



Original Article

Prognostic Value of Residual SYNTAX Score Combined with ACEF Score in Acute Coronary Syndrome Patient After Percutaneous Coronary Intervention in Saiful Anwar Hospital, Malang.

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ARTICLE INFO

Keywords:

Acute Coronary Syndrome;
Percutaneous Coronary Intervention;
Residual SYNTAX Score;
ACEF Score.

ABSTRACT

Background : Percutaneous coronary intervention (PCI) is one of the revascularization options in patients with the clinical acute coronary syndrome (ACS) who often have multiple and complex vascular lesions. So, the decision to complete revascularization is still a widely explored topic to reduce the rate of rehospitalization and reinfarction.

Objectives : This study aims to determine the predictor value of rehospitalization and reinfarction events used in ACS patients undergoing PCI using coronary angiography parameters with residual SYNTAX scores and clinical parameters using ACEF scores

Methods : The study was a prospective cohort with the inclusion criteria being all ACS patients who underwent PCI in RSUD Dr. Saiful Anwar Malang from January 2017 to July 2021. All patients underwent PCI and underwent coronary angiography evaluation after PCI with a residual SYNTAX score (rSS) and divided into categories into $rSS \leq 8$ and $rSS > 8$. All patients underwent laboratory examination of serum creatinine and post-PCI echocardiography, and an ACEF score was obtained ($ACEF \text{ score} = \text{age/left ventricular ejection fraction} + 1$ [if serum creatinine $> 2 \text{ mg/dl}$]). Research subjects will be followed up for at least one year related to the incidence of post-PCI rehospitalization and reinfarction.

Results : From a total sample of 209 patients, it was found that the residual SYNTAX score data had the most significant predictive factor for the occurrence of rehospitalization at 1 year after PCI ($OR = 6.14$; $95\%CI = 1.92 - 19.67$; $p = 0.002$). At the value of $rSS > 8$, ($AUC 0.750$; $95\%CI = 0.682 - 0.818$; $p = 0.001$) has a good predictive value for the occurrence of rehospitalization. However, combining with clinical parameters using the ACEF score provides a better predictive value. This study shows that the combination of $rSS > 8$ and ACEF score > 1.2 provides a better predictive value ($AUC = 0.884$; $95\%CI = 0.832-0.936$; $p = 0.001$) for the incidence of rehospitalization in post-PCI ACS patients.

Conclusion : Acute coronary syndrome patients with residual SYNTAX scores > 8 and ACEF scores > 1.2 had a strong predictive value for rehospitalization events one year after PCI. The use of the combination of these two scores is expected to be a clinical guide to obtain the degree of completeness of revascularization in ACS patients.

1. Introduction

Coronary heart disease (CHD) is the number one cause of death globally. Data in 2017 showed that 17.8 million people in the world died from cardiovascular disease and of all deaths from cardiovascular disease, 35.6 million people were found to be disabled due to cardiovascular disease.¹ It is predicted that by 2030, deaths from cardiovascular disease will reach 24.2 million, which is 32.5% of all deaths that year.² In developing countries from 1990 to 2020, the mortality rate from CHD will increase by 137% in men and 120% in

women, while in developed countries, the increase is lower at 48% in men and 29% in women.³ Based on the 2018 Riset Kesehatan Dasar (Riskesdas), the highest prevalence of cardiovascular disease in Indonesia is CHD. According to age group, CHD is most common in the age group 75 years and over (4.7%), followed by the age group 65-74 years (4.6%), the age group 55-64 years (3.9%), and the age group 45-54 years (2.4%).⁴ Acute coronary syndrome (ACS) is an acute manifestation of torn atheromatous plaques due to changes in plaque composition and thinning of fibrous tissue in CHD patients. Classification of ACS can be divided into ST-segment elevation myocardial

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<https://doi.org/10.21776/ub.hsj.2022.003.01.4>

Received 9 August 2021; Received in revised form 30 November 2021; Accepted 15 December 2021

