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Prognostic factors in mitral valve replacement surgery at Dr. Sardjito General Hospital, Yogyakarta-Indonesia



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ABSTRACT

Background: The high morbidity following valve replacement surgery in mitral valve stenosis remains a big problem in the management of valvular heart disease in Indonesia. However, there has not been a readily available data about the morbidity prognostic factors following mitral valve replacement surgery in Indonesian population.

Method: A retrospective cohort of 60 patients at Dr. Sardjito general hospital from January 2011 to December 2014 were studied. The age, gender, ejection fraction, New York Heart Association (NYHA) functional class, angina Canadian Cardiovascular Society (CCS) grade 4, and postoperative morbidities were analyzed in the univariate and multivariate analysis using Medcalc.

Result: Ejection fraction, older age, and NYHA functional class were significantly related to postoperative morbidities (p -value < 0.05). Gender and angina CCS 4 were not significantly related to postoperative morbidities. Ejection fraction \leq 50% showed the highest odds ratio related to postoperative morbidities (OR 5.645, 95% CI 1.134-0.027). NYHA functional class 3 showed postoperative morbidities odds ratio of 3.200 (95% CI 2.240-23.065), while age \geq 50 years OR was 2.445 (95% CI 2.250-24.500).

Conclusion: Ejection fraction \leq 50%, age \geq 50 year, and NYHA functional class 3 are significantly associated with worse outcome after mitral valve replacement surgery.

Keywords: Heart valve diseases, mitral valve, postoperative period, prognosis

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INTRODUCTION

Valvular heart disease is a common heart disease needing surgical intervention. In developed countries, the estimated prevalence of valvular heart disease is 2.5% of the population.¹ Because valvular heart disease is caused predominantly by the degenerative process, the prevalence increases with age.² However, the majority of valvular heart disease in Indonesia is caused by rheumatic heart disease. Therefore, mitral valve stenosis is the most common type of valvular heart disease in Indonesian population.³ Despite its high prevalence, valvular heart disease in Indonesia has high morbidity, and it is still understudied.

The management of valvular heart disease following valve replacement surgery is complicated by high morbidity. Several prognostic factors had been studied to predict the postoperative outcome of a heart surgery.⁴⁻⁹ However, there has not been a published study in Indonesian population regarding the prognostic factors of morbidities after valve replacement surgery. Our study aimed to explore the prognostic factors of morbidities after mitral valve replacement surgery in Indonesian population. Mitral valve replacement surgery was chosen due to the high prevalence of mitral stenosis in Indonesia.

METHOD

The study was a retrospective study using consecutive sampling. The data were collected from medical records of the patients who underwent mitral valve replacement surgery at Dr. Sardjito General Hospital, Indonesia, between 1 January 2011 and 31 December 2014. The inclusion criteria were patients with a complete medical record who presented with New York Heart Association (NYHA) functional class II or more. Patients with the incomplete medical record, diabetes mellitus (random blood glucose level >200 mg/dL), chronic kidney disease, and history of previous heart surgery were excluded. The patients were categorized as having a morbidity if there were at least one of these conditions: postoperative stroke, acute kidney injury, prolonged ventilator use more than 24 hours, operation wound infection, postoperative cardiac abnormality (arrhythmia or acute myocardial infarct), prolonged ICU occupation more than 6 days, reoperation for any reason, pleural effusion, and death.

The sample characteristics were presented descriptively. Chi-Square test was performed to analyze the relationship between each independent variable and the presence of the morbidity after the surgery. The independent variables were the

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Table 1 Sample Characteristics

	Variable	N	%
Age (year)	< 50	42	70
	≥ 50	18	30
Gender	Male	36	60
	Female	24	40
CCS* 4 Angina	Positive	5	8.3
	Negative	55	91.7
Ejection fraction (%)	≤ 50	15	25
	> 50	45	75
NYHA† Functional Class	2	31	51.7
	3	29	48.3
Post operative morbidities	Postoperative stroke	2	3.3
	Acute kidney injury	2	3.3
	Prolonged ventilator use	17	28.3
	Postoperative wound infection	0	0
	Postoperative cardiac abnormalities	0	0
	Prolonged ICU‡ occupation	3	5
	Reoperation	0	0
	Death	1	1.7
	Total Morbidities	25	41.6

*Canadian Cardiac Society

†New York Heart Association

‡Intensive Care Unit

Table 2 Chi-Square Tests on Factors Related to Postoperative Morbidities

Variable	Morbidities		p-value
	Positive	Negative	
Age (year)			
≥ 50	12	6	0.015
< 50	10	32	
Gender			
Male	10	14	1.000
Female	15	21	
CCS* 4 Angina			
Positive	3	2	0.814
Negative	30	25	
Ejection fraction (%)			
≤ 50	10	5	0.000
> 50	7	38	
NYHA† Functional Class			
3	20	9	0.000
2	5	26	

*Canadian Cardiac Society

†New York Heart Association

Table 3 Logistic Regression Result of Factors Related to Postoperative Morbidities

Variable	Odds Ratio	95% Confidence Interval
Age \geq 50 year	2.445	2.250-24.500
NYHA* Functional Class 3	3.200	2.240-23.065
Ejection Fraction \leq 50%	5.645	1.134-9.027

*New York Heart Association

prognostic factors after heart surgery according to age, gender, NYHA functional class, angina, and the ejection fraction.⁴⁻¹⁰ We categorized age into two groups: <50 years and ≥ 50 years old. The NYHA functional class was categorized into functional class 2 and 3. The ejection fraction was categorized into $\leq 50\%$ and $>50\%$. Angina was defined as present or positive if the patient presented with Canadian Cardiac Society (CCS) class 4 angina.

