

Impact of SYNTAX Score on In-hospital Outcome after Primary Percutaneous Coronary Intervention

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Abstract:

Background: Limited contemporary data exist regarding the impact of SYNTAX score on in-hospital outcomes undergoing primary percutaneous coronary intervention(PCI) in acute STEMI patients.

Objectives: To evaluate the significance of the SYNTAX score for predicting in-hospital outcome after primary PCI in patient with acute STEMI.

Methods: This cohort study was conducted in the department of cardiology, National Institute of Cardiovascular Diseases, Dhaka, Bangladesh from September, 2015 to September, 2016. 42 patients with acute STEMI who underwent primary PCI were considered for the study. But 2 patients were excluded from the study due to failure of primary PCI. The patients were divided into two groups: Group I (low SYNTAX score ≤ 22) and Group II (high Syntax score > 22). The Syntax score of all patients were calculated from an initial coronary angiogram before primary PCI. In-hospital outcome was observed in between two groups.

Results: Among traditional cardiovascular risk factors diabetes was significantly more prevalent in the Group

II than Group I (82.4% vs 34.8%, $p = 0.003$). Angiographic profile revealed maximum (69.6% vs 17.6%) culprit lesion in LAD artery in Group I and maximum culprit lesion (64.7% vs 21.7%) in RCA in Group II, these were the statistically significant between Group I and Group II ($P < 0.05$). The high SYNTAX score group had lower TIMI 3 (76.47% vs 91.3%, $p = 0.03$) compared to the low SYNTAX score group. But there were no significant difference in complications as arrhythmia (2.5% vs 0%), cardiogenic shock (2.5% vs 0%), heart failure (5% vs 2.5%) and mortality (5% vs 0%) between high and low SYNTAX score. Multivariate logistic regression analysis revealed SYNTAX score (OR = 5.95, $p = 0.001$) was an independent predictor of in-hospital outcome in patients under going primary PCI. Performance test of SYNTAX score in the setting of Primary PCI outcome showed positive predictive value 83%. **Conclusions:** SYNTAX score was an independent variable that can predict in-hospital outcomes of patients with acute STEMI undergoing primary PCI.

Key words : SYNTAX score, Primary PCI, STEMI

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Introduction:

Cardiovascular diseases account for more than 17 million deaths globally each year. This figure is to grow to 23.6 million by the year 2030.¹ Estimates from the global burden of disease study suggests that by the year 2020 the South Asian part of the world (India, Pakistan, Bangladesh, Nepal) will have more individuals with atherosclerotic cardiovascular diseases than any other region.²

Primary PCI reduces the risk for mortality and subsequent myocardial infarction when compared with Thrombolytic therapy in patients with acute coronary syndromes. However, the invasive mechanical reperfusion strategies have their own complications. Major complications include death, MI, or stroke, and minor complications include transient ischemic attacks, vascular complications, contrast induced nephropathy, and angiographic complications.

Originally, the SYNTAX score was designed to grade the complexity of stable coronary artery disease. Higher values of this score, reflecting a more challenging coronary anatomy for the interventional cardiologist, also predict a worse prognosis after acute STEMI.³ Patients with very low predicted mortality could benefit from early discharge from the intensive care unit and from the hospital, resulting in better clinical care and optimization of health resources. In contrast, morbidity and mortality after STEMI are still high in other subgroups.⁴

The aim of the study is to investigate the usefulness of SYNTAX score in predicting outcome of primary PCI in acute STEMI patients in terms of severity and complexity of CAD.

Methods:

This prospective cohort study was conducted in the Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, Bangladesh, from September, 2015 to September, 2016. The study included patients with acute STEMI who undergone primary PCI during the study period. Patients with valvular heart diseases, congenital heart diseases, prior thrombolytic therapy, prior MI, PCI or CABG and severe comorbidities were excluded.

Proper medications was given in CCU. After adequate explanation Coronary angiogram (CA) was done by conventional method. Angiographic pattern and CAD severity assessment was done by visual estimation.

The SYNTAX scores of all patients were calculated by 2 independent experienced interventional cardiologists who were blinded to the identities. The patients were divided into 2 groups, those with low SYNTAX scores ≤ 22 (Group I) and those with intermediate to high SYNTAX scores ≥ 23 (Group II).⁵

Data analysis was performed using SPSS version 16. Categorical variables were expressed as frequency and percentage and continuous variables as mean and standard deviation. Data was analyzed by student's t-test, chi-square test and Fisher exact test. Multivariate logistic regression analysis was done to assess the effect of independent variable and adjustment was done for confounding variable.

