



VALIDATION OF CAMI-NSTEMI SCORE IN ASSESING IN-HOSPITAL MORTALITY RISK IN NON ST ELEVATION MYOCARD INFARCT (NSTEMI) IN HAJI ADAM MALIK GENERAL HOSPITAL MEDAN

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Abstract

Background : Risk Stratification in patient with acute myocardial infarction, especially NSTEMI, is clinically important. GRACE score and TIMI score are used frequently, although the number of Asian population represented in this risk score model was small. CAMI-NSTEMI score is a novel risk score to predict inhospital mortality derived from CAMI registry with Chinese population. This study aims to validate this score in North Sumatera.

Method : Data were collected from 50 patients diagnosed with NSTEMI in Haji Adam Malik General Hospital Medan consecutively. Baseline data, clinical findings, ECG, and laboratory findings were recorded, whereas mortality and major cardiovascular events (MACEs) were observed during inhospital care. CAMI-NSTEMI and GRACE score were counted. The new CAMI-NSTEMI score cutoff in this study were measured and compared with the CAMI-NSTEMI score from the novel study (sensitivity, specificity, positive predictive value, negative predictive value).

Result : From 50 patients, mortality was recorded in 6 patients (12%) whereas MACEs were recorded in 25 patients (52%). The CAMI-NSTEMI score cutoff in this study was <83.5, 83.5-115, >115 (low, moderate, high risk respectively). From data analysis, this study found the sensitivity (100%, 77.8%, 92.3) , spesificity (90.0%, 97.6%, 100%), positive predictive value (93.3%, 87.5%, 100%), and negative predictive value (100%, 95.2%, 97.4%) compared with the novel study for low, moderate and high risk respectively.

Conclusions : CAMI-NSTEMI Score is for assessing inhospital mortality risk in NSTEMI patients at Haji Adam Malik General Hospital Medan (North Sumatera).

Keywords: CAMI-NSTEMI, Score, Mortality, Risk, NSTEMI, Inhospital.

Introduction

The 2016 Heart Disease and Stroke Statistics update of the American Heart Association (AHA) has recently reported that 15.5 million persons ≥ 20 years of age in the USA have CHD.¹In Asia-Pacific, Acute Coronary Syndrome (ACS) remains main mortality and morbidity cause, while many efforts have been done for the last decade to improve the treatment.²In North Sumatera, physician diagnosis of Coronary Heart Disease (CHD) from Indonesian national registry was estimated 0.5% (44,9698) and from diagnosis/symptoms was 1.1% (98,336) in 2013.³ From 2018 Indonesian national registry data, the estimated number of all heart disease diagnosis was 1.5%, with the highest was North Kalimantan (2.2%) dan the lowest was East Nusa Tenggara (0.7%).⁴

Compared with ST Elevation Myocardial Infarct (STEMI), Non-ST Elevation Myocardial Infarct (NSTEMI and Unstable Angina Pectoris (UAP) diagnosis were found more frequently, which patients were relatively older and having more comorbids.⁵ Moreover, early mortality of NSTEMI was lower compared with STEMI, but after 6 months, the mortality was almost similar, and for longterm mortality, NSTEMI was found higher.⁵



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Risk stratification is an important component of patient management with ACS.^{5,6} Prognostic information is important for triage and allocation of resources to provide the right intensity and location for treating patients with myocardial infarction.⁶ Several ways of risk stratification have been developed and validated for SKA. Some risk stratifications used are TIMI (Thrombolysis In Myocardial Infarction), and GRACE (Global Registry of Acute Coronary Events), while CRUSADE (Can Rapid risk stratification of unstable angina patients Suppress Adverse outcomes with Early implementation of the ACC / AHA guidelines) is used to stratify the risk of bleeding.⁵

The Asian population is slightly represented in standard mortality risk prediction models from Acute Myocardial Infarction (AMI) such as the GRACE score.⁷ In a study conducted by comparing the incidence of CHD in the Netherlands and Singapore, it was found that ethnicity was independently associated with CHD severity and changing the strength of the relationship of certain risk factors and CHD severity.⁸

CAMI (China Acute Myocardial Infarction) NSTEMI score is a risk stratification system developed from the CAMI registry that uses data from Chinese AMI patients.⁹ The CAMI-NSTEMI score is believed to be simple and useful to guide clinicians to choose the appropriate therapy and level of care.⁹ Further studies, involving larger samples and ethnic differences are needed to further validate this scoring system.⁹

This study aims to test the validity of the CAMI-NSTEMI score in assessing the risk of mortality during treatment and as the first study undertaken in Indonesia, particularly North Sumatra, with ethnic research samples that differ from the original study.

