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RESEARCH

CREATINE KINASE RELATED TO THE MORTALITY IN MYOCARDIAL INFARCTION

(Creatine Kinase terhadap Angka Kematian di Infark Miokard)

Liong Boy Kurniawan^{1,2}, Uleng Bahrun^{1,2}, Darmawaty Rauf^{1,3}, Mansyur Arif^{1,2}

ABSTRAK

Creatine Kinase (CK) merupakan salah satu uji yang sering diperiksa untuk mendiagnosis infark miokard akut. Peningkatan enzim ini menunjukkan ada nekrosis sel otot meskipun tidak khas di otot jantung. Kenaikan tingkat CK di infark miokard akut menggambarkan luas serta beratnya penyakit dan dihubungkan dengan peningkatan angka kematian pasien. Untuk mengetahui tingkat CK di pasien infark miokard akut saat masuk rumah sakit dan menilai pengaruhnya terhadap angka kematian pasien selama perawatan di rumah sakit. Penelitian ini merupakan kajian potong lintang dengan mengambil data sekunder dari rekam medik 62 pasien infark miokard akut yang dirawat di Unit Perawatan Jantung Intensif Rumah Sakit Dr. Wahidin Sudirohusodo Makassar masa waktu bulan Juli 2010 hingga Juni 2011. Kadar CK yang diteliti diperoleh saat pasien masuk rumah sakit. Uji statistik dilakukan dengan uji Mann Whitney, T Test dan Chi-Kuadrat. Rerata kadar CK di pasien infark miokard akut yang tetap hidup dan meninggal selama perawatan adalah $507,38 \pm 749,62$ U/L dan $1995,39 \pm 2290,06$ U/L ($p=0,002$). Perbedaan tingkat angka kematian yang bermakna ditemukan antar kuartil CK ($p=0,021$). Kebahayaan relatif angka kematian pada kuartil keempat (4) sebesar 13 kali dibandingkan dengan kuartil kesatu (1) (selang kepercayaan 95%, 2,07-81,5; $p=0,006$), kuartil ketiga (3) sebesar 4,8 kali dibandingkan dengan kuartil kesatu (1) (selang kepercayaan 95%, 1,07-21,45; $p=0,04$) dan kuartil kedua (2) sebesar 3 kali dibandingkan dengan kuartil kesatu (1) (selang kepercayaan 95%, 0,68-13,3; $p=0,148$). Didasari telitian ini, ditemukan perbedaan bermakna kadar CK ditemukan saat masuk rumah sakit di pasien infark miokard akut yang tetap hidup maupun yang meninggal selama perawatan. Semakin tinggi kadar CK saat pasien masuk rumah sakit semakin tinggi tingkat angka kematiannya.

Kata kunci: Creatine kinase, infark miokard, angka kematian

ABSTRACT

Creatine Kinase (CK) is frequently used for testing to diagnose acute myocardial infarction. The increase of this enzyme level suggests injury of muscle cells although it is not specific cardiac. The increase of CK level in acute myocardial infarction patients reflects its size and the severity of the disease which is associated to the patient's mortality. The aim of this study is to know the admission of CK level of acute myocardial patients and evaluate its influence to the in-hospital mortality. A cross sectional study was performed using secondary data of 62 acute myocardial infarction patients hospitalized in the Intensive Cardiac Care Unit of Dr. Wahidin Sudirohusodo Hospital Makassar from June 2010 to July 2011. The admission CK levels were then analyzed. Mann Whitney, T Test and Chi-Square were used in statistic tests. The mean of admission CK level in the in-hospital survived and non survived acute myocardial infarction patients were 507.38 ± 749.62 U/L and 1995.39 ± 2290.06 U/L respectively ($p=0.002$). There were significant mortality rate among all CK quartiles ($p=0.021$). The relative risks of mortality for quartile 4th compared to the 1st was 13 times (CI 95%, 2.07-81.5; $p=0.006$), the 3rd compared to the 1st was 4.8 times (CI 95%, 1.07-21.45; $p=0.04$) and the 2nd compared to the 1st was 3 times (CI 95%, 0.68-13.3; $p=0.148$). Based on this study, it can be concluded that there was significant difference in the admission of CK levels in the in-hospital survived and those non one (survived) relating to the acute myocardial infarction. The higher the CK levels so did (the higher) the mortality rate.

