Original paper • DOI: 10.2478/pneum-2022-0005 • 70 • 2021 • 18-25

sciendo

Pneumologia

COVID-19 disease in the pulmonology unit of a dedicated COVID-19 hospital – our experience

Ketaki Utpat[1], Vinod Pal[1], Vitthal Chintalwar[1], Unnati Desai[1,*], Abhishek Gupta[1], Sandeep Sharma[1], Parikshit Thakare[1], Mala Kaneria[2], Sarita Fernandes[3], Jyotsna Joshi[1], Ramesh Bharmal[4]

[1]*Department of Pulmonary Medicine, TNMC and BYL Nair Hospital, Mumbai, India*
[2]*Department of Medicine, TNMC and BYL Nair Hospital, Mumbai, India*
[3]*Department of Anesthesiology, TNMC and BYL Nair Hospital, Mumbai, India*
[4]*Dean TNMC and BYL Nair Hospital, Mumbai, India*

Abstract

English:

Background: *The Coronavirus disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) has led to a global health care crisis. We report profiles of cases admitted to our hospital.*
Methods: *We conducted this study at the pulmonology unit of a Dedicated COVID Hospital (DCH) of Western India. This is a prospective observational study which analysed the demographical data, clinical parameters, comorbidities, complications and laboratory and outcome parameters.*
Results: *Our study included 101 patients. The mean age was 43 years; 64 (63.3%) were men and 37 (36.7%) women. Out of 101, 6 (6%) had mild, 30 (30%) had moderate and 65 (64%) had severe COVID-19 disease. Severity increased with age and comorbidities. Ninety-four (94%) had pneumonia. Of these 94, 65 (69%) patients had acute respiratory distress syndrome (ARDS). Twenty-one (21%) were mild, 20 (31%) moderate and 24 (37%) severe ARDS. ARDS severity increased with age and in men. Thirty-six (36%) required oxygenation only and 29 (29%) required additional ventilatory management – mostly non-invasive ventilation (NIV). The laboratory values analysis revealed elevation of D-dimers level in 66 (65.3%) and IL6 in 68 (67.3%). Diabetes mellitus (DM) and hypertension (HT) were the common comorbidities. Totally three (2.97%) patients died due to COVID-19 infection. Mortality was associated with HT and myocarditis. Mean duration of hospital stay was 15 days, and it increased with increasing severity of disease and ARDS.*
Conclusion: *COVID-19 is common in the adult with male preponderance. The majority recovered with a good outcome. Comorbidities affected outcome adversely.*

Keywords

COVID-19 • comorbidities • outcome

Boala COVID-19 in sectia de pneumologie a unui spital dedicat COVID-19 – experienta noastra

Rezumat

Romanian:

Cadru general: *Pandemia COVID-19 produsa de virusul SARS-cov-2 a condus la o criza globala a sistemelor de sanatate. Articolul raporteaza profilul cazurilor internate in spitalul nostru.*
Metode: *Studiul de fata s-a realizat in sectia de pneumologie a unui spital dedicat ingrijirii pacientilor cu COVID-19 din Vestul Indiei. Este un studiu prospectiv observational care a analizat datele demografice, parametrii clinici, comorbiditatile, complicatiile, analizele de laborator si modul de finalizare al cazurilor internate.*
Rezultate: *Studiul a inclus 101 pacienti. Varsta medie a populatiei studiate a fost 43 ani: 64 (63.3%) barbati, 37 (36.7%) femei. Dintre cei 101, 6 (6%) au avut forma usoara de boala, 30 (30%) forma moderata, iar 65 (64%) forma severa de COVID-19. Severitatea a fost in crestere odata cu varsta si prezenta comorbiditatilor. Nouazecisipatru (94%) dintre cazuri au avut pneumonie. Dintre acesti 94 pacienti, 65 (69%) au dezvoltat sindrom de detresa respiratorie acuta (ARDS). Douazecisiunu (21%) dintre acestea au fost forme usoare, 20 (31%) moderate si 24 (37%) forme severe de ARDS. Severitatea ARDS a crescut cu varsta si la sexul masculin. Treizecisisase de cazuri (36%) au necesitat doar oxigenoterapie si 29 (29%) au avut nevoie de suport ventilator, cel mai frecvent ventilatie non-invaziva (NIV). Analizele de laborator au aratat valori crescute ale D-dimerilor la 66 pacienti*

Corresponding author: Dr. Unnati Desai
E-mail: unnati_desai82@yahoo.co.in

Open Access. © 2021 Utpat et al., published by Sciendo
This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 License.

(65.3%) si a IL6 la 68 pacienti (67.3%). Valoarea acestora s-a corelat semnificativ cu severitatea ARDS. Diabetul zaharat si hipertensiunea arteriala au fost comorbiditatile comune. Trei pacienti (2.97%) au murit datorita infectiei COVID-19. Mortalitatea a fost asociata cu hipertensiunea si miocardita. Durata medie de spitalizare a fost de 15 zile, aceasta crescand direct proportional cu severitatea bolii si cu prezenta ARDS.

