

Factor Analysis of Clinical Outcome in Patient With Ischemic Stroke

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Abstract- Increasing of life expectancy leads an epidemiological transition to non-communicable diseases (NCD). The incidence is related to the increased risk factors due to lifestyle changes in the community. In Indonesia, since 1995-2007 the proportion of NCD had increased significantly. Stroke was positioned in the first rank of 10 most degenerative diseases with mortality rate of 12.68% in 2009. Stroke is the second leading cause of death worldwide and is a major cause of disability globally. This research was a type of analytic observational studies with case control study design. 110 patient had been included and divided into 55 case groups and 55 control groups. Bivariate analysis was performed using chi square test with $p < 0.05$. The results of study shows that age ($p = 0.037$), gender ($p = 0.000$), history of hypertension ($p = 0.038$), heart abnormalities ($p = 0.039$) and therapeutic time window ($p = 0.050$) have a related to the clinical outcome of stroke. This study can be provide input on appropriate promotive and preventive measures to reduce the number of disability and death from stroke.

Index Terms- Noncommunicable disease¹, Ischemic stroke², Clinical outcome³.

1. INTRODUCTION

Increasing of life expectancy driven by the success of national development and the expanding modernization in Indonesia, leads to an epidemiological transition to non-communicable diseases. The number of morbidity caused by NCD is expected to increase significantly. The incidence is related to the increased risk factors due to lifestyle changes in the community⁽¹⁾. World Health Organization (WHO) show that 57 million deaths occurring in the world in 2008, 36 million were caused by non-communicable diseases⁽²⁾. Stroke is the second leading cause of death worldwide and is a major cause of disability globally⁽³⁾. In Indonesia, since 1995-2007 the proportion of non-communicable disease had increased significantly from 41.7% to 59.5%. Stroke was positioned in the first rank of 10 most degenerative diseases with mortality rate of 12.68% in 2009⁽²⁾. East Java was one of the provinces that experienced significant increase in stroke from 2007-2013 compared to other provinces which also had the highest stroke prevalence.

There are many factors which can affect the outcomes and levels of improvement after experiencing ischemic stroke⁽⁴⁾. Outcome of stroke is generally described in terms of mortality and functional status after experiencing stroke. Decrease in ability can occur due to loss of consciousness as well as malfunction of certain areas of the brain that caused by disruption of blood flow or the rupture of blood vessels in that certain areas⁽⁵⁾. The treatment of acute stroke is also influenced by knowledge at the

community level about the risk factors for stroke and healthcare workers regarding the concept that stroke is a disease which needs emergency treatment. The philosophy which must be held is, time is brain and the golden hour. Given the common understanding that stroke disease is a medical emergency, it will play a role in saving lives and preventing long-term disability^(6,7).

2. RESEARCH METHOD

This research was a type of analytic observational studies with case control study design. The source of population was obtained from medical record of ischemic stroke patient in Syarifah Ambami Rato Ebu Hospital during January-December 2016 period with these following inclusion criteria: 1) Assessment data on medical record was well completed, 2) Determination of diagnosis performed by neurologist of Syarifah Ambami Rato Ebu Hospital, 3) Medical record of ischemic stroke patients who were inpatient at Syarifah Ambami Rato Ebu Hospital.

The sample size was determined by using Lemeshow 1997 and it obtained 110 respondents, with ratio 1:1 which consists of 55 groups as control and 55 groups as case using single blind method. Bivariate analysis was performed using chi square test with $p < 0.05$.

3. RESULT AND DISCUSSION

3.1. Unmodified factor

3.1.1. Age

The decline of the vascular system increases with age, and stroke is twice as often experienced when a person is >55 years⁽³⁾.

Table 1. Age Cross Tabulation with Clinical Outcome in Patient with Ischemic Stroke

Age (years)	Clinical Outcome		p-value	OR	CI 95%
	Severe outcome	Moderate outcome			
21-55	32 (58,2%)	30 (54,5%)	0,037	1,15	1,045-2,465
56-83	23 (41,8%)	25 (45,5%)			
Total	55 (100%)	55 (100%)			

From the results of this study there was significant effect between age with clinical outcome of stroke. This was consistent with a study conducted by Adja in 2015 which found out that older patients had a higher incidence and an increased prevalence of ischemic stroke with worse functional outcomes compared to younger patients.⁽⁸⁾ In other studies it was also explained that age differences correlated with clinical deterioration where in clinical worsening groups had an older age averagely, since in older age there was more than one risk factor that could aggravate clinical outcomes such as hypertension, diabetes mellitus, dyslipidemia, atrial fibrillation, smoking, and an increased of inflammatory process in old age⁽⁹⁾.

