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THE RELATIONSHIP OF INCREASING BLOOD LACTIC AND LEFT VENTRICLE EJECTION FRACTION (LVEF) IN ST ELEVASI MIOKARD INFARK (STEMI) PATIENTS IN ADAM MALIK HOSPITAL MEDAN, 2019

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Abstract
Introduction: Cardiovascular disease is the leading cause of death in the world. Lactate is produced by most tissues in the human body, with the highest production levels found in muscles. In anaerobic conditions, lactate is the final product of glycolysis and gluconeogenesis Knowing early heart attack is very important. Lactic acid will increase and LVEF will decrease during a heart attack.

Aim: Toinvestigatethe relationship of increasing blood lactic acid levels with a decrease in the Left Ventricular Ejection Fraction (LVEF) of ST-Elevation Myocardial Infarction (STEMI) patients.

Methods: A prospective observational study was conducted at the Haji Adam Malik General Hospital in Medan from June 2018 to March 2019 with total sample are 45STEMI patients. Patients performed Lactate and Echocardiography examinations on the first day. Data analysis using SPSS 22nd.

Result: 50 STEMI patients were tested lactic acid levels : group ≥ 2.5 mmol / l were 18 patients (40%), group <2.5 mmol / l were 27 patients (60%). Echocardiography examination was divided into LVEF $\geq 50\%$ were 26 patients (58%) and LVEF <50% were 19 patients (42%)..It was found that there were a significant relationship between the increasing lactic acid levels and a decrease in LVEF in STEMI patients(p = 0.03) and OR = 9.1.

Conclusion: Increasing lactic acid levelsis significantly related to decrease in LVEF.

Keywords: Lactate Acid, LVEF, STEMI.

Introduction
Cardiovascular disease (CVD) is now the leading cause of death in the world. In 2016 there were> 54 million deaths (95% CI, 53.6-56.3 million) globally and 32% of these deaths, or 17 million (95% CI, 16.5-18.1 million), due to coronary heart disease. This disease remains the main cause of death globally, developed and developing countries in the last 15 years while in poor countries is the third cause of death.[1]

Atherosclerosis is a process that underlies the occurrence of CVD. Some risk factors can be divided into two groups. The first group is unmodified risk factors such as: age, gender, race, and family history. The second group is modifiable risk factors such as: hypertension, diabetes mellitus (DM), dyslipidemia, overweight and smoking.[2,3,4]

Lactate is produced by most tissues in the human body, with the highest production levels found in muscles. Under normal conditions, lactate is quickly cleared by the liver with a little extra cleansing by the kidneys.. In anaerobic conditions, lactate is the final product of glycolysis and is included in the Cori Cycle as a substrate for gluconeogenesis.(Figure1)[5]

ST-Elevation Myocardial Infarction (STEMI) is defined by the presence of myocardial cell necrosis due to significant and sustained ischemia. Usually result of coronary heart disease, which implies obstruction of blood