Concluzii: *COVID-19 este o boala frecventa la adulti, cu preponderenta la sexul masculin. Majoritatea cazurilor analizate au avut o rezolvare favorabila. Comorbiditatile au influentat negativ modul de evolutie a bolii.*

Cuvinte-cheie

COVID-19 • comorbiditati • rezultat

Introduction

Coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) has surfaced as a profoundly virulent and impactful disease of this millennium. It has affected and jeopardised the global health system. It has been proclaimed as a pandemic by the World Health Organization (WHO) (1). Its clinical manifestations consist of a varied spectrum. They include asymptomatic carriers, mild upper respiratory tract infections, pneumonias and acute respiratory distress syndrome (ARDS). It may culminate in multiorgan dysfunction syndrome (MODS) and death in a small proportion of cases (2). The disease passes through the phases of initial incubation period, stage of viremia followed by a cytokine storm in some patients and eventually a stage of fibrosis. However, there could be deviations in the timelines and the intensity of the clinical manifestations of these stages (3). The understanding of these concepts is essential for the choice of the appropriate therapy. While mild cases can be managed on a home quarantine basis and moderate ones in a ward, severe cases and patients having ARDS need intensive care management (4,5) The core indications of an ICU transfer include altered neurological status, haemodynamic instability and severe acute respiratory insufficiency, including ARDS, MODS, shock and pulmonary thromboembolism (PTE), and all of these conditions necessitate non-invasive or invasive mechanical ventilation (NIV/IMV) (6). The outcomes in these patients depend essentially on a time-management and a protocol-based approach. As this is a novel virus, there is deficient literature on the first-hand experience of outcomes and the patterns of the disease, particularly in patients requiring intensive care. A time-management approach as was followed by the pulmonology unit during non-COVID times was replicated for COVID-19. It included timely assessment, regular monitoring and triaging of all cases hospitalised with intradisciplinary discussions amongst the junior/senior resident doctors with junior/senior faculty and interdisciplinary discussions with the infectious disease specialists/internist, anaesthetist and other ancillary staff as and when needed. A unit-specific protocol-based approach was designed with the existing thoracic society guidelines and COVID-19 guidelines. The main objective of the study was to report our initial experience with the COVID-19 patients hospitalised at the pulmonary unit and the Respiratory Intensive Care Unit (RICU) of a Dedicated COVID Hospital (DCH) of Western India. We analysed their demographic profile, clinical presentation and their outcomes.

Methods

This was an independent subset analysis of a prospective observational study approved by the Institutional Ethics Committee (IEC) in 2019 to study the profile of admissions in the RICU from 2019 to 2021. The subset of consecutive COVID-19 patients admitted to the pulmonary medicine department and needing intensive care/monitoring was included in the study. Our hospital was also declared as a DCH during the peak of the pandemic. The inclusion period consisted from 18th May 2020 to 30th September 2020. The pulmonology unit was dedicated to caring for COVID-19 affected health care workers (HCWs) and most hospitalisations under the unit were HCWs, although non HCWs were admitted subject to availability of vacancy. The isolation facility at our hospital was assessed for preparedness according to a checklist standardised by the Ministry of Health and Family Welfare (4). All the health care workers caring for infected patients received comprehensive training and demonstrated competence in implementing infection control practices and procedures. The oropharyngeal swabs reports were available from the local viral research and diagnostic laboratory (VDRL) or the private labs which used the quantitative polymerase chain reaction for confirmation. Patients with laboratory-confirmed COVID-19, diagnosed using reverse transcriptase–polymerase chain reaction (RT–PCR), were enrolled in this study.

The clinical data were recorded at admission. Symptoms and clinical signs were noted. Portable chest radiograph (CXR) and high resolution computed tomography (HRCT) of the thorax were done in all unless contraindicated. HRCT thorax was done as soon as the patient was stable for the shift to the CT department. Laboratory parameters consistently available

were noted. COVID-19 severity was classified as mild if the patient was symptomatic in absence of pneumonia and hypoxemia, moderate if symptomatic for pneumonia but no hypoxemia and severe/critical if symptomatic for pneumonia with one of the following: respiratory rate > 30 breaths/min, severe respiratory distress; or SpO_2 < 90% on room air, which warrants oxygen therapy. The presence of pneumonia was documented. All cases of pneumonia were classified for the presence and severity of ARDS. ARDS was classified as per PaO_2/FiO_2 ratio; mild as 200–300, moderate as 100–200 and severe as <100. Any other complications if present during the hospitalisation were noted. All patients were treated as per Indian Council of Medical Research (ICMR) guidelines (7). Supportive care was the crux of intensive care, which consisted of oxygenation, ventilation, prone positioning and other forms of physiotherapy, nutrition, hydration, management of comorbid conditions, complications, mental health care and pharmacotherapy. A unit-specific protocol was made.