Results:

Total 42 patients with acute STEMI who underwent primary PCI were enrolled in this study. The main objective of the study was to determine impact of SYNTAX score for predicting In-hospital outcome after primary PCI in patients with acute STEMI. Two patients were excluded from this study due to primary PCI failure. In our study 57.5% were in SYNTAX score ≤ 22 (Group I) and 42.5% were in SYNTAX score > 22 (Group II).

The mean age \pm SD was 51.40 ± 13.20 years in Group I and 46.00 ± 13.56 years in Group II (Table I). The difference was not statistically significant. There are no significant difference of traditional cardiovascular risk factors among the Group I and Group II except DM which was statistically significant different in between two group. Angiographic profile (Table I) revealed maximum (69.6% vs 17.6%) culprit lesion in LAD artery in Group I and maximum culprit lesion (64.7% vs 21.7%) in RCA in Group II, these were the statistically significant between Group I and Group II ($P < 0.05$).

Group I = SYNTAX score ≤ 22 ; Group II: SYNTAX score > 22
p value $> 0.05^{ns}$

Regarding sex 69.5% and 30.5% patients were male and female in Group I and 88.2% and 11.8% were male and female in Group II respectively.

Angiographic outcome showed that 91.3% patient in Group I and 76.47% in Group II achieved TIMI flow 3 and the difference was statistically significant ($p = 0.03$). In Group I 8.7% patients and 11.76% patient in Group II achieved TIMI flow 2 and the difference was not statistically significant ($p = 0.8$). No patient in Group I and 11.76% patient in Group II achieved TIMI flow 1 and the difference was not statistically significant ($p = 0.14$).

Complications of primary PCI in Group I Vs Group II: acute heart failure 2.5. % Vs 2.5% cardiogenic shock 00 % Vs 2.5% significant arrhythmia 00 % Vs 2.5% and death 00 % Vs 5% and total in-hospital outcome: acute heart failure 5%, cardiogenic shock 2.5%, significant arrhythmia 2.5% and death 5% (Table III).

Multivariate analysis revealed that out of ten variable DM, ejection fraction and SYNTAX score were found to be the independently significant predictors outcome of the patients undergoing primary PCI with Odds ratio being 4.75 ($p = 0.001$), 1.71 ($p = 0.01$) and 5.95 ($p = 0.001$) respectively.

Table-I
Distribution of age, cardiac risk factor and culprit vessel among the study patients

	Group I(n=23)		Group II(n=17)		Total (n=40)		p value
	No	%	No	%	No	%	
Mean age±SD	51.40±13.20		46.00±13.56				0.397 ^{ns}
Risk factors	No	%	No	%	No	%	
Smoking	13	56.5	14	82.4	27	67.5	0.085 ^{ns}
Hypertension	14	60.9	11	64.7	25	62.5	0.804 ^{ns}
DM	8	34.8	14	82.4	22	75.0	0.003 ^s
Dyslipidemia	11	47.8	13	76.5	24	60.0	0.068 ^{ns}
Family history of IHD	5	21.7	6	35.3	11	27.5	0.343 ^{ns}
Culprit vessel							
LAD	16	69.6	3	17.6	19	47.5	
LCX	2	8.7	3	17.6	5	12.5	0.014 ^s
RCA	5	21.7	11	64.7	16	40.0	

Data were analysis using chi-square and Fisher exact test
Group I= SYNTAX score ≤22; Group II: SYNTAX score >22;
ns-not significant; s- significant

Table-II
Angiographic outcome between two groups according to TIMI flow after primary PCI (n=40)

TIMI flow	Group I(n=23)		Group II(n=17)		p value
	No	%	No	%	
0	0		0		
1	0	0	2	11.76	0.14 ^{ns}
2	2	8.7	2	11.76	0.8 ^{ns}
3	21	91.3	13	76.47	0.03 ^s

Data were analysis using chi-square test and Fisher exact test
Group I= SYNTAX score ≤22; Group II: SYNTAX score >22

Table-III
Complications of study patients according to SYNTAX score (n=40)

