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THE LACTATE-ALBUMIN RATIO: A VALUABLE TOOL FOR PREDICTING OUTCOME IN RESPIRATORY ICU PATIENTS'

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ABSTRACT

Background: Lactate levels used to detect tissue hypoxia and albumin levels reflect severity of inflammation. **Aim and objective:** To assess predictive value of serum lactate and to evaluate the lactate albumin ratio for its prognostic relevance in first 24 hours of RICU patients regarding mortality and length of RICU stay. **Methods:** Total 50 critically ill patients enrolled. 3 sample for lactate, albumin obtained at admission, at 12 and at 24 hour. **Result:** Out of 50 patients, 31 survived. A comparison were made between survivors and non survivors, mean lactate and lactate albumin ratio was significantly higher in non-survivors, and positively correlated with length of RICU stay. **Conclusion:** Non-survivors had higher lactate, lactate albumin ratio at admission as well as 12 and 24 hours which reflect poorer prognosis.

Background:

The critical condition of patients admitted to ICU is vulnerable to oxidative stresses caused by reactive oxygen species which result in injuries to cells and tissues and activating extracellular antioxidant defence network consecutively.1,2 The normal blood lactate concentration is around 1 mEq/l.3 Even minor increases in lactate concentrations to >1.5 mEq/l are associated with higher mortality rates.3

Serum albumin as an indicator of the disease severity and the mortality is suggested and studied in adult patients.4

Multiple conditions resulting in inadequate oxygen delivery, disproportionate oxygen demand and diminished oxygen use may lead to elevated lactate levels. Consequently the early identification and rapid treatment of these patients with hyperlactatemia is widely acknowledged as a vital step toward improving survival

Aim and objective:

To study the correlation of serum lactate and albumin as a predictor of outcome in Respiratory ICU (RICU) patients regarding mortality and length of RICU stay. To assess predictive value of lactate levels in first 24 hours of RICU admission regarding mortality and hospital stay and to evaluate the ratio of serum lactate /serum albumin for its prognostic relevance.

Material and methods:

A hospital based prospective type of observational cohort study done on 50 ICU patients in Institute of Respiratory Diseases, SMS Medical College, Jaipur from June 2018 to May 2019. Necessary permission was taken from Ethical Committee and Research Review Board.

Inclusion Criteria: Critically ill patient more than 18 years of both sex, patient & attender giving valid written consent.

Exclusion Criteria: Alcoholics, hepatic failure, malignancy, epilepsy, acute renal failure, use of epinephrine, metformin, isoniazide, zidovudine or valproic acid.

Study Population:

Detailed history, clinical examination, routine blood investigation and chest radiography, arterial blood gases analysis and other needful investigation along with blood sample (2 ml of venous blood) for analysis of serum lactate and serum albumin obtained on admission (sample 1), 12 h (sample 2) and 24 h (sample 3), with correlation with the patients' clinical condition and progression of the case.

The normal reference values for lactate are traditionally considered 1 ±0.5 mmol/L in normal patients and<2 mmol/L in critically ill patients.5

Acute physiology and chronic health evaluation (APACHEII score)6 as well as Glasgow coma scale (GCS) score7 were recorded for all patients.

Statistical analysis:

Data were coded and entered using the statistical package SPSS version 16. Comparisons between quantitative variables were done using the non-parametric Mann–Whitney test. For comparing categorical data, Chi square (v2) test was performed.

RESULT

In our study most of the cases were 32 male (64%). Regarding diagnosis, 25 had acute exacerbation of COPD, 6 interstitial lung disease, 4 pneumonia, 4 pneumoconiosis, 3 obstructive sleep apnea, 3 acute severe asthma, 2 other OAD, 2 bronchiectasis & 1 pulmonary embolism.

The studied population was divided in two groups:
(A) Survivors (31): 22 (70.96%) patients were male & 9 (29.04%) were female
(B) Non-survivors (19): 10 (52.63%) patients were male & 9 (47.36%) were female

The mean age of survivors was 59.55±10.25 years and 65.47±8.618 years in non survivors, mean value of Apache II score was higher in non-survivors (22.21±5.073) comparing to survivors (13.32±3.718), mean value of GCS score was lower in non-survivors (11.68±2.083) comparing to survivors (14.65±0.6082). Comparison of mean value of age (P=0.0407), Apache II score (P<0.0001), GCS score (P<0.0001) were statistical significance.