(1) Oxygen therapy and ventilation – Oxygen was delivered using a nasal cannula or face mask. If the oxygen requirements increased and/or in presence of tachypnea, the patient was shifted to NIV. High flow nasal cannula (HFNC) was available during the period of the study. It was applied as and when needed. However, being a dedicated RICU in the pre-COVID-19 era, the treating team was well versed and experienced in NIV usage and used it to the maximum advantage. All care to prevent aerosolisation and protection of the HCW was taken as per the institute infection control policies. Intubation and IMV were instituted for the failure of NIV. The management of ARDS on IMV was as per the ARDS NET protocol (8).

(2) Prone positioning and other physiotherapy measures – All patients were assessed by the physiotherapist daily. Prone positioning as per the Covid awake repositioning proning protocol (CARP) protocol was advised for all patients needing oxygen therapy. Other physiotherapy measures to prevent DVT and in-bed ambulation followed by early out of bed ambulation on clinical improvement were encouraged.

(3) Nutrition and Hydration – All cases were tele-consulted with the dieticians and appropriate oral/enteral nutrition was given.

(4) Management of comorbidities and complications of COVID – Pharmacotherapy specifically for associated comorbid conditions like diabetes mellitus (DM)/hypertension (HT)/ Ischemic heart disease was optimised in consultation with experts. COVID complications like pneumothorax, subcutaneous emphysema or sepsis was managed as per existing respiratory guidelines. Other system involvement like myocarditis, renal failure or haemodynamic compromise was managed with expert consultation.

(5) Mental health – Every case was assessed for anxiety and sleep problems and prompt referral to the psychiatrist was made.

(6) Pharmacotherapy – Therapy was mainly for symptomatic relief. Other than those, antibiotics, steroids (in cases with oxygen needs), vitamin C, zinc, low molecular weight heparin (LMWH) and special drugs like antivirals, biologicals and plasma were considered for administration as necessary and as per the ever-changing guidance.

Patients were considered for discharge as per the IDSA pneumonia guidelines. The time to discharge was noted. An outcome assessment was done. Outcomes were assessed by clinical and radiological improvement, the requirement of steroids and the need for home oxygen at discharge. At discharge, patients were advised to continue vitamin C and zinc for 15 days. Medications for comorbid conditions were continued as per the advice of a physician/specialist. Medium doses of inhaled corticosteroids and long-acting beta-agonist (ICS + LABA) inhalers were given to all those needing oral steroids and oxygen. Steroids were considered if the patient needed oxygen therapy and in cases (not needing oxygen) if significant post-exertional desaturation occurred <90% on simple ambulation. Steroids were given in doses of 0.6–1 mg/kg/d of oral prednisolone (maximum 80 mg/d) for 1 month followed by clinical, spirometry and pulmonary function evaluation and tapering, which remained out of the purview of the current study. Oxygen therapy was considered at discharge if SpO_2 was <88–90% on room air. This oxygen therapy was reviewed at 1 month of follow-up, which was again beyond the purview of the current study protocol.

Descriptive statistics (mean, median and standard deviation) were used appropriately by tabulation of the data. Statistical analysis was done using percentages, mean and Standard Deviation (SD). Chi-squared test, Fischer test and ANOVA test were applied to study significance. Significance was set at $P < 0.05$.

Results

A total of 101 moderate to severe COVID-19 patients were included in the study. These were 64 (63.3%) men and 37 (36.7%) women. The mean age was 43.44 (12.5) years. Ninety-four (93.1%) were hospitalised in the ICU due to pneumonia with or without other complications, one due to myocarditis alone and six did not have pneumonia but other indications of ICU care. Of these six, three had a very high-grade fever unmanageable in the ward, one had malaria with thrombocytopenia, one had intractable cough causing syncope and one had a falsely reported elevated serum creatinine which was later corrected. Of the 94 cases with pneumonia, 45 (48%) warranted ICU stay at admission and the other 49 (52%) progressed while in the ward and then needed transfer in the ICU. Of the total 101 cases, 83 (82.2%) reported fever, 77 (76.2%) had cough and 54 (53.5%) had breathlessness. Almost all had other symptoms

which included fatigue (68%), body ache (72%) and anosmia (55%). While 56 (55.4%) patients had comorbidities, 45 (44.6%) had not. DM was the most common, in 32 (57.14%), followed by HT in 28 (50%). Other documented comorbidities were psoriasis, hypothyroidism, vertigo, cerebrovascular accidents, psychiatric comorbid conditions and obstructive sleep apnea (OSA).

We dealt with most patients who were our HCW, though an occasional non HCW was admitted if there was a vacancy in our ICU and unavailability in the general ICU. As per the ICMR guidance (7) and local institute policy, most of our HCW who had symptomatic COVID-19 were hospitalised in our unit in the wards or ICU/HDU. Of the total 1010 pulmonary unit admissions, 101 (10%) warranted an ICU/HDU stay and were included in the study. One patient was excluded from the study – who had myocarditis on ward admission but preferred transfer to an ICU in a different hospital, for personal reasons, within 24 h of hospitalisation. The other three patients included in the study were transferred after a week of staying in our ICU, but they were followed up for outcome analysis.

