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Comparison of Syntax II Score And Grace Score As Predictors of Major Cardiovascular Events 30 Days after Treatment in STEMI Undergoing PPCI

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ABSTRACT

Introduction: IMA-EST is still the main cause of morbidity and mortality in Coronary Artery Disease (CAD) and PPCI is still the main treatment method for IMA-EST patients. Even though PPCI has been undergone, patients are reported to still experience mortality and morbidity both in hospital and after discharged. The SYNTAX II score uses clinical, laboratory and anatomical parameters that are believed to be better than the GRACE score to predict mortality and morbidity.

Method: This study is an observational analytic with a retrospective cohort design in STEMI patients who underwent PPCI at HAM General Hospital from January 2023 to June 2023. Patients who were diagnosed with STEMI and underwent with PPCI had their GRACE score and SYNTAX II score calculated and followed for 30 days. SYNTAX-II Score's cut-off point, sensitivity and specificity as well as predictive possibilities in predicting adverse outcomes were determined. Then bivariate analysis was carried out on each SYNTAX-II Score and GRACE score.

Results: The study subjects totaled 73 people with an average age of 56.05 ± 10.07 years. The incidence of MACE 30 days after treatment in our sample was 23.3%. It was found that the SYNTAX II score could well predict occurrence of MACE 30 days after treatment (cut off 33,75, AUC 0.861; 0.773 – 0.949; sensitivity 94.1%; specificity 69.6%, PPV 94.1% and NPV 67.6). The result of the bivariate analysis of the SYNTAX-II Score were: P < 0,0001; OR: 18,353; 95%; CI: 2,566 – 131,241and the results of the GRACE Score were: P < 0,006; OR 5,854; 95%; CI: 1,442 – 23,764.

Conclusion: The SYNTAX II score is better to predict occurrence of MACE 30 days after treatment in STEMI patients who undergoing PPCI compared to the GRACE score.

Keywords

STEMI, PPCI (Primary Percutaneus Coronary Interventions), GRACE score, SYNATX-II score, MACE (Major Adverse Cardiac Events)

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INTRODUCTION

In 2013, the prevalence of SCI in Indonesia was known to be 1.5% or equivalent to 2,650,340 cases.[1-3] Basic Health Research in 2013 showed the prevalence of coronary heart disease was 0.5% of the total population of Indonesia.[4-5] In North Sumatra, the diagnosis of coronary heart disease (CHD) was estimated at 0.5% (44,9698) in 2013. From the 2018 Indonesian national registry data, the estimated incidence of heart disease diagnosis was 1.5%, the highest in North Kalimantan (2.2%) and the lowest in East Nusa Tenggara (0.7%).[6]

Myocardial infarction with ST-segment elevation (IMA-EST) is a major cause of morbidity and mortality in ischaemic heart disease. Primary percutaneous coronary intervention (PCI) is the main treatment method for patients with IMA-EST. However, complete reflow recovery cannot be achieved in 2.3%-29% of

patients after reperfusion attempts. This condition is called the no-reflow phenomenon.[7] In-hospital mortality is significantly higher in IMA-EST patients than in IMA-NEST patients (7.7 vs 5.1%).[8] In-hospital mortality after primary IKP for IMA-EST patients ranges from 2.5% to 9.4% in Japan, 2.2% to 6.1% in Europe, and 5.7% to 6.3% in the United States.[2] Indonesian studies show the percentage of mortality in IMA-EST patients undergoing primary IKP to be 2.7%, 4.9% and 2.0% for the first, second and third years, respectively.[1]

The Global Registry of Acute Cardiac Events (GRACE) risk score is a scoring developed for patients with SCA and used to predict in-hospital mortality. Its use is recommended by the European Society of Cardiology for risk stratification in patients with IMA-NEST.[2] Based on the Global Registry of Acute Coronary Events (GRACE) report, the GRACE score consists of 8 semiquantitative variables analysed at admission namely age, heart rate, systolic blood pressure, plasma creatinine, and Killip class; and 3 dichotomous variables namely cardiac arrest at admission, ST segment deviation, and cardiac biomarker elevation with a total score ranging from 0 to 372.[9]

Kumar study showed that the GRACE score had good accuracy for predicting in-hospital mortality (AUC = 0.80, sensitivity = 93.8% and specificity = 53.2%) and mortality within 6 months (AUC = 0.792, sensitivity = 80% and specificity = 70.8%) in patients with IMA-NEST.[10] Neves study showed an in-hospital mortality rate in cases of myocardial infarction with ST-segment elevation (IMA-EST) of 11.9% with a C test statistic for the GRACE score of 8.8 (p = 0.359) and an AUC of 0.78. The cutoff value used was 179, with a sensitivity of 80% and specificity of 91.9%.[9]

