ORIGINAL ARTICLE

Clinical profile of mechanically ventilated COVID-19 patients: A retrospective observational study from Dubai

Prashant Nasa*, Aanchal Singh, Habib Talal Syed, Saroj Patidar, Vishal Sapakale, Kandy Koul, Rajesh Kumar

Critical Care Medicine NMC Speciality Hospital, Dubai, United Arab Emirates

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ABSTRACT

Background: We did a retrospective analysis of critical coronavirus disease 2019 (COVID-19) patients admitted to our intensive care unit (ICU). The objective was to evaluate the outcome, risk factors and effect of prone position in critically ill patients requiring invasive mechanical ventilation (IMV).

Patients and methods: The data were collected regarding demographics, comorbidities, laboratory parameters and treatment. Logistic regression was used for analysis of the association of risk factors to the outcome.

Results: From 15 March to 30 May 2020, 35 (59.3%) out of 59 critical COVID-19 requiring IMV were admitted to a tertiary care hospital in Dubai. The day-28 ICU mortality was 28.8% and 48.6% in patients requiring IMV. Prone position (PP) was used in 17 (48.6%) patients for median duration of 19 (5-20) hours with significant PaO_2/FiO_2 improvement. Acute kidney injury was common (30.5%), and half of the patients required renal replacement therapy (RRT) with higher mortality (77.8%). Lactate dehydrogenase (LDH) odd ratio (OR)- 1.006 [95% CI- 1.00-1.01], D-dimer (OR-1.003 [1.000-1.000, low total leucocyte count (OR-1.135 [1.01-1.28]), and lymphopenia (OR-0.909 [0.84-0.98]) were independently associated with increased risk of IMV.

Conclusions: IMV requirement in patients with COVID-19 is associated with higher mortality. Inflammatory markers like LDH, D-dimer, and lymphopenia can be used to predict the prognosis. The patients with COVID-19 on IMV respond significantly with prone position, and it should be considered early with a longer duration.

Key Words: Coronavirus disease 2019, COVID-19 related respiratory failure, Acute respiratory distress syndrome, Invasive mechanical ventilation

1. INTRODUCTION

The pandemic of coronavirus disease 2019 (COVID-19) has caused an unprecedented requirement of intensive care unit (ICU) beds and mechanical ventilators globally. The patients who required invasive mechanical ventilation (IMV) in the large registries from Italy or New York have reported worse outcomes.[1,2] The pathophysiology of acute hypoxemic respiratory failure (AHRF) seen with COVID-19 and its management has been a matter of debate among experts in the field.[3,4] The United Arab Emirates (UAE) has 504,872 cases of confirmed COVID-19 as on 22 April 2021 with a case fatality rate of 0.3%. There is no data available from individual emirates of UAE about number of cases and mortality. We did a retrospective analysis of 59 critically ill patients of COVID-19 admitted in our ICU for risk factors, respiratory support, and effect of prone position while on

*Correspondence: Prashant Nasa; Email: dr.prashantnasa@hotmail.com; Address: Critical Care Medicine NMC Speciality Hospital, AL Nahda 2, Dubai, United Arab Emirates.

IMV and their outcome.

2. METHODS

2.1 ICU design

We did a retrospective observational cohort study in a tertiary care private hospital in Dubai. The data was collected for the patients admitted between 10 March to 30 May 2020. The nine bedded ICU was expanded to 18 beds during the surge of COVID-19 patients. The ICU was managed round the clock by an "ICU team" of nine doctors (mix of anesthesiologists and intensivist) and 36 dedicated nurses. The team building, mobilization of resources and training of nursing staff was done as part of the surge planning in the first week of March 2020.[6] Patients on IMV were managed with a lung-protective ventilation strategy. The intubated patients were managed into a prone position (PP) if PaO_2/FiO_2 ratio less than 150 mmHg and fraction of inspired oxygen (FiO_2) more than 0.6, as recommended in PROSEVA trial.[6] The use of antivirals, immunomodulators and steroids was based on the national guidance from the Ministry of Health, UAE, which was regularly updated (four versions updated till 30 May 2020).[7]