The severity of COVID-19 was mild in 6 (6%), moderate in 30 (30%) and severe/critical in 65 (64%). Clinical characteristics as per disease severity are illustrated in Table 1. **The severity of COVID-19 increased statistically significantly with increasing age (*P* = 0.007) and comorbidities (*P* = 0.04) but had no correlation with gender (*P* = 0.3)**. Except for the six mild cases and one moderate case classified as only myocarditis, all 94 had pneumonia. Of the 94 cases of COVID-19 pneumonia, 65 (69%) i.e. two-thirds had ARDS and 29 (31%) i.e. one-third did not have ARDS. Of the 65 cases with ARDS, 21 (32%) had mild ARDS, 20 (31%) had moderate ARDS and 24 (37%) had severe ARDS. Clinical characteristics as per ARDS severity are illustrated in Table 2. **The severity of ARDS increased statistically significantly with increasing age (*P* = 0.003) and male gender (*P* = 0.004) but had no correlation with the presence of comorbidities (*P* = 0.09)**.

Table 1. Clinical characteristics as per the severity of COVID-19 disease.

COVID-19 severity	Age		Sex		Comorbidities (yes)	Pneumonia (yes)	ARDS (n=)	Oxygen#/NIV/invasive ventilation needed (n)			D-dimers (Mean)	IL6 (Mean)	Stay (Mean)	Recovered (n=)	Deaths (n=)
	Mn	SD	M	F				O	N	I					
Mild (6)	30.2	7	5	1	2	0	0	0	0	0	653.8	6.5	9.7	6	0
Moderate (30)	39.4	10.1	16	14	12	29	0	0	0	0	1012.7	20.2	10	30	0
Severe (65)	46.5	12.8	43	22	42	65	65	36	25	4	1870.6	97.8	17.5	62	3
P value	A; *P* = 0.007*		C, *P* = 0.3		C, *P* = 0.04*	–	–	–	–		A, *P* = 0.3	A, *P* = 0.31	A, *P* = 0.00094*	F, *P* = 0.5	

*Statistically significant.
#Oxygen includes HFNC also.
A, ANOVA test; ARDS, acute respiratory distress syndrome; C, Chi-squared test; COVID-19, Coronavirus disease 2019; F, Fischer test; HFNC, high flow nasal cannula; NIV, non-invasive ventilation.

Table 2. Clinical characteristics as per Severity of ARDS.

ARDS severity	Age		Sex		Comorbidities (n=)	Oxygen#/NIV/invasive ventilation needed (n)			D-dimers (Mean)	IL6 (Mean)	Stay (Mean)	Antivirals (n=)	Tocilizumab (n=)	Plasma (n=)	Recovered (n=)	Deaths (n=)
	Mn	SD	M	F		O	N	I								
Mild (21)	40.6	11.8	10	11	10	21	0	0	800.1	36.2	13.3	20	1	4	21	0
Moderate (20)	45	11	11	9	13	12	8	0	1252.2	33.7	14.3$	14	6	10	20	0
Severe (24)	53.1	12.3	22	2	19	3	17	4	3322.7	205	21.2	12	18	10	21	3
P value	A, *P* = 0.003*		C, *P* = 0.004*		C, *P* = 0.09	F, *P* = 0.0000001*			A, *P* = 0.04*	A, *P* = 0.02*	A, *P* = 0.001*	F, *P* = 0.0004*			F, *P* = 0.1	

*Statistically significant.
#Oxygen includes HFNC also.
A, ANOVA test; ARDS, acute respiratory distress syndrome; C, Chi-squared test; F, Fischer test; HFNC, high flow nasal cannula; NIV, non-invasive ventilation.
$Excluding the 82 d hospital stay patient.

Twenty-four (24%) had other complications during the hospital stay. These included myocarditis in nine, severe high-grade fever in three, documented PE in three (one had additionally pneumomediastinum), intractable cough in two, malaria in two, haemoptysis in one, bacterial sepsis in one, blurring of vision in one, falsely increased serum creatinine in one, hospital-acquired pneumonia with *Klebsiella* and pneumothorax in one and critical care myopathy (both also had myocarditis) in the two survived IMV patients who later improved.

We charted a few laboratory parameters including lymphopenia, D-dimers and IL6. All laboratory parameters being ever dynamic and difficult to document serially were not be assessed and discussed. Laboratory value analysis at admission revealed that lymphopenia was present in 42 (41.58%). D-dimers was elevated in 66 (65.3%). The cut-off considered was 500 ng. Mean D-dimers was 1543.5 (2998.8). All these cases were treated with LMWH. IL6 was elevated in 68 (67.3%), 46 men and 22 women. Mean IL6 was 69.3 (194). Both D-dimers and IL6 elevation were not significantly associated with the severity of disease ($P = 0.3$, respectively, $P = 0.31$, ANOVA) but were **significantly associated with severity of ARDS** ($P = 0.04$, respectively, $P = 0.02$, ANOVA).