Available online 1 January 2022

infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina pectoris (UAP).⁵ ACS patients often have multivessel coronary artery lesions obtained after percutaneous coronary intervention (PCI). In these conditions, it is necessary to assess whether complete revascularization is necessary to reduce the number of recurrent infarctions or repeated hospitalizations due to myocardial infarction. The incidence of rehospitalization in STEMI patients undergoing PCI has decreased significantly compared to patients receiving only fibrinolytic (4.8% and 9.6%) within one year.⁶

The SYNTAX score is developed to predict the risk of acute myocardial infarction or death in stable coronary heart disease. The prognostic value of the SYNTAX score is obtained from assessing the severity of coronary artery obstruction and the location of the obstruction.⁷ Currently, the SYNTAX score has been developed for various clinical conditions, including in patients with single-vessel disease or ACS. This score has also been developed into other scores, including the residual SYNTAX score (rSS), which was developed to measure and describe the degree of complexity of the stenosis remaining after PCI. rSS was reported to increase the prognostic value after undergoing PCI, and rSS > 8 was identified as the degree of incomplete revascularization, which was strongly associated with increased mortality and adverse ischemic events.⁸ In addition, PCI has also been shown to improve quality of life, especially due to improvement in chest pain complaints. However, the rSS measurement method as a predictor to assess the extent to which revascularization can significantly improve quality of life is still not widely used.⁹

Apart from the angiography results in ACS patients, the value of clinical parameters in patients also has a significant prognostic value for the incidence of repeated hospitalization. In a study that analyzed the PRAMI Study, the clinical presentation of patients with Killip scores > 1, left ventricular ejection fraction < 50%, and residual coronary artery stenosis > 30% were strong predictors of recurrent infarction within 30 days post-PCI.¹⁰ This indicates the need for a comprehensive parameter value as a risk stratification between the values of clinical parameters and the angiography results in ACS patients. Risk stratification in ACS patients has been studied previously and found in several clinical parameters showing significant prognostic value. TIMI and GRACE scores have been widely used as risk stratification, but their use is still limited only as clinical parameters and has not been used in conjunction with angiographic parameter values. Scores of age, serum creatinine values, and left ventricular ejection fraction (ACEF Score) have been studied significantly as risk stratification for the 30-day post-myocardial infarction mortality. The ACEF score of 1.2 significantly indicates a high mortality rate in post-myocardial infarction patients, and its use has been widely used in conjunction with the SYNTAX score.¹¹ This study was conducted by measuring the combined rSS score and ACEF scores to assess the prognostic capacity of the incidence of reinfarction and rehospitalization in ACS patients undergoing PCI at Saiful Anwar Hospital Malang.

2. Material and Methods

The population in this study were patients with acute coronary syndrome from January 2017 until June 2020 who had optimal medical therapy and underwent PCI procedures at Saiful Anwar Hospital, Malang. The sample was selected by non-probability sampling, and the sampling technique used was consecutive sampling, where all subjects consecutively and meeting the selection criteria were included in the study until the required number of subjects was met. The inclusion criteria were patients with acute coronary syndrome, both with a diagnosis of STEMI and NSTEMI. They are receiving optimal medical therapy, have undergone a PCI procedure at Saiful Anwar Hospital, and have complete medical record data (laboratory

and echocardiography). Exclusion criteria were patients who were not willing to be included in this study, patients who could not be followed up, and patients with coronary artery angiography who decided to undergo coronary bypass surgery (CABG). Patients who were followed up did not consume optimal medication after PCI. Finally, 208 patients were included in this investigation according to the inclusion and exclusion criteria. This study was authorized by the hospital's central institutional review board committee. Reviewing patient medical records yielded clinical data. An independent core angiography examined all of the patients' angiograms, both pre-and post-procedure. Experienced technicians calculated the baseline SYNTAX score and the residual SYNTAX score visually. In vessels with less than 1.5 mm diameter, the SYNTAX score method (<http://syntaxscore.com/>) was used to score each lesion. The residual SYNTAX score of the lesions after the PCI operation was used to calculate the rSS. The endpoint of this study was 1-year rehospitalization and reinfarction after the PCI procedure.

