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The Characteristics and the Outcome of Critically ill patients with Covid-19 in a Tertiary Care Hospital in Saudi Arabia: A Retrospective Review from the Critical Care Database Registry

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Abstract

Objective: *We aimed to describe the characteristics, identify the outcomes of critically ill patients with COVID-19, and assess the risk factors that affect the mortality of COVID-19 cases admitted to the tertiary care intensive care unit.*

Methods: *A retrospective review of the collected data in the critical care database registry from 200 patients confirmed with positive COVID-19 PCR admitted to the ICU at King Abdullah Medical City. The Registry includes data on ICU patient characteristics, procedures, treatments, and outcomes.*

Result: *200 patients with COVID-19 were identified during the study period. The average age of the study population was 59 years, with males representing 65% and females at 35%; the majority were comorbid (91.5%), and the commonest comorbidities identified were hypertension in 133 (66.5%), diabetes in 122 (61%), cardiac disease in 86 (43%). Moreover, chronic kidney disease was significantly higher in non-survival (P-value =0.018). Respiratory failure (86.5%) and septic shock (80%) were the most common reasons for ICU admission. 137 (68.5%) patients on mechanical ventilators and 42 (21%) patients required dialysis. 63 (31.5%) patients developed a hospital- acquired infection, and 57 (28.5%) patients developed delirium. Non-survivor had significantly higher urea, creatinine, bilirubin, AST, lower platelets, and failure of non-invasive ventilators.*

However, the independent predictors of mortality were urea >25, and AST>50. The ICU mortality in this study is 36%, while hospital mortality is 39%.

Conclusion*: In this study, comorbidities were highly prevalent among COVID-19 cases admitted to the ICU. However, chronic kidney disease may adversely affect the outcome. Higher urea and AST were independent predictors of mortality.*

Keywords: *COVID-19, ICU Registry, King Abdullah Medical City, therapeutic interventions, outcomes.*

Introduction

On March 11, 2020, the World Health Organization (WHO) declared that the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) had reached the epidemiological criteria to be characterized as a pandemic (1). The critical care beds within healthcare organizations became overwhelmed by COVID-19, with reported high mortality among critical care admissions. Many published studies described COVID-19 cases admitted to intensive care units; however, few published on the outcome of COVID-19 admitted to a tertiary care ICU.

Methods

This is a retrospective study conducted in the King Abdullah Medical City intensive care department, a 500-bed tertiary hospital in Makkah, Saudi Arabia. We collected data from an established critical care database registry. The Institutional Review Board (IRB) of King Abdullah Medical City approved this database registry. The data were extracted for patients with COVID-19 admitted to the ICU from March 2019 until December 2020. The data collected include age, gender, comorbidities, reasons for ICU admission, source of ICU admission, length of stay, laboratory results, radiological imaging, infection acquired during ICU admission, critical care scoring such as the Sequential Organ Failure Assessment (SOFA) score, Acute Physiology and Chronic Health Evaluation (APACHE) II and IV scores, therapeutic interventions, length of stay, and mortality.

Statistical analysis

The data were extracted from the registry system into SPSS version 23. The discrete variables were reported as frequencies and percentages, while the continuous variables were reported as the mean and standard deviation. The differences between the ICU survivors and non-survivors using the t-test or Mann-Whitney U test for continuous variables and the $\chi 2$ test or Fisher exact test for categorical variables. Multivariate logistic regression analyses were used to determine the predictors of ICU mortality. Only statistically significant factors ($P < 0.05$) on a univariate basis were introduced in the multivariate analysis.

