

## **Correlation Between Diabetes Mellitus and Clinical Outcome of Patients with Acute Coronary Syndrome Underwent Percutaneous Coronary Intervention Therapy in Dr Soetomo Surabaya Hospital**

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### **ABSTRACT**

**Introduction:** Coronary heart diseases continue to be the rising cause of mortality amongst Indonesian population, alongside with the increasing number of diabetic patients. The first line management of ACS is percutaneous coronary intervention (PCI), however previous have shown that diabetic patients have worse outcomes after therapy compared to non-diabetic patients. This study aims to compare the clinical outcomes between acute coronary syndrome (ACS) patients with diabetes and those without diabetes following percutaneous coronary intervention therapy.

**Methods:** This study used cross sectional observational approach collecting records of ACS patients that underwent percutaneous coronary intervention in RSUD Dr Soetomo Surabaya from January 2018 to December 2019. Data regarding a patient's age, gender, diabetic status, location of lesion, revascularization status, and clinical outcome were collected. Those with missing or incomplete data were excluded from the study. A total of 55 patients were included and analyzed,

**Results:** amongst 55 patients that underwent PCI observed, 23 were diabetic and 32 were non-diabetic. Study has shown that diabetic patients have higher mortality rate compared to those without diabetes (6 patients vs. 1 patient,  $p=0,072$ ) however based on the result analysis the p value of  $>0,05$  showed no significant relationship between patients' diabetic status and the clinical outcome following PCI therapy. Study has also shown that diabetic patients are more likely to undergo staged PCI (56,5%), than total revascularization PCI.

**Conclusion:** Study has found that diabetic ACS has a higher mortality rate compared to those without diabetes, however analytical studies found no significant relationship between the two variables. Further studies should be performed with higher number of patients to accurately investigate the relationship between diabetes melitus and PCI outcomes.

**Keywords:** Acute Coronary Syndrome, Diabetes Melitus, Percutaneous Coronary Intervention, Mortality

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## INTRODUCTION

Coronary heart diseases continue to be the rising cause of mortality amongst Indonesian population, alongside with the increasing number of diabetic patients<sup>1</sup>, with PERKI claiming that 15 in 1000 Indonesians suffer from coronary heart diseases. Acute coronary syndrome is one of those said coronary diseases. Acute coronary syndrome is a spectrum of acute and severe manifestations which is an emergency condition of the coronary due to an imbalance between myocardial oxygen demand and blood flow.<sup>2</sup> Due to the proatherosclerotic, proinflammatory, and prothrombic factors of diabetes, acute coronary syndrome patients with diabetes are more at risk of further complications.<sup>3</sup> A study conducted in 2007 claimed that ACS patients with diabetes mellitus are at a higher risk of 30-day mortality.<sup>4</sup>

The first line management for ACS is percutaneous coronary intervention (PCI), in which a stent or balloon might be with means of revascularization to salvage the myocardium.<sup>5</sup> Diabetes mellitus is linked with a poorer outcome after PCI procedure, however his phenomenon has not yet been entirely studied, therefore this study aims to compare the clinical outcomes between ACS patients with diabetes and those without diabetes following percutaneous coronary intervention therapy in RSUD Dr Soetomo Surabaya.

## METHODS

This was a cross-sectional observational descriptive study. Secondary data were collected from medical records of patients who underwent PCI in Pusat Pelayanan Jantung

Terpadu RSUD Dr Soetomo, Surabaya from July 2019 to June 2020. Data observed include age, gender, diabetic status, complications, location of coronary lesion, revascularization status, length of stay, and clinical outcomes, which are recovery or inhospital mortality.

Data were obtained using random sampling technique according to inclusion criterias, datas that were incomplete were excluded from the study. Inclusion criterias include patients that were diagnosed with ACS in Dr Soetomo Hospital Surabaya in the 2018-2020 period.

Ethical approval was given by Komite Etik Penelitian Kesehatan RSUD Dr Soetomo Surabaya with number 1877/KEPK/III/2020. The correlation between diabetic status and location of coronary lesion, the correlation between diabetic status and ACS complication, and the correlation between diabetic status and clinical outcome were determined by chi-square test. *P* values less than 0.05 were considered statistically significant. SPSS software (Statistical Package for the Social Sciences) for windows version 16 was used for statistical analysis

## RESULTS

### Baseline Characteristics of patients

Fifty five patients were enrolled in this study. Study shows that from the baseline characteristics of 55 patients (table 1) the majority of patients were in the age range of 51-60, with 87,3% of total patients were male. Study shows that the mean age for female patients were slightly older than male patients (67 vs. 55). The involvement of coronary artery Left Main (LM), Left Anterior Descending (LAD), Left Circumflex Artery (LCX), and

Right Coronary Artery (RCA) were 1.8%; 89.1%; 30.9%; and 47.3% in all patients respectively. The mean length of stay for total patients was 6 days.

