

Lactate Clearance: Predictor for Mortality and Therapeutic Response on Severe Sepsis Patient

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Background: Severe sepsis and septic shock are at high mortality rate. This high mortality persists as important aspect in the term of patient treatment which take account in determining aggressiveness of relevant therapy. Lactate level consideration was considered important among patient under shock, septicemia, post-operative, acute lung injury, and critical condition. Lactate concentration in static blood was widely studied and suggested as prognostic value among severe sepsis and septic shock patient due to the nature of lactate as the result of anaerobic metabolism. Several study documented the use of lactate as prognostic indicator for shock condition. The increase of lactate concentration could be useful as the indicator of inadequate oxygen delivery and the existence of anaerobic metabolism. Lactate clearance investigation is more superior therapeutic target compared with others oxygen derivate variables. **Methods:** This research is a cohort observational study involving secondary data which was collected from laboratory examination results of study subjects. The research held from August 2015 to December 2015 in Digestive Division, Surgery Department, Hasan Sadikin Hospital. 42 patient involved in this study. **Results:** Comparative test results revealed significant lactate clearance based on mortality in LCH (6) ($p = 0.000$) and H (24) ($p = 0.000$) as well. The level of LC H (6) and H (24) seemed lower in died patient compared with life patient. **Conclusion:** This study concluded that lactate clearance in died patient was lower in comparison with life patient.

Keyword: sepsis, lactate clearance, mortality

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INTRODUCTION

Severe sepsis and septic shock are remaining persist as one major cause of death among intensive care patient globally. Several initial resuscitation strategies for patient with severe sepsis and septic shock could reduce the mortality rate. However, some data showed that there were still many patients who are treated in long period under intensive care unit (ICU).¹ Sepsis was not a single disease entity which recently recognized as an accumulation of some diseases including systemic inflammatory response syndrome (SIRS) till severe sepsis (sepsis with acute organ dysfunction), and septic shock

(severe sepsis with hypotension that irresponsive to fluid resuscitation) with mortality rates reported 26% for SIRS and reached 82% for septic shock.^{2,3} There was no research reported from Hasan Sadikin Hospital which investigated the mortality rates and therapeutic responses among patient with sepsis. Therefore, this research was aimed to understand the use of lactate clearance value in predicting mortality level among severe sepsis patient.

METHODS

This study is a cohort observational which categorized as diagnostic test proceed analytically to ass's sensitivity, specificity, positive predictive value and negative predictive value. Samples in this study are inpatient of digestive surgery who fulfilled the diagnostic criteria of severe sepsis treated under period August 2015 to December 2015.

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RESULTS

Normality test (Shapiro-Wilk) showed that the distribution of lactate clearance for death group was normal ($p > 0.05$). In contrary, for life group was not normal ($p < 0.05$). Meanwhile for the distribution of lactate clearance (H24) in life group was normal ($p > 0.05$) and within death group found not normal ($p < 0.05$). Hence, the comparison test for lactate clearance based on mortality status should processed by relevant statistic nonparametric test which was Mann-Whitney test.

Tab 1. Normality Test Result for Lactate Clearance Based on Mortality Status

Tests of Normality			
	Mortality	Shapiro-Wilk	
		P	Decision
Lactate Clearance (H6)	Death	0.079	Normal
	Life	0.005	Not Normal
Lactate Clearance (H24)	Death	0.036	Normal
	Life	0.120	Not Normal

Tab 2. Comparative Test Result for Lactate Clearance Based on Mortality Status

	Mortality	Mann-Whitney test		
		Mean (SD)	Median	p
Lactate Clearance (H6)	Death	Mean (SD)	-7.1 (10.2)	0.000
		Median	-3.8	
		Min-Max	-28.6 – 2.7	
	Life	Mean (SD)	14.7 (10.8)	
		Median	11.1	
		Min-Max	1.8 – 40.0	
Lactate Clearance (H24)	Death	Mean (SD)	-14.8 (16.0)	0.000
		Median	-9.7	
		Min-Max	-50.0 – 5.5	
	Life	Mean (SD)	19.2 (9.6)	
		Median	18.7	
		Min-Max	6.0 – 39.6	

Based on Mann Whitney test, data showed significant difference of lactate clearance based on mortality status in H (6) ($p = 0.000$) and H (24) ($p = 0.000$). Lactate clearance in H (6) and H (24) seemed lower in death group compared with life group.

The comparison test result (Chi-square test continuity correction) showed a significant difference of lactate clearance category based on mortality status in H (6) ($p = 0.000$) and in H (24) ($p=0.000$) as well. The percentage of death patient in lactate clearance H (6) ≤ 2.983 (100,0%) found

higher than lactate clearance H (6) > 2.983 (0.00%). Also, the percentage of death patient among lactate clearance H (24) ≤ 5.725 (100.0%) was higher than lactate clearance H (24) >5.725 (0.0%). Cut-off value lactate clearance category based mon mortality status was gathered from ROC analytic curve as maximal value from J Youdent statistic (sensitivity + specificity –1). Resulted ROC curve had Area Under the Curve (AUC) value 0,993 ($p = 0.000$) for lactate clearance H (6) and AUC 1,000 ($p = 0.000$) for lactate clearance H (24).

Tab 3. Comparative Test Result for Lactate Clearance Category Based on Mortality Status

Lactate Clearance (H6)	Chi-square continuity correction			
	Mortality			p
	Death	Life		
$\leq 2,983$	8 (100.0%)	2 (5,9%)	10	0,000
$> 2,983$	0 (0.0%)	32 (94,1)	32	
	8	34	42	
Lactate Clearance (H24)	Chi-square continuity correction			
	Mortality			p
	Death	Life		
$\leq 5,725$	8 (100.0%)	0 (0.0%)	8	0,000
$> 5,725$	0 (0.0%)	34 (100.0)	34	
	8	34	42	

DISCUSSIONS

This research was aimed to understand the use of lactate clearance value in predicting mortality level among severe sepsis patient. Based on the results, the percentage of death patient for lactate clearance $H(6) \leq 2,983$ (100.0%) was significantly higher than lactate clearance $H(6) > 2,983$ (5.9%). Also, the percentage of death patient among lactate clearance $H(24) \leq 5.725$ (100,0%) was higher than lactate clearance $H(24) > 5.725$ (0,0%). These showed that lactate clearance for death patient is lower than life patient. There was abrupt study documented the use of lactate as prognostic indicator under shock condition. The increase of blood lactate level could use as a mark for inadequate oxygen delivery and anaerobic metabolism.⁵ Ambamson et al said that the mortality significantly reduced after the lactate level reached normal within first 24 hours.

CONCLUSIONS

Lactate clearance level could be used as predictor for mortality and prognostic for severe sepsis patient. In this study, lactate clearance produce sensitivity 100% for both lactate clearance, $H(6)$ and $H(24)$. The specificity reached 94,1% for lactate concentration $H(6)$ and 100% for lactate concentration $H(24)$. The percentage of death patient for lactate clearance $H(6) \leq 2,983$ (100,0%) was significantly higher than lactate clearance $H(6) > 2.983$ (5.9%). Also, the percentage of death patient among lactate clearance $H(24) \leq 5.725$ (100.0%) was higher than lactate clearance $H(24) > 5.725$ (0.0%)

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