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flow due to plaques in the coronary arteries or, more rarely, other barrier mechanisms (eg plaque-free arterial spasm. The criteria diagnosis for myocardial infarction: (1) Detection of the increase and / or decrease in heart biomarker value is preferably cardiac troponin (cTn), (2) Symptoms of ischemia, (3) New or suspected significant changes in new ST-segment-T wave (ST-T) or new left bundle branch block (LBBB), (4) Pathological Q waves on the ECG, (5) Imaging evidence of new loss of new myocardium or new regional wall movement abnormalities, (6) Identification of intra-coronary thrombus by angiography or autopsy.[6,7]
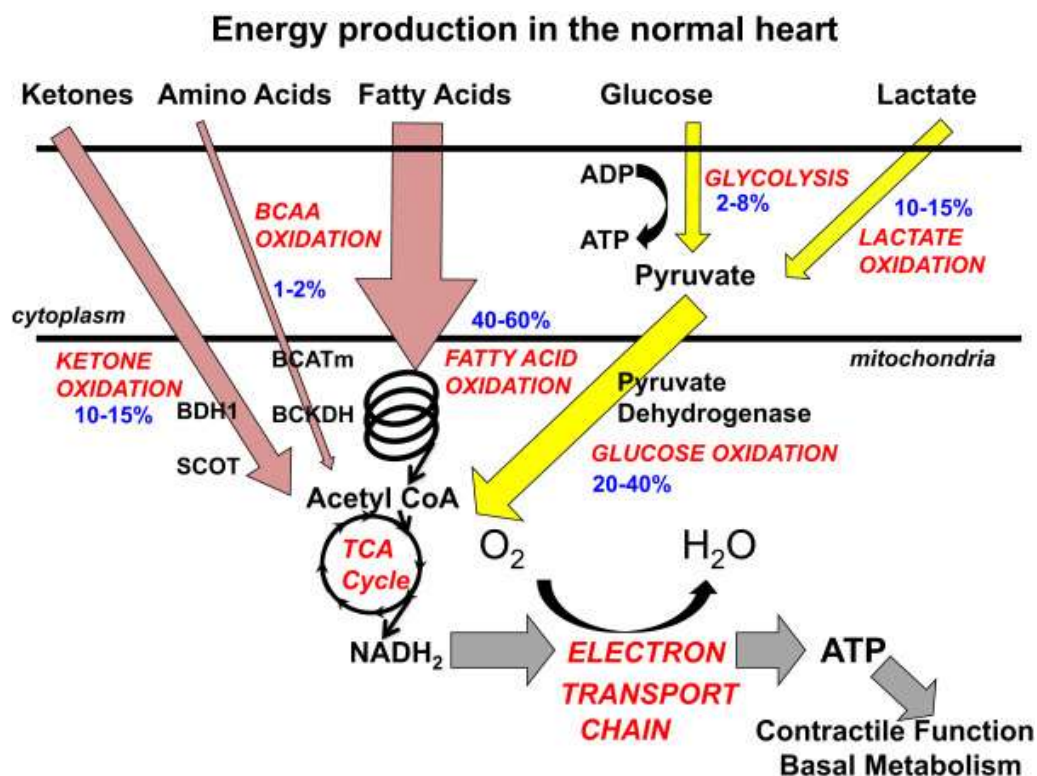

Figure1. Metabolism of Lactate

Measurement ofLeft Ventricle Ejection Fraction (LVEF) after the occurrence of acute myocardial infarction has a prognostic and therapeutic meaning and is a recommendation of the American College of Cardiology (ACC) and the American Heart Association (AHA). Normal LVEF range values :

- Hyperdynamic = LVEF> 70%
- Normal = LVEF 50% - 70% (midpoint 60%)
- Mild = LVEF 40% to 49% (midpoint 45%)
- Moderate = LVEF 30% - 39% (midpoint 35%)
- Severe = LVEF <30%

Decreased LVEF is associated with mortality, hospital stay and poor outcome in CVD patients. Increased LVEF with good revascularization will increase long-term life expectancy. The final LVEF value that can be achieved and the rate of improvement are more important predictors than the value of LVEF during acute events. One of the most important determinants of improvement in ejection fraction seems to be the success of reperfusion. Serial LVEF measurements in the first 6 months can be done.[8,9]

Method
This research uses prospective observationaldesign. The research was conducted atthe General Hospital Haji Adam Malik Medan. The data collection obtained from inpatients with a diagnosis of STEMI in Haji Adam Malik Hospital that existed fromJan 2019 untilMarch 2019. For exclusion criteria are Patients with chronic liver

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disease, chronic kidney failure, malignancy, systemic collagen disease, infectious disease, chronic lung disease, patients with a history of trauma, surgery, burns. The samples were taken from population technique and processed using statistical software.