The mean, standard deviation was used to characterize continuous variables (SD). It was decided to use either the Student's T or the Mann-Whitney rank-sum test to compare two discrete variables. Counts and percentages were used to express categorical variables, and Chi-squared or Fisher's exact tests were used to compare them. rSS was split into two groups, with rSS 8 and rSS > 8 being the most recent numbers. Additionally, there are two ACEF scores: 1.2 and > 1.2. The ACEF score is used to categorize students. Multivariable logistic regression analysis with Hosmer-Lemeshow statistics calibrated the model using the ACEF and rSS scores. In order to determine the predictive value of ACEF-rSS and other risk scores, including ACEF score, SYNTAX score, and combinations between rSS > 8 and ACEF score > 1.2, receiver operating characteristic (ROC) curves were used. The Kaplan-Meier method was used to compute cumulative event rates, and the results were compared using a log-rank test. A significance level of 0.05 was used in the statistical analyses conducted using IBM Corp.'s SPSS version 26.0.

3. Results

This study involved all ACS patients admitted to the Emergency Room RSUD dr. Saiful Anwar Malang from January 2017 to June 2021. All patients received PCI procedures during the treatment period. Three hundred twenty-two subjects met the inclusion criteria, then collected using medical record data and coronary angiography. One hundred thirteen subjects had to be excluded (12 subjects only had angiography or no revascularization with stent placement, 38 subjects had incomplete medical record data, 37 patients could not be followed up, and 26 patients did not continue taking the medication regularly) based on exclusion criteria. Therefore, a total of 209 subjects were analyzed in this study. This study evaluated the primary outcome clinical parameters using the ACEF score consisting of age, left ventricular ejection fraction, and serum creatinine and angiographic parameters using the SYNTAX score and the residual SYNTAX score on rehospitalization and reinfarction followed for at least one year after PCI.

There were 165 (78.9%) male subjects, and 44 (21.1%) subjects were female. The mean age of the study population was 58.1 ± 11.2 years, with an age range of 26–91 years. Population anthropometric data showed a mean BMI of 24.3 ± 3.4 kg/m² (overweight mean). The most common risk factor was smoking (66.5%), followed by hypertension (48.3%). Most of the patients were diagnosed as STEMI, with 174 (83.2%) patients and 35 (16.2%) patients were diagnosed as NSTEMI. At baseline, the hemodynamic profile was obtained with a mean SBP of 126 ± 31.4 mmHg, DBP of 75 ± 16.2 mmHg, and a MAP of 91.65 ± 18.6 mmHg. The laboratory profile showed mean hemoglobin within the normal range of 13.6 ± 2.3 g/dL

Table 1. Baseline characteristics.