Key words: Creatine kinase, myocardial infarction, mortality

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INTRODUCTIONS

Creatine kinase (CK) is an enzyme found in many tissues including myocardium and skeletal tissues. The elevation of CK level is not cardiac specific but shows injury in muscles. This enzyme increases after four (4) up to nine (9) hours following acute myocardial infarction onset, and it reaches the peak at 24 hours and returns to the baseline at 48 to 78 hours.^{1,2} AlGani³ found that the CK levels reached maximum the peak level between after 8–12 hours in both males and females.

The severity of acute myocardial infarction can be measured by using several indicators including Killip class, electrocardiogram descriptors and laboratory tests such as CK levels.⁴ Kazmi, *et al*⁵ found that the admission creatine kinase levels could be used as a prognostic marker in acute myocardial infarction after 18 up to 30 months follow up.

The purpose of this study was to know the admission CK level of acute myocardial patients and evaluate its influence to the in-hospital mortality. The researchers compared the CK levels between survived and non survived acute myocardial infarction patients and evaluated the mortality risks among the CK levels quartiles.

METHODS

This study performed was a cross sectional using secondary data of 62 acute myocardial infarction patients whom hospitalized in the Intensive Cardiac Care Unit of Dr. Wahidin Sudirohusodo Hospital Makassar from June 2010 up to July 2011. The CK levels were tested at admission and mortality among acute myocardial infarction patients and then were analyzed. The CK levels were divided in to quartiles, and the mortality risks between them were analyzed. During the period, 146 acute myocardial infarction patients were hospitalized; among the patients 71 had recorded admission CK levels in medical records. Nine (9) patients were excluded from the study, because they left the hospital before finishing treatment on their own will and no data about their disease progression were available. So the researchers had 62 patients to be analyzed in this study. The researchers got the permission from the Educational and Training Department (Diklat) of Dr. Wahidin Sudirohusodo Hospital to access the medical records. Mann Whitney, independent T and Chi-Square were used in the statistic tests by using version 21 of SPSS software.

RESULTS AND DISCUSSION

During the period the researchers analyzed 62 acute myocardial infarction patients including 41 (66.1%) males and 21 (33.9%) females subjects. 23 (37.1%) patients died and 39 (62.9%) survived during the hospitalization. The samples characteristics are shown in Table 1.

Table 1. The characteristics of acute myocardial infarction patients

Variables	n (%)	Mean+SD	Median (Min-Max)
Sex			
Males	41 (66.1)		
Females	21 (33.9)		
Survival			
Survive	39 (62.9)		
Non survive	23 (37.1)		
Age (years)		56.90+12.47	56 (32-88)
Length of hospitalization (days)		6.74+4.77	7 (1-32)
CK (U/L)		1995.39+1663.31	298 (25-7960)

The data of CK levels and its length of hospitalization were not distributed normally. There were significant admission of CK levels difference between in-hospital survive and non survive acute myocardial infarction patients (see Table 2).

In figure 1 shows the difference of mean CK levels between the survive and non survive patients during hospitalization (Mann Whitney Test).

If the CK levels are divided in to quartiles (quartile 1, <129.75 U/L; the 2nd, 129.75-298 U/L; the 3rd, 298.1-1128 U/L; the 4th, >1128 U/L), the researchers found significant difference of mortality rate among them (quartiles) (see Table 3).

The logistic regression test shows that the patients with CK levels in quartile 4 have mortality risk 13 times higher than those in the 1st. The patients in quartile 3 and 2 have mortality risk of 4.8 and 3 times higher compared to quartile 1 respectively (see Table 4).

Some studies showed that the role of CK levels in predicting the mortality in cardiovascular events. Halkin, *et al*⁶ reported that the CK peak levels were significantly higher in patients who died compared

Table 2. The difference of Age, length of hospitalization and admission CK levels between survived and non survived acute myocardial infarction patients

Variables	Survive		Non survive		P
	Mean±SD	Median (min-max)	Mean±SD	Median (min-max)	
Age (years)	56.15±12.55	55(32-88)	58.17±12.52	60(33-80)	0.542*
Length of hospitalization (Days)	7.92±2.68	8(4-15)	4.74±6.64	2(1-32)	0.000**
CK (U/L)	507.38±749.62	225(25-4029)	1995.39±2290.06	645(50-7960)	0.002**

