RESEARCH ARTICLE

ASSESSMENT OF CORRELATION OF LACTATE /ALBUMIN RATIO IN SEPSIS PATIENTS ADMITTED IN ICU

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ARTICLE DETAILS

Article History:

Received 15 March 2021
Accepted 19 April 2021
Available online 21 April 2021

ABSTRACT

Sepsis is life-threatening organ dysfunction caused by dysregulated host responses to infection, and septic shock is a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are sufficiently profound to substantially increase mortality. Patients with sepsis are usually treated in the intensive care unit (ICU). Hence; under the light of above-mentioned data, the present study was undertaken for determining the correlation of lactate /albumin ratio in outcome of patients of sepsis in ICU. The present study was undertaken for determining the correlation of lactate /albumin ratio in outcome of patients of sepsis in ICU. A total of 30 patients were enrolled. The resulting patients were subjected to detailed history and examination followed by investigations (CBC, ESR, CRP), Bacterial culture, liver function test, renal function test, arterial blood gas analysis for lactate, serum albumin level). Mean Lactate value was 4.59 while mean albumin value was 25.12. Mean lactate to albumin ratio was 0.18. While correlating lactate to albumin ratio with Serum Procalcitonin levels, significant results were obtained. While correlating lactate to albumin ratio, it was seen that higher lactate to albumin ratio was associated with higher mortality. Lactate/albumin ratio is an independent predictor for the mortality among sepsis patients admitted to ICU.

KEYWORDS

Lactate, Albumin, Sepsis

1. INTRODUCTION

Sepsis is life-threatening organ dysfunction caused by dysregulated host responses to infection, and septic shock is a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are sufficiently profound to substantially increase mortality. Patients with sepsis are usually treated in the intensive care unit (ICU). Sepsis results from infection and these patients often develop multiple organ-system failure. The prognosis of critical ill patients is central in clinical routine, especially in consideration of its high relevance in determination of further therapy strategies and increased risk of death even after hospital discharge. In sepsis, oxygen debt ensues because of the mismatch between the oxygen demand and the delivery with global tissue hypoxia. Despite early guidelines for goal-directed volume hemodynamic resuscitation and monitoring, the optimal end points for resuscitation remain uncertain (Mira et al., 2017; Gao et al., 2005; Castellanos-Ortega et al., 2010).

Increased lactate levels are associated with mortality and are widely used for early diagnosis, management, and risk stratification in patients with septic shock. However, lactate elevation can be affected by a number of different conditions including decreased lactate elimination due to hepatic or renal dysfunction as well as accelerated glycolysis, and the diagnostic value of initial lactate level alone might be low. Lactate clearance is defined as the rate of decline in lactate concentration, and this has been recommended as an end point in early goal-directed therapy in critically ill patients in sepsis (Bakker et al., 2013; Lichtenauer et al., 2017). Albumin levels also reflect the severity of inflammation as albumin is a negative acute phase protein. Studies have shown that albumin could serve as an additional parameter for mortality and prognosis (Bakker et al., 2013;

Lichtenaur et al., 2017; Iwashyna et al., 2012). Hence; under the light of above-mentioned data, the present study was undertaken for determining the correlation of lactate /albumin ratio in outcome of patients of sepsis in ICU.

2. MATERIALS AND METHODS

The present study was undertaken for determining the correlation of lactate /albumin ratio in outcome of patients of sepsis in ICU. Inclusion criteria for present study were as follows:

1. All patients with sepsis admitted in ICU
2. Age >18 years
3. Patients or their guardian who gave written consent.

A total of 30 patients were enrolled. The resulting patients were subjected to detailed history and examination followed by investigations (CBC, ESR, CRP, Bacterial culture, liver function test, renal function test, arterial blood gas analysis for lactate, serum albumin level). All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis.

3. RESULTS

Mean age of the patients was 42.8 years. 18 patients were males while the remaining were females. Mean Lactate value was 4.59 while mean albumin value was 25.12. Mean lactate to albumin ratio was 0.18. While correlating lactate to albumin ratio with Serum Procalcitonin levels, significant results were obtained. While correlating lactate to albumin ratio, it was seen that higher lactate to albumin ratio was associated with higher mortality.

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10.26480/jhcdc.01.2021.11.16

Table 1: Lactate and albumin levels

Parameter	Mean	SD
Lactate	4.59	3.95
Albumin	25.12	5.69
L:A Ratio	0.18	0.23

Table 2: Correlation of lactate to albumin ratio with S. Procalcitonin levels

Lactate: Albumin ratio	Mean S. Procalcitonin	SD	p- value
>0.15	16.25	28.46	0.001 (Significant)
<0.15	8.12	13.45	

Table 3: Correlation of lactate albumin ratio with outcome

Outcome	Lactate albumin ratio			
	≥0.15		<0.15	
	Number of patients	Percentage	Number of patients	Percentage
Died	11	78.57	4	25
Recovered	3	21.43	12	75
p- value	0.011 (Significant)		0.011 (Significant)

