

# Differences in Initial Lactate Levels on Elderly and Non-Elderly Sepsis Patients Associated With Sofa Score as a Predictor of Mortality in ICU RSUP H. Adam Malik

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**Abstract:** **Background:** Sepsis, a complex syndrome, multifactorial, incidence, morbidity, mortality are increasing. Old age is a predisposing factor due to co-existing comorbidities, repeated hospitalizations, decreased immunity, functional limitations. Hyperlactanemia is a strong independent predictor of death in sepsis. **Objective:** Know the differences in initial lactate on elderly and non-elderly patients with sepsis associated with the SOFA score as a predictor of mortality. **Method:** Using a prospective cohort. 30 subjects with sepsis who had measured the initial SOFA score, lactate level were taken as samples. The data then analyzed statistically. **Results:** The difference between the initial lactate of the elderly – non-elderly was  $p = 0.724$ . The difference in the SOFA score was  $p = 0.089$ . The difference in initial lactate in dead patients was  $p = 0.478$ . The difference in initial lactate in alive was  $p = 0.226$ . Significant difference in the initial lactate in elderly patients who died-alive ( $p = 0.031$ ). Initial lactate was able to predict mortality in elderly patients ( $p = 0.013$ ). AUC 93.2% (95% CI = 80.2%-100%). Cut-off point (CoP) was 2.1 mmol / L. The initial lactate sensitivity was 81.8%, specificity was 75% in the elderly. **Discussion:** Women are more than men with severe sepsis had a higher risk of dying in hospital. In elderly, initial lactate of life and death patients, significant differences were found. **Conclusion:** Initial lactate predicts mortality in the elderly, cut-off point of 2.1 mmol, elderly patients are admitted to the ICU.

**Keywords:** Baseline lactate level, Sepsis, Age, SOFA score

## 1. Background

Sepsis, a complex, multifactorial syndrome whose incidence, morbidity and mortality is increasing worldwide. Old age with its predisposing factors. The presence of comorbidities, repeated hospitalizations, decreased immunity and functional limitations. Sepsis-associated hyperlactanemia is a strong independent predictor of mortality or severity in sepsis. This study aims to determine the difference in initial lactate in elderly patients (> 60 years) and non-elderly ( $\leq$  60 years) in

patients with sepsis associated with SOFA scores as a predictor of mortality in the ICU Adam malik general hospital.

## 2. Methods

Analytical study research with prospective cohort data collection method. 30 subjects with sepsis who had the initial SOFA and lactate scores measured were taken as samples, then statistically analyzed.

## 3. Results

**Table 1:** Subject Demographic Characteristics

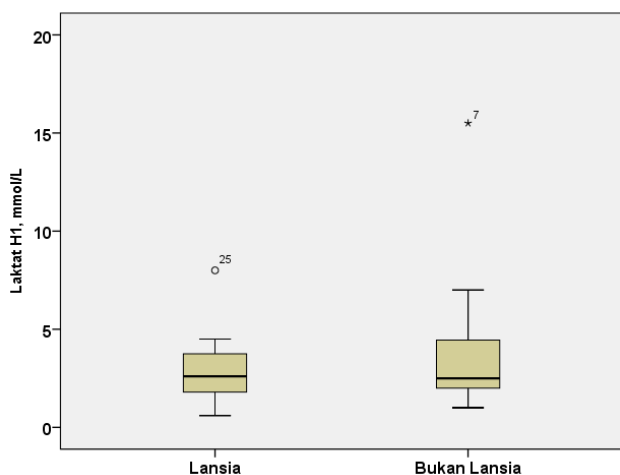
Demographic Characteristics	Elderly (n=15)	Non-Elderly (n=15)	p
Sex, n (%)			
Male	5 (33, 3)	7 (46, 7)	0, 456 <sup>a</sup>
Female	10 (66, 7)	8 (53, 3)	
Age, mean (SD), year	72, 93 (8, 80)	47, 13 (11, 55)	<0, 001 <sup>b</sup>
Ethnic, n (%)			
Batak	9 (60)	8 (53, 3)	0, 491 <sup>c</sup>
Jawa	3 (20)	4 (26, 7)	
Melayu	2 (13, 3)	0	
Nias	0	1 (6, 7)	
Padang	1 (6, 7)	2 (13, 3)	
Job, n (%)			
Teacher	1 (6, 7)	1 (6, 7)	0, 515 <sup>c</sup>
Housewife	5 (33, 3)	6 (40)	
Student	0	1 (6, 7)	
Pensionaries	4 (26, 7)	0	
Farmer	1 (6, 7)	1 (6, 7)	
Government employees	1 (6, 7)	2 (13, 3)	
Private sector worker	0	1 (6, 7)	
Businessman	3 (20)	3 (20)	