The study included 55 patients, in which are then grouped into two categories, diabetic and non-diabetic (Table 1). Slightly less than half of the total population were diabetic (42%), with the majority of patients were male (87,3%) and were in the age group of 51-60 year old. Diabetic patients showed a higher mean age compared to non-diabetic patients (65 vs 54), and was dominated by male patients (17 patients). Amongst diabetic patients, a significant lesion in the LAD was the most common location for coronary lesion (82,6%).

### Coronary artery involvement and diabetes mellitus

Table 1 shows that the involvement of LM coronary artery is more prevalent in the diabetic group (4.3%), while the involvement of LAD artery is more common in the non-diabetic group (93.8%) than in the diabetic group (82.6%). It also shows that involvement of LCX artery is more prevalent in the diabetic group (39.1%) than in the non-diabetic group (25.0%), and the involvement of RCA artery is more common in the diabetic group (60.9%) than in the non-diabetic group (37.5%). However, based in the analysis using chi square test, it is shown that there was significant relationship between diabetes mellitus and the involvement of coronary arteries because all the resulting p value was more than 0.05.

**Table 1. Baseline Characteristics**

	Diabetic (n=23)		Non- Diabetic (n=32)		Total		P
	n	%	n	%	n	%	
<b>Age (years)</b>	61 ± 11		54 ± 10		56 ± 11		
31 – 40	1	4,3	5	15,6	6	10,9	
41 – 50	3	13,0	4	12,5	7	12,7	
51 – 60	10	43,5	17	53,1	27	49,1	
61 – 70	4	17,4	5	15,6	9	16,4	
71 – 80	4	17,4	1	3,1	5	9,1	
> 80	1	4,3	0	0	1	1,8	
<b>Sex</b>							
Male	17	73,9	31	96,9	48	87,3	
Female	6	26,1	1	3,1	7	12,7	
<b>LM</b>							
Significant	1	4,3	0	0	1	1,8	0,418
Non-significant	22	95,7	32	100	54	98,2	
<b>LAD</b>							
Significant	19	82,6	30	93,8	49	89,1	0,223
Non-significant	4	17,4	2	6,2	6	10,9	
<b>LCX</b>							0,376
Significant	9	39,1	8	25,0	17	30,9	
Non-significant	14	60,9	24	75,0	38	69,1	
<b>RCA</b>							0,107
Significant	14	60,9	12	37,5	26	47,3	
Non-significant	9	39,1	20	62,5	29	52,7	
<b>Length of stay (days)</b>	8 ± 6		5 ± 3		6 ± 4		

Source: Research Data, Processed

### ACS complication and diabetes mellitus

The study showed that the complication of heart failure is more prevalent within the non-diabetic group (9,4%), and cardiogenic shock being more prevalent in the diabetic group (13%). The correlation between diabetes mellitus and ACS complication was assessed by chi square test in Table 2. It showed no significant correlation between the two variables ( $p > 0.05$ ,  $p = 0.688$ ).

Source: Research Data, Processed

## Diabetes mellitus and clinical outcome after PCI

Results of this study showed that following PCI procedure, the number of inhospital mortality is more prevalent in the diabetic group (21,7%) than in the non-diabetic group (5 patients vs. 1 patient) (table 3). The correlation between diabetes mellitus and clinical outcome after PCI procedure was assessed using chi square test. It showed no significant correlation between the two variables ( $p > 0.05$ ,  $p = 0.072$ ).

**Table 2. ACS complication and diabetes mellitus**

	ACS Complication						P
	Cardiogenic shock		Heart Failure		No symptoms of complication		
	n	%	n	%	n	%	
Diabetic	3	13,0	2	8,7	18	78,3	0,688
Non Diabetic	2	6,2	3	9,4	27	84,4	

Source: Research Data, Processed

**Table 3. Diabetes mellitus and clinical outcome after PCI**

	Outcome after PCI				P
	Inhospital mortality		Recovered		
	n	%	n	%	
Diabetic	5	21,7	18	78,3	0,072
Non-diabetic	1	3,1	31	96,9	
Non-diabetic	1	3,1	31	96,9	

Source: Research Data, Processed

## ACS complications and clinical outcome after PCI

Study showed that ACS patients who already had gone through cardiogenic shock are 14 times more likely to experience inhospital mortality following a PCI procedure. The

correlation between ACS complications and clinical outcomes after PCI was analyzed with logistic regression test in table 4. It showed a significant correlation between the two variables ( $p < 0.05$ ,  $p = 0.022$ ).

