

Original Research

To study lactate/albumin ratio in patients with sepsis admitted in ICU

Vikram Sharma¹, Anil Gupta², Amber Alliya³

¹Professor, ²Professor & Head, ³PG student, Internal Medicine, ASCOMS Hospital, Sidhra, Jammu

ABSTRACT:

Background: Sepsis is life-threatening organ dysfunction caused by dysregulated host responses to infection. Serum lactate has been established as a prognostic tool in patients with septic shock. Albumin levels also reflect the severity of inflammation as albumin is a negative acute phase protein. Hence; the present study was undertaken for studying lactate/albumin ratio in patients with sepsis admitted in ICU. **Materials & methods:** A total of 20 patients were enrolled in the present study. All cases of sepsis in ICU were taken consecutively till sample size achieved. The resulting study group was subjected to detailed history and examination followed by routine investigations. Serum lactate and albumin levels were recorded and ratio was calculated. The data obtained was analysed. Data collected was entered in MS excel 2010 and demographic parameters were analysed. The data was stratified and analysed in accordance with the aims and objectives of the project. **Results:** Mean lactate levels were found to be 5.28 while mean albumin levels were found to be 28.36. Mean Lactate to albumin ratio was found to be 0.1862. **Conclusion:** Lactate/albumin ratio is very easy to obtain and might therefore be very useful for risk stratification in critically ill patients.

Key words: Sepsis, Intensive care unit, Lactate

Received: 12 April, 2019

Revised: 24 April, 2019

Accepted: 29 April, 2019

Corresponding author: Dr. Anil Gupta, Professor & Head, Internal Medicine, ASCOMS Hospital, Sidhra, Jammu

This article may be cited as: Sharma V, Gupta A, Alliya A. To study lactate/albumin ratio in patients with sepsis admitted in ICU. J Adv Med Dent Scie Res 2020;8(2): 38-40.

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. Aggressive management, including control of the infection source and support of failing organ-systems, is needed for optimal outcomes.¹⁻³

Serum lactate has been established as a prognostic tool in patients with septic shock. It is now used as a more objective surrogate marker for tissue perfusion than physical examination or urine output. 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.

Considering that hypoalbuminemia is also a frequent finding in chronic disease, data from predominantly community-acquired sepsis suggested that hypoalbuminemia is related to infection and showed that albumin can serve as an independent risk parameter. Analysis of serum albumin levels after bacteremia and infection serum albumin levels showed an acute decrease as a result of infection, again correlating with poor prognosis.⁴⁻⁶ Hence; under the light of above mentioned data, the present study was undertaken for studying lactate/albumin ratio in patients with sepsis admitted in ICU.

MATERIALS & METHODS

The present study was conducted in the Intensive Care Unit of the medical institute and included assessment of lactate/albumin ratio in patients with sepsis admitted in ICU. A total of 20 patients were enrolled in the present study.

Inclusion criteria for the present study included:

1. All patients with sepsis admitted in ICU's in SMS Hospital, Jaipur between June 2018 to August 2019
2. Age >18 years
3. Patients or their guardian who gave written consent.

Exclusion criteria included:

1. Other causes of hyperlactatemia (seizure, diabetic ketoacidosis, toxins, ethanol, medications like metformin, zidovudine, lamivudine, etc.)
2. Other causes of hypoalbuminemia (chronic liver disease, nephrotic syndrome, malnutrition).
3. Patients or their guardians who didn't give informed consent

All cases of sepsis in ICU were taken consecutively till sample size achieved. The resulting study group was subjected to detailed history and examination followed by routine investigations. Serum lactate and albumin levels were recorded and ratio was calculated. The data obtained was analysed. Data collected was entered in MS excel 2010 and demographic parameters were analysed. The data was stratified and analysed in accordance with the aims and objectives of the project.

RESULTS

In the present study, a total of 20 patients with sepsis were enrolled. Mean age of the patients of the present study was 47.39 years. 30 percent of the patient belonged to the age group of 41 to 50 years. 25 percent of the patients were males while the remaining were females. Mechanical ventilation was done in 84 percent of the patients. PSEUDOMONAS, ENTEROBACTER and CANDIDA were found to be present in 24 percent, 18 percent and 18 percent of the patients respectively. In the present study, mean lactate levels were found to be 5.28 while mean albumin levels were found to be 28.36. Mean Lactate to albumin ratio was found to be 0.1862.