Results

Variable	Patients with Covid-19 (n=200)
Age	
< 65	120 (60%)
≥ 65	80 (40%)
Mean ± SD	
Gender	
Male	130 (65%)
Female	70 (35%)
Nationality	
Saudi	142 (71%)
Non-Saudi	57 (28.5%)
Smoking	
Smoker	73 (36.5%)
Non smoker	127 (63.5%)
Source of admission	
In-patient department	104 (52%)
ER	96 (48 %)
Comorbidity	
None	17 (8.5%)
Hypertension	133 (66.5%)
Diabetes	122 (61%)
Chronic cardiac	86 (43%)
Chronic renal failure	38 (19%)
Chronic lung disease	22 (11%)
Cancer	21 (10.5%)
Hypothyroidism	12 (6%)
Chronic liver disease	2 (1%)
Reason of admission	
Respiratory failure	173 (86.5%)
Septic shock	160 (80%)
Cardiovascular emergencies	20 (10%)
Neurological diseases and disorders	11 (5.5%)
Symptoms	
None	4 (2%)
A feeling of being breathless or shortness of breath	175 (87.5%)
A high temperature	171 (85.5%)
A new, continuous cough	169 (84.5%)
A loss of the sense of smell or taste	113 (56.5%)
Feeling tired; having muscle aches or a headache	91 (45.5%)
Decrease level of consciousness	12 (6%)
Vomiting	4 (2%)
Diarrhea	3 (1.5%)

Table 1: Baseline characteristics and symptoms

Variable	Patients with Covid-19 (n=200)
APACHE II Mean ± SD Median (min-max)	 15.06 ± 8.48 14 (4-86)
APACHE IV Mean ± SD Median (min-max)	 51.06 ± 25.05 46 (9-135)
SOFA Mean ± SD Median (min-max)	 5.17 ± 4.07 4 (0-24)
WBC count < 11 ≥ 11 Mean ± SD	 131 (65.5%) 68 (34%) 10.7
Urea < 25 ≥ 25 Mean ± SD	 100 (50%) 90 (45%)
Creatinine < 1.5 ≥ 1.5 Mean ± SD	 131 (65.5%) 64 (32%)
AST < 50 ≥ 50 Mean ± SD	 112 (56%) 76 (38%)
ALT < 80 ≥ 80 Mean ± SD	 163 (81.5%) 25 (12.5%)
Bilirubin < 1.2 ≥ 1.2 Mean ± SD	 157 (78.5%) 30 (15%)
LDH < 300 ≥ 300 Mean ± SD	 23 (11.5%) 155 (77.5%)
ESR < 30 ≥ 30 Mean ± SD	 42 (21%) 144 (72%)

CRP	
< 10	110 (55%)
≥ 10	79 (39.5%)
Mean ± SD	
Ferritin	
< 400	43 (21.5%)
≥ 400	84 (42%)
Mean ± SD	
Procalcitonin	
< 1	97 (48.5%)
≥ 1	27 (13.5%)
Mean ± SD	
Platelet count	
< 100	15 (7.5%)
≥ 100	184 (92%)
Mean ± SD	
D-Dimer	
< 0.5	172 (86%)
≥ 0.5	5 (2.5%)
Mean	
Lymphocytes	
< 1	83 (41.5%)
≥ 1	107 (53.5%)
Mean ± SD	
Troponin	
< 0.05	0
≥ 0.05	51 (25.5%)
Mean ± SD	
Chest x-ray	
Normal	3 (1.5%)
Air space disease (Infiltration, Consolidation)	180 (90%)
Plural effusion	12 (6%)
Hyper-inflation	3 (1.5%)
Interstitial changes	2 (1%)
CT scan chest	
No	114 (57%)
Yes	86 (43%)
CT scan chest	
Air space disease (Infiltration, Consolidation)	72 (36%)
Plural effusion	8 (4%)
PE (Embolism)	3 (1.5%)
Hyper-inflation	2 (1%)
Interstitial changes	1 (.5%)

Table 2: Lab Investigations and Radiology

	Patients with Covid-19 (n=200)
Dialysis	42 (21%)
Vasopressors/Inotropes drugs used in shocked patients	94 (47%)
Norepinephrine	79 (39.5%)
Vasopressin	61 (30.5%)
Dopamine	41 (20.5%)
Epinephrine	40 (20 %)
Phenylephrine	16 (8%)
Sedation/ analgesia drugs	108 (54%)
Fentanyl	106 (53%)
Midazolam	78 (39%)
Propofol	69 (34.5%)
Ketamine	62 (31%)
Precedex (Dexmedetomidine)	27 (13.5%)
Morphine	5 (2.5%)
Mechanical ventilation	137 (68.5%)
Invasive ventilation	103 (51.5%)
Non-invasive ventilation	69 (34.5%)
High-flow Nasal Cannula	66 (33%)
Non-invasive ventilation shifted to mechanical ventilation	33 (16.5%)
Mechanical ventilation duration	
Mean ± SD	10.6 ± 13.6
Median (min-max)	6.5 (.0-89)
Anti-COVID Medications	
Favipiravir	111 (55.5%)
Dexamethasone	99 (49.5%)
Tocilizumab	80 (40%)
Lopinavir/ Ritonavir	54 (27%)
Interferon	47 (23.5%)
Methylprednisolone	31 (15.5%)
Ribavirin	29 (14.5%)
Hydroxychloroquine	18 (9%)