Variable	No rehospitalization (n=120)	Rehospitalization (n=89)	Total (N=209)	p
Age (year)	56.1 ± 12.2	60.9 ± 9.1	58.1 ± 11.2	0.002*
Gender				0.671
Male, %	93 (44.5)	72 (34.4)	165 (78.9)	
Female, %	27 (12.9)	17 (8.1)	44 (21.1)	
BMI (kg/m ²)	25.3 ± 3.8	25.0 ± 2.9	25.2 ± 3.5	0.459
History Hypertension, %	66 (31.6)	35 (16.7)	101 (48.3)	0.036*
History Diabetes Mellitus, %	25 (12.0)	33 (37.1)	58 (27.8)	0.015*
History Smoker, %	77 (36.8)	61 (29.2)	138 (66.0)	0.608
Dyslipidemia, %	6 (2.9)	5 (2.4)	11 (5.3)	1.0
Diagnose				0.823
STEMI, %	101 (48.3)	73 (34.9)	174 (83.2)	
NSTEMI, %	19 (9.1)	16 (7.6)	35 (16.8)	
Hb (g/dl)	13.7 ± 3.8	13.5 ± 2.9	13.6 ± 2.3	0.672
Creatinine serum (mg/dl)	1.35 ± 1.14	2.29 ± 4.89	1.75 ± 3.3	0.044*
Creatinine clearance (ml/min/1.73m ²)	77.13 ± 39.0	59.69 ± 30.51	69.7 ± 36.6	>0.001*
Troponin I (ug/L)	8.6 ± 12.7	13.2 ± 19.1	10.5 ± 15.9	0.04*
CKMB (ug/L)	130.2 ± 143.9	120.9 ± 114.7	125.9 ± 132.1	0.588
LDL (g/dl)	127.6 ± 38.8	129.9 ± 42.3	128 ± 40.2	0.549
HDL (g/dl)	39.5 ± 10.1	38.6 ± 10.2	39.1 ± 10.1	0.324
SBP (mmHg)	127 ± 30.3	124 ± 32.8	126 ± 31.4	0.477
DBP (mmHg)	77 ± 15.4	72 ± 16.9	75 ± 16.2	0.036*
MAP (mmHg)	94 ± 19	89 ± 20.4	92 ± 19.7	0.122
Killip >II, %	25 (12)	24 (11.2)	49 (23.4)	0.384
LVEF (%)	49.3 ± 9.8	44.3 ± 10.3	47.2 ± 10.3	0.001*
LM Disease, %	13 (6.2)	15 (7.2)	28 (13.4)	0.290
Vessel disease				>0.001*
1 VD, %	30 (14.4)	4 (1.9)	34 (16.3)	
2 VD, %	32 (15.3)	15 (7.2)	47 (22.5)	
3 VD, %	58 (27.8)	70 (33.5)	128 (61.2)	
Femoral Access, %	118 (56.5)	86 (41.1)	204 (97.6)	0.734
Fluoro Time (min)	13.75 ± 8.8	14.98 ± 8.9	14.28 ± 22.4	0.324
Target vessel				0.416
1 vessel, %	116 (55.5)	83 (39.7)	199 (95.2)	
2 vessel, %	4 (1.9)	6 (2.9)	10 (4.8)	
Stent Implantation				0.622
1 stent, %	104 (49.3)	76 (35.9)	180 (86.2)	
2 stent, %	16 (7.7)	12 (5.7)	28 (13.3)	
3 stent, %	0	1 (0.5)	1 (0.5)	
Direct Stent, %	31 (14.8)	14 (6.7)	45 (21.5)	0.113
Thrombosuction, %	16 (7.7)	6 (2.9)	22 (10.5)	0.191
TIMI Flow 3, %	109 (52.2)	75 (35.9)	184 (88)	0.325
Complication related procedure	30 (14.4)	32 (36)	62 (29.7)	0.118
Baseline SYNTAX Score		28.47 ± 11.7	22.05 ± 12.6	>0.001*
Residual SYNTAX Score	17.3 ± 11	16.5 ± 10.5	11.09 ± 11.1	>0.001*
rSS=0, %	7.05 ± 9.8	3 (1.4)	26 (12.5)	
0<rSS≤8, %	23 (11)	18 (8.6)	91 (43.5)	
rSS>8, %	73 (34.9)	68 (32.5)	92 (44)	
ACEF Score	24 (11.5)	1.87 ± 0.73	1.62 ± 0.72	>0.001*
ACEF score≤1,2, %	1.42 ± 0.65	21 (10)	80 (38.3)	
ACEF score>1,2, %	59 (28.2)	68 (32.5)	129 (61.7)	
	61 (29.2)			

Note. Significant p value <0.05. STEMI, ST-elevation myocardial infarction; NSTEMI, Non-ST elevation myocardial infarction; BMI, Body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; MAP, mean arterial pressure; LVEF, left ventricle ejection fraction; CKMB, creatinine kinase-MB; HDL, high density lipoprotein; LDL, low density lipoprotein; TIMI, Thrombolysis in Myocardial Infarction; LM, left main; VD, vessel disease; SYNTAX, Synergy between percutaneous coronary intervention with taxus and cardiac surgery; rSS, residual SYNTAX score.