SYNTAX score, a comprehensive angiographic scoring method that takes into account anatomical risk factors to assess the severity of CHD.[11] The SYNTAX score (SS) is an angiographic scoring system that measures coronary artery disease burden and has been shown to be an independent predictor of major cardiovascular events (MCEs) and mortality in stable coronary artery disease and SCI. Residual SS (rSS) assesses the extent of coronary disease after primary percutaneous coronary intervention (PCI) and can be used as an indicator of successful revascularisation.[12]

The SYNTAX score is exclusively based on coronary vascular anatomical abnormality features and lesion characteristics (such as number of lesions, bifurcation or trifurcation lesions, total occlusion, calcification, thrombus formation, aortic-ostial stenosis) without taking into account clinical variables, therefore its use is limited and the SYNTAX-II score was developed which combines anatomical and clinical factors to predict post-procedure outcomes.[13,14]

The aim of this study is to see whether the Syntax II Score is better than the GRACE Score for predictors of major cardiovascular events (MME) 30 days after treatment in IMA-EST patients who underwent PCI at Adam Malik Hospital Medan.

METHOD

This study is an observational analytic study conducted in a retrospective cohort to compare the ability of SYNTAX II Score and GRACE Score as predictors of the occurrence of KKvM 30 days after treatment in IMA-EST patients who underwent PCI action at H Adam Malik Hospital Medan. Sampling was conducted at H. Adam Malik Hospital Medan from January 2023 to June 2023. The target population was patients with a diagnosis of IMA-EST who underwent PCI. The target population was patients with a diagnosis of IMA-EST who underwent IKPP at H Adam Malik Hospital Medan.

Inclusion criteria in this study were patients with a diagnosis of IMA-EST who underwent PCI at H Adam Malik Medan Hospital, had complete clinical data and supporting examinations in medical records and were willing to become research subjects by signing informed consent. While the exclusion criteria consisted of patients with a diagnosis of IMA-EST who underwent IKPP who were not examined according to research needs, patients with a history of having major cardiovascular events (MVC) at admission and patients who underwent IKPP with TIMI Flow results <3.

Informed consent will be obtained from all study subjects after explaining the purpose of the study, examination procedures, and management. This study will seek approval from the Health Research Ethics

Committee of the Faculty of Medicine, University of North Sumatra and Adam Malik Hospital Medan. Before the study began, researchers requested ethical clearance from the Standing Committee for Research Ethics Assessment of the Faculty of Medicine, University of North Sumatra. Each individual who was included as a research sample made an informed consent letter signed by the participant and the researcher.

All samples of this study were patients with a diagnosis of IMA-EST who underwent IKPP at H Adam Malik Hospital Medan who met the inclusion and exclusion criteria. The diagnosis of IMA-EST was made based on the SKA guidelines from ESC and PERKI. The sample collection used the quota method (consecutive) where each subject who met the inclusion criteria was sampled until the total sample size was at least 73 patients.

Subjects who became research samples were all patients with a diagnosis of IMA-EST in the emergency department who then underwent IKPP actions where before the action had been carried out informed consent to patients who met the inclusion criteria. Baseline data, subject identity (age, gender, history of cardiac arrest at diagnosis), physical examination (pulse, blood pressure), laboratory examination (plasma creatinine, troponin), ECG (ST segment deviation), and angiographic examination (coronary artery lesions) were fully documented.

Then the Killip-Kimball classification was calculated, followed by the calculation of the Syntax II Score and GRACE Score. After that, all data obtained according to the Syntax II Score and GRACE Score criteria were inputted. For patients admitted before the study time, the clinical course during treatment and KKvM were seen through medical record data. For patients admitted within the study time, observations were made during treatment and accompanied by KKvM that occurred for 30 days. Then all the data obtained will be subjected to data processing, analysis, and hypothesis testing, which have been determined using SPSS ver 19.

To assess the comparison between the Syntax II Score and the GRACE Score to predict KKvM during treatment in IMA-EST patients undergoing IKPP if the data is normally distributed, the chi square test is used and if the data is not normally distributed, the Fisher exact test is used. For numerical data, bivariate analysis used Independent T-test if the data was normally distributed, or Mann Whitney U test if the data was not normally distributed. For samples that were found to be significant in the bivariate analysis test, they were entered into the multivariate test with logistic regression. Statistical data analysis using computer statistical tools, p value <0.05 was considered statistically significant.