Table 3: Therapeutic interventions

	Patients with Covid-19 (n=200)
DNR	24 (12%)
Delirium	57 (28.5%)
Positive hospital-acquired infection	63 (31.5%)
Bacterial **Fungal**	49 (24.5%) 14 (7%)
Focus of infections Bloodstream infection Respiratory infection UTI	 44 (69.8%) 27 (42.9%) 20 **(**31.7%)
Length of ICU stay Mean ± SD Median (min-max)	 12 ± 12.9 9 (0-90)
ICU mortality	72 (36%)
Hospital mortality	78 (39%)

Table 4: Outcome Variable

Variable	Survivor (n=128)	Non-survivor (n=72)	P-value
Age < 65 ≥ 65	 78 (60.9%) 50 (39.1%)	 42 (58.3%) 30 (41.7%)	.718
Gender Male Fema le	 84 (65.6%) 44 (34.4%)	 46 (63.9%) 26 (36.1%)	.805
Nationality Saudi Non-Saudi	 90 (70.3%) 37 (28.9%)	 52 (72.2%) 20 (27.8%)	.738
Smoking Smoker Non- smoker	 43 (33.6%) 85 (66.4%)	 30 (41.7%) 42 (58.3%)	.255
Source of admission In-patient departmentER	 67 (52.3%) 61 (47.7%)	 37 (51.4%) 35 (48.6%)	.897

Comorbidity			
None	14 (10.9%)	3 (4.2%)	**.099**
Hypertension	84 (65.6%)	49 (68.1%)	.727
Diabetes	78 (60.9%)	44 (61.1%)	.981
Chronic cardiac	51 (39.8%)	35 (48.6%)	.229
Chronic renal failure	18 (14.1%)	20 (27.8%)	**.018**
Chronic lung disease	13 (10.2%)	9 (12.5%)	.611
Cancer	12 (9.4%)	9 (12.5%)	.489
Hypothyroidism	6 (4.7%)	6 (8.3%)	.297
Chronic liver disease	0 (0%)	2 (2.8%)	.058
Reason of admission	103	70 (97.2%)	**.001**
Respiratory failure	(80.5%)	64 (88.9%)	**.018**
Septic shock	96 (75%)	7 (9.7%)	.922
Cardiovascular emergencies	13 (10.2%)	2 (2.8%)	.205
Neurological diseases and disorders	9 (7%)		
Obesity (BMI)			
Overweight (25 – 30)	1 (.8%)	1 (1.4%)	
Obese Class I (30 – 35)	10 (7.8%)	2 (2.8%)	.502
Obese Class II (35 – 40)	18 (14.1%)	12 (16.7%)	
Obese Class III (>40)	98 (76.6%)	56 (77.8%)	
Symptoms			
None	3 (2.3%)	1 (1.4%)	.505
A feeling of being breathless or shortness of breath	108 (84.4%)	67 (93.1%)	.075
A high temperature	113 (88.3%)	58 (80.6%)	.136
A new, continuous cough	108 (84.4%)	61 (84.7%)	.948
A loss of the sense of smell or taste	76 (59.4%)	37 (51.4%)	.274
Feeling tired; having muscle aches or a headache	53 (41.4%)	38 (52.8%)	.121
Decrease level of consciousness	5 (3.6%)	7 (9.7%)	.096
Vomiting	3 (2.3%)	1 (1.4%)	.643
Diarrhea	3 (2.3%)	0 (0%)	.191
Lab investigations			
APACHE II			
Mean ± SD	13.9 ± 9.3	17 ± 6.1	**.000**
Median (min-max)	12 (4-86)	16 (6-41)	
APACHE IV			
Mean ± SD	44.8 ± 22.3	62.1 ± 25.8	**.000**
Median (min-max)	41 (9-125)	64 (19-135)	