<sup>a</sup>Chi Square, <sup>b</sup>Mann Whitney, <sup>c</sup>Kruskal Wallis

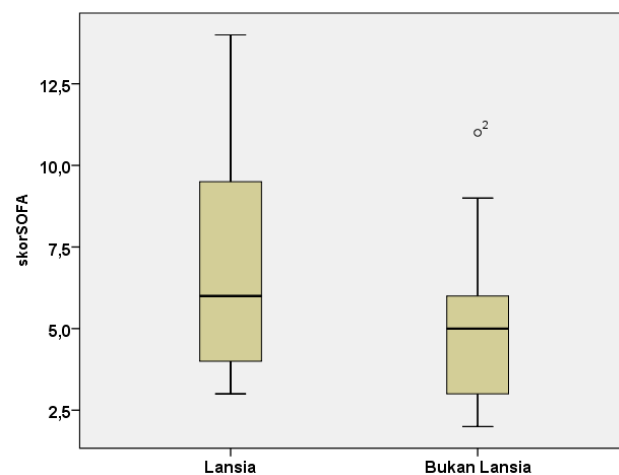
**Table 2:** Differences in initial lactate levels and SOFA scores in the elderly and non-elderly groups

	Elderly (n=15)	Non-Elderly (n=15)	p
Initial lactate Levels, mmol/L			
Mean	2,97	3,93	0,724 <sup>a</sup>
SD	1,84	3,68	
Median	2,6	2,5	
Min – Max	0,6 – 8	1 – 15,5	
SOFA Score			
Mean	7,07	5,13	0,089 <sup>b</sup>
SD	3,35	2,62	
Median	6	5	
Min – Max	3 – 14	2 – 11	

<sup>a</sup>Mann Whitney, <sup>b</sup>T Independent



**Figure 1:** Boxplot Graph of Initial Lactate Levels in the Elderly and Non-Elderly Groups

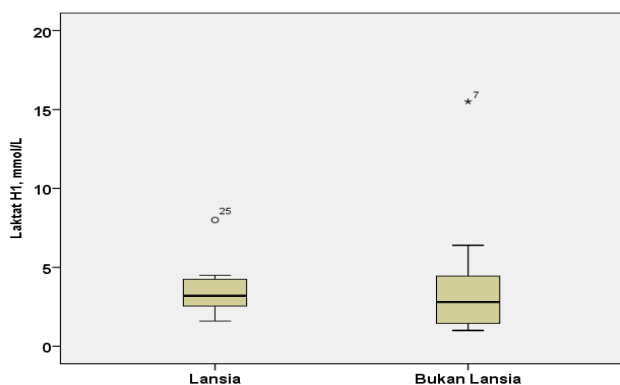


**Figure 2:** Boxplot Graph of SOFA Score in the Elderly and Non-Elderly Groups

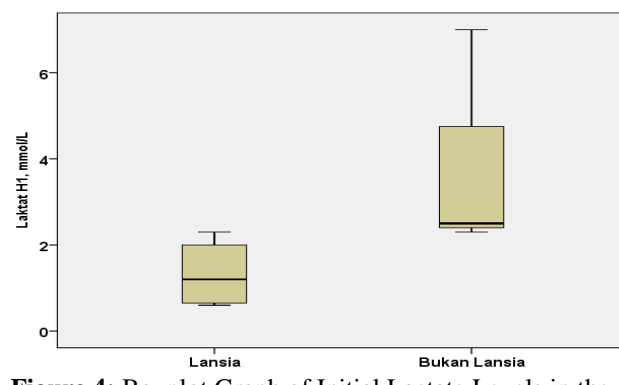
**Table 3:** Differences in initial lactate levels between deceased and living subjects

Initial lactate levels	Died		P	Survived		p
	Elderly (n=11)	Non-Elderly (n=12)		Elderly (n=4)	Non-Elderly (n=3)	
Mean	3,57	3,92	0,478 <sup>a</sup>	1,33	3,93	0,226 <sup>b</sup>
Median	3,2	2,8		1,2	2,5	
SD	1,75	4		0,82	2,66	
Min-Max	1,6 – 8	1 – 15,5		0,6 – 2,3	2,3 – 7	

