The Effect of Urea/Albumin Ratio on Mortality in the Geriatric Patients Admitted in the Intensive Care Unit

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ABSTRACT

Objective: To analyse the effect of urea albumin ratio on mortality in intensive care patients aged over 65 years.

Study Design: An observational study.

Place and Duration of the Study: Health Sciences University, Ankara Training and Research Hospital, Emergency Critical Intensive Care Unit, from October 2021 to March 2022.

Methodology: Patients over 65 years of age admitted in the intensive care unit were included in this study, and the laboratory and clinical data were recorded within the first 24 hours after the admission of the patient. The urea : albumin ratio was calculated using serum urea and albumin concentrations. All the patients were monitored during intensive care admission and mortality rates were recorded; additionally 1-month mortalities of the patients were also recorded. The data of the survivors and non-survivors were compared.

Results: There were 362 patients with mean age of 79.00±8.40 years; 53.9% were females. The median urea : albumin ratio was found to be 22.8 mg/gr. The area under curve, sensitivity and specificity values were found to be 0.631, 68%, and 56% at a cut-off value of 22.1 mg/gr for urea : albumin ratio, respectively. In addition, urea : albumin ratio >22.1mg/gr was found to be significant in univariate regression analysis ($p<0.001$) and multivariate regression analysis ($p<0.002$) for the predictive value of 1-month mortality.

Conclusion: Urea : albumin ratio is a simple and potentially useful prognostic factor in the geriatric patient population admitted in the intensive care unit.

Key Words: *Geriatrics intensive care unit, Urea:albumin ratio, Mortality (MeSH database).*

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INTRODUCTION

In recent years, a remarkable increase has been encountered in the elderly patient population presented to the emergency department (ED) and/or who were admitted in the intensive care unit (ICU) world-wide and in the authors' country. In a study conducted in the USA between 1997 and 2018, hospital admissions of geriatric patients were found to be significantly higher among all age groups, with a rate of 21-23%.[1] Since many years, studies have addressed the scoring systems and clinical parameters that may be used in predicting the prognosis of the patients admitted in the ICU. Several scoring systems such as Sequential Organ Failure Assessment (SOFA) and Quick Sequential Organ Failure Assessment (qSOFA) for sepsis and confusion, uremia, respiratory rate, blood pressure (age ≥65 years), and Pneumonia Severity Index for pneumonia are used in predicting the prognosis.[2,3]

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However, these are not always easily calculated, particularly in the elderly patients, and easily accessible, low-cost and simply applicable ideal biomarkers that can be easily adapted to the routine clinical practice are needed.

The serum urea : albumin ratio (UAR) is a prognostic biomarker that was discovered in the recent years. Serum urea is a consequence of the balance between production, metabolism and excretion of urea, and it is a biomarker that provides important information about the clinical condition of the patients such as renal hypoperfusion, low coronary flow rate, dehydration, and neurohumoral activity.[4] Urea level can be affected by many factors such as protein intake, glomerular filtration, catabolism of the endogenous proteins, blood volume, and upper gastrointestinal haemorrhage.[5] Therefore, it is not accepted as a factor that directly exhibits the system failure. It has been reported that the high level of urea is associated with mortality in many diseases, particularly among elderly patients in ICU.[6,7] Albumin is a negative acute phase reactant and an essential protein with many physiological roles. It influences organ functions directly and indirectly, and it also indicates the nutritional state of the patient.[8] It has been reported that low serum albumin level is an independent risk factor in diseases with high mortality rates such as pneumonia, COVID-19, pancreatitis and acute coronary syndrome in the geriatric patient population.[9-13]

Recent studies have denoted that high UAR value is a mortality indicator in pneumonia, sepsis and the ICU patients.[14-16] This study aimed to prospectively investigate the relationship of UAR with in-hospital mortality and 1-month mortality independently from the clinical diagnosis in the geriatric patients admitted in the ICU.