## Diabetes mellitus and revascularization status

Results of this study showed that diabetic patients are more likely to undergo staged revascularization compared to non-diabetic patients. The correlation between diabetes mellitus and revascularization status was analyzed using the chi square test in table 5, with the result showing no significant relationship between the two variables ( $p > 0,05$ ,  $p = 0.24$ ).

**Table 4. ACS complications and clinical outcome after PCI**

ACS Complications	Clinical outcome				P	OR
	Inhospital mortality		Recovered			
	n	%	n	%		
Cardiogenic shock	2	40,0	3	60,0	0,022*	14,33
Heart failure	2	40,0	3	60,0	0,022*	14,33
No symptoms of complications	2	4,4	43	95,6		

Source: Research Data, Processed

**Table 5. Diabetes mellitus and revascularization status**

	Revascularization Status				p
	Staged		Complete		
	n	%	n	%	
Diabetic	13	56,5	10	43,5	0,244
Non-Diabetic	13	40,6	19	59,4	

Source: Research Data, Processed

## Diabetes mellitus and length of stay

Result of this study showed that there was no significant difference between the average length of stay of diabetic patients and non-diabetic patients (table 6), (8 days vs 5 days). The correlation between diabetes mellitus and length of stay was assessed using Mann Whitney test, with the result showing no significant relationship between the two variables ( $p > 0.05, p = 0,360$ ).

**Table 6. Diabetes mellitus and length of stay**

	Length of Stay		P
	Median (days)	Min – max (days)	
Diabetic	8	3 – 21	0,360
Non-diabetic	5	2 – 13	

Source: Research Data, Processed

## DISCUSSION

In this study, it was found that the mean age for ACS patients was 56 years, with the number of inhospital mortality following a PCI procedure being higher amongst diabetic patients. The most common age group for ACS patients was 51-60 years, this goes in line with a previous study that showed the most common age group for ACS patients being 56-65 years old.<sup>6</sup> Female patients were shown to have a higher mean age than male patients, this might be supported by a study that claimed menopausal women have a higher risk of suffering from coronary heart diseases than premenopausal women due to the reduced protective role of estrogen against cardiovascular diseases.<sup>7</sup>

In this study it was found that the coronary arteries involved were dominated by LAD, both in diabetic and non-diabetic patients. This is in accordance with the findings previously made by Hedge et al, in which research shows that coronary arteries that are often involved in ACS patients are LAD then followed by LCX and RCA.<sup>8</sup> Study shows that involvement of the LAD artery are more common in non-diabetic patients than in diabetic patients, this may be due to the population of diabetic patients in this study being only 42%.

This study showed that the complication of cardiogenic shock is more prevalent in diabetic patients than it is in non-diabetic patients. This is in line with a previous study that claimed diabetic patients being more susceptible to recurring and multivessible lesions that increase the likelihood of reinfraction. This reinfraction alongside with the worsening of cardiac output will then worsen the incidence of ischemia. Prolonged ischemia will then cause further myocardial dysfunction which can result in cardiogenic shock.<sup>9</sup>

Results of this study showed that diabetic patients are more susceptible of inhospital mortality, with the mortality number being higher in diabetic patients than in non-diabetic patients, which is in line with previous studies that claimed diabetic patients are more prone to worse outcomes than non-diabetic patients.<sup>10</sup> However the total number of inhospital mortality is relatively small, and this study did not acquire any data regarding 30-days nor 6 months post PCI procedure. The PRESTO trial conducted in 2004 claimed that In-hospital adverse events are relatively rare in the short term for both diabetic and non-diabetic patients, but long-term clinical outcomes show worse outcomes in diabetic patients. The PRESTO

Trial showed that in the nine-month follow-up period after the procedure, adverse events were more common in patients with diabetes mellitus compared to those without diabetes mellitus.<sup>11</sup>

This study showed that patients with more severe complications are at higher risk of inhospital mortality, with the presentation of cardiogenic shock being linked with a 14 times higher chance of inhospital mortality. This goes in line with the theory of patients with higher Killip score being linked with a higher mortality rate.<sup>12</sup> Study showed that diabetic patients are more likely to undergo staged revascularization because of their multivessible lesions.<sup>9</sup> There were no significant difference in the length of stay between diabetic patients and non-diabetic patients, which contradicts previous claims that stated diabetic patients having a longer length of stay compared to non-diabetic patients.<sup>13</sup>

## CONCLUSION

Acute coronary syndrome patients with diabetes mellitus showed to have a higher inhospital mortality rate following a PCI procedure than those without diabetes mellitus. Diabetic ACS patients were more prone to a staged revascularization procedure despite there was no significant correlation found between the two variables. Further and more thorough studies with more samples are needed to achieve a more in-depth analysis regarding this topic.

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## Conflict of Interest

The author stated there is no conflict of interest in this study.

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