The severe COVID-19 is defined as hypoxemia ($Spo_2 \leq 90\%$), PaO_2/FiO_2 less than 300, tachypnea (RR > 30/min) or lung infiltartes > 50% while critical COVID-19 is acute respiratory distress syndrome (ARDS) with PaO_2/FiO_2 ratio less than 200, shock, encephalopathy, myocardial injury, heart failure, coagulation dysfunction and acute kidney injury. Laboratory diagnosis for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection was made using reverse transcriptase-polymerase chain reaction (RT-PCR) of paired samples from nasopharyngeal and oral cavity or tracheal secretions once intubated. All patients with severe and critical COVID-19 were assessed for cardiac functions with 2-D echocardiography (ECHO).

The patients with AHRF were given a trial of high flow nasal oxygen (HFNO) or non-invasive ventilation (NIV) in ICU if there was no contraindication. The decision of tracheal intubation in each patient was taken by at least two physicians, one of which was an intensivist.

The indications for tracheal intubation were:

(1) Rapid progression of hypoxemia over hours
(2) Signs of respiratory fatigue excessive use of accessory muscles of breathing, hypercarbia (pCO_2 more than 45 mmHg), or altered mental status
(3) Unable to maintain oxygen saturation (SpO_2) > 88% on HFNO with a flow of 50 L/min and $FiO_2 \geq 0.6$
(4) Unable to maintain SpO_2 > 88% on NIV with $FiO_2 \geq 0.6$ and persistent use of NIV for more than 48 hours
(5) Hemodynamic instability

The study was approved by the hospital central scientific committee (CSC) and Dubai scientific and research ethics committee (DSREC-07/2020_47). The requirement for informed consent was waived by the hospital ethics and research committee because of the retrospective nature.

2.2 Procedure

The retrospective data were collected from the electronic medical record (EMR) on demographics, preexisting chronic illness, time of onset of symptoms to hospital admission. The result of arterial blood gas, inflammatory markers like C-reactive protein (CRP), Lactate Dehydrogenase (LDH), ferritin, D-dimer, Interleukin (IL)-6 during the ICU stay was collated as part of laboratory results. All patients with severe and critical COVID-19 were assessed for cardiac functions with 2-D echocardiography (ECHO). The data on respiratory support included the need for HFNO, NIV, indication and timing of tracheal intubation, initiation and duration of mechanical ventilation, administration of adjuvant therapies [(neuromuscular blocking agents, PP, and extracorporeal membrane oxygenation (ECMO)]. The specific treatment included antiviral drugs, immunomodulatory agents (tocilizumab, corticosteroids). The data on organ dysfunction and support [vasopressor agents, acute kidney injury (AKI), renal replacement therapy (RRT)] was also recovered.

2.3 Outcome

The primary outcome was day 7 and day 28 mortality.

The secondary outcomes were ICU length of stay (LOS), IMV-LOS, frequency of vasopressor use, AKI and RRT, frequency and effect of PP during IMV. Any adverse events during tracheal intubation, IMV and PP were also measured.

2.4 Statistical analysis

The continuous variables were expressed as mean [standard deviation (SD)] and median (range). The categorical variables were expressed in counts and percentages. The association of risk actors in mechanical ventilation group versus not on mechanical ventilation and between survivors versus non-survivors was tested using two-sample t-test for continuous variables and Fisher's exact or Chi Square test for categorical variables. The data not available from EMR was assumed missing and not imputed. The odd ratio (OR), univariate and multivariate logistic regression, was used to compare patients in the mechanical ventilation group versus not on mechanical ventilation and between survivors versus non-survivors. p-value less than .05 was taken as significant. IBM SPSS (version 26.0, Armonk, NY: IBM Corp.) was used for analysis.

3. RESULTS

3.1 Patients' demographics

We received 84 patients in our ICU during this period. Seventy-four patients were confirmed RT-PCR for SARS-CoV-2. Fifty-nine patients (79.7%) met the criteria of critical COVID-19. The median age of the patients was 51 (25-70) years (see Table 1 and Figure 1).