Graph 1: Correlation of lactate albumin ratio with outcome

4. DISCUSSION

Sepsis is a medical emergency that describes the body's systemic immunological response to an infectious process that can lead to end-stage organ dysfunction and death. Despite significant advancements in the understanding of the pathophysiology of this clinical syndrome, advancements in hemodynamic monitoring tools, and resuscitation measures, sepsis remains one of the major causes of morbidity and mortality in critically ill patients. Over the years, our understanding of the complex pathophysiology of sepsis has improved, and so has our ability to define sepsis. There has been a marked evolution in our understanding of the molecular pathobiology and immunology of sepsis. Previously it was felt that hemodynamic manifestations of sepsis were primarily related to the hyperimmune host response to a particular pathogen. However, a large body of work on the molecular basis of sepsis has revealed a far more nuanced and complex interplay between the infectious agent and host that together produce the heterogeneous manifestations of sepsis (Iwashyna et al., 2012; Karnatovskaia and Festic, 2012; Bone et al., 1992; Levy et al., 2001; Singer et al., 2016). Hence; under the light of above-mentioned data, the present study was undertaken for determining the correlation of lactate /albumin ratio in outcome of patients of sepsis in ICU.

In the present study, mean age of the patients was 42.8 years. 18 patients were males while the remaining were females. Mean Lactate value was 4.59 while mean albumin value was 25.12. Mean lactate to albumin ratio was 0.18. Kaçar CK et al assessed the effect of age, gender, estimated glomerular filtration rate, albumin and lactate on mortality on critically ill patients admitted to intensive care unit due to acute kidney injury. The study included 54 critically ill patients over the age of 18, who were admitted to our Level 3 intensive care unit with the diagnosis of acute kidney injury. Patients were divided into two groups as those who did not develop mortality (Group 1) and those who developed (Group 2). Both groups were compared in terms of age, gender, estimated glomerular

filtration rate, albumin and lactate levels in the first 24 hours of admission. In addition, patients were divided into two groups according to both albumin levels and lactate levels and examined in terms of 30-day mortality. The patients' total mortality was 68.5% (37 patients). There was no statistically significant difference between the two groups (Group 1 and Group 2) in terms of age, sex, estimated glomerular filtration rate, albumin and lactate levels. In addition, there was no statistically significant difference between the groups in terms of 30- day mortality. It was concluded that age, gender, estimated glomerular filtration rate, albumin and lactate levels did not affect 30-day and total mortality in our patients who were hospitalized in our intensive care unit with acute kidney injury diagnosis, and that albumin and lactate levels during admission were not a predictor of mortality in this patient group (Kacar and Uzundere, 2019).

In the present study, while correlating lactate to albumin ratio with Serum Procalcitonin levels, significant results were obtained. While correlating lactate to albumin ratio, it was seen that higher lactate to albumin ratio was associated with higher mortality. Kendall H et al examined the relationship between the trend of serum albumin over time and mortality in adults admitted to the intensive care unit (ICU) with sepsis. Logistic regression analysis was used to assess the ability of serum albumin to predict mortality. Serum albumin trend, admission serum albumin level, and lowest serum albumin level were significant unique predictors of mortality. The probability of survival decreases by 70.6% when there is a strong negative trend in serum albumin level, by 63.4% when admission serum albumin is ≤ 2.45 g/dl, and by 76.4% when the lowest serum albumin is ≤ 1.45 g/dl. They encouraged clinicians to measure serum albumin levels in patients with sepsis. Low serum albumin levels and a strong negative trend in serial measurements should instigate aggressive monitoring and treatment in this population (Kendall et al., 2019). Basile-Filho A et al compared the different predictive values of prognostic indices and biological markers in the outcome of 847 surgical patients admitted to the intensive care unit (ICU) in the postoperative phase. The patients were divided into survivors (n=765, 57.4% males, age 61, interquartile range 51-71) and no survivors (n=82, 57.3% males, age 70, interquartile range 58-79). APACHE II, APACHE II death probability (DP), SOFA, SAPS 3, SAPS 3 DP, CRP, albumin, and lactate were recorded on ICU admission (first 24 hours).

The area under the ROC curve (AUROC) and 95% confidence interval (95% CI) were used to measure the index accuracy to predict mortality. The AUROC and 95% CI for APACHE II, APACHE II DP, SOFA, SAPS 3, SAPS 3 DP, CRP/albumin ratio, CRP, albumin, and lactate were 0.850 (0.824-0.873), 0.855 (0.829-0.878), 0.791 (0.762-0.818), 0.840 (0.813-0.864), 0.840 (0.813-0.864), 0.731 (0.700-0.761), 0.708 (0.676-0.739), 0.697 (0.665-0.728), and 0.601 (0.567-0.634), respectively. The ICU and overall, in-hospital mortality were 6.6 and 9.7%, respectively. The APACHE II, APACHE II DP, SAPS 3, SAPS 3 DP, and SOFA scores showed a better performance than CRP/albumin ratio, CRP, albumin, or lactate to predict in-hospital mortality of surgical critically ill patients. Even though all indices were able to discriminate septic from nonseptic patients, only APACHE II, APACHE II DP, SOFA and to a lesser extent SAPS 3, SAPS 3 DP, and blood lactate levels could predict in the first 24-hour ICU admission surgical patients who have survived sepsis (Basile-Filho et al., 2019). The shortcoming of the study is small sample size.

5. CONCLUSION

From the above results, it can be concluded that Lactate/albumin ratio is an independent predictor for the mortality among sepsis patients admitted to ICU.

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