Table 1: Age-wise distribution

Age group (years)	Number of patients	Percentage of patients
Less than 20	1	5
20 to 30	4	20
31 to 40	3	15
41 to 50	6	30
51 to 60	3	15
More than 60	3	15
Total	20	100
Mean age (years)		47.39
SD		14.36

DISCUSSION

Sepsis begins with a source of infection anywhere within the body—skin, urinary tract, peritoneal cavity, lungs, and others. As the organism replicates, antigens are released by the body to elicit a systemic inflammatory response to aid in eliminating and limiting the invading pathogens. In addition, many elements of invading organisms can also induce systemic inflammation: endotoxins of the gram-negative bacteria, exotoxins of the gram-positive bacteria, lipoarabinomannan of mycobacteria, mannoproteins and β-glucan of fungi, to name a few.

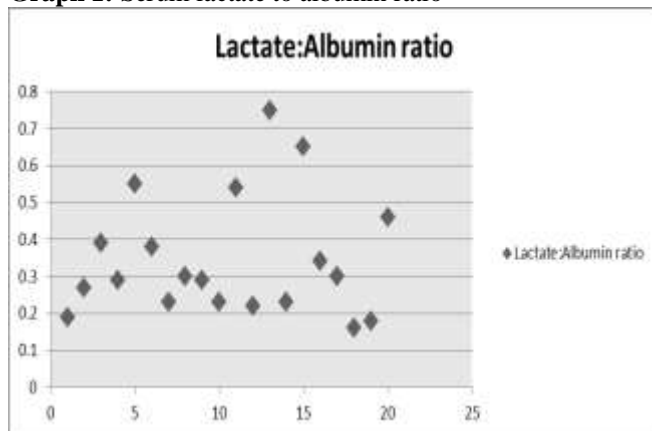
Table 2: Gender-wise distribution

Gender	Number of patients	Percentage of patients
Males	15	75
Females	5	25
Total	50	100

Table 3: Lactate and albumin levels

Parameter	Mean	SD
Lactate	5.28	5.12
Albumin	28.36	5.69
L:A Ratio	0.1862	0.36

Graph 1: Serum lactate to albumin ratio



As microbial components are identified by specific pattern recognition molecules (CD14 cells and Toll-like receptors), a complex process of cellular activation ensues, consisting of release of cytokines; activation of neutrophils, monocytes, and endothelial cells; neuroendocrine involvement; and activation of the complement, coagulation, and fibrinolytic systems.⁷⁻⁹ Hence; under the light of above mentioned data, the present study was undertaken for studying lactate/albumin ratio in patients with sepsis admitted in ICU.

In the present study, a total of 20 patients with sepsis were enrolled. Mean age of the patients of the present study was 47.39 years. 30 percent of the patient belonged to the age group of 41 to 50 years. 25 percent of the patients were males while the remaining were females. Mechanical ventilation was done in 84 percent of the patients.

PSEUDOMONAS, ENTEROBACTER and CANDIDA were found to be present in 24 percent, 18 percent and 18 percent of the patients respectively. Yu G et al determined the efficacy of the lactate area score (calculated from repeated lactate measurements during initial resuscitation) as a prognostic marker of septic shock in the emergency department (ED). They performed a retrospective study of adult patients with septic shock in the ED of a single tertiary medical center. A total of 362 patients were enrolled in this study, and the overall 28-day mortality was 31.8%. The lactate area score of serial lactate levels as well as the initial lactate levels were significantly higher in the non-survivor group. However, in multivariate analysis, only the lactate area score was significantly associated with 28-day mortality. The early lactate area score may be a possible prognostic marker for predicting the 28-day mortality of adult septic shock patients.¹⁰

