

# CORRELATION BETWEEN GRADE OF HYPERTENSION AND LENGTH OF STAY OF STROKE PATIENTS IN SLEMAN GENERAL HOSPITAL

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## Abstract

**Background:** Stroke is a clinical syndrome which impair the function of the brain due to neurovascular disorder. Hypertension is the most important risk factor of ischemic stroke and hemorrhagic stroke. The length of stay is patient's service time starts from observation, diagnosis, and treatment, can determine the indicator for a successful management.

**Objective:** This study aims to analyse the correlation between grade of hypertension with length of stay of stroke patients in Sleman General Hospital.

**Method:** This is an observational study with cross sectional method of stroke patients admitted to Sleman General Hospital from January 2016 to January 2017. Sample were selected with consecutive sampling until the required number of patients was fulfilled. The research data collected from medical records based on sociodemographic variables and patient clinical variables. Bivariate analysis with chi-square and fisher exact were used to identify correlation between grade of hypertension with length of stay of stroke patients.

**Result:** A total 98 patients of this study, which 55 patients (56.1%) were women, and 64 patients (65.3%) were  $\geq 60$  years old. The bivariate analysis showed that factors associated with length of stay were dyslipidemia ( $p=0.016$ ), age ( $p=0.013$ ), grade of hypertension ( $p=0.002$ ), and type of stroke ( $p<0.001$ ). Grade of hypertension was not an independent factor of length of stay in stroke patient based on multivariate analysis (OR=2.55;  $p=0.048$ ).

**Conclusion :** Grade of hypertension has been shown to be associated with length of stay of stroke patients in Sleman General Hospital.

**Keywords :** Stroke, Hypertension, Length of stay, Hospitalization.

## INTRODUCTION

Currently, the leading causes of death have changed from communicable diseases to non-communicable diseases<sup>[1]</sup>. Stroke is the third leading cause of death in the world and is the second as cause of death in developed countries, whereas in developing countries, stroke is the third leading cause of death after ischemic heart disease and infection of lower respiratory tracts. In 2010, there are 33 million people of the world suffered from stroke with 16 million of a new stroke patient<sup>[2,3]</sup>.

Stroke is a syndrome characterized by progressive symptoms and signs. Functional disturbance of the brain can be focal or global which happen more than 24 hours and caused by vascular disorder of the brain<sup>[4]</sup>. The prevalence of stroke in Indonesia is 12.1 per 1000 population and has been diagnosed by health worker by 7 per 1000 population. The highest incidence of stroke were in South Sulawesi, D.I.Yogyakarta, Central Sulawesi and East Java<sup>[5]</sup>. Worldwide, the burden of ischemic and hemorrhagic stroke increased significantly from 1990 until 2010 with the incident number of ischemic and hemorrhagic stroke (37% and 47% increase), number of death (21% and 20% increase), and disability rates (18% and 14% increase). In 2010, the total incidence of ischemic stroke in Indonesia was 149 per 100,000 population and the number of mortality was 77 per 100,000 population. The incidence of hemorrhagic stroke was 110 per 100,000 population and mortality rate was 115 per 100,000 populations<sup>[6]</sup>.

Stroke can be triggered by some risk factors such as hypertension, atrial fibrillation, acute coronary syndrome, diabetes mellitus, and hyperlipidemia<sup>[7,8]</sup>. Hypertension is the most important risk factor in stroke patients, both ischemic stroke and hemorrhagic stroke<sup>[4]</sup>. The previous study has shown that a decrease in blood pressure could reduce the risk of stroke by 30% at each 10 mmHg decrease in systolic blood pressure<sup>[9]</sup>.

Hypertension plays an important role in the pathogenesis of atherosclerosis that leads to ischemic stroke, as well as arterial occlusion thrombosis, embolism, or a combination of the two. Hypertension alters the structure of blood vessels by vascular hypertrophy and remodeling, and triggers the formation of atherosclerosis in the cerebral artery and lipohyalinosis in arterioles. In addition, hypertension also damages the vascular endothelial elasticity and alters cerebrovascular autoregulation and mechanism of neurovascular. Hypertension leads to the occlusion of blood vessels or degenerative changes that tend to cause rupture and bleeding of the vessels<sup>[10]</sup>.

The aim of hospitalization is for observation, diagnosis, treatment, medical rehabilitation and other health services. The patient's length of stay is the important factor to determine the cost factor during acute stroke treatment in the hospital. Increased age, the number of comorbidities and disabilities caused by the disease affects the length of stay of stroke patients. In Australia, stroke patients who are in physician care spend as much as 1.3 million Australian dollars during their lifetime<sup>[11,12]</sup>.

