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Clinical characteristics and outcomes in adult patients with COVID-19 infection admitted to a Tertiary Care Hospital in Dubai, United Arab Emirates

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Abstract
SARS-CoV-2 is a novel coronavirus that was responsible for the global COVID-19 pandemic. Our hospital was one of the largest hospitals in the UAE to admit and manage patients with this novel infection since the beginning of the pandemic in the country. The main objective of this paper was to review clinical characteristics and outcomes in adult patients with COID-19 infection admitted to our hospital.

Methods: A single center retrospective observational study of 684 adult patients with confirmed COVID-19 infection admitted to a tertiary care hospital in Dubai in 2020 from 28/1/2020 until 13/05/2020. A select of clinical, radiological, epidemiological and Laboratory data was analyzed in relation to clinical presentation and disease outcome including ICU admission and overall mortality. Only patients with confirmed COVID-19 infection based on positive nasopharyngeal/throat swabs for SARS-CoV-2 virus on Real Time PCR (RT-PCR) were included in final analysis.

Results: Of the total 684 adult patients, 90.9% were males (n=622) with a mean age of 44.43 years (range of 66 years, from 15 to 81 years). Significant number of patients had co-morbidities as 177 (25.9%) patients had diabetes, 121 (17.7%) had hypertension, 28 (4.1%) had heart disease and 7 (1.0%) had renal disease. The most common presenting symptoms were fever (87.4%) cough (73.5%), shortness of breath (35.1 %), URTI (18.6%), and Diarrhea (8%). The clinical conditions among these 99 patients included upper respiratory tract infection (47.5%), abnormal chest X-ray, lymphopenia, high inflammatory markers a fifth (21%) of patients had moderate pneumonia, while 7% had severe pneumonia with 22.2% requiring admission to the intensive care unit and 12.1% died. Late presentation with severe disease, an abnormal chest X-ray, lymphopenia, high inflammatory markers (C- reactive protein, ferritin and procalcitonin), and end organ damage (high creatinine or high aspartate aminotransferase) were predictors for admission to critical care unit or died.

Conclusion: Older patients (age > 50 years), those with High BMI (>27), high LDH, hypertension, diabetes, SOB, High urea, presence of pneumonia, were associated significantly with a higher risk of ICU admission and higher mortality rates.

Keywords: COVID-19, UAE, Dubai, ICU, outcomes, clinical characteristics

Introduction
SARS-CoV-2 virus resulting in COVID-19 infection, was declared as a global pandemic by World Health Organization on 11 March 2020 [1]. The infection had huge medical and financial consequences affecting the whole world. It infected hundreds of millions globally and resulted in millions of lives lost secondary to the infection or its complications. Coronaviruses (CoVs) are a large family of viruses that cause diseases in mammals and birds and are responsible for severe respiratory illnesses such as the Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) in humans [2]. First cases of SARS-CoV-2 infection were diagnosed in the city of Wuhan, China, by the end of December 2019 and they were initially thought to be linked to a local food market in the city. On January 29, 2020, the United Arab Emirates Ministry of Health and Prevention announced the diagnosis of the first COVID-19 infection in the UAE for members of a family arriving from the Chinese city of Wuhan [3]. Following that family cluster, positive cases continued to be detected as an imported infection; however, as in other countries regionally and globally, it did not take long for local transmission of COVID-19 to be well established [4].

So, during the first wave and as of December 27, 2020, UAE had a COVID- 19 cases recovery rate of 89% and recorded 669 deaths from COVID-19 with an overall case-fatality of 0.3% since the beginning of the pandemic [5]. The UAE led in testing and the number of tests conducted per one thousand people is highest in the United Arab Emirates [6]. This helped a lot in early case identification, isolation and quarantine measures and contributed significantly to the cumulative initiatives and efforts to contain the pandemic locally and globally. Having that said, the pandemic continued and there were several subsequent waves resulting in hundreds of millions of COVID-19 cases diagnosed globally with a death toll reaching 6,542,894 lost lives as of September 2022 [7].

