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STUDY OF SERUM LACTATE LEVELS IN PATIENTSWITH SEPSIS ON THE BASIS OF SURVIVAL AND NON-SURVIVAL

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ABSTRACT

OBJECTIVE:- Sepsis is a leading cause of morbidity and mortality internationally. Early spotting and interventions are essential to ensure better patient's outcome. Lactate concentration in septic patients is of particular prognostic value in predicting septic shock and mortality.

AIM:- The present study was intended to evaluate the serum Lactate levels on the basis of severity rate in patients suffering of sepsis, severe sepsis and septic shock.

MATERIAL & METHOD:- 100 patients diagnosed for sepsis were enrolled for the study and they were grouped as sepsis (n=30), severe sepsis (n=37)and septic shock (n=33). On the basis of survival rate serum Lactate levels in patients with sepsis were estimated in all the 3 categories of subjects according to the inclusion criteria. A p-Value of ≤0.05 were considered as statistically significant.

RESULT:- In the present study when the lactate levels were evaluated among all the three categories, it was observed

that the Lactate levels were found to be statistically significant (p-value <0.0001). Lactic acid evaluated on the basis of survival rate was also found to be statistically significant with the p-Value 0.015.

CONCLUSION:- Lactic acid could be utilized as a reliable marker to assess prognosis at the initial phase of presentation because its initial evaluation shows good predictability in mortality prediction in sepsis patients**.**

Keywords: Sepsis,lactate.

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INTRODUCTION:

Severe organ dysfunction is a syndrome of systemic inflammatory response. A major cause of morbidity and mortality globally, it is a potentially fatal disease that arises from an uncontrolled host response to infection. Severe sepsis encompasses a broad spectrum of conditions, ranging from minor indications and symptoms to shock and organ failure.In emergency medicine, accurately diagnosing sepsis is a problem. Globally, the mortality rate for patients with sepsis remains high (>30%) despite advancements in antibiotic therapy and contemporary life support. (2,3) Sepsis occurs approximately 2% of all inpatients in developed countries and 6% to 30% of all patients in the intensive care unit (ICU), with large variations due to heterogeneity between ICUs. (4) Early identification of patients at high risk of death from sepsis can help initiate timely and appropriate therapeutic intervention.(5)

Early diagnosis, prognosis guidance, severity assessment, and antibiotic therapy can all be aided by biomarkers. Furthermore, they can aid in the assessment of the patient's reaction to treatment, aid in the recovery process from sepsis, and distinguish between infectious and non-infectious sources of SIRS. Predicting complications from sepsis and the onset of organ downregulation is probably one of its functions. One of the byproducts of glycolysis that occurs during hypoxia is lactic acid. The buildup of protons and lactic acid in bodily fluid, or lactic acidosis, is frequently associated with unfavorable clinical outcomes.

Normal physiological conditions usually result in blood lactate concentrations of 0.5–1 mmol/L. On the other hand, persistent levels >2 mmol/L in critically ill patients.This level is linked to worse patient outcomes and inadequate tissue perfusion. (9) Tissue hypoxia results in an elevated lactic acid level (hyperlactatemia) in sepsis and septic shock.(10)

Seizures, physical exertion, and shivering are some factors that can lead to lactic acidosis; however, since the body eliminates lactate fast, major serum levels do not arise.Accordingly, due to organ dysfunction, the lactate level is typically elevated in septic shock and severe sepsis. (12) The "Surviving Sepsis" campaign suggests that determining the patient's lactate level at admission is crucial in determining how best to treat them.13% Patients who are extremely sick often use lactic acid as a marker of tissue perfusion. Blood lactate is typically produced by anaerobic metabolism in a variety of organs and tissues and is present in blood at levels of 0.5 mmol/L under physiological conditions. However, sustained lactate levels above 2

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mmol/L in critically ill patients are associated with poor patient outcomes due to inadequate tissue perfusion. Patients with lactate levels above 4 mmol/L are at particular risk of death regardless of shock.

(14) Previous research has shown that lactate levels are a unique prognostic factor for septic shock and patient mortality. In accordance with the Sepsis Surviving guidelines, clinicians have employed lactate standardized goals for the management of sepsis patients through a sepsis care package, drawing from this research.(13).Therefore, the purpose of this study is to evaluate blood lactate's function in sepsis patients.

MATERIALS AND METHODS:

Study population consists of total 100 Patients diagnosed for SEPSIS, visiting Medical intensive care unit and cardiac crical care unit Sree Mookambika Institute of Medical Sciences, Kulasekharam for a period of 8months from May 2023 to December 2023 fulfilling the inclusion criteria were enrolled for the study. Patients weregrouped on the basis of sepsis(n=30), severe sepsis(n=37) and septic shock (n=33) categories.

Inclusion Criteria for the study: Age between 15- 65 years, either gender, patients diagnosed with sepsis, patients who willingly participated and signed consent document.

Exclusion Criteria for the study: Patients with co-morbidities of severe liver dysfunction, cardio and cerebrovascular disease, blood system disease, renal transplant therapy, malignant tumor, diabetes, pregnant and lactating women.