METHODOLOGY

It was a single-centre, prospective and observational, clinical study conducted on the geriatric patient population admitted in the ICU of Health Sciences University, Ankara Training and Research Hospital, Emergency Critical Intensive Care Unit, from October 2021 to March 2022. All the patients aged over 65 years admitted in ICU of the hospital were included. The patients who were on the routine dialysis programme for end-stage chronic kidney disease (CKD), those who stayed in the ICU for shorter than 24 hours and those from whom consent could not be taken personally or from their relatives were excluded from the study. This study was started at after obtaining the approval (E-21-754) from the Ethics Committee of the hospital, and all the patients aged over 65 years admitted in the ICU within the 6 months from the beginning of the study were recorded.

Demographic data (age, gender), vital signs (systolic/diastolic blood pressure, heart rate, SpO_2, fever, blood glucose level, respiration rate), comorbidities [diabetes mellitus (DM), cerebrovascular disease (CVD), hypertension (HT), congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), coronary artery disease (CAD), malignancy, chronic kidney disease (CKD)], features at admission in ICU (admission diagnosis, need for inotropes, need for dialysis and ventilation), laboratory findings at time of admission in ICU (urea, albumin, creatinine, sodium, potassium, alanine aminotransferase (ALT), aspartate aminotransferase (AST), pH, lactate, HCO_3, CO_2, haemoglobin, platelet, and white blood cell counts), scores from Acute Physiology and Chronic Health Evaluation (APACHE II), SOFA and qSOFA scoring systems, admission durations, the numbers of in-hospital mortality, and 1-month mortalities of the patients were recorded. The mortality information of the patients in one month was scanned from the hospitals information processing system and the national mortality registration system. UAR (mg/gr) was calculated by baseline serum urea (mg/dL) / serum albumin (gr/dL).

The primary endpoint of this study was to evaluate the in-hospital mortality incidence of the patients over 65 years of age admitted in the ICU. The secondary endpoints were to evaluate 1-month mortality, scores from ICU scoring systems (APACHE 2, SOFA, qSOFA), need for invasive procedures (mechanical ventilation, non-invasive mechanical ventilation, etc.), need for positive inotropes and hospital-admission durations.

According to automatic G power analysis, a statistical error margin of 0.05, statistical power of 0.95 and an effect size of 0.27 were obtained with inclusion of 356 patients. Therefore, a minimum of 356 patients were included.

The descriptive statistics of continuous data were given as mean, standard deviation, median, IQR values while discrete data were presented as numbers and percentage values. Kolmogorov-Smirnov test was utilised for evaluating distribution normality of the data. The comparison of normally distributed continuous data between survivors and non-survivors was performed using Student's t-test while Mann-Whitney U test was used for non-normally distributed data. Chi-square and Fisher's exact tests were used for group comparisons between nominal variables (cross tables). The diagnostic performance of laboratory values was evaluated with the area under ROC curve (AUC). The optimal cut-off point was calculated using Youden's index. The laboratory values were evaluated using diagnostic accuracy scales (sensitivity, specificity, positive predictive value [PPV], negative predictive value [NPV]). The risk factors influencing in-hospital mortality were analysed with univariate and multivariate logistic regression analyses. The statistical evaluation was carried out using IBM SPSS for Windows 20.0 (SPSS Inc. Chicago, IL) software and statistical significance level was accepted as $p<0.05$.

RESULTS

During the study period, 398 patients over 65 years of age, hospitalised in the intensive care unit were included in the study. Patients who refused to participate in the study with their consent or with legal permission of their closest relatives (n = 16), CKD patients included in routine dialysis programme (n = 12), and patients with stay of less than 24 hours (n=8) in the ICU were excluded from the study. The remaining 362 patients were included in the study.

The mean age was 79.00±8.40 years (65-97 years) and 53.9% were females. The median value of UAR was found to be 22.8 mg/gr (2.8-169). The median admission duration in the ICU was 5.5 (3-10) days. The in-hospital mortality rate was 33.7% (n=122) while 1-month mortality rate was found to be 47% (n = 170). The most common cause for admissions in the ICU was infection (25.7%). The most frequent comorbidity was HT by 71.8% between 362 patients. There was a need for inotropic support, dialysis treatment, non-invasive mechanical ventilation (NIMV), and invasive mechanical ventilation (IMV) in 38.7%, 17.4%, 33.4%, and 22.7% of the patients, respectively. The characteristics of the study population are demonstrated in Table I.