SOFA Mean ± SD Median (min-max)	 4.1 ± 3.4 3 (0-14)	 6.9 ± 4.5 6 (1-24)	**.000**
WBC count < 11 ≥ 11	 82 (64.6%) 45 (35.4%)	 49 (68.1%) 23 (31.9%)	.618
Urea < 25 ≥ 25	 79 (64.2%) 44 (35.8%)	 21 (31.3%) 46 (68.7%)	**.000**
Creatinine < 1.5 ≥ 1.5	 90 (73.2%) 33 (26.8%)	 41 (56.9%) 31 (43.1%)	**.020**
AST < 50 ≥ 50	 77 (65.3%) 41 (34.7%)	 35 (50%) 35 (50%)	**.039**
ALT < 80 ≥ 80	 102 (86.4%) 16 (13.6%)	 61 (87.1%) 9 (12.9%)	.891
Bilirubin < 1.2 ≥ 1.2	 105 (89.7%) 12 (10.3%)	 52 (74.3%) 18 (25.7%)	**.005**
LDH < 300 ≥ 300	 18 (16.1%) 94 (83.9%)	 5 (7.6%) 61 (92.4%)	.103
ESR < 30 ≥ 30	 22 (18.6%) 96 (81.4%)	 20 (29.4%) 48 (70.6%)	.091
CRP < 10 ≥ 10	 65 (55.1%) 53 (44.9%)	 45 (63.4%) 26 (36.6%)	.263
Ferritin < 400 ≥ 400	 27 (32.9%) 55 (67.1%)	 16 (35.6%) 29 (64.4%)	.765
Procalcitonin < 1 ≥ 1 Mean ± SD	 65 (82.3%) 14 (17.7%)	 32 (71.1%) 13 (28.9%)	.147
Platelet count < 100 ≥ 100 Mean ± SD	 6 (4.7%) 121 (95.3%)	 9 (12.5%) 63 (87.5%)	**.046**
D-Dimer < 0.5 ≥ 0.5	 103 (95.4%) 5 (4.6%)	 69 (100%) 0	.070
Mean ± SD			

Lymphocytes < 1 ≥ 1 Mean ± SD	 50 (41%) 72 (59%)	 33 (48.5%) 35 (51.5%)	.315
Troponin < 0.05 ≥ 0.05 Mean ± SD	 0 25 (100%)	 0 26 (100%)	-
Therapeutics			
Dialysis Vasopressors/Inotropes drugs used in shockedpatients Sedation/ analgesia drugsMechanical ventilation	 10 (7.8%) 27 (21.1%) 42 (32.8%) 68 (53.1%)	 32 (44.4%) 67 (93.1%) 66 (91.7%) 69 (95.8%)	**.000** **.000** **.000** **.000**
High-flow Nasal Cannula	41 (32%)	28 (38.9%)	.483
Non-invasive ventilation shifted to mechanicalventilation	10 (7.8%)	23 (31.9%)	**.000**
Mechanical ventilation duration Mean ± SD Median (min-max)	 7.7 ± 7.5 6 (.0-39**)**	 13.6 **±** 17.3 **7** (.0-89)	**.033**
Anti-COVID-19 Medication Favipiravir Dexamethasone / MethylprednisoloneTocilizumab Lopinavir / Ritonavir Interferon Ribavirin Hydroxychloroquine	 69 (53.9%) 74 (57.8%) 46 (35.9%) 30 (23.4%) 25 (19.5%) 15 (11.7%) 13 (10.2%)	 42 (58.3%) 38 (52.8.8%) 34 (47.2%) 24 (33.3%) 22 (30.6%) 14 (19.4%) 5 (6.9%)	 .545 .491 .118 .130 .078 .136 .446
DNR	4 (3.1%)	20 (27.8%)	**.000**
Delirium	38 (29.7%)	19 (26.4%)	.986
Positive hospital-acquired infection	28 (21.9%)	35 (48.6%)	**.000**
Length of ICU stay Mean ± SD Median (min-max)	 8.8 ± 7.7 7 (0-39)	 17.5 ± 17.6 11 (0-90)	**.000**