Outcome	Group I (n=23)		Group II (n=17)		Total		p value
	No	%	No	%	No	%	
Acute heart failure	1	2.5%	1	2.5	2	5.0	0.863 ^{ns}
Cardiogenic shock	0	00	1	2.5	1	2,5	0.453 ^{ns}
Significant arrhythmia	0	00	1	2.5	1	2.5	0.453 ^{ns}
Death	0	00	2	5.0	2	5.0	0.371 ^{ns}

Data were analysis using chi-square test and Fisher exact test Group I= SYNTAX score ≤22; Group II: SYNTAX score >22

Table-IV
Multivariate logistic regression analysis of determinants including SYNTAX score that affect the outcome of patients undergoing primary PCI (n=40)

	Beta	S.E	p value	OR	95% CI	
					Lower	Upper
Age	0.379	0.793	0.632	0.684	0.144	3.240
Sex	0.973	0.890	0.274	0.378	0.066	2.162
Smoking	1.278	0.763	0.094	0.279	0.062	1.242
Hypertension	0.405	0.527	0.442	0.667	0.321	4.326
DM	2.169	0.772	0.001 ^s	4.750	1.926	9.754
Dyslipidemia	0.956	.0677	0.158	2.600	0.689	9.806
Family history	1.052	0.734	0.152	0.349	0.083	1.473
Creatinine	0.091	0.376	0.809	0.913	0.437	1.909
LVEF	1.702	0.699	0.015 ^s	1.714	0.046	2.717
SYNTAX score	2.973	1.132	0.001 ^s	5.955	2.216	19.839

s- significance

Discussion:

There are few literatures regarding the usefulness of the SYNTAX score for predicting in-hospital outcome after primary percutaneous coronary intervention in patient with acute STEMI.

We found diabetes to increase the risk of MACE in patients who received primary PCI for acute STEMI. In other words, diabetes was significantly more prevalent in the Group II. Various studies have also highlighted the short term (during hospitalization and the first year after the disease) and long term effects of diabetes on the MACE.^{6,7} Diabetes can thus be considered as a risk factor for MACE after primary PCI.

In this study, smoking did not have any negative effects on MACE. However, a previous research reported better reperfusion rate after primary PCI in smokers.⁸ High arterial blood pressure is a risk factor for coronary artery disease and increases the risk of complications after acute coronary syndrome.^{9,10} However, we did not find significant differences in level of blood pressure between the two groups. Hyperlipidemia is a risk factor for coronary artery disease, it has no significant effects on the incidence of MACE in our study. Some studies have identified high levels of lipoprotein (a) to be associated with poor outcome in patients with acute myocardial infarction.¹¹

Angiographic profile in our study showed that left anterior descending (LAD) artery was the most common (47.5%) culprit vessel followed by right coronary artery (RCA) was 40% and left circumflex artery (LCX) was 12.5%. These were similar to the finding (LAD 51.2%, RCA 38.5% and LCX 10.2%).¹² In this study we found cardiogenic shock 2.5%, acute heart failure 5% and death 5%.¹³ reported that cardiogenic shock developed in 3.4% post-randomization,

and mortality at 90 days was 54.6%. Congestive heart failure occurred in 4.4% which are also compatible with our study.¹⁴

TIMI flow is one of the important factor in determining the outcome of primary PCI in patient with acute STEMI. In our study, TIMI 3 flow was established among 91.3% patients in Group I and 76.47% in Group II. Some study found similar finding (87.5%).¹² Multiple regression analysis showed that DM, LVEF and SYNTAX score are independent predictors of adverse in-hospital outcome following primary PCI (OR=4.75, 1.71 & 5.95, respectively). Another author also found Killip class and SYNTAX score (OR=1.12 & 1.08) as the predictors of in-hospital adverse outcome.¹⁵

Conclusion:

This study demonstrates that a high SYNTAX score before Primary PCI provides important prognostic information with regards to in-hospital clinical outcomes including mortality. In our acute STEMI cohort, risk of mortality was notably increased during the early periprocedural period. The SYNTAX score can be used for risk stratification in patients undergoing primary PCI.

Limitations:

Interpretation of angiograms and assessment of the SYNTAX score was not performed by QCA. Although the result of the study supports the hypothesis there were several limitations such as coronary angiogram was evaluated by visual estimation. So there was chance of interobserver and intraobserver variation to calculate the SYNTAX score. The study was carried out only in single centre, study period was short, sample size was small and it was a non randomized study.

Conflict of interest- None.

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