Table 1. Patient's characteristics. Data is in - Median (Interquartile range) or counts (percentage).

Variables	Patient numbers (n = 59)
Age (years)	
Median	51 (25-70)
20-30	5 (8.4%)
31-40	7 (11.9%)
41-50	14 (23.7%)
51-60	23 (39.0%)
61-70	10 (17.0%)
Sex	
Male	55 (93.2%)
Female	4 (6.8%)
Nationality (Region-wise)	
SEA	44 (74.6%)
Middle east	5 (8.4%)
Far east	8 (13.6%)
Others	2 (3.4%)
Comorbidities	
Present	50 (84.7%)
Median	2 (1-3)
Hypertension	35 (59.3%)
Diabetes Mellitus	39 (62.7%)
Chronic kidney Disease	4 (6.8%)
Chronic liver disease	6 (10.2%)
Cardio-vascular disease	9 (15.3%)
COPD/Asthma	2 (3.3%)
Malignancy	0
Obesity (BMI $\geq$ 30 kg/m^2)	22 (37.3%)

Note. SEA: south-east Asia. COPD- chronic obstructive pulmonary disease, BMI-Body mass index

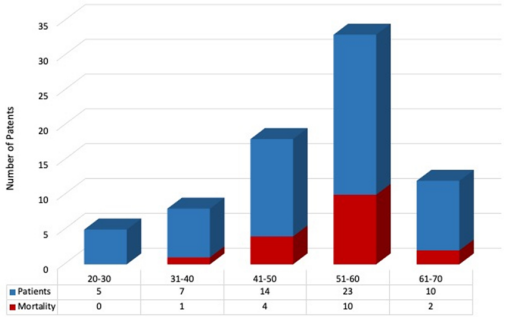

Figure 1. Case-distribution and mortality by age groups (in years)

55 (93.2%) patients were male, and 44 (74.6%) patients were south-east Asian expatriate. The preexisting chronic illness was common, and 50 (84.7%) patients had at least one illness with diabetes mellitus (DM) (62.7%) followed by hypertension (59.3%) were the top two chronic illness. Obesity (body mass index (BMI) > 30 kg/m^2) was present in 22 (37.3%) patients.

3.2 Laboratory measurements

The lymphopenia was common [median lymphocyte count of 8.9 (2.1-21.9) $\times$ 10^9/L]. The significant biochemical investigations were mild renal dysfunction [median creatinine levels of 1.2 (0.8-5.6) mg/dl] and raised liver enzymes. CRP was elevated in all patients with a median of 157.8 (29-330) and normal procalcitonin. The median d-dimer value was 603 (91-5,000) ng/ml. The other inflammatory markers (IL-6, LDH, ferritin) were also elevated in all patients (see Table 2).

3.3 Respiratory support including IMV

The NIV and HFNC were used in 32.2% and 20.3% of the patients, respectively. IMV was required in 35 (59.3%) patients, and most common indication was worsening hypoxemia (94.3%). The median age of patients on IMV was 52 (29-70) years, and 80% had at least one chronic illness. The median PaO_2/FiO_2 ratio of patients requiring IMV was 101 mmHg (45-251). The PP during IMV was used in 17 (48.57%) patients with a median of 2 (1-3) sessions and a duration of 19 (5-20) hours (see Table 3).

3.4 Treatment

Antiviral agents were administered to most of the patients with hydroxychloroquine (HCQ) (91.5%) and lopinavir/ritonavir combination (67.8%) were the top two antiviral agents. Forty-one (69.5%) patients received corticosteroids [methylprednisolone (37.13%) and dexamethasone (27.1%) were the two top agents]. Eighteen (30.5%) patient meeting cytokine storm using IL-6 criteria, received tocilizumab in the absence of contraindications. 96.6% of patients received anticoagulation with enoxaparin (84.7%) most common agent used (see Table 4).