Table 5: Variables for survivor and non-survivor

Variable	Unstandardized coefficients		Standardized coefficients		95% Confidence Interval for B	
	B	Std. error	Beta	Sig.	Lower	Upper
Urea ≥ 25	-1.124	.393	.325	**.004**	.151	.701
Creatinine ≥ 1.5	-.105	.395	.900	.791	.415	1.953
AST ≥ 50	-.663	.335	.515	**.048**	.267	.994
Bilirubin ≥ 1.2	-.510	.481	.600	.289	.234	1.542
Platelet count ≥ 100	.520	.694	1.682	.454	.151	.701

Table 6: multivariate Regression analysis

Results

Population characteristics

The average study population age is 58.7, with 40% at age 65 or above. Out of 200 patients, 130 (65%) are males, 70 (35%) are females, and 96 (48%) were admitted from the ER. The average calculated APACH VI is 51, while SOFA is 5.1. There are 73 (36.5%) smokers. Out of the total study population, there are 183 (91.5%) patients with comorbidities. The reported comorbidities are hypertension in 133 (66.5%), diabetes in 122 (61%), cardiac disease in 86 (43%), chronic kidney

disease in 38 (19%), chronic lung disease in 22 (11%), and cancer in 21 (10.5%). In this study, the most common symptoms at hospital presentation were fever in 175 (87.5%), cough in 171 (85.5%), and loss of smell and taste in 169 (84.5%). The most typical reasons for ICU admission are respiratory failure in 173 (86.5%) and septic shock in 160 (80%) patients. Regarding the reported high inflammatory markers in this study, we observed that the calculated mean of LDH is 542.7, ESR is 66, CRP is 10, ferritin is 948.1, pro-calcitonin is 7.2, the platelet count is 246.4, D-Dimer is 8.7, and troponin is 4.5. Chest imaging revealed that all patients had a chest x-ray done, while 86 patients had CT scans. Air space disease is the most common finding (90%). Among the study population, 94 (47%) patients required vasopressors, 42 (21%) required dialysis, and 137 (68%) required mechanical ventilation. The therapeutic medications used

in this study are favipiravir in 111 (55%), tocilizumab in 80 (40%), lopinavir/ritonavir in 47 (23.5%), interferon in 54 (27%), ribavirin in 29 (14.5%), hydroxychloroquine in 8 (9%), and corticosteroids in 130 (65%). Hospital-acquired infections occurred in 63 (31.5%) patients. The commonest site of infection is the bloodstream in 44 (69.8%), the respiratory tract in 27 (42.9%), and the urinary tract in 20 (31.7%). Delirium was present in 57 (28.5%). The mean ICU length of stay in this study was 12 days. The ICU and hospital mortality rates are 72 (36%) and 78 (39%), respectively.

Univariate analysis comparing survivors versus non-survivors:

Univariate analysis was done to compare the study variables between survivors and non-survivors. There is no significant difference between survivors and non-survivors in the demographic data. It was found that chronic renal failure is the only comorbidity reported significantly higher in non- survivors. Non-survivors have significantly higher ICU scores at admission for APACHE II (P0.00) APACHE IV (P0.000), and SOFA (P0.000). Dialysis, vasopressors, and mechanical ventilators were used significantly more in non-survivors (P 0.000). Non-survivor had significant urea $\geq$ 25, creatinine $\geq$ 1.5, AST $\geq$ 50, bilirubin $\geq$ 1.2 (P=0.000, P= 0.020, P=0.039, P=0.005 respectively), and platelets <100 (P=0.046). It is observed that there is no significant difference among survivors vs non-survivors in other biomarkers, such as D-dimer, ferritin, CRP, ESR, troponin, and LDH. There was no significant difference between the two groups in comparing the exposure of survivors versus non-survivors to drug therapy.

Multivariate analysis results:

Multivariate analysis has been conducted among all variables that revealed significant differences in univariate analysis between survivors and non-survivors to determine if there is an independent predictor of mortality.

Discussion

With the worsening of the COVID-19 pandemic, researchers and clinicians struggled to collect and formulate the data regarding clinical, and laboratory features, treatments, and outcomes of patients admitted to the ICU, which would further enhance their understanding of COVID-19 (2). We have

developed a comprehensive registry in the Intensive Care Unit. This registry collects data that would help to understand different diseases, risk factors, and prognoses, and provide insights for future research plans.