The demographic and vital characteristics of the survivors and those who died in the hospital are compared and summarised in Table II. The median urea values of the non-survivors were found significantly higher than the survivors survivor group; 70 mg/dl (43.2-113.7), non-survivor group; 87 mg/dl (63.2-145.2, $p<0.001$). The median albumin level was detected to be significantly lower in the non-survivor patients compared with survivor patients (survivor group; 36 gr/L (32-40), non-survivor group; 34 gr/L (29.7-38), $p<0.001$. The median UAR value of the non-survivor patients was found higher compared with survivor patients (survivor group; 20.2 mg/gr (11.1-33.9), non-survivor group; 27.8 mg/gr (18.9-47.6), $p<0.001$.

Table I: The demographic characteristics of patient population.

Parameters	n=362
Age (year) [a]	79.00±8.40
Gender [b]	
Male	167 (46.1%)
Female	195 (53.9%)
Vital signs	
SBP (mmHg)	118 (90-145)
DBP (mmHg)	67 (52-80)
HR (min)	95 (78-110)
SPO_2 (%)	88 (80-92)
Temperature (°C)	36.5 (36.3-37.0)
RR (min)	25 (18-30)
Medical History	
Diabetes Mellitus [b]	153 (42.3%)
Cerebrovascular Disease [b]	131 (36.2%)
Hypertension [b]	260 (71.8%)
CHF [b]	96 (26.5%)
Asthma-COPD [b]	104 (28.7%)
CAD [b]	143 (39.5%)
Malignancy	29 (8%)
CKD [b]	35 (9.7%)
ICU admission	
Hospitalisation diagnosis [b]	
CNS	63 (17.4%)
Pulmonary	65 (18%)
Cardiac	31 (8.6%)
Renal	39 (10.8%)
GIS	26 (7.2%)
Infection	93 (25.7%)
Endocrine	9 (2.5%)
Post CPR	34 (9.4%)
Intoxication	2 (0.6%)
Inotrope [b]	140 (38.7%)
Dialysis [b]	63 (17.4%)
Ventilator [b]	
Invasive	82 (22.7%)
Non-Invasive	121 (33.4%)
Laboratory parameters [a]	
Urea (mg/dL) [18-55 mg/ dL]	79.5 (46-126)
Albumin (g/L) [35-52 g/L]	36 (31.75-39)
UAR (mg/g)	22.8 (12.4-38.8)
Creatinine (mg/dL) [<1.2 mg/ dL]	1.42 (0.94-2.24)
Sodium (mEq/L) [136-145mEq/L]	137 (133.75-140)
Potassium (mEq/L) [3.5-5 mEq/L]	4.52 (4.03-5.30)
AST (IU/L) [0-37 IU/L]	23 (15-40)
ALT (IU/L) [0-41 IU/L]	15 (10-29.75)
pH [7.35-7.45]	7.33 (7.23-7.39)
Lactate (mmol/L) [0.4-2.2 mmol/L]	2.6 (1.6-4.3)
HCO_3 (mEq/L) [22-26 mEq/L]	21 (15.9-24.8)
CO_2 (mmHg) [35-45 mmHg]	41.9 (34.97-50.4)
Hgb (gr/dL) [13.5-18 gr/dL]	11.6 (9.6-13.4
WBC [c] ($x10^3$ µl) [4-10.5 $x10^3$ µl]	11.82 (8.04-16.30)
PLT ($x10^3$ µl) [150-450 $x10^3$ µl]	233.5 (174.5-304)
APACHE 2	22 (18-29)
SOFA	6 (4-9)
QSOFA	2 (1-2)
Hospitilisation findings	
LOS	5.5 (3-10)
Hospital ex [b]	
Mortality	122 (33.7)
Discharged	240 (66.3)
Mortality (1 month) [b]	
Mortality	170 (47)
Survive	192 (53)