The spectrum of clinical manifestations of COVID-19 infection ranges from asymptomatic/subclinical infection to mild-moderate-severe infection, with some patients requiring intensive care admission and even mechanical ventilation. Data from several clinical studies revealed that nearly 40% of COVID-19 infections are asymptomatic [8, 9]. This point is important from epidemiological and infection control standpoints.

The most commonly reported symptoms are cough, fever, fatigue, myalgia, headache, loss of smell, nasal obstruction, asthenia, rhinorrhea, gustatory and olfactory dysfunction, and sore throat [10].

Patients with severe COVID-19 can present with dyspnea and hypoxia, with chest imaging revealing more than 50% involvement of the lungs. Patients with critical COVID-19 infection will have a severe respiratory failure with or without multi organ failure and shock. Regarding markers of severe infection, there have been several predictors and risk factors identified in different studies and patient populations. Among those factors, the most reported were age, Body Mass Index, SOFA score on admission, high inflammatory markers, and underlying Diabetes Mellitus [11, 12].

Our study aimed to review the clinical characteristics and outcome of adult patients with COVID-19 infection admitted to a tertiary care hospital in Dubai in the first wave of the pandemic. The review also studied the profiles of patients admitted to the Intensive Care Unit over study period and looked into important prognostic factors.

Methods

Study design and setting

A retrospective observational study was conducted at Rashid hospital, Dubai, UAE, one of the largest tertiary care hospitals and COVID-19 isolation and management facilities across the country during the pandemic.

684 laboratory-confirmed COVID-19 adult patients were admitted to our hospital over the first few months of the pandemic between 28 January to 13 May 2020. Only patients with confirmed COVID-19 infection based on positive nasopharyngeal and or throat swabs for SARS-CoV-2 virus on Real Time PCR (RT-PCR) were included in the study. UAE National COVID-19 management guidelines were used for case definitions, diagnostic work up and active management plan. All patients included in the study had baseline blood tests and radiological workup performed as per National Guidelines recommendations.

Data collection

Patients data were collected from Hospital's Electronic Medical Record (EMR) system. Data included the patient's demographics, age, gender, nationality, Body Mass Index, presenting symptoms, baseline labs, and chest imaging findings. In addition, other variables like medical co-morbidities, Intensive Care Unit admission, need for Oxygen therapy and over all outcome were also included in final data analysis.

Ethical approval

The study was approved by the Dubai Health Authority and hospital ethical committees. No potential risk to the patients was anticipated.

Statistical analysis

Minitab 17 was used as the statistical analysis software tool. Data analysis was done using Chi-square and 2 sample proportions methods. Descriptive statistics to describe data were used, and the level of statistical significance was set at 0.05.

Results

Demographics and Clinical Characteristics

This study included 684 patients with an average age of 44.43 years from different nationalities. As observed during the first wave of COVID-19 infection, there was significant male predominance, and in our patients, there was 9:1 male to female ratio. With the known country's demographics, patients from Asian origin; mainly India (38.3%), Pakistan (20.9%) & Bangladesh (11.7) constituted more than two thirds of overall study sample.

Table 1: Demographics of study data

Characteristics, n(%), unless specified otherwise	All (N = 684)	Not Admitted to ICU (n=567(82.9%)	Admitted to ICU (n = 117(17.1%)	P-value
Demographics				
Age, Mean (SD)	44.43 (±11.37)	43.26 (±10.88)	50.08 (±12.02)	***0.048***
Nationality				
India	262(38.3%)	209(36.9%)	53(45.3%)	0.827
Pakistan	143(20.9%)	116(20.5%)	27(23.1%)	0.476
Bangladesh	80(11.7%)	71(12.5%)	9(7.7%)	0.128
Others	199(29.1%)	171(30.2%)	28(23.9%)	0.415
Gender				
Male	622(90.9%)	513(90.5%)	109(93.2%)	0.912
Female	62(9.1%)	54(9.5%)	8(6.8%)	0.701
Symptoms				
Fever	598(87.4%)	493(86.9%)	105(89.7%)	1.000
Cough	503(73.5%)	409(72.1%)	94(80.3%)	0.081

