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Original Research Article

Evaluation of Bun/Creatin Ratio as Mortality Indicator in COVID-19 Patients in ICU

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Abstract: ***Introduction:*** COVID-19 infection has spread with the development of the pandemic and is transmitted by respiratory droplets. Severe and critically ill patients may deteriorate rapidly and progress to multiple organ failure and death. It is imperative to determine the prognostic values associated with this disease. We aimed to test the strength of the bun/creatinine ratio in predicting mortality in critically ill patients in the infected group. ***Material and method:*** 158 patient data were included in our study after ethics committee approval. The blood results in intensive care units were analyzed, and the patients were grouped as group 1 and group 2. Age, gender, comorbid conditions, bun creatinine, and other blood values were compared statistically. With this comparison, the effects on mortality and clinical features were evaluated. ***Results:*** The study included 158 patients between Mar 31 and Dec 31, 2020. Routine blood tests were seen in these patients according to the intensive care evaluation criteria. It was observed that bun, creatinine, IL-6, CRP values were higher, and GFR, total protein values were lower in the patients who lost their lives. The bun/creatinine ratio was similar between the groups. ***Conclusion:*** It was found that urea and creatinine could help in demonstrating mortality in critical intensive care patients. The bun/creatinine ratio was not associated with mortality in covid 19 infected critical intensive care patients. Studies with larger numbers of patients are needed.

Keywords: COVID-19, BUN/creatinine ratio, mortality.

INTRODUCTION

At the end of 2019, novel coronavirus pneumonia (COVID-19) broke out and spread rapidly in China and other countries [1]. It is transmitted by respiratory droplets and contact [2], and the prognosis is thought to be worse in the elderly and those with comorbidities [3, 4]. Although most patients with COVID-19 have a mild illness, severe and critically ill patients can rapidly progress to acute respiratory distress syndrome, septic shock, multiorgan failure, and even death [1]. It is imperative to identify prognostic indicators of disease severity to aid in the implementation of early measures.

Several studies have suggested that a high BUN/creatinine (BCR) ratio is associated with long-term intensive care and mortality in critically ill patients [5, 6].

Remarkably, a recently published article showed that the combination of developing chronic kidney disease or acute kidney injury during hospitalization in patients with COVID-19 was significantly associated with in-hospital mortality [7]. It is assumed that patients with BCR may have changed during their hospitalization and that BCR may be considered as a prognostic marker of serious illness and mortality.

The novel coronavirus disease (COVID-19) causes high morbidity and mortality. This study aimed to test whether the blood urea nitrogen/creatinine ratio (BCR) is predictive for mortality in critically ill patients infected with COVID-19.

MATERIAL AND METHOD

Our study is retrospective; Patients diagnosed with covid 19 in the adult intensive care unit between Mar 30 and Dec 31, 2020, were included in the study. After obtaining ethics committee approval, 170 patient data were scanned. . Twelve patients with chronic renal failure were excluded from the study. 158 patients were included in the study. After being taken to the intensive care unit, the blood results were analyzed. The patients were divided into two groups. Patients who died were included in Group 1 (Group 1), and other patients were included in Group 2 (Group 2).

Inclusion and exclusion criteria from the study

Despite the 5 lt/min 100% oxygen support (with a reservoir oxygen mask), the patients whose respiratory distress continued (respiratory rate (SS) >20 and oxygen saturation (spo2) <90) were taken to the intensive care unit. Apart from this, patients who underwent emergency endotracheal intubation and received invasive mechanical ventilation support when they came to the emergency room were also taken to the intensive care unit.

Criteria for admission to intensive care

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Statistical Analysis

SPSS v20 program was used in the analysis of the data. Categorical variables were given as numbers and percentages, and numerical variables as mean and standard deviation. CI-Square test was used for the distribution of categorical variables between groups. The suitability of the numerical variables to the normal distribution was examined by the Kolmogorov-Smirnov test and the graphing method. Mann Whitney-U test was used for comparisons of normally distributed numerical variables and t-test for homogeneous data. P<0.05 was considered statistically significant. The correlation of the data was analyzed by Pearson correlation analysis.

RESULTS

There were 105 patients in group 1 and 53 patients in group 2. While the mean age of group 1 was 74±12, the mean age of group 2 was 69±11. The presence of 2 or more diseases was found to be significantly higher in group 1. There was a difference between the groups in terms of age and two or more diseases. P:0.00 and p:0.04, respectively. A positive correlation was found between advanced age, the presence of two or more diseases, and death. (p:0.01 r:0.201) and (p:0.04 r:0.161), respectively. Demographic data and clinical characteristics of the patients are shown in Table 1.

Table 1: Demographic data and clinical characteristics of the patients

	Group 1 (N:105)	Group 2 (N:53)	TOTAL	N	P
AGE	74±12	69±11	158	158	0,00
FEMALE/MALE	44/61	21/32	65/93	158	0,78
DURATION HOSPİTAL	11±8	16±21	158	158	0,29
DM	41	21	62	158	0,94
HT	79	36	115	158	0,32
CARDIOVASCULAR DISEASE	31	12	43	158	0,35
CHRONİC LUNG DİSEASE	26	11	37	158	0,57
CEREBROVASCULAR DISEASE	14	9	23	158	0,53
TWO OR MORE COMORBIDITIES	69	26	95	158	0,04

DM: Diabetes Mellitus, HT: Hypertension

A significant difference was found between groups 1 and 2 in terms of urea and creatinine. p:0.03 and p:0.04, respectively. The variation of blood parameters between the groups is shown in Table 2.