We extracted data from 200 Covid-19 patients confirmed by the PCR test. As we further analyzed the data, we observed several exciting findings in the patient variables, including characteristics and outcomes. Some of these variables did not confirm the current guidelines for managing these patients, as shown in different studies.

The most critical variable in our data is age, which showed no significant difference between survivors and non-survivors. In contrast, several studies have shown that older male patients have significantly higher mortality (3).

Similarly, none of the other baseline characteristics or comorbidities have shown worse outcomes except for patients with chronic kidney disease, especially if they need dialysis (4,5).

The most important reasons for admission to the ICU leading to non-survival were respiratory failure and septic shock, which was consistent with other studies (6,7). The higher the APACHE IV and SOFA scores, the worse the outcome was, as expected, as they were sicker and on vasopressors. The patients on mechanical ventilation did not do well. Several of these ventilated patients may be on higher doses of sedation. We did not study their cumulative effect. This observation of higher mortality separately in these two groups may require further trials to examine their cumulative effects.

Delirium is common in ICU patients, but their rate has been steadily declining since 2015, reaching up to 50%, because of improved inpatient care. However, as the pandemic worsens, the delirium rate is on the rise again as is mortality, both short-term and long-term (8). Our data did not show any rise in the rate of delirium in critically ill patients with COVID-19. We observed no statistical difference between survivors and non-survivors.

Patients requiring high-flow nasal cannula (HFNC) showed no mortality benefit. However, once we intubate and ventilate a patient, irrespective of whether they previously required HFNC, mortality increases, which may be partially related to ventilator-associated events.

Several laboratory markers of COVID-19 severity and prognosis have been described in the recent literature (9,10,11). Our data shows an increase in those markers. However, the only markers showing

increased mortality are a low platelet count and a high ESR, AST, and LDH level. Other markers, like d-dimer, ferritin, CRP, troponin, and lymphocyte count, have not shown any significant prognostic value.

The radiological data from chest X-rays and CT scans are consistent with other studies describing various findings (12).

The anti-COVID-19 medications used in these critically ill patients did not improve the outcome. Interferon showed a positive trend but did not reach statistical significance. A recent study at Imperial College London has shown a reduction in mortality in critically ill patients treated with tocilizumab. In addition, some observational studies have shown mortality benefits. Some recent trials and guidelines raised doubts regarding tocilizumab (13,14). Our data also showed no mortality benefit. Recently, the NIH and IDSA have recommended against using tocilizumab. The COVACTA trial showed no mortality benefit (14). To solve this dilemma, we need more randomized control trials.

In our data, patients who receive corticosteroids did not show any benefit. The RECOVERY trial in the United Kingdom showed mortality benefits with dexamethasone (15). The RECOVERY trial had two significant limitations. First, it was a non-blinded study. Second, 24% of patients were not sick enough and were not on oxygen, so mortality in such patients is likely to be low from the start. A systemic review and meta-analysis of ARDS patients on steroids also showed benefits (16). We need further studies to draw a more definite conclusion.

In this study, higher urea, creatinine, bilirubin, AST, lower platelets, and failure of a non-invasive ventilator were significantly identified among non-survivors. However, only urea above 25 and AST above 50 were identified as independent predictors of mortality. (17,18,19,20)

Finally, our data showed that ICU length of stay influenced overall ICU mortality, which reached 36% as compared to overall hospital mortality of 39%. (21)

Our study has several limitations. First, it was a retrospective observational study, which may have biases affecting generalizability and cannot prove a causal effect relationship. In addition, some data in the registry related to risk factors might not have been documented in the medical records. Second, it was a single-center study done in a single geographic region of the Kingdom of Saudi Arabia.

Thus, the inclusion of other centers and regions could have improved the quality of the study.

Conclusion

The COVID-19 pandemic has increased the need for research worldwide. With the surge in the pandemic, the healthcare system has been overwhelmed to such an extent that it has become a challenge to collect data. It is essential to develop a strategy to maintain a Hospital or ICU registry to improve and increase the pace of research. Research or a therapeutic trial may take years to complete if data is not maintained beforehand. The registry further enhances our understanding of the disease. Our data showed several clinical and non-clinical factors, including independent variables.