SBP, Systolic blood pressure; DBP, Diastolic blood pressure; HR, Heart rate; RR, Respiratory rate; CHF, Congestive heart failure; COPD: Chronic obstructive pulmonary disease, CAD, Coronary artery disease; CKD, Chronic kidney disease; ICU, Intensive care unit; CNS, Central nervous system; GIS, Gastrointestinal tract; CPR, Cardiopulmonary resuscitation; UAR, Urea : albumin ratio; AST, Aspartate aminotransferase; ALT, Alanine aminotransferase; WBC, White blood cell; PLT, Platenet; APACHE II, Acute Physiology and Chronic Health Evaluation; SOFA, Sequential Organ Failure Assessment Score; Qsofa, Quick Sequential Organ Failure Assessment Score; LOS, Length of stay.
a: Data are mean ± standard deviation.
b: Data are presented as n (%).
c: Data are presented as median (25%-75%).

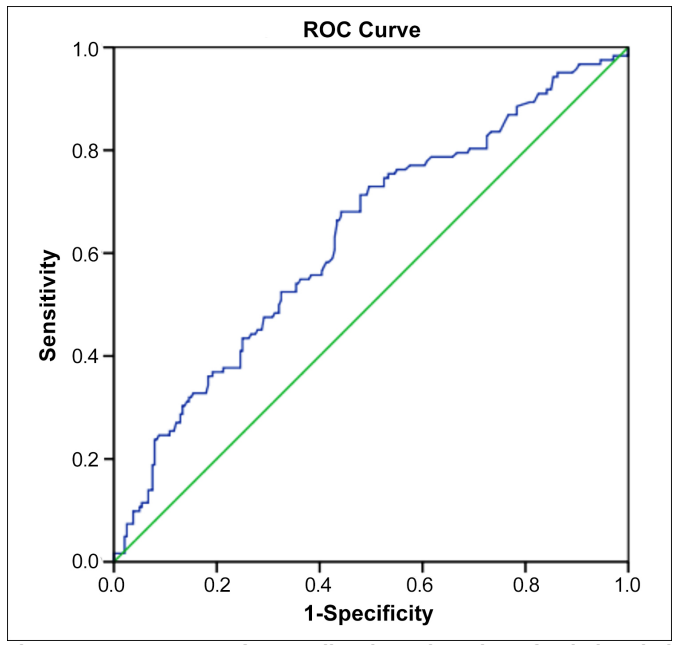

Figure 1: ROC curve of Urea/Albumin ratio values for in-hospital mortality.

The biochemical parameters and scores were evaluated by ROC analysis to determine the powers and to differentiate in-hospital mortality in the geriatric patients admitted in ICU. AUC, sensitivity, specificity, PPV, and NPV were found to be 0.631, 68%, 56%, 44%, and 77% at a cut-off value of 22.1 mg/gr for UAR, respectively (Figure 1). As a result of ROC analysis, AUCs for urea, albumin, lactate values were found to be 0.608, 0.609, 0.650, respectively ($p \leq 0.001$). Furthermore, $p < 0.001$ after ROC analysis for APACAHE II, SOFA and q SOFA scores, and AUC values were 0.711, 0.735, 0.712, respectively.

Univariate and multivariate logistic regression analyses were performed to determine the risk- factors effective on in-hospital mortality and 1-month mortality (Table III). Univariate logistic regression analysis showed an OR value of 2.690 (95% CI, 1.702 – 4.253, $p<0.001$) for in-hospital mortality with UAR values higher than 22.1 mg/gr. Multivariate logistic regression analysis for UAR demonstrated an OR value of 2.912 (95% CI, 1.538 – 5.516, $p =0.001$) with the same cut-off value. Also, for 1-month mortality, an OR value was found to be 2.387 (95% CI, 1.563-3.647, $p<0.001$) with UAR >22.1 mg/gr in the univariate logistic regression analysis while multivariate logistic regression analysis showed an OR value of 2.359 (95% CI, 1.376-4 044, $p<0.002$) with the same cut-off value.