A positive correlation was found between creatinine and death (p:0.01) and (r:0.18). A negative correlation was found between GFR and death (p:0.00) and (r:-0.24). No correlation was found between BCR and death (p>0.05).

Table 2: Comparison of the laboratory results of the groups

	Group 1		Group 2		P
	Mean±SD	N	Mean±SD	N	
Albumin g/dl	3±0,4	104	3,2±0,3	52	0,16
Ürea mg/dl	57±47	105	63±69	53	0,03
Creatinine mg/dl	0,9±0,3	105	1±0,5	53	0,04
Ürea/creatinine	55±19	105	77±112	53	0,68
GFR	71±26	105	78±19	52	0,00
T Proteine mg/dl	5,6±0,6	74	6±0,6	38	0,02
LDH IU/l	465±193	77	347±135	45	0,00
Na mmol/l	138±4	105	135±4	53	0,00
Potasium mmol/l	4±0,6	104	4,2±0,5	52	0,38
Cl mmol/l	102±5	105	95±19	53	0,14
Ca mg/dl	8,1±0,7	104	8,3±0,4	53	0,00
Phosphorus mg/dl	2,8±1,1	64	2,8±0,9	34	0,79
Mg mg/dl	2±0,3	98	1,9±0,2	49	0,24
Lökositcells/mm^3	11±5	105	10±4	53	0,50
Nötrofilcells/mm^3	10±4	105	8±4	53	0,04
Lenfositcells/mm^3	0,8±0,6	105	1,6±3	53	0,06
Hgb gr/dl	12±1	105	12±1	53	0,02
Rbcfl	4,2±0,4	104	4,2±0,6	53	0,13
Pltcells/µl	220±73	105	269±110	53	0,06
MPVfl	10,4±1,3	104	13±1,6	53	0,050
CRP mg/l	139±82	105	110±74	53	0,04
Prokalsitonine ng/ml	0,8±1,2	100	0,7±2,0	50	0,00
İGAng/ml	2,8±1,4	98	2,5±0,9	48	0,00
IL 6ng/ml	161±150	102	145±412	50	0,00

GFR: Glomerular filtration rate, LDH: Lactate dehydrogenase, Hgb: Hemoglobin, Rbc: Red blood cell, Plt: Platelet, Mpv: Mean platelet volume, CRP: C Reactive Protein, IGA: immunoglobulin A, IL6: Interleukin-6.

DISCUSSION

One of the features observed during the COVID-19 outbreak is that the time between the onset of this infection and the average time to hospital admission is approximately one week. Multiorgan failure, which may develop in this process, has been shown as one of the important causes of mortality [7]. It is known that multiorgan failure has also been observed in previous coronavirus outbreaks [8]. The fact that acute kidney injury induced by COVID-19 disease is associated with severe disease and more severe disease in chronic renal failure patients indicates one of the vital points with developing multiorgan failure [9]. Therefore, urea and creatinine values in patients should be associated with clinical features. It needs to be examined and may carry one of the guiding features in treatment. There are many factors in the pathogenesis of acute kidney injury in Covid-19 infection. Among these, causes such as hypoxia, shock, and rhabdomyolysis are counted, and it is thought that virus-derived cytokines may be the cause [10]. Some studies have shown that albumin leakage and massive proteinuria develop in the urine, and high BUN value may develop in covid 19 patients [11]. We included critically ill patients. When these patients were taken to the intensive care unit, their kidney enzyme levels were checked. According to the results of these values, it was determined that BUN, creatinine values were statistically higher in group 1 patients who died compared to group 2 patients. Moreover, the GFR value calculated by the MDRD method was found to be statistically higher in group 1 patients. Considering that all of the patients are patients in critical condition, kidney functions on mortality are seen. Together with this and the factors that cause high creatinine, the increased renin-angiotensin-aldosterone system in COVID-19 patients and the resulting decrease in glomerular filtration and its excretion may be caused [12]. Again in our study, we think that the increase in albumin and total protein values may have developed secondary to the development of renal damage and the high creatinine values in group 1 patients.

Studies have shown that advanced age and comorbid diseases affect the mortality rate [13]. Male gender, the presence of hypertension and heart diseases were classified as high risk [14] leukocytosis, high LDH and D dimer levels, increase in CRP, IL-6, and neutrophil counts were also counted among the risk factors for mortality [15] in our study, the urea and creatinine values of the patients Besides, we compared other clinical features. Similarly, it shows a statistical difference for group 1 patients who died in advanced age. There was no statistical difference between the comorbidities of the patients. However, the presence of two or more comorbid diseases was higher in group 1 patients, indicating that the mortality rate increased significantly with the increase in the number of comorbid diseases in the patients. In addition,

infectious parameters such as CRP, IL-6, and procalcitonin were found to be high in group 1 patients. Along with these features, it can be said that the risk of death is higher in elderly individuals with multiple comorbidities and in individuals with increased infectious parameters. In addition, the presence of high urea and creatinine levels in group 1 patients who lost their lives can be considered as a warning in terms of mortality.

Liu *et al*., [16] show that BCR can be an informative marker in patients with COVID-19 disease monitoring in their study. Ok *et al*., [17] show that BCR is useful in determining disease severity in COVID-19 patients. In our study, no statistical difference was observed in the bu/creatinine values between the groups of the patients. Although there was a significant relationship between urea and creatinine values and death in our study, no significant relationship was found between BCR and death. This may be because we included only critical intensive care patients in our study and excluded patients with chronic renal failure.

CONCLUSION

It has been found that urea and creatinine can be helpful in demonstrating mortality in critical intensive care patients. On the other hand, UCO was not associated with mortality in covid 19-infected critical intensive care patients. Studies with larger numbers of patients are needed.

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