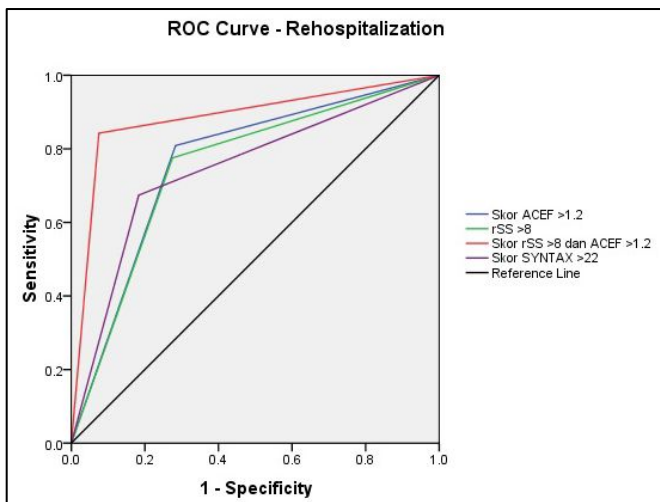


Figure 1. Graph of ROC variable ACEF score, residual SYNTAX score and a combination of the two on the incidence of rehospitalization in ACS patients after PCI.

accompanied by a mean patient with increased troponin I level of 10.5 ± 15.9 . Most of the subjects on angiographic evaluation had multivessel disease lesions, with only 34 patients (16.3%) having a single lesion in the coronary arteries, but almost 199 patients (95.2%) had revascularization of one coronary artery. The number of complications during the procedure reached 29.7% in all patients. The results of angiographic evaluation obtained TIMI flow 3 results in as many as 184 patients (88%).

Multivariate analysis of clinical and angiographic variables using the regression method showed that history of hypertension was a significant factor in the incidence of rehospitalization with $p=0.12$ and residual SYNTAX score > 8 with $p=0.002$. History of controlled hypertension has a value that has protection against rehospitalization events with an OR of 0.38 (0.17-0.81). The residual SYNTAX score has the most significant value, with an OR value of 6.14 (1.92 – 19.67).

Multivariate analysis of the ordinal regression method showed that only the residual SYNTAX score parameter had a significant effect on rehospitalization in ACS patients undergoing PCI. The researcher categorizes the residual SYNTAX score variable into ordinal data by dividing the cut-off 8 and the ACEF score based on the 1.2 cut-offs. The residual SYNTAX score with a cut-off value of >8 also provides an excellent prognostic value with a sensitivity of 77.5% and specificity of 72.5% (AUC = 0.750; 95%CI = 0.682 - 0.818, $p < 0.001$). The cut-off result of ACEF score >1.2 can predict rehospitalization reasonably well with a sensitivity of 80.9% and a specificity of 71.7% (AUC = 0.763; 95%CI = 0.682-0.818, $p < 0.001$). The results of combining both clinical and angiographic parameters with ACEF scores and residual SYNTAX scores showed the best prognostic value for the incidence of rehospitalization with a sensitivity value of 84.3% and a specificity of 92.5% (AUC = 0.884; 95%CI = 0.832 - 0.936, $p = 0.001$). In ACS patients with residual SYNTAX scores >8 , 1 year after PCI, 66.7% were free from rehospitalization. The value of the ACEF score >1.2 indicates the survival rate to rehospitalization of 71%. Patients with ACEF scores >1.2 and residual SYNTAX scores >8 had the highest probability of rehospitalization with a survival rate of 15.5%.