RESULTS

Table 2 shows that the median SYNTAX II and GRACE scores were 31.6 (11.2-75.9) and 142 (120-261) respectively. The majority of patients had SYNTAX II scores ⩽ 32 with 39 people (53.4) and GRACE scores > 140 with 41 people (56.2%). In table 4.3. Table 4.3 shows that there is a significant association between SYNTAX II and GRACE scores on MMC 30 days after treatment (p value <0.05).

Based on the ROC curves and table 4. 4, it was found that SYNTAX II and GRACE could well predict KKvM 30 days after treatment (cut off 33.75, AUC 0.861; 0.773 - 0.949; sensitivity 94.1%; specificity 69.6%, PPV 94.1% and NPV 67.6%); (cut off 141.5, AUC 0.774; 0.641 - 0.906; sensitivity 88.2%; specificity 58.9%, PPV 88.2% and NPV 53.6%). Among the two scores, SS-II was more sensitive and specific in predicting the incidence of KKvM 30 days after treatment compared to GRACE score.

Table 1 Basic characteristics of study subjects

Characteristics	n (%)
Sex	
Man	55 (75,3)
Woman	18 (24,7)
Age (Mean ± SD)(years old)	56,05 ± 10,07*
Body Weight (Mean ± SD) (kg)	68,20 ± 11,24*
Body Height (Median (Min-Max) (cm)	165 (150-182)**
Total	73 (100)

*Kolgomorov Smirnov test > 0,05, **Kolgomorov Smirnov test < 0,05

Table 1. Continuous

Characteristics	n (%)
BMI (Median (Min-Max))(kg/m^2)	24,80 (18,43 – 37,78) **
Heart Rate (Mean ± SD)(x/i)	78,36 ± 19,01
Systolic blood pressure (Median (Min-Max))(mmHg)	126 (80 – 192)**
Troponin (Median (Min-Max))(ng/mL)	15 (0,01-15)**
Creatinin (Median (Min-Max))(mg/dL)	1,01 (0,57 – 9,63)**
Diabetes Mellitus	
Yes	30 (41,4)
No	43 (58,9)
Hypertension	
Yes	58 (79,5)
No	15 (20,5)
Smoking	
Yes	58 (79,5)
No	15 (20,5)
Anterior MI	
Yes	39 (53,4)
No	34 (46,6)
Killip 3	
Yes	15 (20,5)
No	58 (79,5)
MACE 30 days after admision	
Yes	17 (23,3)
No	56 (76,7)
Total	73 (100)

*Kolgomorov Smirnov Test > 0,05, **Kolgomorov Smirnov Test < 0,05

Table 2. Characteristics of Syntax II and GRACE scores of research subjects

Characteristics	n(%)
Score SYNTAX II, Median (Min-Max)	31,6 (11,2-75,9)*
> 32	34 (46,6)
≤ 32	39 (53,4)
Score GRACE, Median (Min-Max)	142 (120 – 261)*
> 140	41 (56,2)
≤ 140	32 (43,8)
Total	73 (100)

*Uji Kolgomorov Smirnov < 0,05

Table 3. Relationship between Syntax II and GRACE scores and MMEs 30 days after treatment

Score	*P value*
Skor SYNTAX II	< 0,001*
Skor GRACE	0,006*

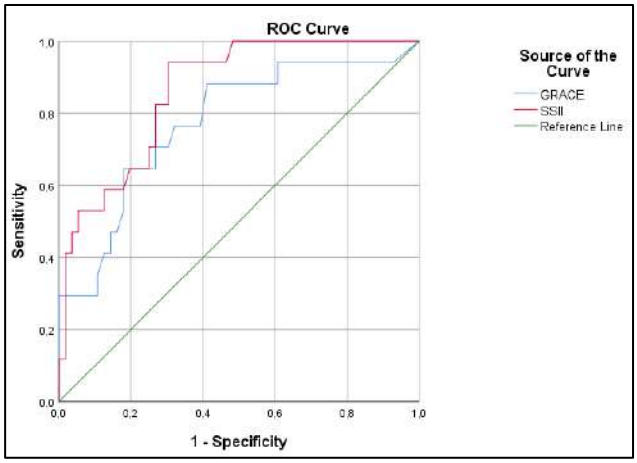

Figure 1. Cut off, Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) of SYNTAX II Score and GRACE Score