Comorbidities in this study population do not influence the outcome. However, chronic kidney disease may adversely affect the outcome. Among COVID-19 markers, the platelet count is the only independent predictor of mortality. Based on our results, we need further research with controlled trials to validate those results concerning the patient outcome.

Abbreviations

APACHE: Acute Physiology and Chronic Health Evaluation

SOFA: Sequential Organ Failure Assessment

ESR: Erythrocyte Sedimentation Rate

CRP: C-reactive protein

LDH: Lactate Dehydrogenase

ALT: Alanine Aminotransferase

AST: Aspartate Aminotransferase

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References

1. Cucinotta D, Vanelli M. WHO Declares COVID-19 a Pandemic. Acta Biomed. 2020 Mar 19; 91(1):157-160. doi: 10.23750/abm.v91i1.9397. PMID: 32191675; PMCID: PMC7569573.

2. Salluh, J.I.F., Arabi, Y.M. & Binnie, A. COVID-19 research in critical care: the good, the bad, and the ugly. Intensive Care Med 47, 470–472 (2021). https://doi.org/10.1007/s00134- 021-06367-5

3. Clara Bonanad MD, PhD, Sergio García-Blas MD, PhD, Francisco Tarazona-Santabalbina MD, PhD, Juan Sanchis MD, PhD, FESC, Vicente Bertomeu-González MD, et.al. The Effect of Age on Mortality in Patients with COVID-19: A Meta-Analysis with 611,583 Subjects. JAMDA. 2020; 21(7): 915-918. DOI:https://doi.org/10.1016/j.jamda.2020.05.045

4. Cai R, Zhang J, Zhu Y, Liu L, Liu Y, He Q. Mortality in chronic kidney disease patients with COVID-19: a systematic review and meta-analysis. Int Urol Nephrol. 2021; 53(8):1623- 1629. doi:10.1007/s11255-020-02740-3

5. Gibertoni D, Reno C, Rucci P, Fantini MP, Buscaroli A, Mosconi G, et al. (2021) COVID-19 incidence and mortality in non-dialysis chronic kidney disease patients. PLOS ONE 16(7): e0254525. https://doi.org/10.1371/journal.pone.0254525

6. Maximous, S., Brotherton, B. J., Achilleos, A., Akrami, K. M., Barros, L. M, et.al. & for the COVID-LMIC Task Force and the Mahidol-Oxford Research Unit (MORU). (2021). Pragmatic Recommendations for the Management of COVID-19 Patients with Shock in Low- and Middle-Income Countries, The American Journal of Tropical Medicine and Hygiene, 104(3_Suppl), 72-86. Retrieved Jul 20, 2021, from https://www.ajtmh.org/view/journals/tpmd/104/3_Suppl/article-p72.xml

7. Santus P, Radovanovic D, Saderi L, Marino P, Cogliati C, De Filippis G, Rizzi M, Franceschi E, Pini S, Giuliani F, Del Medico M, Nucera G, Valenti V, Tursi F, Sotgiu G. Severity of respiratory failure at admission and in-hospital mortality in patients with COVID-19: a prospective observational multicentre study. BMJ Open. 2020 Oct 10; 10(10):e043651. doi: 10.1136/bmjopen-2020-043651. PMID: 33040020; PMCID: PMC7549463.

8. Marengoni A, Zucchelli A, Grande G, Fratiglioni L, Rizzuto D. The impact of delirium on outcomes for older adults hospitalised with COVID-19. Age Ageing. 2020 Oct 23; 49(6):923- 926. doi: 10.1093/ageing/afaa189. PMID: 32821901; PMCID: PMC7499475.

9. Pan F, Yang L, Li Y, Liang B, Li L, Ye T, Li L, Liu D, Gui S, Hu Y, Zheng C. Factors associated with death outcome in patients with severe coronavirus disease-19 (COVID-19): a case-control study. Int J Med Sci 2020; 17(9):1281-1292. doi:10.7150/ijms.46614. Available from https://www.medsci.org/v17p1281.htm

10. Yang X, Yang Q, Wang Y, Wu Y, Xu J, Yu Y, Shang Y. Thrombocytopenia and its association with mortality in patients with COVID-19. J Thromb Haemost. 2020 Jun; 18(6):1469-1472. doi: 10.1111/jth.14848. Epub 2020 May 4. PMID: 32302435.

