	244 (42.2 %)	301 (52.1 %)
5	Overall, I am totally satisfied during my stay at the centre	2 (0.3 %)	3 (0.5 %)	26 (4.5 %)	239 (41.4 %)	308 (53.3 %)

while 16.8 % did not require oxygen support and could maintain their oxygen saturation on room air (Table 2). Table 3 depicts the final outcome of patients during the one month of study. Out of 740 patients admitted during this period, 578 (78.1 %) were discharged after recovery while 135 (18.3 %) had to be referred to higher centre as they could not maintain their oxygen levels or had other comorbid conditions like uncontrolled diabetes which could not be managed at this COVID-19 care centre and required hospital

setup. Unfortunately, there were 27 casualties during this period.

The feedback gathered from the patients who were discharged after recovery is shown in Table 4. Majority of the patients (94.7 %) were satisfied by the ambience of the centre, facilities provided, the treatment given, behaviour of the staff of the COVID-19 care centre and gave a positive feedback.

Discussion

The COVID-19 pandemic, caused by SARS-CoV2, is of unprecedented global public health concern.⁵ India is currently passing through a critical phase of the second wave of COVID-19 and ranks second globally in total infections and fourth in total mortality.⁶ With a population of ~1.4 billion, India's response to COVID-19 directly affects 17.7 % and 21.8 % of the global and low middle income countries (LMIC) populations, respectively.⁷ As per the constitution of India, as a semi federal democratic governance system, the responsibility of 'health' and prevention of disease spread is concurrently vested with the Government of India (GoI) and the states.⁸

This COVID-19 pandemic has stressed healthcare systems across the globe, irrespective of the development status of the countries. Even the high-income countries with a well-developed healthcare system were overwhelmed with this pandemic

within the first few weeks. However, the developing low- and middle-income countries were awfully hit, due to relatively scarce health care resources.⁹ There is a limited number of hospital beds and skilled healthcare personnel per se in these countries, although this may vary from country to country.¹⁰⁻¹²

Also, there is very limited number of intensive care units (ICUs) with access to mechanical ventilation in LMICs as compared to the developed world, and experts had warned of this inadequacy in the wake of a tsunami of COVID-19 cases requiring hospitalisation.¹³ This fear proved true during the second wave and within days the ICU ventilators were fully occupied, leading to an acute shortage of medical oxygen in major hospitals in Jaipur, as well as in other places across the country.¹⁴

However, not all the patients that filled up the hos-

pitals really needed ICU beds, interventions or mechanical ventilation. This clinical spectrum has been proven by other studies worldwide.^{15,16} This scenario led to exhaustion of the already overwhelmed infrastructure similar to the global trends.¹⁷ A number of oxygen supply systems have been described but, there is, per se, a lack of needed oxygen supply in resource limited areas and hence the importance of proper oxygen supplies management.¹⁸⁻²¹

At the present centre, patients were initially put on 5 to 10 L oxygen concentrators at the time of admission and maintained it unless there arose a need to shift to oxygen cylinders. This endeavour helped in reducing the wastage of oxygen and an optimal triage for oxygen when the supply was limited.

The urgent need to clearly understand the likely burden of infection requiring hospital care and to develop locally appropriate triage and clinical care centre to overcome this problem led to the successful establishment and running of the COVID-19 care centre by a multidisciplinary Government team. This has been supported by WHO, who have concluded that opening field hospitals or care centres in large public spaces (eg, stadiums) allows for triaging and managing stable patients and decongest other hospitals.²²

Local guidelines and standard operating procedures were developed for different aspects of COVID-19 management keeping in view the latest available evidence and international and national recommendations.²³⁻²⁵ No compromise was done for safety of the staff working there and measures for infection prevention and reduction of exposure risk to staff were strictly integrated, as advocated by other studies.^{26,27}

Stringent guidelines were formed and followed for rapid referral of patients to higher centre if they developed symptoms corresponding to severe disease or complications during treatment. The patients who could not be managed at this COVID-19 care centre were referred as and when required to the largest Government sector hospital. This was done in accordance to the guidelines issued by the WHO.²³

Research has shown that the spiritual care provider plays an important role when families are faced with challenging health risks and the prospect of palliative care.²⁸ The psychological wellbeing of those admitted was also well taken care of at this centre with continuous bhajans and availability

of books. This made the patients feel relaxed and decreased their anxiety levels. Moreover, the open tents were a better option to do away with the claustrophobic environment of the hospital, which may have an adverse effect on the mental health of already stress out patient.

The feedback gathered from the patients who got discharged after recovery, tells us that most of the patients were fairly satisfied by the ambience and facilities of the COVID-19 care centre apart from the treatment rendered. To the best of our knowledge, no previous literature is available regarding the patients' perception after establishment of such a COVID-19 centre.

Conclusion

The coronavirus disease 2019 (COVID-19) pandemic is putting health-care systems under unprecedented stress to accommodate unexpected numbers of patients forcing a quick reorganisation. Developing and successfully managing a Government sector COVID-19 care centre in a resource limited country was a big challenge. It involved coordination and cooperation between departments of the state Government along with creating guidelines and out of the box solutions on a day-to-day basis pertaining to the problems encountered.

This low-cost endeavour can act as a role model for countries who are relatively poor in resources and where it is nearly impossible to scale up the development of health infrastructure. And also, can act as a strong pillar in the preparation of the impending third wave.

Such centres may act as saviours in third wave for the children, who would need such open centres for recovery where they can get the treatment without feeling stressed out or claustrophobic in a hospital setting. These can also alleviate the panic of the parents who can stay in a socially pleasant atmosphere with their diseased child. Therefore, present experience may be utilised by the decision makers world over who must prioritise resourcing and capacity development for such care and simple oxygen therapy that most hospitalised COVID-19 patients will need – not the high-end clinical care that may well be impossible to scale up in time in countries with limited resources.