Table 4. *Cut off, sensitivity, specificity, PPV, NPV of SYNTAX II Score and GRACE Score*

Score	Cut-off	AUC	95% CI	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	*p value*
SYNTAX II	33,75	0,861	0,773 – 0,949	94,1	69,6	94,1%	67,6%	< 0,001
GRACE	141,5	0,774	0,641 – 0,906	88,2	58,9	88,2%	53,6%	

DISCUSSION

The median SYNTAX II score in this study was 31.6 (11.2-75.9). The majority of patients had a SYNTAX II score ≤ 32 with a total of 39 people (53.4). This is not much different from Xu et al in 2022 getting the average SYNTAX score of 17.53 ± 10.61. They divided the SYNTAX score into 3 categories with the results being low, 432 (18.3%) patients had moderate SYNTAX scores, and 237 (10%) patients had high SYNTAX scores. The PCI group had a higher incidence of moderate and high SYNTAX scores than the medical therapy group (26.1% vs 8.0%; 14.0% vs 4.7% P<0.05). Karabag et al in 2018 found patients' SS-II scores ranged from 13 to 80 (median 29.5). The study by Sofidis et al in 2021 found the mean SYNTAX score was 16.2 ± 13.4 with the majority of the population (72.7%) having a low SYNTAX score (each <0.001) [5]. In the study by Aldjuleli et al in 2022 also found 511 (66.5%) high-risk patients based on the SYNTAX II score (247 (32.2%) were not high risk, 10 (1.3%) [6]. Patients considered high-risk by SYNTAX II score were older (72 [63, 79] vs 56 [50, 63] years, p <.0001) and more likely to have hypertension (87.1% vs 80.9%, p ¼ .0252) and to have undergone PCI (12.9% vs 7.3%, p ¼ .0207) than non-high-risk patients.

In this study, the median GRACE score was 142 (120 - 261) with the majority of patients having a GRACE score > 140 with a total of 41 people (56.2%). Similarly, Aldujeli et al in 2022 used two divisions of the GRACE score so that 416 (54.2%) patients were found to be at high risk and 350 (45.6%) were not at high risk6. Patients categorised by the high-risk GRACE score were less likely to be male (50.7% vs 84.3%, p<0.0001), smoke (20.8% vs 58.6%, p<.0001), have dyslipidaemia (81.0% vs 88.9%, p=0.0026), and were more likely to have hypertension (89.9% vs 79.4%, p<.0001) compared to patients who were not at high risk. Sofidis et al in 2021 divided the GRACE score into 3 categories namely, 227 (42.1%) patients were considered low risk (GRACE score < 108), 168 (31.2%) were identified as intermediate risk (GRACE score = 109-140), and 144 (26.7%) were high risk (GRACE score > 140). Finally, the mean GRACE score was 116 ± 38.

From the results of the bivariate analysis of this study, there was a significant association between SYNTAX II and GRACE scores and major cardiovascular events (MVC) (p value <0.05). Neves et al in 2022 found that six deaths in the hospital were due to cardiogenic shock, and 2 deaths due to infectious complications with septic shock 3. Sofidis et al's research in 2021 stated that the combination of the two SYNTAX-GRACE score combination algorithms has also been described and shown to have a higher prognostic value for cardiovascular death in the hospital compared to the SYNTAX score alone. A study also stated the GRACE score, SYNTAX II, had the highest AUC for the final outcome of all-cause mortality (0.62, 0.64 respectively) 6. Yalya et al in 2021 divided patients into 2 groups based on SYNTAX score; low (≤22) and medium-high group (>22). Patients with a high GRACE risk (≥140) were older (p<0.001) and had lower hypertension levels than patients with a low-medium GRACE risk score (<140) (p<0.0001). There are several studies showing that the risk of ventricular arrhythmias is also increased in patients with a high GRACE risk score [7,15].

CONCLUSION

The SYNTAX II score is better to predict occurrence of MACE 30 days after treatment in STEMI patients who undergoing PPCI compared to the GRACE score.

DECLARATIONS

None

CONSENT FOR PUBLICATION

The Authors agree to publication in Journal of Society Medicine.

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COMPETING INTERESTS
The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTIONS
All authors significantly contribute to the work reported, whether in acquisition of data, analysis, and interpretation, or in all these areas. Contribute to drafting and revising. Approved the final version to be published, agreed on the journal to be submitted, and agreed to be accountable for all aspects of the work.

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