Supportive care was the crux of ICU care. Thirty-six (36%) were treated with oxygen therapy/HFNC. As per our ICU protocol, NIV was initiated if the need for oxygen therapy kept escalating and/or in presence of tachypnea. Twenty-five (25%) needed NIV and four (4%) needed IMV. Thirty-six (36%) did not need any oxygen therapy or ventilation at all. Thus, 36% of cases of COVID-19 pneumonia were moderate COVID-19 cases and did not need oxygen at all, 36% needed only oxygen and the remaining 29% needed ventilation, mainly NIV. Hence, in COVID-19 pneumonia, one-third needed hospitalisation but no oxygen therapy, another one-third needed oxygen therapy alone and yet another one-third needed ventilation, mainly NIV. As for ARDS cases, of the 21 mild ARDS cases, all (100%) needed only oxygen therapy. Of the 20 moderate ARDS, 12 (60%) needed oxygen therapy and 8 (40%) NIV. Of the 24 severe ARDS, 3 (12.5%) needed only oxygen therapy, 17 (71%) needed NIV and four (16.5%) needed invasive ventilation. **As the severity of ARDS increased, the need for ventilation was realised and the difference was statistically significant ($P = 0.000001$).** In addition to the supportive care, special drugs were available to our patients. Nine (9%) received no special drugs, 54 (54%) received only antivirals, 1 (1%) received antivirals and tocilizumab, 13 (13%) received antivirals and plasma, 10 (10%) received antivirals plus tocilizumab plus plasma, 1 (1%) received both tocilizumab and plasma (no antivirals), 13 (13%) received only tocilizumab and none received plasma alone. The use of special drugs was significantly more in patients with increasing severity of ARDS ($P = 0.0004$).

All except three patients survived and were discharged. Our mortality rate was only 2.97%. One of the three cases who died was a non HCW. This male patient was transferred from a private hospital on day 10th of the illness in a critical state and died within 24 h. The second case was a male HCW of another hospital who had a sudden cardiac arrest due to an arrhythmia. He received NIV and was improving from the pulmonary point of view when the sudden event occurred on day 7th of hospitalisation. The third patient was our male HCW who had a sudden cardiac arrest on IMV (off inotropes) due also to an arrhythmia on day 8th of admission. All had myocarditis, HT and two had DM. All three received tocilizumab while only one received antivirals. Despite the low death rate, we statistically analysed our data for any predictors of mortality. All those who died were men and had severe disease and severe ARDS. However, the effect of gender, severity and ARDS on mortality was statistically insignificant ($P = 0.3$, Fischer test). We found the **presence of HT** ($P = 0.02$, Fischer test) and **myocarditis significantly correlated with an unfavourable outcome** ($P = 0.02$, Fischer test). Special drugs like antivirals alone ($P = 0.12$, Fischer test) or with tocilizumab and/or plasma altogether ($P = 1$, Fischer test) **did not impact mortality**. Hence, the supportive care was the crux of therapy and good outcomes.

The mean duration of hospital stay in the 98 patients discharged was 15 (10) d, with a maximum stay of 82 d and a minimum of 7 d. The patient with 82 d of hospital stay had problems with the feasibility of arranging oxygen therapy at home, and was hence discharged only when maintaining pulse oximetry saturation >90% on room air. Patients with severe COVID-19 disease had a longer hospital stay (mean 16.52 d) as compared to all other severe patients i.e. mild and moderate (mean 9.94 d). The **time to hospital discharge increased significantly with increasing severity** of **the COVID-19 disease** ($P = 0.00094$, ANOVA) **and severity of ARDS** ($P = 0.001$, ANOVA, excluding the patient with 82 d stay).

COVID-19 pneumonia heals with fibrosis. However, this should be viewed as sequelae and not as worrisome idiopathic fibrosis as in other idiopathic interstitial lung diseases (ILD). While radiological clearing was not absolute in all at discharge, all patients responded to clinico-radiological diagnosis when discharged. Of the 98 discharged, 75 (76.5%) needed no other therapy than vitamin C, zinc and pulmonary rehabilitation. Fourteen (14.3%) needed additional steroid therapy only for the ILD post-COVID-19 pneumonia and nine (9.2%) needed oxygen and steroids as well. Further follow-up was beyond the scope of this study. Steroid and oxygen needs at discharge were significantly increased with the severity of ARDS ($P = 0.02$, ANOVA).