SOB	240(35.1%)	161(28.4%)	79(67.5%)	***0.012***
URTI	127(18.6%)	111(19.6%)	16(13.7%)	0.196
Diarrhea	55(8.0%)	47(8.3%)	8(6.8%)	0.561
Other Symptoms	266(38.9%)	228(40.2%)	38(32.5%)	0.602
Abnormal CXR	545(79.9%)	132(23.3%)	7(6.0%)	*0.001*
Unilateral opacification	110(16.1%)	101(17.8%)	9(7.7%)	*0.041*
Bilateral opacification	428(62.6%)	327(57.7%)	101(86.3%)	*0.046*
Comorbidities				
DM	177(25.9%)	125(22.0%)	52(44.4%)	*0.025*
HTN	121(17.7%)	90(15.9%)	31(26.5%)	*0.048*
Heart Disease	28(4.1%)	21(3.7%)	7(6.0%)	0.149
Renal Disease	7(1.0%)	3(0.5%)	4(3.4%)	*0.011*
O2 therapy received	315(46.1%)	216(38.1%)	99(84.6%)	*0.00*
Outcome				
Discharged from our hospital	110(16.1%)	82(14.5%)	28(23.9%)	0.103
Transferred to other facility	484(70.7%)	479(48.4%)	5(4.3%)	0.00
Deceased	75(11.0%)	5(0.9%)	70(59.8%)	0.00

Regarding patient symptomatology, fever was reported and documented in almost 90% of patients, followed by a cough which was reported by 73.5% of patients. Less frequent symptoms among our cohort was Upper Respiratory tract complaints and diarrhea. This was compatible with findings from other studies during the first wave [13, 14, 15].

One third of admitted patients has shortness of breath and this matched the higher oxygen requirements and worse chest X ray findings and subsequent ICU admission and higher mortality rates.

There was an important observation regarding BMI and ICU admission; so, patients with BMI above 29 Kg/m^2 had higher risk of intubation and mechanical ventilation. The same observation was made by other groups as well [16, 17].

Laboratory and radiological findings

Baseline hematology panel was normal in almost all patients upon day one of admission. Excluding patients with underlying renal diseases, almost all patients had normal baseline renal and electrolytes profiles. And similar to other studies which showed mild rise in transaminases, there was mild rise in ALT in majority of patients [18]. Our patients had normal bilirubin as well. There was an observed acute rise in globulin signifying the intense immune response and rapid formation of antibodies during acute infection.

In our study, higher levels of urea, LDH and CRP and were associated with risk for ICU admission, and they reflected more severe disease and possible concomitant bacterial pneumonia.

LDH for ICU patients has an average of 467 U/L, significantly higher than those not admitted to ICU.

Mean CRP level among all admitted patients was 76.9 mg /L and the mean for ICU admitted patients was 154.4 mg/l (p- values 0.039). CRP levels above 70 mg/L was taken as one marker of severe infection and guided the use of steroids and other immune-modulating therapy [19, 20, 21].

Almost 80% of patients had abnormal chest X-rays and the presence of bilateral pulmonary opacifications was found to be associated with higher disease severity score and higher rate of ICU admission.

Clinical outcomes

Figure 1 outlines the clinical outcomes of the cohort including overall mortality. And in alignment with clinical and field observations from other COVID-19 managing centers and countries in the first wave of the pandemic; there was high mortality among admitted patients. Among our cohort of admitted patients; the overall mortality was 11%. This was significantly higher in patients admitted to ICU and reached almost 60% of patients (59.8% of the patients in ICU) in comparison to non-ICU patient group where it was below 1% (0.9% of non- ICU patients). Factors associated with higher mortality among ICU-admitted patients included DM (p = 0.025), age above 50 years (p = 0.048), high CRP (p = 0.039) and high Urea levels (p = 0.016).