Methods

Population and Research Design

This is a prospective study conducted at Cardiac Centre Haji Adam Malik General Hospital, Medan involving 50 consecutive patients based on inclusion and exclusion criteria from July 2019 to October 2019. Patients with a diagnosis of NSTEMI were the population in this study. Patient who failed to complete the test to fulfil this study were excluded.

The diagnosis of NSTEMI was established based on ESC criteria in 2015 and PERKI guidelines in 2018. Patients were examined during treatment to obtain data on patient profiles, risk factors, ECG examinations, and laboratory examinations. ECG examination was done using a Bionet Cardiotouch 3000 device, a speed of 25 mm / s and an amplitude scale of 10 mV / mm when the patient entered the Emergency Department (ER). Laboratory tests were performed when the patient were in the ER through the Clinical Pathology laboratory of the Haji Adam Malik General Hospital.

Statistical Analysis

Data was presented descriptively in frequency distribution and percentage for categorical data. Whereas numerical was presented in mean and standard deviation for normally distributed data, while numerical data that was not normally distributed will be displayed in median. Numerical variable normality test was performed by Kolmogorov Smirnov method.

Bivariate analysis was performed using paired t-test or Mann Whitney test on numerical variables, while Chi-square or Fisher test was used on categorical variables. The new cutoff point was determined based on the mortality event in the study. The sensitivity and specificity values of the cut off points of the CAMI-NSTEMI score in this study were then tested against the value of the CAMI-NSTEMI score in the study of Fu et al (the novel study). Analysis of statistical data using SPSS software version 20, p values <0.05 were considered statistically significant.



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Results

This study included NSTEMI patients who were treated in Cardiac Center Haji Adam Malik Hospital Medan.

Table 1. Baseline Characteristics

Variables	Male(43/86)		Female (7/14)	
Gender (n/%)	Male(43/86)		Female (7/14)	
Age (years)	59.50 (36-81)			
Body Mass Index(kg/m ²)	25.13±4.43			
Systolic Blood Pressure (mmHg)	128.40±31.12			
Heart Rate (x/minute)	90 (48-160)			
Creatinine serum (µmol/L)	114.92 (4.48-1095.28)			
Leucocyte (/µL)	11,546.80±4,420.71			
Killip Class (n/%)	I (27/54)	II(10/20)	III(6/12)	IV(7/14)
ST Depression(n/%)	Yes (29/58)		No (21/42)	
Cardiac Arrest (n/%)	Yes (2/4)		No (48/96)	
Smoking (n/%)	Smoker (23/46)	Ex-smoker (19/38)	Non-smoker (8/16)	
MI history (n/%)	Yes (23/46)		No (27/54)	
PCI history (n/%)	Yes (12/24)		No (38/76)	
CAMI-NSTEMI (n/%)	<80 (13/26)	80-101 (9/18)	>101 (28/56)	
GRACE (n/%)	<109 (8/16)	109-140 (23/46)	>140 (19/38)	
In-hospital MACEs(n/%)	Yes (26/52)		No (24/48)	
Heart Failure	20			
Arhythmia	3			
Cardiogenic Shock	7			
STEMI ECG changes	0			
In-hospital Mortality (n/%)	Yes (6/12)		No(44/88)	

From the entire sample, male gender was found in 86 % (43 people), with the median age of 59.5. In-hospital major adverse cardiovascular events (MACEs) were found in 52 % samples (26 people), mostly heart failure. In-hospital mortality was found in 6 people (12%). Most patients were include into low risk CAMI-NSTEMI score (56%) and moderate risk GRACE score (46%) group.

Table 2 Clinical Characteristic based on In-Hospital Mortality

Variables	In-hospital Mortality		P value
	Yes (N=6)	No (N=44)	
Gender			1.00 ^a
Male	5	38	
Female	1	6	
Age (years)	75.50 (63-81)	58.00 (36-76)	<0.001 ^c
Body mass index (kg/m ²)	22.01±4.74	25.56±4.27	0.06 ^b
Systolic Blood Pressure (mmHg)	106.67±28.75	131.36±30.54	0.06 ^b
Heart Rate (x/minute)	150 (90-160)	82.50 (48-150)	<0.001 ^c
Creatinine serum (µmol/L)	125.08 (88.40-538.36)	114.03 (4.48-1095.28)	0.33 ^c
Leucocyte (/µL)	14,870.00±5,189.04	11,093.64±4,169.83	0.04 ^b
Killip Class			<0.001 ^a
I	0	27	
II	1	9	
III	2	4	
IV	3	4	