The mean value of serum lactate, serum albumin & lactate albumin ratio were statistical significant (P<0.0001, P<0.0001 & P<0.0001 respectively) in sample 1. Survivors had better serum albumin level. Serum lactate level & lactate albumin ratio was higher in non-survivors group. Table 1

Table 1: Comparison between survivors and non survivors regarding serum lactate, serum albumin and lactate albumin ratio in sample 1

		Survivors (N=31)	Non-Survivors (N=19)	P-value
Serum lactate	Mean±SD	2.994±0.8347	5.231±0.6054	<0.0001
	Range	1.780-5.400	4.20-6.60	
	Median	2.870	5.10	
Serum albumin	Mean±SD	4.265±0.7783	2.90±0.6064	<0.0001
	Range	2.50-5.60	1.50-4.20	
	Median	4.30	2.80	
Lactate albumin ratio	Mean±SD	0.7570±0.3681	1.897±0.530	<0.0001
	Range	0.370-2.160	1.016-3.20	
	Median	0.6780	1.790	

The mean value of serum lactate, serum albumin & lactate albumin ratio were statistical significant (P<0.0001, P<0.0001 & P<0.0001 respectively). Survivors had better serum albumin level, lower serum lactate and serum lactate albumin ratio in sample 2. Table 2

Table 2: Comparison between survivors and non survivors regarding serum lactate, serum albumin and lactate albumin ratio in sample 2

		Survivors (N=31)	Non-Survivors (N=19)	P-value
Serum lactate	Mean±SD	2.775±0.7414	4.872±1.335	<0.0001
	Range	1.680-4.900	0.0-6.20	
	Median	2.800	5.20	
Serum albumin	Mean±SD	4.290±0.7730	2.80±0.8882	<0.0001
	Range	2.70-5.90	0.0-4.10	
	Median	4.30	2.90	
Lactate albumin ratio	Mean±SD	0.6863±0.2998	1.680±0.5449	<0.0001
	Range	0.3370-1.810	0.0-2.520	
	Median	0.6570	1.700	

The mean value of serum lactate, serum albumin & lactate albumin ratio were statistical significant (P<0.0001, P<0.0001 & P<0.0001 respectively). It was found that survivors had better serum albumin level, lower serum lactate and serum lactate albumin ratio in sample 3. Table 3

Table 3: Comparison between survivors and non survivors regarding serum lactate, serum albumin and lactate albumin ratio in sample 3

		Survivors (N=31)	Non-Survivors (N=19)	P-value
Serum lactate	Mean±SD	2.489±0.7071	4.326±1.998	<0.0001
	Range	1.460-5.000	0.0-6.20	
	Median	2.510	4.80	
Serum albumin	Mean±SD	4.368±0.7355	2.574±1.221	<0.0001
	Range	2.80-5.80	0.0-3.90	
	Median	4.60	3.00	
Lactate albumin ratio	Mean±SD	0.6050±0.2861	1.449±0.7261	<0.0001
	Range	0.2920-1.780	0.0-2.600	
	Median	0.5120	1.600	

Mean value of RICU stay was 4.065±1.436 in survivors and 6.263±1.881 in non-survivors, which was statistical significant (P<0.0001).

DISCUSSION:
In today's clinical practice, lactate levels are used to detect tissue hypoxia; however increased lactate levels reflect more than just this aspect. Albumin levels also reflect severity of inflammation as albumin is a negative acute phase protein.

Our study showed mean age of survivors was 59.55±10.25 years and 65.47±8.618 years in non survivors, which was statistical significant (P=0.0407). Out of 50 patients, 31 (62%) survived, among these 22 (70.96%) were male and among non-survivors, 10 (52.63%) were male. One died before obtaining sample 2 and three died before obtaining sample 3.

In our study mean value of APACHE II score & GCS score were 13.32±3.718, 14.65±0.6082 respectively in survivors and 22.21±5.073, 11.68±2.083 respectively in non-survivors (P<0.0001). In our study samples at admission, at 12 hours and at 24 hours showed that non survivors had higher serum lactate levels which was similar to Alaa Shalaby et al[8] and Jat et al[9].

It was found that out of 50 patients survivors (N=31) had higher serum albumin, lower serum lactate & serum lactate albumin ratio in all three samples. So mean serum lactate & serum lactate albumin ratio was significantly higher in the non-survivors groups (N=19).

Domínguez de Villota E et al[10] reported mean serum albumin 2.88 /+- 0.74 g/100 mg. Survivors had mean serum albumin (3.18 /+- 0.60) higher than non-survivors (2.35 /+- 0.68 g/100 ml) (p < 0.05).

In our study mean serum lactate albumin ratio in all three samples were significantly higher in non survivor group (N=19) which was similar to Wang B et al[11] and Michael Lichtenauer et al.[12]

CONCLUSION:
The increased lactate levels and lactate albumin ratio usually reflect poorer prognosis. Lactate albumin ratio is cheap and easy to obtain. So in a resource limited country like ours, might constitute an independent risk parameter, with additive value to established and complex scores for risk stratification.

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