

## ORIGINAL ARTICLE

# Association between Lactate Dehydrogenase to Albumin Ratio and 28-Day Mortality in Patients with Sepsis: a Retrospective Cohort Study

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### SUMMARY

**Background:** This study aims to evaluate the lactate dehydrogenase to albumin ratio and mortality at 28 days in patients with sepsis.

**Methods:** Data from the Medical Information Mart for Intensive Care IV (MIMIC-IV) database were used for this retrospective cohort analysis. The level of the lactate dehydrogenase to albumin ratio was recovered at admission and the outcome index was mortality at 28 days. Multivariate Cox regression, survival curve analysis, and subgroup analysis were used to study the relationship between lactate dehydrogenase to albumin ratio and 28-day mortality in sepsis patients.

**Results:** This study included a total of 4,265 patients with sepsis, with a 28-day mortality rate of 51.9%. After conducting multivariable COX regression analysis and adjusting for all potential confounding factors, we observed that compared to the LDH/ALB (Q1) group, the Q2 group had a 1.34-fold higher risk of 28-day mortality (HR = 1.34, 95% CI: 1.20 - 1.49,  $p < 0.001$ ), while the Q3 group had a 1.90-fold higher risk (HR = 1.90, 95% CI: 1.69 - 2.14,  $p < 0.001$ ). Furthermore, the survival analysis curve indicated a gradual increase in the 28-day mortality rate of septic patients as LDH/ALB levels increased. In addition, the ROC curve demonstrated that the area under the curve for LDH/ALB was 0.6507 (95% CI: 63.4991% - 66.6368%), which was higher than that of LDH (AUC = 0.6434), ALB (AUC = 0.55), and SOFA SCORE (AUC = 0.5564). Finally, subgroup analysis revealed no significant interaction between LDH/ALB and the various subgroups.

**Conclusions:** The LDH/ALB ratio is significantly correlated with mortality at 28 days in patients with sepsis, which is of significant clinical importance and deserves further study.

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## Supplementary Data

Table S1. Univariate Cox regression analysis of the LDH/ALB ratio and 28-day mortality from sepsis.

| Variables                                 | HR (95% CI)             | P       |
|---|-------------------------|---------|
| <b>Gender, n (%)</b>                      |                         |         |
| Female                                    |                         |         |
| Male                                      | 0.99 (0.91, 1.07)       | 0.769   |
| Age (years)                               | 0.9978 (0.9951, 1.0005) | 0.109   |
| <b>Vital signs</b>                        |                         |         |
| DBP (mm/Hg)                               | 1.0008 (0.9987, 1.003)  | 0.455   |
| Heart rate (bpm)                          | 1.0046 (1.0028, 1.0064) | < 0.001 |
| MAP (mm/Hg)                               | 0.9996 (0.9975, 1.0017) | 0.696   |
| Respiratory rate (bpm)                    | 1.02 (1.02, 1.03)       | < 0.001 |
| SBP (mm/Hg)                               | 0.9974 (0.9958, 0.999)  | 0.002   |
| SpO <sub>2</sub> (%)                      | 0.98 (0.97, 0.99)       | < 0.001 |
| Temperature (°C)                          | 0.86 (0.83, 0.89)       | < 0.001 |
| <b>Laboratory tests</b>                   |                         |         |
| ALB (g/L)                                 | 0.98 (0.98, 0.99)       | < 0.001 |
| Glucose (mg/dL)                           | 1 (1,1)                 | 0.007   |
| Anion gap (mm/Hg)                         | 1.04 (1.03, 1.04)       | < 0.001 |
| Bicarbonate (mEq/L)                       | 0.97 (0.96, 0.97)       | < 0.001 |
| Chloride (mmol/L)                         | 0.9969 (0.992, 1.0018)  | 0.216   |
| Calcium (mmol/L)                          | 0.98 (0.95, 1.02)       | 0.337   |
| Sodium (mmol/L)                           | 1.0029 (0.9972, 1.0085) | 0.322   |
| Potassium (mmol/L)                        | 1.05 (1.01, 1.09)       | 0.009   |
| INR                                       | 1.06 (1.04, 1.08)       | < 0.001 |
| Hemoglobin (g/dL)                         | 1.04 (1.03, 1.06)       | < 0.001 |
| RBC (10 <sup>6</sup> /L)                  | 1.09 (1.04, 1.14)       | < 0.001 |
| Bun (mg/dL)                               | 1.0021 (1.0007, 1.0034) | 0.003   |
| Creatinine (ng/dL)                        | 0.9963 (0.9746, 1.0185) | 0.743   |
| PLT (10 <sup>9</sup> /L)                  | 0.9998 (0.9995, 1.0001) | 0.284   |
| WBC (10 <sup>9</sup> /L)                  | 1.0042 (1.0023, 1.0062) | < 0.001 |
| LDH (IU/L)                                | 1.0001 (1.0001, 1.0001) | < 0.001 |
| ALT (IU/L)                                | 1.0002 (1.0001, 1.0002) | < 0.001 |
| AST (IU/L)                                | 1.0001 (1.0001, 1.0001) | < 0.001 |
| <b>Accompanied diseases (comorbidity)</b> |                         |         |
| <b>Myocardial infarction</b>              |                         |         |
| No  |                         |         |
| Yes                                       | 1.15 (1.04, 1.27)       | 0.005   |
| <b>Congestive heart failure</b>           |                         |         |
| No  |                         |         |
| Yes                                       | 0.91 (0.84, 0.99)       | 0.027   |
| <b>Chronic pulmonary disease</b>          |                         |         |
| No  |                         |         |
| Yes                                       | 0.89 (0.81, 0.97)       | 0.01    |

**Table S1. Univariate Cox regression analysis of the LDH/ALB ratio and 28-day mortality from sepsis (continued).**

| <b>Variables</b>            | <b>HR (95% CI)</b>       | <b>p</b>          |
|-----------------------------|--------------------------|-------------------|
| <b>Diabetes</b>             |                          |                   |
| No                          |                          |                   |
| Yes                         | <b>0.74 (0.64, 0.85)</b> | <b>&lt; 0.001</b> |
| <b>Renal disease</b>        |                          |                   |
| No                          |                          |                   |
| Yes                         | <b>0.82 (0.75, 0.9)</b>  | <b>&lt; 0.001</b> |
| <b>Malignant cancer</b>     |                          |                   |
| No                          |                          |                   |
| Yes                         | <b>0.91 (0.83, 1)</b>    | <b>0.055</b>      |
| <b>Severe liver disease</b> |                          |                   |
| No                          |                          |                   |
| Yes                         | <b>1.12 (1.01, 1.24)</b> | <b>0.039</b>      |
| <b>Sofa score</b>           | <b>1.07 (1.05, 1.08)</b> | <b>&lt; 0.001</b> |