4. Discussion

This study shows that the largest population of patients diagnosed with ACS who underwent PCI during treatment were STEMI

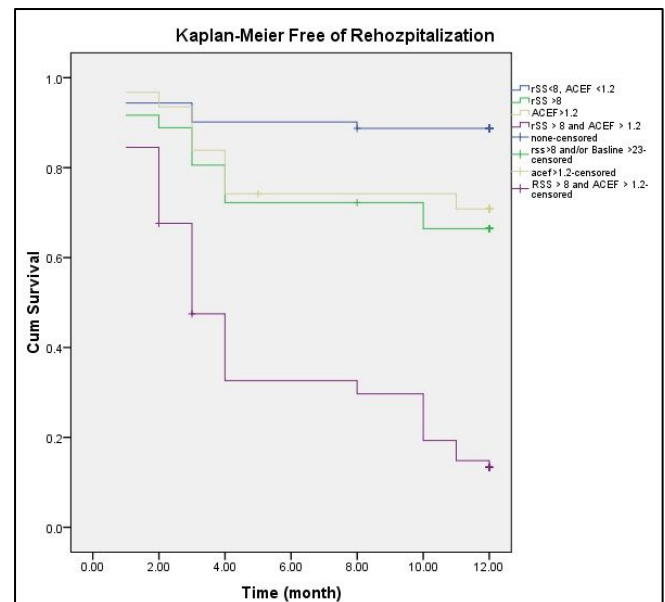


Figure 2. Kaplan-Meier chart Free of Rehospitalization of ACS patients in 1 year after PCI based on ACEF scores and residual SYNTAX scores.

patients, with a proportion of 83.2%. Demographic data in this study showed that most patients were male (78.9%) with a mean age of >58 years, and the highest risk factor was smoking. The mean BMI was 25.2 ± 3.5 kg/m² (overweight). The results of this study are in line with the research by Tern et al. in 2020 involving the STEMI population in 5 Asia-Pacific countries (Australia, Japan, Korea, Singapore, and Malaysia). Tern et al. showed that the highest proportion of STEMI patients were men (78.7%), smokers (53%), the youngest average age was 56 years in Malaysia, and the oldest age was 67.1 years in Japan.¹² Data in Indonesia, especially Jakarta, showed a similar pattern of the STEMI population, with the highest proportion being male (85%) and smoking as the main risk factor (61%).¹³

Analysis of bivariate studies showed that the rehospitalization rate was influenced by several factors, including clinical factors such as age, history of hypertension, history of diabetes mellitus, serum creatinine level, creatinine clearance, troponin, diastolic blood pressure, and left ventricular ejection fraction; and factors influenced by PCI measures such as patients with multivessel disease, baseline SYNTAX score, and residual SYNTAX score. However, a multivariate study showed that the most influential variables were a history of hypertension and a residual SYNTAX score of more than 8. This multivariate analysis study showed that a history of hypertension is a protective factor for the occurrence of rehospitalization in ACS patients after PCI with an OR of 0.38 (95% CI, 0.17-0.81). This is consistent with several observational studies related to the effect of hypertension on the clinical outcome of patients with ACS. A study conducted by Erne et al. showed that of 41,771 patients diagnosed with ACS where 24,916 patients with a history of hypertension showed a good prognostic value for events in the hospital with OR = 0.82 (95% CI, 0.73-0.93).¹⁴ This is supported by another study which showed that hypertensive patients diagnosed with myocardial infarction had a lower mortality rate. This is indicated by the data that hypertensive patients experienced less cardiogenic shock (4% vs 11.6%, $p = 0.01$), atrioventricular block (4.9% vs 7.4%, $p = 0.02$), and the incidence of ventricular arrhythmias (2.2% vs 3.7%, $p = 0.04$).¹⁵

The residual SYNTAX score has a significant prognostic value for the rehospitalization rate in post-PCI ACS patients.

Table 2. The results of multivariate analysis of clinical and angiographic variables on the incidence of post-PCI rehospitalization.