4. OUTCOME

17 (28.8%) patients died, and one patient (2.9%) was still on mechanical ventilation till 27 June 2020. The ICU mortality on day 7 and 28 was 15.2% and 28.8%, respectively. The day-7 and day-28 mortality in patients on IMV was 25.7% and 48.6%, respectively. The mortality rate increased with age and 51-60 years (43.5%) of the age group had the highest mortality (see Figure 1). The median ICU-LOS was 8 (1-38) days and ventilator LOS was 7 (1-27) days. AKI developed in 18 (30.5%) patients, 50% required RRT and seven (77.8%) died (see Table 5).

Table 2. Laboratory measurements of critically ill COVID-19 patients

Variable (n = 59)	Median (Interquartile range)	Normal lab values
CRP, n = 59 (mg/dl)	157.8 (29-330)	0-5
Procalcitonin, n = 59 (ng/ml)	0.03 (0.01-6.2)	< 0.05
Hemoglobin, n = 59 (mg%)	13.8 (9.9-15.8)	M-13.5-15.5 F-12 -14
Total leucocyte count, n = 59 (10^9/L)	10.47 (3.46-28.6)	4.0-11.0
Lymphocyte count, n = 59 (%)	8.9 (2.1-21.9)	20%-40%
Platelets, n = 59 (× 10^9/L)	178 (79-345)	150-300
Ferritin, n = 56 (ng/L)	2021 (138-3707)	12-300
D-Dimer, n = 54 (ng/ml)	603 (91-5000)	< 250
Interleukin 6, n = 50 (pg/ml)	29 (6-581)	0-7
Creatinine, n = 59(mg/dl)	1.2 (0.8-5.6)	0.8-1.0
LDH, n = 59 (IU/L)	583.7 (241-1237.2)	140-280
AST/ALT, n = 57 (IU/L)	56/65 (35/41-578/341)	10-40/7-45
Serum bilirubin n = 57 (mg/dl)	0.9 (0.7-1.8)	0.6-1.0
Lactate, n = 59 (mmol/L)	1.3 (1.0-4.6)	0.2-1.0

Note. CRP- C-reactive protein, LDH- lactate dehydrogenase, AST- aspartate transaminase, ALT-alanine transaminase, M-male, F- female, COVID-19 Coronavirus disease 2019

There was significant difference in PaO_2/Fio_2 ratio (125.89 vs. 162.42, p = .049) and ICU-LOS (12.94 vs. 5.42, p = .000) in patients requiring IMV versus patients not on IMV. CRP, LDH, D-Dimer (day 1 and 2), TLC, Lymphocytes (day 1, 2 and 7) were also significantly different between the two groups (see Table 6). The patients who were given PP on IMV had significant improvement in PaO_2/Fio_2 ratio after the first two sessions (see Table 7 and Figure 2).

On univariate logistic regression (see Table 8), LDH odd ratio (OR)- 1.006 [95% CI- 1.00-1.01], D-dimer (OR-1.003 [1.000-1.000, TLC (OR-1.135 [1.01-1.28]), lymphopenia (OR-0.909 [0.84-0.98]) were significantly associated with increased risk of IMV. LDH (1.014 [1.001-1.027]) was the only marker independently associated with increased risk of IMV on multivariate logistic regression (see Table 8). The univariate logistic regression on Day 28 mortality showed DM (OR 3.388 [1.066-11.411]), Obesity (OR-2.477 [1.310-10.0812]), driving pressure (DP) (OR-1.415 [1.023-1.958]), LDH (OR-1.003 [1.001-1006]), Ferritin (OR-1.001 [1.000-1.002]), D-dimer (OR-1.000 [1.000-1001]) and lymphocytes (OR-0.855 [0.731-1.000]) were independently associated with mortality, however on multivariate logistic regression only DP (OR-2.50 [1.007-6.199]) was found to be an independent factor associated with increased mortality (see Table 9).