Acknowledgements

None.

Conflict of interest

None.

References

- World Health Organization (WHO). WHO director General's opening remarks at the media briefing on COVID 19 [Internet]. [Cited 28 Apr 2020]. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-openingremarks-at-the-media-briefing-on-covid-19---11-march-2020>.
- World Health Organization (WHO). Coronavirus [Internet]. [Cited 28 Apr 2020]. Available from: <https://www.who.int/healthtopics/coronavirus>.
- GRID COVID-19 Study Group. Combating the COVID-19 pandemic in a resource-constrained setting: insights from initial response in India. *BMJ Glob Health* 2020 Nov;5(11):e003416. doi: 10.1136/bmjgh-2020-003416.
- Ranjan R, Sharma A, Verma MK. Characterization of the second wave of Covid 19 in India. *medRxiv*;2021. doi:10.1101/2021.04.17.21255665.
- Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun* 2020 May;109:102433. doi: 10.1016/j.jaut.2020.102433.
- World Health Organization (WHO), 2021. India Situation. [Internet]. [Cited 28 Apr 2020]. <https://covid19.who.int/region/searo/country/in>.
- The World Bank. Low & middle income data. [Internet]. [Cited 28 Apr 2020]. Available from: <https://data.worldbank.org/income-level/low-and-middle-income>.
- Ministry of Law and Justice, Government of India. The Constitution of India [As on 1st April, 2019]. New Delhi, India:Government of India Ministry of Law and Justice;2019:1-281.
- Hopman J, Allegranzi B, Mehtar S. Managing COVID-19 in low- and middle-income countries. *JAMA* 2020;323:1549-50.
- Diaz JV, Riviello ED, Papali A, Adhikari NKJ, Ferreira JC. Global critical care: moving forward in resource-limited settings. *Ann Glob Health* 2019 Jan 22;85(1):3. doi: 10.5334/aogh.2413.
- Kamath S, Kamath R, Salins P. COVID-19 pandemic in India: challenges and silver linings. *Postgrad Med J* 2020 Jul;96(1137):422-3.
- World bank. Physicians (per 1,000 people) (n.d.). [Internet]. [Cited 28 Apr 2020]. Available from: <https://data.worldbank.org/indicator/SH.MED.PHYS.ZS>.
- Dondorp AM, Papali AC, Schultz MJ. Recommendations for the management of COVID-19 in low- and middle-income countries. *Am J Trop Med Hyg* 2021 Jan 6;104(3 Suppl):1-2.
- Mallapaty S. India's massive COVID surge puzzles scientists. *Nature* 2021 Apr;592(7856):667-8.
- Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 2020 Mar 28;395(10229):1054-62.
- Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. *JAMA* 2020 Apr 7;323(13):1239-42.
- Dondorp AM, Hayat M, Aryal D, Beane A, Schultz MJ. Respiratory support in Covid-19 Patients, with a focus on resource limited settings. *Am J Trop Med Hyg* 2020;102(6):1191-7.
- Meara JG, Leather AJ, Hagander L, Alkire BC, Alonso N, Ameh EA, et al. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Int J Obstet Anesth* 2016 Feb;25:75-8.
- Duke T, Peel D, Wandt F, Subhi R, Sa'avu Martin, Matai S. Oxygen supplies for hospitals in Papua New Guinea: a comparison of the feasibility and cost-effectiveness of methods for different settings. *P N G Med J* 2010 Sep-Dec;53(3-4):126-38.
- Bradley BD, Light JD, Ebonyi AO, N'jai PC, Ideh RC, Ebruke BE, et al. Implementation and 8-year follow-up of an uninterrupted oxygen supply system in a hospital in The Gambia. *Int J Tuberc Lung Dis* 2016 Aug;20(8):1130-4.
- Siow WT, Liew MF, Shrestha BR, Muchtar F, See KC. Managing COVID-19 in resource-limited settings: critical care considerations. *Crit Care* 2020 Apr 22;24(1):167. doi: 10.1186/s13054-020-02890-x.
- World Health Organization. Minimum requirements for infection prevention and control. Geneva: World Health Organization; 2019. Licence: CC BY-NC-SA 3.0 IGO, p. 2-27.
- Ministry of Health and Family Welfare, Government of India. COVID-19 India, 2020 [Internet]. [Cited 28 Apr 2020]. Available from: <https://www.mohfw.gov.in/>.
- All India Institute of Medical Sciences. AIIMS COVID portal, 2020 [Internet]. [Cited 30 Mar 2020]. Available from: <https://covid.aiims.edu>.
- Center for Disease Control and Prevention (CDC). Operational considerations for infection prevention and control in outpatient facilities: non-U.S. healthcare settings [Internet]. [Cited 30 Mar 2020]. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/non-us-settings/index.html>.
- Schwartz J, King CC, Yen MY. Protecting healthcare workers during the coronavirus disease 2019 (COVID-19) outbreak: lessons from Taiwan's severe acute respiratory syndrome response. *Clin Infect Dis* 2020 Jul 28;71(15):858-60.
- World Health Organization. Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19). WHO reference number: WHO/2019-nCoV/HCF_operations/2020 [Internet]. [Cited 30 Mar 2020]. Available from: <https://apps.who.int/iris/handle/10665/331497>.
- Roman NV, Mthembu TG, Hoosen M. Spiritual care - 'A deeper immunity' - A response to Covid-19 pandemic. *Afr J Prim Health Care Fam Med* 2020 Jun 15;12(1):e1-e3.