DISCUSSION

The aim of this study was to investigate the impact of UAR values of the geriatric patients admitted in the ICU on mortality. The present study evaluated 362 geriatric patients admitted in the ICU within a 6-month period. It was found that UAR is an independent mortality factor in predicting in-hospital mortality and 1-month mortality.

Table II: Comparisons of the demographic and vital characteristics of the survivors and who died in-hospital.

	Survived (n=240)	Expired (n=122)	p-value
Age [a]	77.95±7.95	81.07±8.91	0.001
Gender [b]			
Male	104 (62.3)	63 (37.7)	0.134
Female	136 (69.7)	59 (30.3)	
SBP [c] (mmHg)	124 (100-150)	100 (73.75-134.5)	<0.001
DBP [c] (mmHg)	70 (55-81)	60 (42-76)	<0.001
HR [c] (min)	95 (79.25-110)	95.5 (75-190)	0.971
SPO_2 (%)	90 (82-93)	82.5 (73.5-90)	*<0.001*
Fever (°C)	36.5 (36.3-37)	36.4 (36.2-36.8)	0.358
RR (min)	24 (18-30)	25.5 (16.7-30)	0.972
Diabetes Mellitus [b]	105 (43.8)	48 (39.3)	0.422
Cerebrovascular Disease [b]	87 (36.2)	44 (36.1)	0.972
Hypertension[b]	172 (71.7)	88 (72.1)	0.926
CHF [b]	64 (26.7)	32 (26.2)	0.929
Asthma-COPD [b]	71 (29.6)	33 (27)	0.614
CHD [b]	89 (37.1)	54 (44.3)	0.187
Malignancy	15 (6.2)	14 (11.5)	0.083
CKD [b]	23 (9.6)	12 (9.8)	0.939
Inotrope [b]	63 (26.2)	77 (63.1)	*<0.001*
Dialysis [b]	30 (12.5)	33 (27)	*<0.001*
Ventilator [b]			
None	134 (55.8)	25 (20.5)	*<0.001*
Invasive	19 (7.9)	63 (51.6)	*<0.001*
Non-invasive	87 (36.2)	34 (27.9)	
Urea (mg/dL) [c]	70 (43.2-113.7)	87 (63.2-145.2)	0.001
Albumin (g/L) [c]	36 (32-40)	34 (29.7-38)	<0.001
UAR (mg/g) [c]	20.2 (11.1-33.9)	27.8 (18.9-47.6)	0.001
Creatinine (mg/dL) [c]	1.32 (0.89-1.93)	1.76 (1.04-2.55)	0.004
Sodium (mEq/L) [c]	137 (133-140)	138 (134-141.2)	0.065
Potassium (mEq/L) [c]	2.40 (1.52-3.50)	3.10 (1.80-7.70)	<0.001
AST (IU/L) [c]	21.75 (17.82-24.97)	18.35 (13.5-23)	0.001
ALT (IU/L) [c]	21 (17-26)	27 (21-34)	<0.001
pH [c]	6 (4-8)	9 (6-13)	<0.001
Lactate (mmol/L) [c]	1 (1-2)	2 (1-3)	<0.001

SBP, Systolic blood pressure; DBP, Diastolic blood pressure; HR, Heart rate; RR, Respiratory rate; CHF, Congestive heart failure; COPD: Chronic Obstructive Pulmonary Disease, CAD, Coronary artery disease; CKD, Chronic kidney disease; ICU, Intensive care unit; CNS, Central nervous system; GIS, Gastrointestinal tract; CPR, Cardiopulmonary resuscitation; UAR, Urea : albumin ratio; AST, Aspartate aminotransferase; ALT, Alanine aminotransferase; WBC, White blood cell; PLT, Platenet; APACHE II, Acute Physiology and Chronic Health Evaluation; SOFA: Sequential Organ Failure Assessment Score; Qsofa, Quick Sequential Organ Failure Assessment Score; LOS, Length of stay.
a:Data are mean ± standard deviation and Student's t test.
b: Data are presented as n (%) and Chi -Square test.
c: Data are presented as median (25%–75%), Mann-Whitney U test.