Variable	OR (95% CI)	P
Age	1.01 (0.97-1.05)	0.606
History hypertension	0.38 (0.17-0.81)	0.012*
History diabetes mellitus	1.04 (0.45-2.36)	0.926
Creatinine clearance	0.92 (0.59-1.43)	0.729
Creatinine clearance	0.99 (0.97-1.01)	0.214
Troponin I	1.01 (0.98-1.01)	0.332
DBP	0.99 (0.97-1.02)	0.743
Multivessel disease	1.19 (0.64-2.22)	0.575
LVEF	0.98 (0.95-1.02)	0.471
Baseline SYNTAX Score	1.79 (0.56-5.75)	0.323
Residual SYNTAX Score	6.14 (1.92-19.67)	0.002*
ACEF Score	1.20 (0.45-3.23)	0.716

Note. Significant p value <0.05; DBP, diastolic blood pressure, LVEF, left ventricle ejection fraction, SYNTAX, Synergy between percutaneous coronary intervention with taxus and cardiac surgery

Researchers used a cut-off residual SYNTAX score of more than 8 based on several previous studies that have been tested to show a good prognostic value. The study conducted by Braga et al. categorizes the residual SYNTAX scores into three groups, namely complete revascularization (rSS=0), reasonable incomplete revascularization ($0 < \text{rSS} < 8$), and incomplete revascularization ($\text{rSS} \geq 8$). This study showed that incomplete revascularization increased the risk of death by 1.8 times higher than patients who underwent complete revascularization.¹⁶ Another study with a more significant number of patients with a sample of 10,344 patients showed the same thing. In 2 years of observation in patients who had undergone revascularization with PCI procedure, this study showed an rSS value > 8 indicating the incidence of MACE compared to patients who had complete revascularization (20% vs. 8.7%, $p < 0.001$) and after multivariate analysis showed that rSS is an independent predictor of the incidence of MACE in CHD patients who have undergone PCI.¹⁷ This is consistent with the results of our study, which show that the residual SYNTAX score is the only significant factor in the incidence of rehospitalization in ACS patients undergoing PCI. The proportion of patients who received complete revascularization in this thesis was lower, with only 12.4% of patients undergoing complete revascularization. Most of the angiographic data obtained showed that the patients had multivessel disease lesions, as many as 175 (83.7%) patients. Of course, it will be challenging to achieve a complete revascularization rate. Most of the interventions performed on patients were only targeted at single lesions, with 199 (95.2%) patients. In another study that assessed STEMI patients with multivessel disease who underwent revascularization with PCI procedure, it was found that from a total of 535 patients, a complete revascularization rate of 198 patients (37%).¹⁶

In the bivariate analysis, it was found that age, serum creatinine level, and left ventricular ejection fraction were significant variables indicating the rate of rehospitalization. The use of the ACEF score, where the parameters used are age, left ventricular ejection fraction, and serum creatinine, has been studied previously. The use of ACEF cut-off score in this study used a value of 1.2, where the mean ACEF score in patients with rehospitalization was significantly higher than in patients who were not rehospitalized (1.42 vs. 1.87, $p > 0.001$). In the initial study, the ACEF score in post-PCI patients used data from the LEADERS study. In this study, 1208 patients were determined to have an ACEF cut-off score of more than 1.27, indicating a significant value for mortality (0.7% vs. 4.5%, $p = 0.002$) and reinfarction rate (2.5% vs. 6.7%, $p = 0.006$) in 1-year post-follow-up was significant

compared with a low ACEF score.¹⁸ Another multicenter study in Italy also showed that an ACEF score > 1.25 indicated a significant MACE rate at 30 days post-PCI. The ACEF score can provide significant prognostic value in terms of the incidence of MACE, all-cause mortality, the incidence of myocardial infarction, and stent thrombosis.¹⁹ The ACEF score is a simpler clinical parameter and can provide an excellent prognostic value.