The result was considered as significant if the p-value less than 0.05. Variables with a significant relationship to postoperative morbidity were included in a multivariate analysis using logistic regression. The data analysis was done using Medcalc software.

RESULT

The characteristics of the sample are presented in Table 1. The total of the sample was sixty patients, where 60% of them were males. There were 10 males (16.7%) and 15 females (25%) who experienced postoperative morbidities. However, the proportion difference was not significant (p-value >0.05).

The age of the patients ranged between 17 and 67 years old (median 41 years old) where 70% was under 50 years. There were more patients with postoperative morbidities (p-value < 0.05) in the group ≥ 50 years (20%) compared to < 50 years (16.7%).

Left ventricular function abnormality indicated by ejection fraction $\leq 50\%$ was only found in 25% of total patients. There were more patients with postoperative morbidities (p-value < 0.05) in the group of patients with ejection fraction $\leq 50\%$ than in the group of patients with a better ejection fraction.

There were only 5 patients (8.3%), who had CCS 4 angina. The difference between the proportion of patients with postoperative morbidities in patients with CCS 4 angina compared to patients without the angina was not significant (p-value > 0.05).

All patients in this study had NYHA functional class 2 or 3. There were more patients with NYHA functional class 2 than with functional class 3. There were 20 patients with NYHA functional class 3 and 5 patients with NYHA functional class 2 who experienced postoperative morbidities. There was a

significant relationship between NYHA functional class and postoperative morbidities (p-value < 0.05).

The variables showed a significant relationship with postoperative morbidities in bivariate analysis (age, ejection fraction, and NYHA functional class) were included in a multivariate analysis. Patients with postoperative morbidities were 2.445 more likely to be ≥ 50 years old (95% CI 2.250-24.500), 5.645 more likely to have ejection fraction $\leq 50\%$ (95% CI 1.134-0.027), 3.200 more likely to have NYHA functional class 3 (95% CI 2.240-23.065).

DISCUSSION

Our study showed that age had a significant relationship with morbidities after mitral valve replacement surgery (OR 2.445). A study by Handayani et al. in ICU patients at Persahabatan Hospital in Indonesia showed a similar result.¹⁰ The study showed that over 50 years old ICU patients experienced more morbidities than younger patients. However, a study by Nashef et al. in European, American, African, East Asian, and Central Asian population showed a different result.⁴ Their study about EuroSCORE II (a scoring system widely used for determining heart surgery risk) showed that in patients with > 60 years of age the risk of morbidity and mortality after heart operation increased.

In our study, postoperative morbidities occurred more in female than male patients although the difference was not significant. A study by Al-Githmi et al. showed that gender is an independent factor of outcome after multiple heart valve surgery.⁵ Older age, NYHA functional class II and III, and lower ejection fraction were associated with longer ICU stay in female but not in male patients.⁵

Lower ejection fraction ($\leq 50\%$) illustrates functional abnormality of the left ventricle.⁴ Our study showed it is associated with postoperative morbidities. The result is similar to several studies in heart surgery postoperative outcome.^{4,6,7} Left ventricle has essential role in cardiac output. Cardiac output determines oxygen delivery throughout the body. A patient with left ventricle functional abnormality undergoing heavy perioperative stress will suffer a further decrease in systemic oxygen delivery. This

condition can cause postoperative stroke, acute kidney injury, and prolonged ventilator use.^{6,7}

Our study showed angina CCS 4 was not associated with postoperative morbidities in contrast to other studies.^{4,8} Peric et al. showed the severity of angina in CCS classification is associated with worse postoperative outcome in patients after coronary artery bypass grafting surgery.⁸ In addition, Nashef et al. mentioned only angina CCS 4 that correlated with poor outcome after heart surgery in their study.⁴

Our study showing a significant relationship between NYHA functional class and postoperative morbidities confirms another study by Azarfarin et al.⁹ Their study showed prolonged stay in ICU for more than 96 hours in patients with NYHA functional class IV. In our study, there were no patients with NYHA functional class IV who was considered eligible or had a proper condition for cardiac surgery. However, in our study, patients with NYHA functional class III already showed significant postoperative morbidities.

Our findings revealed factors influencing postoperative morbidities of patients after mitral valve replacement surgery in Indonesian population. Several differences with other studies might be caused by different population and the type of heart surgery. It opens the possibility of developing new modified heart surgical risk scoring system for Indonesian population.

CONCLUSION

Ejection fraction, age, and NYHA functional class are related to postoperative morbidities of patients after mitral valve replacement surgery. Ejection fraction $\leq 50\%$, age ≥ 50 year, and NYHA functional class III are associated with a worse outcome.

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