The incidence and burden of stroke continuously change as response of the high risk of stroke in Asian countries. Hypertension is still a significant risk factor for stroke in some Asian country<sup>[13]</sup>. Our study aim is to determine the relationship between the grade of hypertension with length of stay in stroke patients.

## METHOD

Our study was an observational study with cross sectional method to find the correlation between grade of hypertension with length of stay in stroke patient in Sleman General Hospital. The target population in this study were all ischemic and hemorrhagic stroke patients who hospitalized in Sleman General Hospital. We collected data of patient using consecutive sampling method. The inclusion criteria of this study were patients diagnosed with stroke and hypertension who hospitalized in Sleman General Hospital between the ages of 25 and 90 years old. Patients enrolled in medical records at Sleman General Hospital. Patients whose data were not supplemented with the results of the examination on the variables in this study such as vital sign, computed tomography (CT) scan, electrocardiography (ECG), blood glucose examination and lipid profile examination or patient died were excluded from this study.

The sample size was calculated based on the determination of  $\alpha$ :5% and  $\beta$ : 20%, this resulted in a minimum sample size of 98 subjects. The dependent variable in this study was length of stay in the hospital and the independent variable focuses on the grade of hypertension. The confounding variables from this study were gender, age, history of stroke/transient ischemic attack (TIA), diabetes mellitus, dyslipidemia, and heart disease. The subjects were classified according to the grade of hypertension by assessing the blood pressure level. The grade of hypertension was classified as severe hypertension ( $\geq 180/110$  mm Hg) and not severe ( $\geq 140/90$  mm Hg but  $< 180/110$  mm Hg). The length of stay was assessed until the treatment and functional rehabilitation goal was reached and discharged from the hospital. The length of stay was classified into two groups,  $< 7$  days or  $\geq 7$  days.

The study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Islam Indonesia and has obtained permission from the Sleman Regency Government.

All predictor variables were analyzed using bivariate analysis to assess the significance of the relationship between variables with the length of stay of stroke patients using statistical software. The difference was considered significant if  $p < 0.05$ .

## RESULT

This study was conducted by taking medical records of stroke patients from January 2016 until January 2017 which the subjects were selected based on the criteria until the required number was fulfilled. A total of 122 stroke patients were enrolled in the study, both ischemic stroke and hemorrhagic stroke, 14 patients were excluded from the study and 10 patients did not have the inclusion criteria, so they were not included in the study. Total 98 patients was recorded, all meet the completeness of data.

A total of 98 patients, 49 (50.0%) were severe hypertensive patients ( $\geq 180/110$  mmHg) and 49 (50.0%) were not severe patients. There were 55 (56.1%) female stroke patients and 64 (65.3%) patients  $\geq 60$  years old. The number of patients with hemorrhagic stroke were 19 (19.4%) and ischemic stroke were 79 (80.6%). There were 21 (21.4%) patients with the history of stroke, 14 (14.3%) patients with diabetes mellitus, 7 (7.1%) patients with heart disease and 63 (64.3%) patients with dyslipidemia (**Table 1**).

The analysis of length of stay in stroke patients, 57 (58.2%) patients hospitalized for  $\geq 7$  days and 41 patients (41.2%) were hospitalized  $< 7$  days. Bivariate analysis of independent variables showed that there was significant correlation between grade of hypertension with the length of stay in stroke patients ( $p=0.02$ ). Other confounding variables that had statistically significant values were dyslipidemia ( $p=0.016$ ), age ( $p=0.013$ ), and type of stroke ( $p<0.001$ ) (**Table 2**, **Table 3**).

Table 1. Distribution of variables (n=98)

Variables	Frequency (n=98)	Percentration
	N	%
<b>Grade of hypertension</b>		
Severe	49	50.0
Not severe	49	50.0
<b>Gender</b>		
Male	43	43.9
Female	55	56.1
<b>Age-groups</b>		
≥ 60	64	65.3
< 60	34	34.7
<b>Type of stroke</b>		
Hemorrhagic	19	19.4
Ischemic Stroke	79	80.6
<b>History of stroke</b>		
Yes	21	21.4
No	77	78.6
<b>Diabetes mellitus</b>		
Yes	14	14.3
No	84	85.7
<b>Heart disease</b>		
Yes	7	7.1
No	91	92.9
<b>Dyslipidemia</b>		
Yes	63	64.3
No	35	35.7
<b>Length of stay</b>		
≥7 days	57	58.2
<7 days	41	41.2