Discussion

Of the total 1010 admissions in our pulmonology unit in the study period, 101 (10%) warranted an ICU/HDU stay and were included in the study. These figures are consistent with the epidemiological pattern of the disease in India where it has predominantly presented in a milder form (9,10). In our study group, we observed that COVID-19 infection predominantly affected the younger age group with a mean age of 43.44 years, which is proximate to other Indian studies done by Pande et al. and Gupta et al. (9,10). We observed a male predominance in our study, which is similar to a study quoted by Wang et al. and also similar to Indian studies by Gupta et al. and Budhiraja et al. (9,11,12) The associated comorbidities were noted among 55.4%, namely diabetes 57.14% and HT 50%. This is similar to studies done by Guan et al., Pande et al. and also a pooled analysis (10,13,14). The clinical symptoms at presentation in our study group were fever in 82.2% of patients followed by cough in 76.2% and dyspnea in 53.5%. This symptomatology is similar to a study done by Budhiraja et al. (12) on a large sample size of 976 patients and also similar to findings of a pooled analysis (14). However, according to a study done by Aggarwal et al. (15), dyspnea was the most common symptom.

The severity of COVID-19 disease (4) was mild in 6 (6%), moderate in 30 (30%) and severe in 65 (64%). The distribution was more inclined towards a severe disease as compared to other studies (11). However, it was similar to a study done by Aggarwal et al. (15), where they found an occurrence of severe disease in 75% of patients.

The severity of COVID-19 disease increased statistically significantly with increasing age and comorbidities but had no correlation with gender. This is similar to a study done by Tian et al. where they reiterated that elderly with associated comorbidities had severe disease and worse outcomes. However, the negative impact of the male sex on the disease severity seen in their study was not observed by us (16). Pneumonia was present in most (93.1%) of our patients, which was diagnosed clinically and by CXR/HRCT evidence. This was consistent with a study done by Saluja et al. (17) in which they found radiological abnormalities in 87% of patients. Of the 94 cases of COVID-19 pneumonia, 69% had ARDS. The severity of ARDS increased statistically significantly with increasing age and male gender. This phenomenon is similar to that seen in other studies (12,14,18). Laboratory value analysis revealed that lymphopenia was present in 41.58%. This is consistent with the study done by Zhang et al. (19) where it has been reported to be in a range of 50–70%. Lymphopenia has been stated to correlate with the prognosis and oxygen requirements (20). D-dimers were elevated in 65.3% while IL6 was elevated in 67.3%. The elevation of both these values was not significantly correlated with the severity of the disease but was significantly associated with the severity of ARDS. Even in the previous studies, the D-dimers and IL6 levels were significantly higher in the group of patients requiring oxygen and were associated with a worse outcome (11,20).

All patients were treated as per ICMR guidelines (7). Supportive care was the crux of ICU care. Supportive care indicates management for all aspects of the disease and later pulmonary rehabilitation. Like non-COVID respiratory diseases, COVID-19 too has many extrapulmonary manifestations and comorbidity associations and leaves a great impact on not just the physical but also mental health of the patient. The various aspects of supportive care as explained in the protocol should be followed improvising to region and unit specific guidelines. In our study group, 36% of cases of COVID-19 pneumonia did not need oxygen at all, 36% needed only oxygen and the remaining 29% needed ventilation, mainly NIV. This is similar to a multicenter Indian study done by Budhiraja et al. (12) where 23% of patients needed oxygen therapy whereas 17% required ventilatory support. In addition to the supportive care, special drugs were available to our patients. Nine (9%) received no special drugs, 54 (54%) received only antivirals, 1 (1%) received antivirals and tocilizumab, 13 (13%) received antivirals and plasma, 10 (10%) received antivirals, tocilizumab and plasma all, 1 (1%) received both tocilizumab and plasma (no antiviral), 13 (13%) received only tocilizumab and none received only plasma. The therapeutic armamentarium against COVID-19 disease primarily involves supportive therapy and oxygenation. Antiviral drugs like remdesivir and favipiravir or anti-inflammatory drugs like steroids and tocilizumab each have their own scientific rationale (21–24). However, their efficacy except steroids has not been robustly documented in literature and results of many trials including the results of the recent SOLIDARITY study are discouraging vis a vis these therapies consisting of special drugs (25).

The complications in our patients were seen in 24% and largely included myocarditis and PE. The myocardial injury in COVID-19 stems from a combination of fulminant viral myocarditis and myocardial infarction due to myocardial oxygen supply–demand imbalances. It has been associated with poor outcomes taking a toll largely on the elderly hypertensive individuals (26). PE in COVID-19 occurs due to the prothrombotic state caused by the predisposing factors of Virchow's triad of four, namely inflammation, platelet activation, endothelial dysfunction and stasis (27).