<sup>a</sup>Mann Whitney, <sup>b</sup>T Independent



**Gambar 3:** Boxplot graph of initial lactate levels in the elderly and non-elderly in patients who died

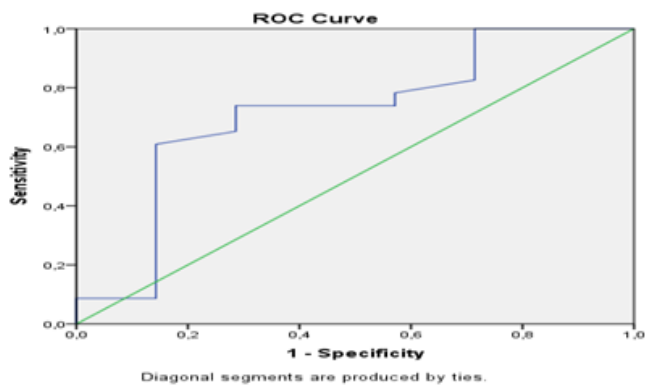


**Figure 4:** Boxplot Graph of Initial Lactate Levels in the Elderly and Non-Elderly in Living Patients

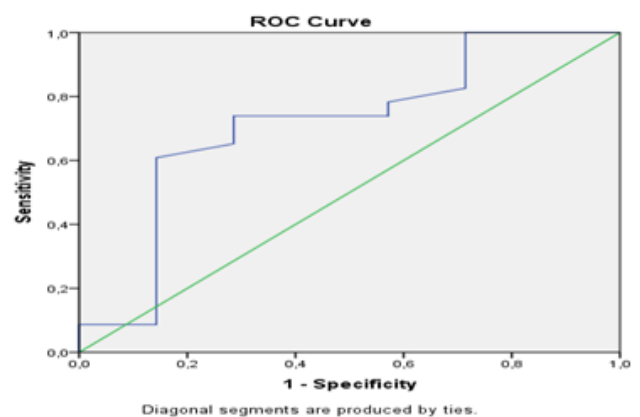
**Table 4:** ROC Curve Analysis to Predict Mortality in Sepsis Patients Using Initial Lactate Levels

Groups	P	AUC	95% CI
All patients	0,091	0,714	0,477 – 0,952
Elderly	0,013	0,932	0,802 – 1,000
Non-Elderly	0,665	0,583	0,236 – 0,931

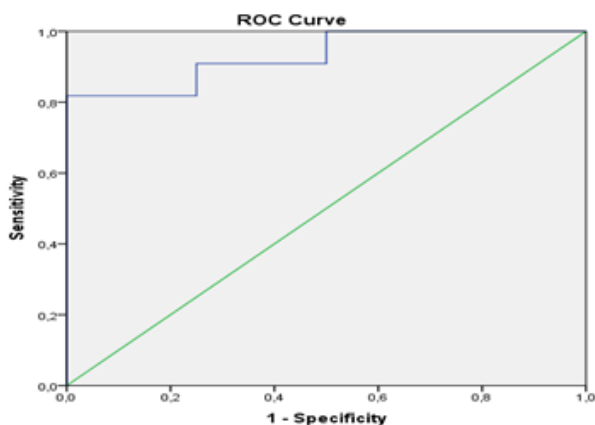
AUC=Area Under Curve, ROC=Receiver Operating Curve, IK= Confidence Interval



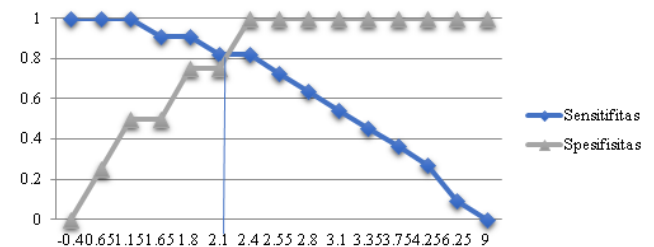
**Figure 5:** ROC curve from baseline lactate levels to mortality in all patients



**Figure 7:** ROC curve from initial lactate levels to mortality in the non-elderly group



**Figure 6:** ROC curve from initial lactate levels to mortality in the elderly group



**Figure 8:** Early Lactate sensitivity and specificity curve on mortality

**Table 5:** Sensitivity, specificity, positive and negative predictive value of initial lactate levels (CoP 2.1 mmol/L) on mortality

Initial lactate levels, mmol/l	Mortalitas		Sensitifitas	Spesifisitas	NPP	NPN
	Ya	Tidak				
≥ 2,1	9	1	81,8%	75%	90%	60%
< 2,1	2	3				

**Table 6:** Sensitivity, specificity, positive and negative predictive value of initial lactate levels (CoP 2 mg/l) on mortality