5. Discussion

ICU admission among hospitalised COVID-19 patients between 16%-20% depending on ICU admission criteria and system capacity.[1,2,8,9] Most of the patients in our study were male (97.1%) and expatriate (74.6%), that could be explained by skewed female to male ratio (3:4) in Dubai and 85% resident population being expatriate.[10] The median age of 51 years (25-70) was younger by a decade as compared to studies from the United States (US), Italy but similar to Chinese studies.[1,2,8,10] The preexisting chronic illness like diabetes mellitus (62.7%) and hypertension (59.3%) was common in the patients (see Table 1).[1,2,8,11] The lymphopenia and high inflammatory markers like LDH, ferritin, D-Dimer, CRP are associated with severe COVID-19 and similar results were seen in our study (see Table 2).[1,2,10] The median duration of onset of symptoms to tracheal intubation was 9 (1-18) days coinciding with the peak pulmonary phase of illness as reported with other studies.[12,13] The IMV was required in 35 (59.3%) patients (see Table 3), with a median age of 52 (29-70) years. The rate of IMV was 70%-79% in critical COVID-19 in other studies.[1,2,14,15] It may be explained by higher use of HFNO (20.3%) and NIV (30.2%) rather than early intubation and use of steroids (69.5%) and tocilizumab.[16,17] HFNO can prevent the need for IMV in patients with COVID-19, had been reported in other studies.[17] Patients who required IMV in our study were very hypoxemic [median PaO_2/FiO_2 ratio of 101 (45-251)] and low lung compliance 25 (13-49) ml/cm of H20 as reported by other studies.[14,15] The compliance with lung-protective ventilation strategy was high in our ICU with median tidal volume 6 (3.9-8.2) ml/kg/ideal body weight (IBW), plateau pressure 29 (23-33) cm of H_2O and DP 14 (10-18) cm of H_2O. The PEEP requirement was low with a median of 12 (9-15) cm of H_2O, as reported in other studies.[9,14,16] The

Table 3. Parameters of the patients requiring respiratory support and Invasive Mechanical ventilation, Data in Median (Interquartile range), counts (percentage)

Parameters	N = 35 (59.3%)
Age, n = 35 (years)	52 (29-70)
Sex	N = 35
Male, n (%)	34 (97.1%)
Female, n (%)	1 (2.9%)
Comorbidities	28 (80%)
Hypertension	14 (40%)
Diabetes Mellitus	19 (54.3%)
Chronic Kidney Disease	2 (5.7%)
Chronic liver disease	2 (5.7%)
Cardiovascular disease	3 (8.6%)
COPD/Asthma	0
Obesity (BMI > 30 kg/m^2)	10 (28.6%)
Use of NIV	25 (32.2%)
Use of HFNC	12 (20.3%)
Days from onset of symptoms to intubation	9 (1-18)
PaO_2/FiO_2 (before intubation) (mm of Hg)	101 (45-251)
Intubation done by	N = 35
Anesthesiologist	18 (51.4%)
Intensivist	17 (48.6%)
Reason for Intubation	N = 35
Worsening Hypoxemia	33 (94.3%)
Hypercapnia	4 (11.4%)
Altered mental status	6 (17.1%)
Shock	2 (5.7%)
Sedation	N = 35
Propofol	31 (88.56%)
Midazolam	29 (82.9%)
Opioid	8 (22.9%)
Dexmedetomidine	18 (51.4%)
Neuromuscular blocker	30 (85.71%)
Mode of Ventilation	N = 35
Assist Volume Controlled	33 (94.3%)
Assist Pressure Controlled	2 (5.71%)
Tidal volume (ml/kg/IBW)	6 (3.9-8.2)
PEEP (mmHg)	12 (9-15)
Compliance (ml/cm H_2O)	25 (13-49)
Plateau pressure (mmHg)	29 (23-33)
Driving Pressure (mmHg)	14 (10-19)
Prone Position ventilation	N = 17 (48.6%)
Median	2 (1-3)
1 session	7 (20%)
2 sessions	7 (20%)
3 sessions	3 (8.6%)
Median time from intubation to prone (hours)	6 (2-32)
Duration of Prone position (hours)	19(5-20)
Corticosteroids	N = 29 (82.9%)
Dexamethasone	16 (45.71%)
Methylprednisolone	11 (31.42%
Hydrocortisone	2 (5.71%)
Tracheostomy	4 (11.42%)

Note. COPD- chronic obstructive pulmonary disease, BMI-Body mass index, NIV-Non-invasive ventilation, HFNC- high flow nasal cannula, PEEP-positive end-expiratory pressure.