In our study, 97.03% of patients had a good outcome and were discharged in a stable state. We reported a lower-case fatality rate than other studies. In the study done by Docherty et al. (28) in the UK, 41% of cases were discharged, 26% died and 34% continued to receive treatment at their centre. Our study had an outcome similar to an Indian study done by

Saluja et al. (17). where they found a mortality rate of 1.9% and to a study done by Mohan et al. (29) where the mortality was 1.4%. Also, the mortality observed in a multicentre Indian study, done by Budhiraja et al., (12) on a huge population size was 10.5%. Our extremely good outcomes in severe cases could be attributed to various factors. Our ICU was a dedicated RICU with strict implementation based on guidelines and protocol adherence in management. We largely hospitalised HCWs and hence the threshold for indications for ICU admissions was much lower. Although we had a low death rate, we statistically analysed our data for any predictors of mortality. We found the presence of HT and myocarditis significantly correlated with death, consistent with previous studies (12,26). The pessimistic impact of comorbidities on the disease is well documented in the literature (12). Special drugs like antivirals alone or with tocilizumab and/or plasma altogether did not impact mortality. This reiterates the fact that supportive care is the crux of therapy.

The mean duration of hospital stay in the 98 patients discharged was 15 d, consistent with a study done by Budhiraja et al., (12) where it was 9 d and Gupta et al. (9) where it was 11 d. Patients with severe COVID-19 disease had a longer hospital stay as compared to mild and moderate. The time to hospital discharge increased significantly with increasing severity of the COVID-19 disease and severity of ARDS. This is consistent with previous studies done on patients with a severe disease which reported longer hospital stays (30). Of the 98 discharged home, 76.5% needed no other therapy than vitamin C, zinc and pulmonary rehabilitation, 14.3% needed additional steroid therapy only for the ILD post-COVID-19 pneumonia and 9.2% needed both oxygen and steroids. This underlines the fact that the proportion of patients requiring oxygen therapy or steroids at discharge is relatively smaller.

Conclusions

Overall COVID-19 infection has a good recovery rate and most of the cases improved after supportive management. This provides a ray of hope among the scarce data available on these relevant issues in management and outcomes. We also emphasise the need for studies involving larger sample sizes and follow-up studies. A dedicated multi-unit structure for different groups of patients with facilities for hospital-based wards as well as ICU management and awareness and education about the disease could see a paradigm shift in outcomes in these cases.

The limitation of our study was that there was an unavoidable referral bias. The study site was a pulmonology unit of DCH providing more of the moderate to severe COVID-19 cases amongst the HCWs predominantly. This was a group which was aware and educated about the disease. They sought medical advice early and could be assessed for progression and deterioration at the earliest. As a policy protocol, all initial COVID-19 HCWs were hospitalised at least in the ward set up for observation, which was also managed by the same unit. Interventions in this group including special drugs, ICU transfers etc. was done almost as soon as the progression or deterioration was documented. This could have contributed to the low mortality observed.

Acknowledgment

Nil

Conflict of interest

Nil

References

1. Dhama K, Khan S, Tiwari R, Sircar S, Bhat S, Malik YS, et al. Coronavirus disease 2019—COVID-19. *Clinical Microbiology Reviews*. 2020;33: e00028–e00020.
2. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, Mcginn T, Davidson KW. Presenting characteristics, comorbidities and outcomes among 5,700 patients hospitalized with COVID-19 in the New York City area. *JAMA*. 2020;323: 2052–2059.
3. Huang C, Wang Y, Li X, Ren Li, Zhao J, Hu Yi, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223): 497–506.
4. Ministry of Health & Family Welfare, Government of India. Revised guidelines on clinical management of COVID-19. Available from: https://www.mohfw.gov.in/pdf/RevisedNationalClinicalManagementGuidelineforCOVID1931032020.pdf [Accessed 20th June 2020].
5. World Health Organization. Clinical management of COVID-19. Available from: https://www.who.int/publicationsdetail-redirect/clinical-anagement-of-covid-19 [Accessed 22nd November 2020].
6. Varghese GM, John R, Manesh A, Karthik R, Abraham OC. Clinical management of COVID-19. *Indian Journal of Medical Research*. 2020;151(5): 401–410.
7. Indian Council of Medical Research. Available from: https://main.icmr.nic.in/content/covid-19 [Accessed 22nd November 2020].
8. Acute Respiratory Distress Syndrome Network, Brower RG, Matthay MA, Morris A, Schoenfeld D, Thompson BT, et al. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. *The New England Journal of Medicine*. 2000;342: 1301–1308.