Our study emphasizes merging the two parameters, both clinical parameters represented by the use of ACEF scores and angiographic parameters using residual SYNTAX scores. In this study, combining the two values with an rSS value > 8 with an ACEF score > 1.2 indicates a better prognostic value than using only a single parameter both clinically and angiographically. This is consistent with recent studies by combining the two parameters of ACEF scores and residual SYNTAX scores. In 10,072 patients evaluated for the next two years, post-PCI using ACEF and rSS scores were better. They showed better prognostic scores than the use of ACEF scores alone (C-statistic = 0.835 vs. 0.776 $p < 0.001$). The combined use of the two scores shows better predictive value in the long-term evaluation of cardiac death.²⁰

The subset analysis of the study is more specific to patients with ACS who underwent PCI. This score combination has only been widely used recently, but in patients with stable CHD conditions undergoing PCI. This thesis study emphasizes the role of achieving complete revascularization with clinical parameters to assess the rehospitalization rate. Another study conducted in India showed that the IMA-NEST subset of patients who underwent PCI showed that combining clinical and angiographic parameters using SYNTAX SCORE II (SSII) provided a predictive value for developing MACE that was better than angiographic values (SYNTAX score, SYNTAX score). And clinical values such as ACEF score (OR 5.72 [1.81-18.08] $p = 0.003$).²¹ Patients with acute coronary syndromes, using the ACEF score can be a good and simple risk stratification tool. This was demonstrated in an observational study in Switzerland. The study showed that the ACEF score showed a good prognostic value predictive of mortality one year after being diagnosed with ACS. ACEF scores corresponded to increased mortality (HR 3.53, 95%CI [2.90-4.31], $p < 0.001$), MACE incidence (HR 2.23, 95%CI [1.88-2.65], $p < 0.001$), and reinfarction rates. ($p < 0.001$) (HR 2.58, 95% CI [1.71-3.89], $p < 0.001$).²²

Our study shows that the ACEF score > 1.2 and the residual SYNTAX score > 8 show a good predictive value for the incidence of

rehospitalization and reinfarction at one year after PCI. This shows the benefits of pursuing complete revascularization with a target value of residual SYNTAX score = 0. In this study from multivariate analysis, the residual SYNTAX score was the single most significant independent variable on the incidence of rehospitalization. A recent study based on the SHINANO registry in Japan showed that the use of residual SYNTAX scores could be strengthened by using clinical parameters in acute coronary syndrome patients. In 120 patients who were followed for the next five years and evaluated the incidence of cardiovascular mortality. This study showed that using the combined score showed that the combined value with residual SYNTAX and SSII scores had a good predictive value (HR 1.08, 95% CI [1.05-1.11, $p < 0.001$]). The incidence of death correlates well with the combined score between residual SYNTAX scores and clinical parameters.²³

Therefore, a prospective and multicenter study is needed to assess the correlation between ACEF scores and residual SYNTAX scores in post-PCI ACS patients. The use of these two scores is expected as good risk stratification and a simpler way to determine the next choice of therapy, whether to perform complete or adequate revascularization with optimal medical treatment in ACS patients with multiple coronary artery lesions. A significant reduction in rehospitalization rates will reduce mortality in the long term and a cumulative reduction in costs for ACS patients.

5. Conclusion

ACEF scores and residual SYNTAX scores showed good predictive value for rehospitalization and reinfarction events one year after acute coronary syndrome patients after percutaneous coronary intervention. The combination of the ACEF score and residual SYNTAX score showed a better predictive value than the single parameter on the incidence of rehospitalization and reinfarction in acute coronary syndrome patients one year after percutaneous coronary intervention.

6. Declarations

6.1. *Ethics Approval and Consent to participate*
Not applicable.

6.2. *Consent for publication*
Not applicable.

6.3. *Availability of data and materials*
Data used in our study were presented in the main text.

6.4. *Competing interests*
Not applicable.

6.5. *Funding source*
Not applicable.

6.6. *Authors contributions*

Idea/concept: AP, MSR. Design: AP. Control/supervision: MSR, NK, SW, AR. Data collection/processing: AP, MSR. Analysis/interpretation: AP, MSR. Literature review: HA, NAN. Writing the article: MDHQ, HA, NAN. Critical review: MDHQ, HA, NAN. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

6.7 *Acknowledgements*
We thank to Kediri District Hospital.

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