Table 4. Treatment received in all critically ill COVID-19 patients

Treatment	Counts (percentage)
Antiviral agents	54 (91.5%)
Hydroxychloroquinine	54 (91.5%)
Lopinavir/Ritonavir	40 (67.8%)
Favipiravir	19 (32.2%)
Interferon	2 (3.4%)
Tocilizumab	18 (30.5%)
Steroids	41 (69.5%)
Dexamethasone	16 (27.1%)
Methylprednisolone	22 (37.3%)
Hydrocortisone	3 (5.1%)
Anticoagulation	57 (96.6%)
Low molecular weight heparin	50 (84.7%)
Fondaparinux	2 (3.4%)
Unfractionated Heparin	5 (8.5%)

Table 5. Outcome data collected in all critically ill COVID-19 patients. Data in median (interquartile range), counts (percentage)

Parameters	Outcome
ICU Mortality (n = 59)	17 (28.8%)
Day 7 Mortality	9 (15.2%)
Day 28 Mortality	17 (28.8%)
Patient extubated	17 (48.6%)
Patient still on ventilator	1 (2.9%)
MV Mortality (n = 35)	17 (48.6%)
Day 7 Mortality	9 (25.7%)
Day 28 Mortality	17 (48.6%)
Prone Ventilation	N = 17
Day 7 Mortality	4 (23.5%)
Day 28 Mortality	8 (47.0%)
Length of ICU stay (days)	8 (1-38)
With MV	11 (1-38)
Without MV	4 (1-12)
Length of Ventilator stay (days)	7 (1-27)
New Onset Organ dysfunction	N = 24 (40.67%)
Shock	6 (10.16%)
Acute Kidney Injury	18 (30.5%)
Hepatic failure	1 (16.9%)
Myocarditis	5 (8.5%)
Use of antibiotics	
Empirical	55 (88.13%)
Therapeutic (superadded sepsis)	12 (20.3%)
Organ support	
Renal Replacement therapy	9 (15.25%)
Use of vasopressors	11 (18.6%)
ECMO	1 (1.7%)
Prone Ventilation Complications	N = 17
Pressure sore	8 (47.1%)
ETT obstruction/ displacement	0
Lines displacement	0

Note. MV: Mechanical Ventilation, ECMO: extracorporeal membrane oxygenation, ETT: endotracheal tube

PP during IMV was done in 17(48.6%) patients, higher than reported in other studies with a median of 2 (1-3) sessions (see Table 3).[9, 14, 15] The PP during IMV was done early [within 6 (2-32) hours of tracheal intubation] and longer with a median duration of 19 (5-20) hours.[6, 18] The patients on IMV were prone responders with significant improvement in PaO_2/FiO_2 ratio seen with the first two sessions of PP (see Table 7 and Figure 2). The mortality rate was lower in patients given PP, but the difference was nonsignificant (see Table 9). The only complication seen with PP was an increased incidence of minor pressure ulcer (47.1%), which did not require any significant intervention (see Table 5).

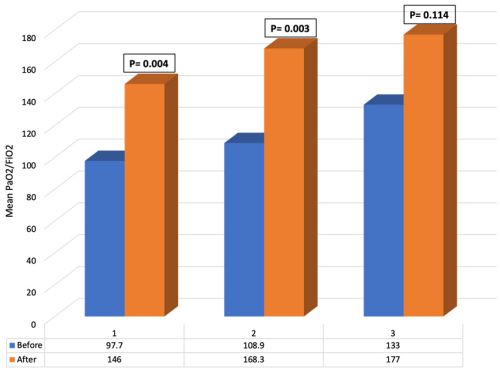

Figure 2. Effect of prone ventilation on oxygenation, $p <$ .05 is significant

Table 6. Comparison of significant parameters between patients on mechanical ventilation and without mechanical ventilation. Bold- p value is significant