Initial lactate levels, mmol/l	Mortalitas		Sensitifitas	Spesifisitas	NPP	NPN
	Ya	Tidak				
≥ 2	9	1	81,8%	75%	90%	60%
< 2	2	3				

**4.Discussion**

The ages in this study varied. The Batak tribe is the largest ethnic group in two groups. Most jobs are housewives. More women than men. These results are supported by a large cohort study of 18,757 ICU patients, in which women with severe sepsis or septic shock had a higher risk of dying in hospital than men (Opal et al., 2016). There was no significant difference between elderly and

non-elderly initial lactate. The same result was found by Chen et al (2014), age did not affect the outcome of sepsis patients admitted to the ICU. In this study, the difference in SOFA scores was seen when the patient first entered the ICU. there was no significant difference between elderly and non-elderly SOFA scores. In line with the results of Nurok et. al's research, there is no relationship between SOFA scores and age (Nurok, Michael 2012). The initial lactate admission in the ICU was used to see the mortality

rate of elderly and non-elderly patients. there was no significant difference between the elderly and non-elderly initial lactate in the group of patients who died. Based on the initial lactate ROC curve analysis, it cannot predict mortality (death) in all patients and non-elderly patients. However, early lactate can be used to predict mortality in the elderly group. AUC of 93.2% (95% IK = 80.2%-100%), in line with research by Arvin Anand et al (2013), that elderly lactate is strongly associated with mortality due to sepsis, also correlates well with severe sepsis, and levels of The highest lactate was associated with septic shock. Analysis of sensitivity and specificity curves obtained the initial lactate cut off point (CoP) value in this study of 2.1 mmol/L. Sensitivity 81.8%, specificity 75%. With a Positive Prediction Value (PPV) of 90% and a Negative Prediction Value (NPV) of 60%, the accuracy value is 80%. Analysis using a CoP value of 2 mmol/L obtained the same results.

## 5. Conclusions and Suggestions

### Conclusions

Based on the results of data analysis obtained in this study, it can be concluded that:

1. There was no significant difference between the initial lactate of elderly patients and non-elderly patients with sepsis & no significant difference was found with SOFA score as a predictor of mortality
2. There was no significant difference between the initial lactate of the deceased patient & the living patient in the elderly and non-elderly.
3. Initial lactate levels can be used to predict mortality only in the elderly group, with a cut off of 2.1 mmol/L.
4. Based on the sensitivity and specificity curves, the sensitivity value is 81.8% and specificity is 75%. The positive predictive value (PPV) of initial lactate is 90% and the negative predictive value (NPV) is 60% with an accuracy value of 80%. By using a CoP value of 2 mmol/L, the same sensitivity and specificity were obtained as CoP 2.1 mmol/L in the elderly group of patients in this study in predicting mortality.

### Suggestion

Biomarker of early lactate levels with a cut off of 2.1 mmol/L can be used as a predictor of mortality when elderly patients enter the ICU, as a reference for starting resuscitation so as to reduce mortality.

## References

- [1] Arvin Anand, I S Gambhir, Gopal Nath, Niles Kumar. Serum lactate as prognostic marker in Indian Elderly with septicemia. National Journal of Medical Research.2013. Eissn: 8810
- [2] Chen, C. M. et al. 'Age may not influence the outcome of patients with severe sepsis in intensive care units', International Journal of Gerontology. Elsevier (Singapore) Pte Ltd.2014 8 (1), pp.22–26. doi: 10.1016/j.ijge.2013.08.004.
- [3] Cheng HH, MSa, b, Fu-Cheng Chen, MSa, Meng-Wei Change, MDa, Chia-Te Kung. Difference between elderly and non-elderly patients in using serum lactate level to predict mortality caused by sepsis in the emergency department. Medicine.2018; 97: 13
- [4] Indah Sapta Wardani. . Tatalaksana Sepsis Berat pada pasien lanjut usia.2019
- [5] Nurok, Michael; The relationship between SOFA score, ASA Classification, Age, and procedure for patients undergoing major orthopedic surgery Volume 40-Isuue.2012; 12 – p 1-328
- [6] Opal, S. M. et al. 'The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3).2016; 315 (8), pp.801–810. doi: 10.1001/jama.0287.
- [7] Palomba H, Correa TD, Silva E, et al. Comparative analysis of survival between elderly and non-elderly severe sepsis and septic shock resuscitated patients. Einstein.2015; 13: 357–63.
- [8] Roberto R. F, Leonardo L. R, Thiago D. C. et. al: Blood lactate levels cut off and mortality prediction in sepsis – time for a reappraisal? A retrospective cohort study. SHOCK.2016; vol.46, No.5, pp.480-485