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ST Depression				0.38 ^a
	Yes	5	24	
	No	1	20	
Cardiac Arrest				0.22 ^a
	Yes	1	1	
	No	5	43	
Smoking				<0.001 ^a
	Smoker	1	22	
	Ex-smoker	1	18	
	Non-smoker	4	4	
MI History				<0.001 ^a
	Yes	6	17	
	No	0	27	
PCI history				<0.001 ^a
	Yes	5	7	
	No	1	37	

^aChisquare ^bT Test ^cMann-Whitney

Table 2 above presented some statistically significant data difference in in-hospital mortality, such as age, heart rate, leucocyte, Killip Classification, smoking history, MI history, and PCI history. The median age of in-hospital mortality group was 75.5, where as the median heart rate and mean leucocyte were 150 and 14,870 respectively. Other parameter differences were not statistically significant such as gender, body mass index (BMI), systolic blood pressure, creatinine serum, ST depression and history of cardiac arrest.

All samples CAMI-NSTEMI were counted and the distribution of inhospital mortality was presented in figure 1. Five samples with inhospital mortality were included to highrisk CAMI-NSTEMI score group, where as one sample was in moderate risk group.

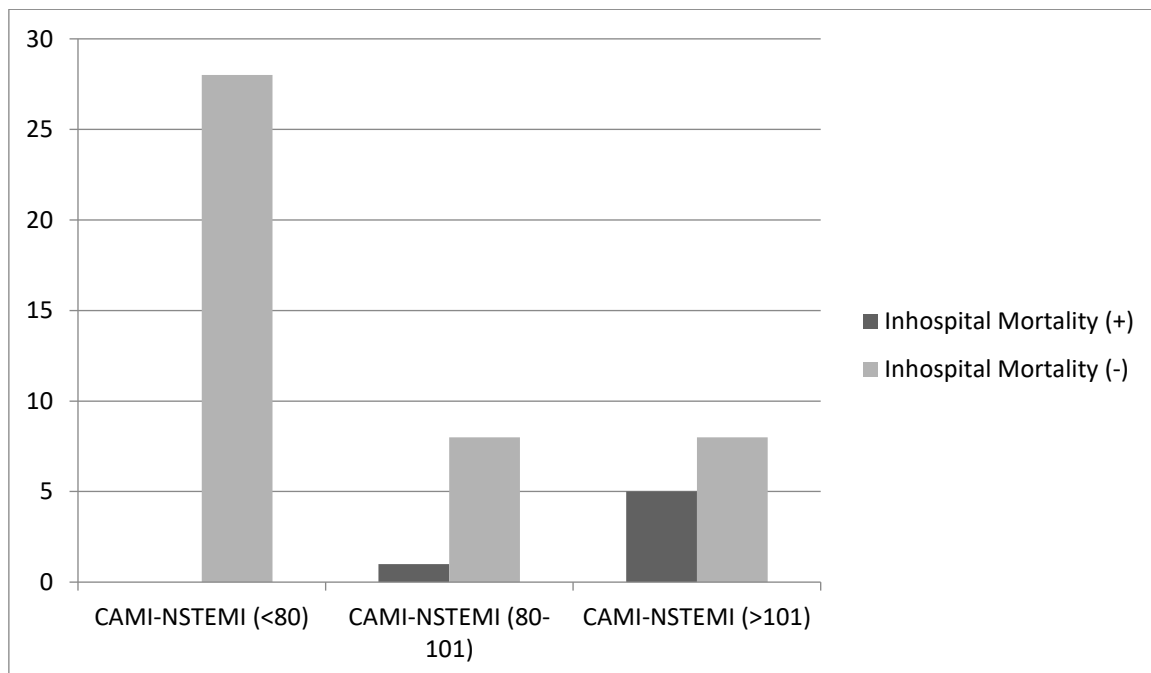


Figure 1. Distribution of Inhospital mortality based on CAMI-NSTEMI score



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Table 3. CAMI-NSTEMI Score Study cut off

	Low Risk	Moderate Risk	High Risk
Fu et al	<80	80-101	>101
This study	<83.5	83.5-115	>115

New cutoff points for CAMI-NSTEMI risk values were obtained based on mortality events during treatment in the study by analyzing ROC curve. From the research data, the cutoff values for low risk for mortality during treatment are below 83.5, medium 83.5 to 115 and high risk above 115, presented in table 2.