Multivariate analysis was done to investigate the predictor variables on the length of stay of stroke patients. The multiple logistic regression analysis showed that grade of hypertension ( $p=0.048$ ; odds ratio 2.55 [CI 95%:1.01-6.43]); age group ( $p=0.022$ ; odds ratio 3.12 [CI 95%:1.18-8.26]) and type of stroke ( $p=0.009$ ; odds ratio 17.48 [CI 95%:2.06–148.1]) were statistically significant associated as factors affecting stroke patients hospitalized more than 7 days in Sleman General Hospital (**Table 4**).

Table 2. Bivariate analysis of grade of hypertension among stroke patients with length of stay (n=98)

		Length of stay				<i>p</i>
		≥7 days		<7 days		
		n	%	n	%	
Grade of hyper-tension	Severe	36	36.7	13	13.3	0.002
	Not severe	21	21.4	28	28.6	
Total		57	58.2	41	41,8	

Table 3. Bivariate analysis of comorbid factors among stroke patients with length of stay (n=98)

		Length of stay				<i>p</i>
		≥7 days		<7 days		
		n	%	n	%	
Gender	Male	24	24.5	19	19.4	0.677
	Female	33	33.7	22	22.4	
Age-groups	≥60 years old	43	43.9	21	21.4	0.013
	<60 years old	14	14.3	20	20.4	
Type of stroke	Hemorrhagic	18	18.4	1	1.0	<0,001
	Ischemic Stroke	39	39.8	40	40.8	
History of stroke	Yes	10	10.2	11	11.2	0.269
	No	47	48.0	30	30.6	
Diabetes mellitus	Yes	9	9,2	5	5,1	0.616
	No	48	49.0	36	36,7	
Heart disease	Yes	4	4.1	3	3.1	1
	No	53	54.1	38	38.8	
Dyslipidemia	Yes	31	31.6	32	32,7	0.016
	No	26	26.5	9	9,2	

Table 4. Multivariate analysis of the length of stay (n=98)

	Variable	Coefficient	p	OR (CI 95%)
Step 1	Grade of hypertension	0.913	0.056	2.49 (0.98-6.36)
	Age-groups	1.046	0.038	2.84 (1.06-7.65)
	Type of stroke	2.681	0.014	14.60 (1.71-124.3)
	Dyslipidemia	-0.658	0.205	0.52 (0.19-143)
Step 2	Grade of hypertension	0.935	0.048	2.55 (1.01-6.43)
	Age-groups	1.137	0.022	3.12 (1.18-8.26)
	Type of stroke	2.860	0.009	17.46 (2.06-148.1)

## DISCUSSION

In our study, there is a significant association between grade of hypertension with length of stay in stroke patients, although the grade of hypertension was not an independent factor that affects length of stay of stroke patients in Sleman General Hospital. Hypertension is known to be controversial as a comorbid factor in stroke patients. Previous studies have shown that hypertension has a significant relationship to the length of stay in hospital<sup>[14,15]</sup>. Kim et. al. reported that there was an association between hypertension and length of stay in acute stroke patients<sup>[15]</sup>. This is in contrast to the Saxena study that showed no significant association between hypertension and length of stay in acute stroke patients<sup>[16]</sup>. These studies showed the presence of hypertension as a comorbid factor in the incidence of stroke, not categorizing hypertension based on the severity of hypertension. In study done by Manabe et. al. showed that there was a significant correlation between the severity of hypertension and length of stay of ischemic stroke patients with  $p=0.007$  ( $p<0.05$ )<sup>[17]</sup>.

Our study still has some limitations. The first limitation is that the researchers did not include other factors that affect the length of stay in hospital such as the presence of infection, surgery, diseases that may not affect the stroke but affect the length of stay in the hospital. The second limitation, variables such as genetic factors, blood glucose level, urea level, creatinine level, and leukocyte count, were not analyzed in this study. The last, our study was held in only one hospital on the third and second class wards, as they may be have differences in the characteristics of health services that affect the length of stay.

## CONCLUSION

The results of this study showed that grade of hypertension had a statistically significant correlation with the length of stay in stroke patients in Sleman General Hospital. We also found that the comorbid factor i.e age and type of stroke were related with the length of stay of stroke patients in Sleman General Hospital.

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