Table III: Univariate and multivariate logistic regression analysis for risk factors.

In-hospital death	Univariate			Multivariate		
	OR	95% CI	p-value	OR	95% CI	p-value
Age	1.046	1.018 – 1.074	0.001	1.086	1.047 – 1.126	<0.001
Inotropes	4.807	3.014 – 7.668	<0.001	2.134	1.167 – 3.904	0.014
Dialysis	2.596	1.493– 4.513	0.001			
Ventilator						
Non-invasive	2.095	1.170 – 3.751	0.013	2.512	1.304 – 4.839	0.006
Invasive	17.773	9.118 –34.643	<0.001	23.415	10.227 – 53.609	<0.001
UAR>22.1	2.690	1.702 – 4.253	<0.001	2.912	1.538 – 5.516	0.001
Lactate >2.95	2.509	1.605 – 3.920	<0.001			
HCO_3 <18.45	2.971	1.884 – 4.684	<0.001			
One month mortality	**Univariate**			**Multivariate**		
	OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Age	1.057	1.030 – 1.085	<0.001	1.084	1.050 – 1.119	<0.001
Inotropes	3.726	2.384 – 5.824	<0.001	2.042	1.181 – 3.528	0.011
Dialysis	1.923	1.105 – 3.346	0.021			
Ventilator						
Non-invasive	1.612	1.034 – 2.769	0.037	1.820	1.055 – 3.141	0.032
Invasive	11.915	6.027– 23.555	<0.001	13.219	6.044 – 28.913	<0.001
UAR >22.1	2.387	1.563 – 3.647	<0.001	2.359	1.376 – 4 044	0.002
Lactate >2.95	2.096	1.371 – 3.206	0.001			
HCO_3 <18.45	2.018	1.304 – 3.122	0.002			

OR: Odds ratio; CI: Confidence interval; UAR, Urea:albumin ratio.

Several scoring systems and clinical biomarkers such as APACHE II and SOFA were utilised in the ICUs for evaluation of mortality, however, these parameters were not found to be precisely reliable in predicting prognosis because of the complicated nature of the geriatric patient group.[17] Particularly, the scoring systems such as APACHE II are time-consuming, complicated and difficult to apply in a clinical practice.

Serum urea and albumin values are cost-effective and easily accessible biochemical parameters, preferred for their high--predictive capacity in assessment of disease severity and nutritional status of the patient.

Serum urea values are useful for risk classification in various diseases such as heart failure, aortic dissection, pancreatitis and peripheral arterial diseases as well as acute kidney injury.[18] It is known that albumin synthesis decreases in the acute stage of inflammation. Hypoalbuminaemia is associated with long duration of admission in the ICU, high morbidity, and mortality particularly in critical patients.[19] This study also demonstrated that mortality increased in the patients with low-level of albumin (AUC 0.609, p<0.001) and high-level of urea (AUC 0.608, p<0.001).

The UAR was evaluated for a specific disease such as pneumonia or sepsis[14,16] in the previous studies, whereas UAR values were evaluated in all the geriatric patients admitted in the ICU regardless of their disease. The authors aimed to determine whether UAR is a general prognostic parameter for all geriatric patients admitted in the ICU. To the best of authors' knowledge, the present study was the first prospective study on this topic.

As a result of this study, UAR was found statistically significantly high in the geriatric patient group with poorer prognosis (AUC 0.631, CI 95%, 0.570-0.692, p<0.001). In the literature, Pereira *et al*. have found that UAR predicts mortality in the septic patients. In that study, cut-off value of UAR was found to be 47.25 (AUC 0.617; CI 95%, 0.541 - 0.693; p=0.003).[14] The difference in this study can be attributed to the fact that the whole geriatric patient population was evaluated regardless of the final diagnosis. Another retrospective study was conducted on the patients with non-chronic kidney disease admitted in a mixed ICU, and it was suggested that UAR was a better parameter alone than serum urea and serum albumin in predicting mortality and duration of ICU admission (AUC 0.791; 95% CI, 0.784 - 0.829).[15]