Table 2: Patient lab results classified based on ICU admission

Characteristics	All (N = 684)	Not Admitted to ICU (n=567(82.9%)	Admitted to ICU (n = 117(17.1%)	P-value
BMI, Mean (SD),	27.38(±4908)	26.92(±4.666)	29.66(±5.413)	0.049
WBC, Mean (SD), /ul	7.230(±2.962)	6.976(±2.773)	8.461(±3.508)	0.163
HB, Mean (SD), g/dl	14.16(±1.353)	14.23(±1.330)	13.84(±1.421)	0.401
PLT, Mean (SD), ul	217.5(±74.82)	215.7(±73.83)	226.3(±79.17)	0.356
Lymphocyte, Mean (SD), /ul	1.273(±0.960)	1.315(±0.9448)	1.068(1.010)	0.763
Urea, Mean (SD), mg/dl	26.75(±12.18)	25.74(±10.84)	31.62(±16.47)	0.016
Creatinine, Mean (SD), mg/dl	0.9385(±0.3339)	0.9175(±0.2875)	1.040(±0.4903)	0.056
ALT, Mean (SD), u/l	38.73(±21.99)	38.22(±21.85)	41.21(±22.55)	0.415
Bilirubin, Mean (SD), mg/dl	0.5638(0.2866)	0.5571(±0.2960)	0.5961(±0.2338)	0.156
Globulin, Mean (SD), g/dl	3.745(±0.5207)	3.711(0.5220)	3.912(±0.4830)	0.231
LDH, Mean (SD), u/l	326.8(±145.5)	296.6(±121.8)	467.0(±164.0)	0.001
CRP, Mean (SD), mg/L	76.90(±84.27)	60.77(±68.14)	154.5(±108.3)	0.039
LOST, Mean (SD),	11.59(±13.01)	8.982(±9.085)	25.17(±20.08)	0.001

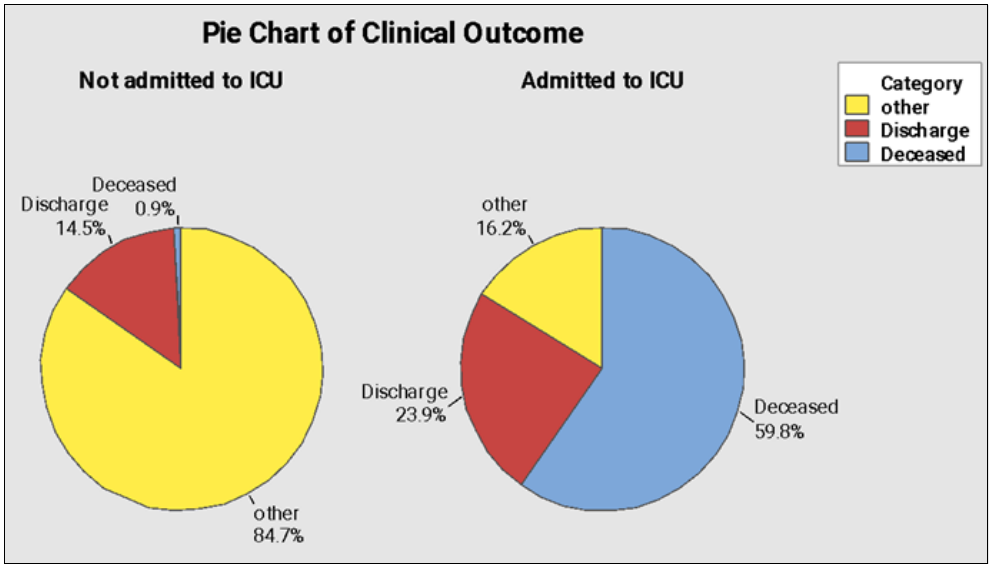

Fig 1: Comparison of Clinical Outcome of Covid-19 patients based on ICU admission

In this study, we describe the clinical characteristics, outcomes, and laboratory findings of confirmed COVID-19 patients admitted to a tertiary care hospital in Dubai in the first wave of the pandemic.

