

Analysis of serum lactate level in septic shock at Emergency Department of Patan Hospital, Nepal

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Abstract

Background: Sepsis is a leading cause of death in emergency department. Serum lactate level assessment can play an important role for risk assessment and prognostication in critically ill septic patient.

Objective: The objective of this study is to determine the relevance of initial serum lactate measurement after the implementation of sepsis protocol in emergency department, based on guidelines of Surviving Sepsis Campaign.

Methods: This was a cross sectional descriptive study conducted at Patan Hospital from January 2014 to January 2015 among 94 sample of serum lactate who had clinical suspicion of sepsis as per established sepsis emergency department protocol. Data of serum lactate sent from emergency department was noted from the registry book of department of biochemistry, Patan Academy of Health Sciences. Based on clinical practice the obtained lactate results were stratified into three risk groups: high (> 4 mmol/L), intermediate (2.5 to 3.99 mmol/L) and low (< 2.5 mmol/L).

Result: Out of the total 94 samples, 56 (59.6%) were male and 38 (40.4%) were female. Mean lactate level in males was 5.73 mmol/L and that in females was 5.47 mmol/L. Abnormal lactate level was predominantly high 85 (80%) out of which 31 (29%) had intermediate whereas more than half 54 (50.76%) had high lactate level.

Conclusion: This study tells that clinically diagnosed sepsis do have higher serum lactate level. So, in our context, this needs to be explored to be used for early diagnosis of sepsis.

Key words: Emergency, Sepsis, Serum Lactate Level

INTRODUCTION

Sepsis is a challenge in Emergency department (ED) for its significant morbidity and mortality rate between 30% and 50%^{1, 2}. Early detection of sepsis is complex due to subtle clinical picture. There are numbers of tests and biomarkers like C-reactive protein and prolactin for risk stratification of sepsis. However, no single test is reliable as sepsis increases inflammatory reaction². Along with clinical assessment, serum lactate is useful tool for prognostic prediction of critically ill patient. It is an indicator of cellular hypoxia which leads to anaerobic tissue metabolism that increases lactate production and decreases lactate clearance^{3,4}. There are numerous international studies done on prognostic

value of lactate, however limited studies have been done in Nepal^{1,2,5,6}. A protocol-based approach showed more cases of sepsis detection and sepsis was found to be the most common cause of mortality at Patan hospital⁷. The objective of this study was to see the level of lactate in patients who are clinically diagnosed as a case of septic shock in emergency department.

METHOD

This was a retrospective cross sectional descriptive study conducted at Patan Hospital from January 2014 to January 2015. All records of lactate measurement done during this period were included in the study. In those patients, lactate was sent as a part of sepsis protocol from the patient⁷. Patients more than 18 years as per record were included in the study and those not meeting inclusion criteria, incomplete records and lactate sent from other department were excluded from the study. Lactate was measured from standard biochemistry analyzer at Patan Hospital. Data collection

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was done from the registry book from the Department of Biochemistry, Patan Academy of Health Sciences (PAHS). Based on clinical practice, the obtained lactate results were stratified into three risk groups: high (> 4 mmol/L), intermediate (2.5 to 3.99 mmol/L) and low (< 2.5 mmol/L)^{1,3,9,10}. Data was entered in excel sheet and analysis was done with Statistical Package for Social Sciences version 16. Mean and ratio were calculated and t-test was used to compare the means in sub group analysis. Ethical approval was taken from institutional review board of PAHS.

RESULTS

The total (94) samples of serum lactate were sent in the period of one year from January 2014 to January 2015 who had clinical suspicion of sepsis as per established sepsis ED protocol. Out of the 94 patients with clinical diagnosis of sepsis, 56 (59.6%) were male and 38 (40.4%) were female.

Mean lactate level was 5.6 mmol/L (SD±3.5); 5.73 mmol/L among the males and 5.47 mmol/L among the females (P=0.1). Patients presenting with severe sepsis had abnormal lactate level 80% (85), out of which 29% (31) had intermediate and more than half 50.76% (54) had high lactate level.

Females have more normal and moderate lactate level than males. Likewise in severe stage, males had higher lactate level in comparison to females. The distribution of gender per lactate level was statistically not significant (Table 1).

DISCUSSION

This study demonstrates that the majority of the patients meeting the criteria of sepsis protocol had abnormal serum lactate (80%), among which 29% had intermediate and half of them had high serum lactate. Various clinical trials have been done for early detection and enhancements of early goal directed therapy have proven improvement in the clinical outcome¹¹⁻¹³. Severe sepsis and septic shock are the leading causes of hospital admission and deaths⁷. A study done by Mark et.al revealed maximum patients to be in intermediate lactate level (45.3%). Most of the patients (50.76%) in our study whose lactate was sent as per clinically-diagnosed sepsis had very high lactate level. A study done by Portal et al however had maximum number of patients in low lactate group (49.9%). This reflects towards the increase accuracy of clinical decision with sepsis protocol in our setup. Serum lactate can be the feasible risk stratification prognostic tool in critically ill patient in ED. It also established that mortality benefit is achieved by goal directed therapy^{2,3}. Several studies have shown a linear relation of serum lactate level and poor clinical outcome^{2,3,5,10,13}. Nathan et al stated that 28% mortality in patients with lactate level ≥ 4 mmol/L within three days of hospital admission. Initial high serum lactate alarms clinician for rapid attention and prompt treatment². So the study hypothesized that serum lactate can be a useful screening tool in critically ill patient in ED for prediction of clinical outcome as well as for initiation of early therapy.

Table 1: Comparison of normal and abnormal lactate level according to gender

Lactate Level	Gender				p value
	Female		Male		
	Frequency	Percent	Frequency	Percent	
Normal	5	13.1	4	7.1	0.26
Abnormal	33	86.9	52	92.9	
Total	38	100	56	100	

Table 2: Categorization of lactate level according to gender

Category	Gender				p value
	Female		Male		
	Frequency	Percent	Frequency	Percent	
Low	5	55.6	4	44.4	0.2
Intermediate	15	48.4	16	51.6	
High	18	33.3	36	66.6	
Total	38	100	56	100	

This is a preliminary study and thus has several important limitations. As this was retrospective study, details about patients' demography, comprehensive clinical picture were not taken into account. Multivariable analysis could not be done as registry did not comprise details about co-morbidities, organ dysfunctions, therapies received, etc. Also, the study had only included the serum lactate tests sent by clinicians of variable levels of expertise, so serum lactate may not have been obtained among those who might have met sepsis protocol. As many studies have considered serum lactate as a predictor of mortality

in septic patients, our study has not done critical analysis of serum lactate obtained with its clinical outcome.

CONCLUSION

This study reveals that high initial serum lactate is seen in patients with severe sepsis and septic shock as per sepsis protocol based on Surviving Sepsis Campaign guidelines which further adds up to confirm sepsis. Further studies possibly with multicenter data are required to get a greater picture.

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