In the present study, mean lactate levels were found to be 5.28 while mean albumin levels were found to be 28.36. Mean Lactate to albumin ratio was found to be 0.1862. Noer A et al determined the Lactate / Albumin ratio in sepsis patients, so that it can be used as a marker predictor of mortality in sepsis patients that is more accessible at a cheaper and more specific cost for sepsis that can be used in simple facilities without reducing accuracy. They concluded that there is a significant positive relationship between day lactate / albumin ratio 3 and day 3 SOFA score in sepsis patients, so that the Lactate / Albumin ratio can be used as a predictor of mortality in sepsis patients associated with SOFA scores. But there was no significant relationship between day lactate / albumin ratio level and day 1 SOFA score in sepsis patients. They suggested that the serial lactate / albumin ratio associated with the SOFA score can be used as a marker for predictors of mortality in septic patients admitted to the ICU.¹¹ 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. 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.¹²

CONCLUSION

From the above results, the authors concluded that the lactate/albumin ratio is very easy to obtain and might therefore be very useful for risk stratification in critically ill patients.

REFERENCES

1. Ogura T, Nakamura Y, Takahashi K, Nishida K, Kobashi D, Matsui S. Treatment of patients with sepsis in a closed intensive care unit is associated with improved survival: a nationwide observational study in Japan. *J Intensive Care*. 2018;6:57.
2. Sakr Y, Jaschinski U, Wittebole X, et al. Sepsis in Intensive Care Unit Patients: Worldwide Data From the Intensive Care over Nations Audit. *Open Forum Infect Dis*. 2018;5(12):ofy313.
3. Genga KR, Russell JA. Update of Sepsis in the Intensive Care Unit. *J Innate Immun*. 2017 Sep; 9(5): 441–455.
4. Bakker, J.; Nijsten, M.W.; Jansen, T.C. Clinical use of lactate monitoring in critically ill patients. *Ann. Intensive Care* 2013, 3, 12.
5. Lichtenauer M, Wernly B, Ohnewein B, Franz M, Kabisch B, Muessig J et al. The Lactate/Albumin Ratio: A Valuable Tool for Risk Stratification in Septic Patients Admitted to ICU. *Int J Mol Sci*. 2017 Sep 2;18(9). pii: E1893.
6. Mira JC, Gentile LF, Mathias BJ, et al. Sepsis Pathophysiology, Chronic Critical Illness, and Persistent Inflammation-Immunosuppression and Catabolism Syndrome. *Crit Care Med*. 2017;45(2):253–262.
7. Gao F, Melody T, Daniels DF, Giles S, Fox S. The impact of compliance with 6-hour and 24-hour sepsis bundles on hospital mortality in patients with severe sepsis: a prospective observational study. *Critical care*. 2005;9(6):R764–770.
8. Castellanos-Ortega A, Suberviola B, Garcia-Astudillo LA, Holanda MS, Ortiz F, Llorca J, Delgado-Rodriguez M. Impact of the Surviving Sepsis Campaign protocols on hospital length of stay and mortality in septic shock patients: results of a three-year follow-up quasi-experimental study. *Critical care medicine*. 2010;38(4):1036–1043.
9. Levy MM, Dellinger RP, Townsend SR, Linde-Zwirble WT, Marshall JC, Bion J, Schorr C, Artigas A, Ramsay G, Beale R, et al. The Surviving Sepsis Campaign: results of an international guideline-based performance improvement program targeting severe sepsis. *Intensive care medicine*. 2010;36(2):222–231.
10. Yu G, Yoo SJ, Lee SH, Kim JS, Jung S, Kim YJ et al. Utility of the early lactate area score as a prognostic marker for septic shock patients in the emergency department. *Acute and Critical Care* 2019; 34(2): 126-132.
11. Noer A, Ganie RA, Solihat Y. The Lactate/Albumin Ratio As A Predictor Of Mortality Sepsis Patients In Icu. *H. Adam Malik Hospital Medan And Connected To Sofa Scores. Global Journal For Research Analysis*. 2019; 8(8): 7- 9.
12. Kendall H, Abreu E, Cheng AL. Serum Albumin Trend Is a Predictor of Mortality in ICU Patients With Sepsis. *Biol Res Nurs*. 2019 May;21(3):237-244.