Table 4. Comparison with Fu et al study

CAMI-NSTEMI group	Sensitivity (%)	Spesifisity (%)	Positive Predictive Value/PPV (%)	Negative Predictive Value/NPV (%)
Low Risk	100	90.9	93.3	100
Moderate Risk	77.8	97.6	87.5	95.2
High Risk	92.3	100	100	97.4

Table 4 has shown comparison of this study cut off with Fu et all study. Almost all variable group with sensitivity, spesificity, PPV and NPV value above 80%.

Discussion

The majority of samples in this study were male (86%). This is consistent with research in China where the two ACS subgroups studied were male sex (71.9% and 69.5%).¹⁰ The same thing was found in a study in Surakarta, found that the male NSTEMI population was 61.1%.¹¹

From the age group in this study, the median age of the study sample was 59.50 (36-81) years and almost similar as the results of various studies. According to research in Pakistan, the average age of NSTEMI samples was 59.91 ± 9.04 years¹². While study in Semarang, Indonesia, found the average age of patients 58.47 ± 9.57 years.¹³ These results indicate that the age of the sample in the study is relatively the same as other studies.

Based on body mass index values, found in this study with a mean value of 25.13 ± 4.43 kg / m². From Fu et al's research data in China, the mean body mass index obtained in patients with non-mortality NSTEMI subgroups was 24.09 ± 3.05 kg / m² while in mortality subgroups during treatment 23.02 ± 3.11 kg / m².⁹ From a study in Makassar, obesity body mass index (> 25 kg / m²) was found in the SKA subgroup at 32.7%, while in the angina pectoris subgroup it was stable at 40.7%.¹⁴

The mean systolic blood pressure sample at admission was 128.40 ± 31.12 mmHg. In the Makassar study, the mean value of systolic blood pressure of patients with ACS was 130.00 ± 27.60 mmHg.¹⁴ Research in Medan, found the mean value of systolic blood pressure NSTEMI patients with heart failure presentation was 134.7 ± 29.0 mmHg with MACEs subgroups during treatment 131.3 ± 32.7 mmHg and non-MACEs subgroups during treatment 137.4 ± 25.9 mmHg.¹⁵

The median heart rate in this study was 90 (48-160) times per minute. McNamara et al found the mean heart rate of patients with acute myocardial infarction was 84.2 ± 24.0 times per minute.¹⁶ From the research in Medan, the mean heart rate of NSTEMI patients with heart failure presentation was 102.9 ± 25.8 times per minute.¹⁵

The mean value of serum creatinine in this study was 114.92 (4.48-1095.28) $\mu\text{mol} / \text{L}$. From McNamara's research, the average creatinine value was 1.3 ± 1.2 mg / dl or 114.92 ± 106.08 $\mu\text{mol} / \text{L}$, which for mortality subgroups during treatment with an average value of 159.12 ± 141.44 $\mu\text{mol} / \text{L}$ and non-mortality during treatment 114.92 ± 106.08 $\mu\text{mol} / \text{L}$.¹⁶



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The mean value of leukocytes in this study was found to be $11,546.80 \pm 4,420.71 / \mu\text{L}$. According to research in Surakarta found the average value of leukocyte samples was $10.192 \pm 3.2456 / \mu\text{L}$.¹¹

Mortality during treatment was found in the study of 12%. This result was higher than McNamara's study with a mortality value of 4% treatment.¹⁶ Fu et al's study in China found that the mortality value during NSTEMI treatment was around 6%.⁹ This is likely due to the smaller sample size compared to the two studies. However, research in Makassar found mortality results during ACS treatment at 12.6%, almost the same as the results of this study.¹⁴

This study found that the sensitivity of the CAMI-NSTEMI score study cutoff comparison with Fu et al for low risk groups was 100%, medium risk 77.8% and high 92.3%. For the specificity of the CAMI-NSTEMI study cutoff comparison with Fu et al for the low risk group is 90.9%, the middle risk group is 97.6% and the high risk group is 100%. Positive and negative predictive values of CAMI-NSTEMI scores study cut points compared with Fu et al CAMI-NSTEMI score showed high results in each risk category. This data showed that the CAMI-NSTEMI score with changes in the cutoff point in this study did not show a significant difference when compared with the CAMI-NSTEMI score from the study of Fu et al. So it can be concluded that the CAMI-NSTEMI score is valid for use in assessing the risk of mortality during treatment in this study sample.

Conclusions

CAMI-NSTEMI scores are valid for assessing risk of inhospital mortality of NSTEMI at H. Adam Malik General Hospital Medan (North Sumatera).

Conflict of Interest

The authors declare that there is no conflict of interest.

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