Matching with other epidemiological data from other countries, there was significant male predominance in the first wave and our study population was mostly presented by middle-aged men from non-UAE nationality. This is well explained by the country's demographic constitution where almost 90% of the resident population are is non-UAE nationals.

Diabetes Mellitus and obesity were the most important factors associated with COVID-19 clinical progression, ICU admission and final disease outcome. Other authors have studied in details COVID-19 prognostic factors and data from several papers has been consistent with this observation [22, 23].

Age on itself was another risk factor for disease progression and patients above the age of 50 years were at higher risk of severe infection and ICU admission. These patients will suffer from other medical comorbidities that increase their risk of ICU admission [24]. This was observed by other researchers as well [25, 26, 27]. However, patients were older in other studies in comparison to our cohort.

Shortness of breath in the setting of COVID-19 infection can signify severe COIV-19 pneumonia resulting ultimately in ICU admission. Zhao *et al*. looked into clinical presentation of patients admitted to the ICU patients and found that those who presented with SOB were more likely to requires higher levels of care (78.5% vs. 64.8%, p = 0.001) [28].

Chest imaging is an important diagnostic and prognostic tool in the setting of COVID-19 pneumonia. There have been several publications in this field starting from early group of infected patients in Wuhan. Studies have shown that patients with bilateral pulmonary opacifications were at higher risk of ICU admission and worse outcome. Patients with bilateral pneumonia also had higher oxygen requirements [18, 29-33].

Our study also pointed to other patient-related factors associated with higher risk of ICU admission like Diabetes Mellitus; higher body mass index; dyslipidemia, and Hypertension [34, 35].

Among tested biomarkers based on our National COVID-19 management guidelines; LDH was significantly higher in more sick patients who ended up in the ICU. This finding was also observed by other researchers in other studies where elevated LDH levels on admission can be considered an independent risk factor for the mortality and severity of COVID-19 [36, 37]. It is not specific to COVID-19 infection and higher levels reflects more systemic inflammation and higher disease burden.

Other inflammatory markers tested in our patients included CRP and procalcitonin. Indeed, we used them to stratify patients with concomitant bacterial pneumonia and reduce the use of antibiotics as part of active Antimicrobial stewardship activities during the pandemic. The presence of high CRP alone was not an indictor to start antibiotics and was taken into the context of more severe COVID-19 infection.

Other studies also looked into clinical significance of CRP and PCT as prognostic markers, mainly in patients with pneumonia [38, 39].

Study Limitation

This study has several limitations. The retrospective data collection design did not allow the capture of more detailed information; follow-up process was limited and not well structured in the first wave; some data were missing, particularly in the non-ICU patients, in addition, small sample size and single center experience could have affected the statistical significance of important risk factors and clinical parameters.

Conclusion

The United Arab Emirates took the lead in controlling the pandemic locally and globally from different aspects and proved its success in containing the damage. Among our admitted patients in the first wave; fever and respiratory complaints predominated the symptomatology and majority of patient had abnormal chest X ray signifying COVID-19 pneumonia. Some prognostic markers were associated with higher risk of ICU admission including some non-modifiable factors like age, gender, BMI and underlying co-morbids and overall mortality rates were high among patients admitted to the ICU. This is expected in the setting

of novel virus with multi-systemic presentation in the lack of effective specific anti-viral therapy and safe vaccines during the first wave of the pandemic.

Conflict of Interest
The authors declare no conflict of interest.

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Ethical Approval
Dubai Health Authority and hospital ethical committees approved the study. No potential risk to the patients was anticipated.

Data Availability Statement
Data used and/or analyzed during this study was extracted from a patient data system in a tertiary care hospital in Dubai.

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