*Independent Student t Test

**Mann Whitney Test

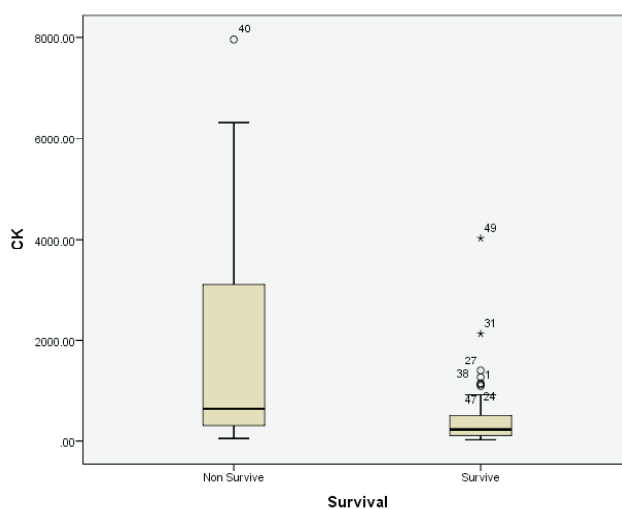


Figure 1. The difference of mean CK levels between survive and nonsurvive patients during hospitalization.

Table 3. The mortality rate of survive and nonsurvive acute myocardial infarction patients among quartiles of CK

	Nonsurvive		Survive		p*
	n (%)	n (%)	n (%)	n (%)	
CK quartile 1 (<129.75 U/L)	2 (13.3)	13 (86.7)			0,021
CK quartile 2 (129.75–298 U/L)	5 (29.4)	12 (70.6)			
CK quartile 3 (298.1–1128 U/L)	6 (40)	9 (60)			
CK quartile 4 (>1128 U/L)	10 (66,7)	5 (33,3)			

*Chi-Square Test

Table 4. The mortality Risk of acute myocardial infarction patients based on the CK quartiles

	Mortality				p	OR(CI 95%)	
	Nonsurvive		Survive				
	n	%	n	%			
CK quartiles	4	10	66.7	5	33.3	0.006	13 (2.07–81.5)
	3	6	40	9	60	0.040	4.8 (1.07–21.45)
	2	5	29.4	12	70.6	0.148	3(0.68–13.3)
	1	2	13.3	13	86.7		Baseline
Total		23	37.1	39	62.9		

with one year survivors (mean level 2865 U/L vs 1885 U/L) after the primary percutaneous coronary intervention for acute myocardial infarction. Kazmi⁵ reported that the admission of CK was associated with the subsequent cardiac event and the related mortality over 18 to 30 months follow up after acute myocardial infarction. Patients with CK level above normal had 3.46 times higher risk encountering cardiac event than those with the normal one (CK level) (using normal values for males ≤ 174 U/L and females ≤ 140 U/L).

The researchers found that the mean level of CK level admission were significantly higher in the nonsurvive compared to the survive patients. Those with CK level in quartile 4 had mortality risk 13 times higher than those (patients) in the (quartile) 1st. The patients in quartile 3 and 2 had the mortality risk 4.8 and 3 times higher than those in the (quartile) 1st. This showed that the higher the CK levels so does the mortality risk in acute myocardial infarction patients during their hospitalization. This finding was consistent with the report of Savonitto, *et al*⁷. They found that patients with CK ratio of >1 up to 2 above upper limit had 1.26 times higher mortality risk than those with normal range in six (6) months evaluation after acute coronary syndromes events. They evaluated that the higher the CK ratio the higher mortality and the reinfarction risks.

The limitation of this study is that the researchers use the admission of CK level for analyzing the data, whereas the patients came to the hospital in different time after the onset of their chest pain, so it does not reflect the peak level of CK. Another limitation is that the researchers do not investigate other sources which may interfere the increase of the CK level such as skeletal muscles injury and others causes due to the lack of data from the medical records. In the future study, it is suggested to perform cohort study by evaluating the influence of the peak level of CK to the

in hospital's mortality of acute myocardial infarction patients excluding other causes which may increase it (the CK level).

CONCLUSION AND SUGGESTION

Based on this study, it can be concluded that there was significant difference of the admission CK levels in the in-hospital survived and non-one (survived) related to the acute myocardial infarction. The higher the CK levels so does the mortality rate. In the future study, it is suggested to use peak CK levels to evaluate its role in in-hospital myocardial infarction mortality.

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