Result

This study was attended by 45 patients who met the inclusion criteria with The majority of subjects were 27 patients male (60%) and female 18 patients (40%) wirh age range of 35-73 years with an average of 56.38 ± 8.14. History of smoking was found in all men. Group of hypertensive patients 11 people (24%) and non-hypertensive groups 34 people (76%). Most patients suffer from diabetes mellitus, 26 patients (58%) while those without diabetes mellitus were 19 patients (42%) although dyslipidemia was only found in 34 patients (76%) while 11 patients did not suffer from dyslipidemia (24%). The mean BMI examination of 25.39 ± 3.50 kg was almost the same as a normal group of 22 patients (49%) and overweight groups of 23 patients (51%).(Table1)

Tabel 1 Demographic and clinical characteristics of the patients

		Frequency (%)
Age (Years)		
-	< 56	24 (53%)
-	≥ 56	21 (47%)
Sex		
-	Male	27 (60%)
-	Female	18 (40%)
Smoking		
-	Yes	27 (60%)
-	No	18 (40%)
Diabetes Melitus		
-	Yes	26 (58%)
-	No	19 (42%)
Dyslipidemia		
-	Yes	34 (76%)
-	No	11 (24%)
Hypertension		
-	Yes	11 (24%)
-	No	34 (76%)
IMT		
-	< 25kg/m^2	22 (49%)
-	≥ 25kg/m^2	23 (51%)

The results of examination of lactic acid levels were divided into 2 groups, namely: lactic acid group ≥ 2.5 mmol / l as many as 18 patients (40%) and lactic acid group <2.5 mmol / l as many as 27 patients (60%). While echocardiography examination was divided into 2 groups as well namely: LVEF group ≥ 50% as many as 26 patients (58%) less than the LVEF group <50% as many as 19 patients (42%). (Table2)

Tabel 2 Research variable

Variabel		Frequency (%)
Lactic acid		
-	< 2,5 mmol/l	27 (60%)
-	≥ 2,5mmol/l	18 (40%)
Left Ventricle Ejection Fraction		
-	< 50%	19 (42%)
-	≥ 50%	26 (58%)

In this study, we examine a relathionship of increasing blood lactate toLVEF using Chi-Square test. There was no correlation RDW on the first day and ageto CURB-65 score (p = 0.657; p=0,307). there was a significant

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relationship between the increase in lactic blood acid levels and a decrease in LVEF (p = 0.003) and estimated risk 9,1 95% with confidence interval (2,3 - 35,9).(Table 3&4)

Table 3. Results of Chi-Square Analysis of the relationship of Lactic Acid with LVEF

		Left Ventricle Ejection Fraction		p
		< 50%	≥ 50%	
Lactic Acid Level	< 2,5 mmol/l	6 (13%)	21 (47%)	0,003
	≥ 2,5 mmol/l	13 (29%)	5 (11%)	

Table 4. Estimated Lactic Acid Risk with LVEF

	Value	95% Confidence Interval	
		Low	High
Odd Ratio Lactic Acid	9,1	2,3	35,9

Discussion

This study assessed blood lactate and LVEF on the first day.Several risk factors STEMI patienswere also noted in this study but were not related to each otherFrom Chi-Square analysis was concluded that there was a significant relationship between the increase in lactic blood acid levels and a decrease in LVEF (p = 0.003) and estimated risk 9,1 95% with confidence interval (2,3 - 35,9).

Lactate acid could be used as a marker of prognostic in STEMI patients. Coupled with an Odd Ratio of 9.1 which indicates poor heart function or low LVEF (<50%) that occurs due to the high severity of STEMI will increase blood lactate value (≥ 2.5 mmol / l) by 9.1 times

In Indonesia there is a study by Artha et al (2017) at Sanglah General Hospital, Denpasar, Bali for 275 STEMI patients. The proportion of male sex was 75%, age 58.3 + 11.79 years and obtained sex risk factors, smoking, diabetes mellitus, hypertension, hypercholesterolemia not related to the mortality rate of STEMI patients.[9]

In several theories and research said the relationship was very strong the incidence of STEMI with a decrease in LVEF. Amy Leigh Miller et al (2012) examined 128,845 patients with SKA in 2 years found EF <50% in 50.5% of STEMI patients and 42.3% of patients with NSTEMI, LVEF <40% in 23.7% of STEMI patients and 21.9% NSTEMI patients. Blake N et al. (2017) also showed that from 633 STEMI patients, LVEF = 29.2% ± 4.77% was obtained. This can be explained because after STEMI there can be a decrease in LVEF other than due to necrosis but also physiological processes such as hibernation and myocardial stuning.[10,11,12]

Conclusion

Increasing lactic acid levels is significantly related to decrease in LVEF.

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