11. Henry BM, Aggarwal G, Wong J, et al. Lactate dehydrogenase levels predict coronavirus disease 2019 (COVID-19) severity and mortality: A pooled analysis. Am J Emerg Med. 2020; 38(9):1722-1726. doi:10.1016/j.ajem.2020.05.073

12. Xu Y, Dong J, An W, Lv X, Yin X. Clinical and computed tomographic imaging features of novel coronavirus pneumonia caused by SARS-CoV-2. J Infect. 2020; 80(4):394–400. Pmid: 32109443. DOI: https://doi.org/10.1016/j.jinf.2020.02.017

13. Parr JB. Time to Reassess Tocilizumab's Role in COVID-19 Pneumonia. JAMA Intern Med. 2021; 181(1):12–15. doi:10.1001/jamainternmed.2020.6557

14. Furlow B. COVACTA trial raises questions about tocilizumab's benefit in COVID-19. Lancet Rheumatol. 2020 Oct; 2(10): e592. doi: 10.1016/S2665-9913(20)30313-1. Epub 2020 Sep 9. PMID: 32929415; PMCID: PMC7480990.

15. RECOVERY Collaborative Group, Horby P, Lim WS, Emberson JR, Mafham M, Bell JL, Linsell L, Staplin N, Brightling C, Ustianowski A, Elmahi E, Prudon B, Green C, Felton T, Chadwick D, Rege K,

Fegan C, Chappell LC, Faust SN, Jaki T, Jeffery K, Montgomery A, Rowan K, Juszczak E, Baillie JK, Haynes R, Landray MJ. Dexamethasone in Hospitalized Patients with Covid-19. N Engl J Med. 2021 Feb 25; 384(8):693-704. doi: 10.1056/NEJMoa2021436. Epub 2020 Jul 17. PMID: 32678530; PMCID: PMC7383595.

16. Hasan SS, Capstick T, Ahmed R, et al. Mortality in COVID-19 patients with acute respiratory distress syndrome and corticosteroids use: a systematic review and meta- analysis. Expert Rev Respir Med. 2020; 14(11):1149-1163. doi:10.1080/17476348.2020.1804365

17. Sharma J, Rajput R, Bhatia M, Arora P, Sood V. Clinical Predictors of COVID-19 Severity and Mortality: A Perspective. Front Cell Infect Microbiol. 2021 Oct 25;11:674277. doi: 10.3389/fcimb.2021.674277. PMID: 34760713; PMCID: PMC8573222.

18. Bi X, Su Z, Yan H, Du J, Wang J, Chen L, Peng M, Chen S, Shen B, Li J. Prediction of severe illness due to COVID-19 based on an analysis of initial Fibrinogen to Albumin Ratio and Platelet count. Platelets. 2020 Jul 3;31(5):674-679. doi: 10.1080/09537104.2020.1760230. Epub 2020 May 5. PMID: 32367765; PMCID: PMC7212543.

19. Alirezaei T, Hooshmand S, Irilouzadian R, Hajimoradi B, Montazeri S, Shayegh A. The role of blood urea nitrogen to serum albumin ratio in the prediction of severity and 30-day mortality in patients with COVID-19. Health Sci Rep. 2022 May 6;5(3):e606. doi: 10.1002/hsr2.606. PMID: 35572169; PMCID: PMC9075606.

20. Paliogiannis P, Zinellu A. Bilirubin levels in patients with mild and severe Covid-19: A pooled analysis. Liver Int. 2020 Jul;40(7):1787-1788. doi: 10.1111/liv.14477. Epub 2020 May 22. PMID: 32304343; PMCID: PMC7264680.

21. Alwafi H, Naser AY, Qanash S, Brinji AS, Ghazawi MA, Alotaibi B, Alghamdi A, Alrhmani A, Fatehaldin R, Alelyani A, Basfar A, AlBarakati A, Alsharif GF, Obaid EF, Shabrawishi M. Predictors of Length of Hospital Stay, Mortality, and Outcomes Among Hospitalised COVID-19 Patients in Saudi Arabia: A Cross-Sectional Study. J Multidiscip Healthc. 2021 Apr 15;14:839-852. doi: 10.2147/JMDH.S304788. PMID: 33883900; PMCID: PMC8055273.