9. Gupta N, Agrawal S, Ish P, Mishra S, Gaind R, Usha G, et al. Clinical and epidemiologic profile of the initial COVID-19 patients at a tertiary care centre in India. *Monaldi Archives for Chest Disease*. 2020;90: 1294.
10. Pande D, Kochhar A, Saini S, Ganapathy U, Gogia AR. An update on initial epidemiological profile, clinical course, and outcome of COVID-19 patients at a tertiary care center in India. *Indian Journal of Palliative Care*. 2020;26(Suppl S1): 36–39.
11. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. *JAMA*. 2020;323(11): 1061–1069.
12. Budhiraja S, Soni A, Jha V, Indrayan A, Dewan A, Singh O, et al. Clinical profile of first 1000 COVID-19 cases admitted at tertiary care hospitals and the correlates of their mortality: an Indian experience. *medRxiv*. 2020.11.16.20232223. Available from: doi:10.1101/2020.11.16.20232223.
13. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of coronavirus disease 2019 in China. *New England Journal of Medicine*. 2020;382(18): 1708–1720.
14. Kaur N, Gupta I, Singh H, Karia R, Ashraf A, Habib A, et al. Epidemiological and clinical characteristics of 6635 COVID-19 patients: a pooled analysis. *SN Comprehensive Clinical Medicine*. 2020;9: 1–5. Available from: doi:10.1007/s42399-020-00393-y.
15. Aggarwal A, Shrivastava A, Kumar A, Ali A. Clinical and epidemiological features of SARS-CoV-2 patients in SARI ward of a tertiary care centre in New Delhi. *Journal of the Association of Physicians of India*. 2020;68(7): 19–26.
16. Tian S, Liu H, Liao M, Wu Y, Yang C, Cai Y, et al. Analysis of mortality in patients With COVID-19: clinical and laboratory parameters. *Open Forum Infectious Diseases*. 2020;7(5): ofaa152.
17. Saluja M, Pillai D, Jeliya S, Bauddh N, Chandel R. COVID 19-clinical profile, radiological presentation, prognostic predictors, complications and outcome: A perspective from the Indian subcontinent. *Journal of the Association of Physicians of India*. 2020;68(7): 13–18.
18. Bhatraju PK, Ghassemeih BJ, Nichols M, Kim R, Jierome KR, Nalla AK, et al. Covid-19 in critically Ill patients in the Seattle Region – Case series. *The New England Journal of Medicine*. 2020;382: 2012–2022.
19. Zhang JJ, Dong X, Cao YY, Yuan YD, Yang YB, Yan YQ, et al. Clinical characteristics of 140 patients infected with SARS-cov-2 in Wuhan, China. *Allergy*. 2020;75(7): 1730–1741.
20. Bhandari S, Bhargava A, Sharma S, Keshwani P, Sharma R, Banerjee S. Clinical profile of Covid-19 infected patients admitted in a tertiary care hospital in North India. *Journal of the Association of Physicians of India*. 2020;68(5): 13–17.
21. Shrestha DB, Budhathoki P, Syed N, Rawal E, Raut S, Khadka S. Remdesivir: A potential game changer or just a myth? A systematic review and meta-analysis. *Life Sciences*. 2020;26: 118663. doi: 10.1016/j.lfs.2020.118663.
22. Shrestha DB, Budhathoki P, Khadka S, Shah PB, Pokharel N, Rashmi P. Favipiravir versus other antiviral or standard of care for COVID-19 treatment: a rapid systematic review and meta-analysis. *Virology Journal*. 2020;17: 141.
23. Singh AK, Majumdar S, Singh R, Misra A. Role of corticosteroid in the management of COVID-19: A systemic review and a Clinician's perspective. *Diabetology & Metabolic Syndrome*. 2020;14(5): 971–978.
24. Focosi D, Anderson AO, Tang JW, Tuccori M. Convalescent plasma therapy for COVID-19: state of the art. *Clinical Microbiology Reviews*. 2020;33(4): e00072-20.
25. Pan H, Peto R, Karim QA, Alejandria M, Henao-Restrepo Am, Garcia Ch, et al. Repurposed antiviral drugs for COVID-19 – interim WHO SOLIDARITY trial results. WHO Solidarity Trial Consortium. *The New England Journal of Medicine*. 2021;384:497–511.
26. Fu L, Li XY, Fei J, Xiang Y, Xiang HX, Li MD, et al. Myocardial injury at early stage and its association with the risk of death in COVID-19 patients: A Hospital-Based Retrospective Cohort Study. *Frontiers in Cardiovascular Medicine*. 2020;7: 590688.
27. Bikdeli B, Madhavan MV, Jimenez D, Chuich T, Dreyfus I, Driggin E, et al. Global COVID-19 thrombosis collaborative group, endorsed by the ISTH, NATF, ESVM, and the IUA, supported by the ESC working group on pulmonary circulation and right ventricular function. COVID-19 and thrombotic or thromboembolic disease: implications for prevention, antithrombotic therapy, and follow-up: JACC state-of-the-art review. *Journal of the American College of Cardiology*. 2020;75(23): 2950–2973. Available from: doi:10.1016/j.jacc.2020.04.031.
28. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, et al. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO clinical characterisation protocol: prospective observational cohort study. *BMJ*. 2020;369: m1985.
29. Mohan A, Tiwari P, Bhatnagar S, Patel A, Maurya A, Dar L, et al. Clinico-demographic profile & hospital outcomes of COVID-19 patients admitted at a tertiary care centre in north India. *Indian Journal of Medical Research*. 2020;152(1 & 2): 61–69.
30. Xie J, Wu W, Li S, Hu Y, Hu M, Li J, et al. Clinical characteristics and outcomes of critically ill patients with novel coronavirus infectious disease (COVID-19) in China: a retrospective multicenter study. *Intensive Care Medicine*. 2020;46(10): 1863–1872.