Many studies in the literature have aimed to evaluate the performance of UAR in predicting in-hospital mortality. In the present study, 1-month mortality of the patients was analysed and demonstrated that baseline UAR value at admission in ICU >22.1 mg/gr was statistically significant as well as in predicting 1-month mortality in the univariate logistic regression analysis (95% CI, OR 2.38, p <0.001). It was ascertained that UAR was statistically significant in predicting 1-month mortality in the patients with UAR value higher than cut-off value in the multivariate logistic regression analysis (p<0.002). Feng *et al*. evaluated 30-day mortality in their study on patients with nosocomial pneumonia and have found that blood urea nitrogen: albumin ratio (BAR) was statistically significant in predicting 1-month mortality,[20] similar to the result of this study. In another retrospective study, AUC value of BAR was determined to be 0.70 (95% CI = 0.65-0.74, p<0.001) in predicting 28-day mortality in the patients diagnosed with aspiration pneumonia.[21]

It was also observed that the sensitivity of UAR in predicting mortality (AUC = 0.631, 95% CI = 0.59-0.75, p <0.001) was close to the sensitivity of APACHE II (AUC 0.711, 95% CI = 0.53 - 0.70, p<0.001) according to the ROC analysis of UAR, APACHE II and SOFA scores. Han *et al*. carried out a study on the sepsis patients and obtained BAR (AUC = 0.741, 95% CI = 0.688–0.793, p<0.001) and APACHE II (AUC = 0.772, 95% CI = 0.732 – 0.813, p<0.001) scores in predicting 7-day mortality,[22] similar to results of this study.

Many studies have demonstrated the high-level of lactate as another clinical parameter indicating bad prognosis for the patients admitted in the ICU. Dundar *et al*. have analysed the relationship between mortality and lactate on the geriatric patient group admitted in the ICU and identified that lactate level showed a sensitivity of 55% and a specificity of 69% in predicting mortality for a patient population with lactate level ≥2 mmol/L at admission in the ED.[23] In this study, the lactate level displayed an AUC value of 0.650, a sensitivity of 56%, and a specificity of 66% for lactate levels >2.95 mmol/L of patients admitted in the ICU (p<0.001). It was concluded in this study that lactate levels >2.95 mmol/L create risk for mortality according to the univariate logistic regression analysis (OR 2.096, p<0.001) applied for predicting 1-month mortality of the discharged patients. The lack of significance in the multivariate analysis may be associated with the limited number of the present patient population.

Beside the limitations of this study, it is an important contribution to affirm that UAR level is a marker of mortality regardless of diagnosis in the geriatric intensive care patients. Additionally, UAR may be an easily applicable, fast and low-cost biomarker for prognosis in the ICU patients, and may replace the use of APACHE II which is impractical as a prognostic marker in the ICU.

CONCLUSION

The UAR is an easily accessible, cost-effective parameter and may be used in evaluating mortality in the geriatric patients admitted in the ICU. The admission of the geriatric patients examined in the ED and detected with high UAR values in the ICU in the early stage and initiation of close monitoring and appropriate treatment may be effective in reducing mortality in these patients.

ETHICAL APPROVAL:
An approval for this research was obtained from the Ethical Committee (E-21-754) prior to the initiation of this research. The study was conducted in accordance with the principles of the Declaration of Helsinki.

PATIENTS' CONSENT:
Informed consents were obtained from the patients and/or their families/legal guardians to publish the data concerning their cases prior to publishing the data. The confidentiality of the patients were maintained by using the coding system.

COMPETING INTEREST:
The authors declared no competing interest with respect to the authorship and publication of this article.

AUTHORS' CONTRIBUTION:
DUK, HR: Contributed to study concept and design, acquisition of the data.
SG, YKG, HR: Contributed to analysis and interpretation of the data.
SG, DUK: Contributed in statistical evaluation.
SG, YKG: Contributed to drafting and critical revision of the manuscript.
DUK: Accountable for the whole paper.
All authors have approved the final version of the manuscript to be published.

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