Blood samples for all subjects were collected using standard aseptic technique and analyzed for serum lactate level (By Lactate oxidase method- colorimetry on VITROS 5600 autoanalyzer). The results obtained during the study were presented as mean±SD. The result of lactate in above subgroups were assessed by applying one way anova. p- value ≤0.05 was considered statistically significant.

RESULT:

In the present study 100 patients were enrolled fulfilling inclusion criteria among which sepsis patients were 30, severe sepsis were 37 and septic shock were 33. When cases were distributed on the basis of age, majority of cases (47%) were above the age of 45 years and

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35% of cases were in the age group of 25-45 years and 31% cases were above the age of 55 years. The male: female ratio was 3.1:1, showed that the percentage of males affected with sepsis was higher as compared to females. Overall mortality was 20% among non-survival group, in which 10% cases were in sepsis group, 16.22% and 33.33% were in severe sepsis and septic shock group respectively (p-value-0.006).

The mean age of total population was 42.57±14.77. The mean age of survivors was 41.96 ±15.49 and non-survivors was 45.33±10.88 and it was non-significant. Normal biological reference range of blood lactate is between 0.5-1.0 mmol/L.

Distribution of cases on the basis of blood lactate showed Mean±SD for sepsis group, severe sepsis and septic shock group were 1.00±0.60, 3.29±0.51, 10.79±2.82 respectively (p-value <0.0001) as shown in table no.1.

Table 1: Distribution Of Cases On The Basis Of Blood Lactate Level.

Parameter	Sepsis	Severe sepsis	Septic shock	F-value	p-value
Blood lactate level (mmol/L)	1.00± 0.60	3.29± 0.51	10.79± 2.82	299. 52	<0.000 1

P-value as obtained on applying One way ANOVA

Mean value of Lactate when distributed on the basis of survival, in survivors it was 3.10 ±1.59 and in non-survivors
4.20 ± 4.56 respectively. It was statistically significant (p- Value- 0.015) as shown in table 2 and graphically presented as figure 2.

Table 2: Distribution on the basis of Survival and Non-Survival Lactate Mean Value

Parameters	Survival	Non-Survival	t-value	P-value
LACTATE (mmol/L)	3.10 ±1.59	4.20 ± 4.56	-2.472	0.015

P-value as obtained on applying student's t-test

DISCUSSION:

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The present study was conducted to explore the importance of Blood Lactate levels in patients of sepsis and to evaluate its importance in survival and non-survival of sepsis patients. When cases were distributed on the basis of age, it was observed that majority of cases (47%) were above the age of 45 years and 35% of cases were in the age group of 25-45 years and 31% cases were above the age of 55 years. Similar findings were reported by **Sudhir U et al., 2011,** according to his study incidence of sepsis is found in patients above 57 years.(15)The mean age of total population was found to be statistically significant with the p value 0.010.

When cases were distributed on the basis of gender it was observed that, 76% were male and 24% were female. The male: female ratio was 3.1:1, it showed that the percentage of males affected with sepsis was higher as compared to females. Studies by several workers also indicated the high incidence of sepsis among males. A study by Martin et al., 2003 (16) demonstrated that sepsis was more common in men, accounting for 48.1% of cases on the average each year and men were more likely to possess sepsis than women with a mean annual relative risk of 1.28. Another study by Todi et al., 2007 reported from a multicenter trial done at 12 centers in India that sepsis was more common in male.(17)

In the present study, during evaluating the lactate levels, it was observed that the Lactate levels were significantly high (p- value <0.0001) as shown in **Table 1**. According to the study done by Amit K Asati, Rajnish Gupta and D Behera (2013) high significant mean values of lactate were found among the patients of sepsis than control group (3.13 ± 2.86 vs. 2.16 ±1.86 respectively, p = 0.03).(18)

Lactic acid is a product of anaerobic metabolism in the body. Blood lactate level is a biomarker of organ function and energy metabolism, which is related to prognosis and mortality of the patients. (18) Mainly produced by striated muscle, erythrocytes and brain tissue. Degree of its changes in plasma depends on the metabolic rate of liver and kidney in patients.

According to the above study mean values of Initial, as well as,. Serial lactate at all time intervals were observed to be(significantly higher among non-survivors than survivors (p value = 0.000) according to above study. In the restrospective cohort study. lactate level more than 2.5 mmol/L was the best threshold to predict 28-day mortality among severe sepsis and septic shock patients. Howell MD et al.,2007 done a prospective single center cohort study involving 1,287 patients admitted to the Emergency Department with suspected infection showed that initial venous lactate levels between 2.5 and 4.0 mmol/L were independently associated with an increased risk of 28-day in-hospital death.

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CONCLUSION:

The purpose of the current investigation was to evaluate the serum lactate level's potential as a prognostic marker for sepsis patients. According to the study, blood lactate levels and the severity of sepsis are strongly correlated. Furthermore, it has been observed that patients who do not survive have higher mean levels of the aforementioned markers. Accordingly, the study suggests routinely monitoring blood lactate levels in all patients who are suspected of having sepsis or who have been diagnosed with it. Early diagnosis and treatment of critically ill patients can be aided by prompt detection of sepsis progression.

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Nil.

CONFLICTS OF INTEREST:

There are no conflicts of interest

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