Variable	MV	No MV	*p* (< 0.05 -significant)
Age	51.200 (10.346)	47.542 (11.898)	.215
Obesity (BMI)	35.310 (4.301)	33.358 (3.323)	.237
Comorbidity [n (%)]	28 (80%)	22 (91.6%)	.849
PaO_2/FiO_2	125.89 (77.66)	162.42 (51.86)	.049
LDH (Day 1)	692.25 (239.07)	452.83 (212.80)	.001
D-Dimer (Day 1)	3,294.87 (1,943.18)	1,033.58 (1,631.92)	.000
D-Dimer (Day 2)	2,296.04 (1,982.48)	1,148.56 (1,579.99)	.045
TLC	14.86 (7.67)	10.18 (4.31)	.016
Lymphocytes (Day 1)	9.35 (6.63)	15.42 (10.14)	.008
Lymphocytes (Day 2)	8.96 (6.53)	12.86 (6.73)	.038
Lymphocytes (Day 7)	6.67 (6.22)	13.42 (8.90)	.007
ICU-LOS	12.94 (9.25)	5.42 (3.09)	.000

Note. BMI- body mass index, LDH- lactate dehydrogenase, TLC-total leucocyte count, ICU- intensive care unit. LOS-length of stay

Table 7. A. Comparison of PaO_2/FiO_2 (mm of Hg) before and after (minimum 4 hours) prone session; B. Comparison of prone position sessions in patients who survived and not survived

A

Factor	Mean	SD	N	*p*-value
Session 1_PP_before	97.65	22.15	17	.004
Session 1_PP_after	146.06	56.91	17	
Session 2_PP_before	108.90	24.09	10	.003
Session 2_PP_after	168.30	37.71	10	
Session 3 PP_before	133.00	20.07	3	.114
Session 3_PP_after	177.00	10.82	3	

B

Factors	Not Survived		Survived		*p*-value
	Mean	SD	Mean	SD	
Session 1 PP before	97.00	15.34	97.85	24.40	.949
Session 1 PP after	152.75	48.22	144.00	60.97	.798
Session 1 PP duration	18.38	9.91	18.42	1.62	.988

Note. PP-Prone position, SD- standard deviation, *p*-value (less than .05 is significant)

The high percentage of PP during IMV could be done safely because of surge planning with adequate mobilization of resources and staff training. The use of neuromuscular blockers was high in our study to control patient-ventilator dyssynchrony despite a deeper level of sedation.[13]

The ICU mortality on Day 7 and 28 was 15.2% and 28.8%, respectively, as seen with other studies.[2, 9] The day 7 and 28 mortality were higher in patients with IMV 25.7% and 48.6%, similar to other case series.[14, 15] The mortality risk increased by the age, with the patients in 51-60 years had the highest mortality (43.4%) (see Figure 1). Inflammatory markers like CRP, Troponin I, D-Dimer have been found to be associated with severe disease.[19, 20] However, LDH was only biomarker, independently associated with increased mortality [OR-1.014 (1.001-1.027)]. We measured Troponin I only in the patients with abnormal 2-D ECHO. The DP was an independent factor associated with Day 28 mortality (see Table 9). The AKI (30.5%) was the second most common organ dysfunction after lungs and half of the patients required RRT with higher mortality (77.7%).[1, 2, 9]

Table 8. Univariate and Multivariate logistic regression in patients on mechanical ventilation ($p < .05$ significant)

Factor	Univariate Chi Square					Univariate Logistic Regression			Multivariate Logistic Regression		
	MV		Non MV		*p*-value	OR	Range	*p*-value	Odds Ratio	Range	*p*-value
PaO_2/FiO_2	125.89	77.66	162.42	51.86	.049	0.992	0.98 - 1.00	.066			
LDH_D1	692.25	239.07	452.83	212.80	.001	1.006	1.00 - 1.01	.003	1.014	1.001 -1.027	.032
LDH_D1	680.82	259.62	506.73	240.65	.032	1.003	1.00 - 1.00	.043			
DDi_D2	3,294.87	1,943.18	1,033.58	1,631.92	.000	1.001	1.00 - 1.00	.004			
DDi_D3	2,296.04	1,982.48	1,148.56	1,579.99	.045	1.000	1.00 - 1.00	.068			
DDi_D4	2,151.75	1,879.51	668.07	453.20	.001	1.001	1.00 - 1.00	.052			
TLC_D6	14.86	7.67	10.18	4.31	.016	1.135	1.01 - 1.28	.041			
Lymph_D1	9.35	6.63	15.42	10.14	.008	0.909	0.84 - 0.98	.016			
Lymph_D2	8.96	6.53	12.86	6.73	.038	0.915	0.84 - 1.00	.047			
Lymph_D3	7.26	5.08	13.77	7.45	.001	0.840	0.75 - 0.95	.004			
Lymph_D4	7.95	5.58	12.50	7.21	.013	0.893	0.81 - 0.98	.021			
Lymph_D5	7.48	4.42	14.05	7.82	.001	0.814	0.70 - 0.94	.006			
Lymph_D6	6.20	4.30	14.51	8.82	.000	0.787	0.68 - 0.92	.002			
Lymph_D7	6.67	6.22	13.42	8.90	.007	0.882	0.80 - 0.98	.018			
ICU-LOS	12.94	9.25	5.42	3.09	.000	1.238	1.08 - 1.42	.003			

Note. LDH: lactate dehydrogenase, Lymph: lymphocytes (%), TLC: total leucocyte count, ICU: Intensive care unit. D-day, ICU-LOS length of stay, DDi: D-dimer, OR: odd ratio, Range-95% confidence interval (CI), MV mechanical ventilation, *p*-value less than .05 is significant.

Table 9. Univariate and Multivariate logistic regression on day 28 mortality ($p < .05$ significant), Range-95% confidence interval (CI)

Univariate Logistic regression						Multivariate Logistic regression				
Factor		Odds Ratio	Range		*p*-value	Factor	Odds Ratio	Range		*p*-value
			Lower	Upper				Lower	Upper	
DM	No	1			.049	Obesity	1309.07	0.253	6766.66	.100
	DM	3.388	1.006	11.411		Tidal Volume	0.03	0.001	1.951	.101
Obesity	Non-Obese	1			.022	DP	2.50	1.007	6.199	.048
	Obese	3.477	1.310	10.01821		DDi_D1	1.00	1.000	1.004	.076
TV		0.339	0.126	1.913	.052	Lymph_D1	1.43	0.937	2.187	.097
PP_D1		1.330	0.980	1.805	.067	Constant	0.00			.429
DP		1.415	1.023	1.958	.036					
LDH_D1		1.003	1.001	1.006	.015					
Ferr_D1		1.001	1.000	1.002	.108					
DDi_D1		1.000	1.000	1.001	.045					
TLC		1.093	0.999	1.196	.054					
Lymph_D1		0.855	0.731	1.000	.050					

Note. LDH: lactate dehydrogenase, Lymph: lymphocytes (%), DM: Diabetes Mellitus, TV: tidal volume, DDi: d-Dimer, PP: plateau pressure, DP: Driving pressure, Ferr: Ferritin, D-day, ICU-LOS length of stay, *p*-value less than .05 is significant

This study, to our knowledge, this is the first study from the UAE of patients with critical COVID-19 requiring IMV. The teamwork of anesthesiologists, intensivists, and ICU nursing staff with team preparation under a joint task force helped to manage the surge. There was not even a single case of cross-infection to the doctor and staff during this period. The team managed the patients with standard management principles and back-up each other with a "buddy system."

Our study has few limitations: a retrospective, single center study with a limited number of patients.

6. Conclusion

IMV requirement in patients with COVID-19 is associated with higher mortality and lymphopenia. Inflammatory markers like LDH and D-dimer can be used to predict these patients. The COVID-19 patients on IMV respond significantly with prone position, and it should be considered early with a longer duration.

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Department of Anesthesiology, NMC Specialty Hospital, Dubai.

Conflicts of Interest Disclosure

The authors declare they have no conflicts of interest.

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