3.1.2. Gender

Table 2. Gender Cross Tabulation with Clinical Outcome in Patient with Ischemic Stroke

Gender	Clinical Outcome		p-value	OR	CI 95%
	Severe outcome	Moderate outcome			
Male	27 (49,1%)	26 (47,3%)	0,000	0,92	0,439-1,967
Female	28 (50,9%)	29 (52,7%)			
Total	55 (100%)	55 (100%)			

Table 2. showed a significant effect of sex on clinical outcomes of stroke. The results were consistent with research conducted by Spaander in 2017 that explained that women were more

susceptible to the alteplase process, thus accelerating the process of recanalization that could affect the functional outcome after stroke attacked. This was caused by the distribution of groups of women that in the two groups were almost identical so it could illustrate the influence of female sex on the clinical outcomes of stroke. It might also be related to the age of the majority of respondents who were in the elderly age range that would affect the level of estrogen hormone in female respondents. Another mechanism that also explained the differences in endogen fibrinolysis due to sex hormone differences between men and women had indirect effect on the control of the fibrinolytic system due to low levels of platelet inhibitors^(10,11). Other studies have also discussed gender differences in stroke outcomes, based on several animal experiments that estrogen level is one of the most important factors associated with worsening brain tumor ischemia⁽¹²⁾.

3.2. Modified factor

3.2.1 History of hipertension

Table 3. History of hipertension Cross Tabulation with Clinical Outcome in Patient with Ischemic Stroke

History of Hypertension	Clinical Outcome		p-value	OR	CI 95%
	Severe outcome	Moderate outcome			
Yes	34 (61,8%)	32 (58,2%)	0,038	1,16	0,542-2,497
No	21 (38,2%)	23 (41,8%)			
Total	55 (100%)	55 (100%)			

Hypertension is the most important risk factor for all types of stroke, both ischemic stroke and bleeding stroke. From the results of this study obtained a significant influence between history of hypertension to clinical outcome of stroke. The results were consistent with studies conducted by Ingeman, et al 2017 who reported an association between hypertension history with stroke outcome despite using different tools (mrS score)⁽¹⁰⁾. Blood pressure affected the events of stroke and affected the process of ischemia through the regulation of cerebral blood flow. Increased blood pressure during acute stroke was often a brain autoregulation mechanism to suffice brain blood flow in the ischemic area.

This autoregulation was influenced by sympathetic inactivity of blood vessels, arterial CO2 pressure,

blood pressure-lowering drugs and the presence of chronic hypertension. Systolic pressure described the phase of heart muscle contraction while diastolic pressure described the relaxation phase. Systolic pressure affected the content of cardiac output pumped by the heart and diastolic pressure reflected the volume of blood to be pumped in the left ventricle, so the blood vessel was clogged, autoregulation mechanism would rise systolic blood pressure and lower diastolic blood pressure so that cerebral blood flow would remain Constant in the area of the ischemic brain through the collateral system⁽¹¹⁾.

3.2.2 History of diabetes mellitus

Table 4. History of diabetes mellitus CrosTabulation with Clinical Outcome in Patient with Ischemic Stroke

History of Diabetes Mellitus	Clinical Outcome		p-value	OR	CI 95%
	Severe outcome	Moderate outcome			
Yes	14 (25,5%)	9 (16,4%)	0,880	1,74	1,684-4,456
No	41 (74,5%)	46 (83,6%)			
Total	55 (100%)	55 (100%)			

Based on the results of the study in Table 4, there was no significant effect of history of diabetes mellitus to the clinical outcome of stroke. The results were not in accordance with previous studies conducted by Kooten and quoted by Adja in 2015 that they found 43% of patients who affected by acute phase of stroke with hyperglycemia, more than half of them had experienced diabetes or had latent diabetes^(8,11). The study also found a significant relationship between hyperglycemia and worsening stroke outcome. This happened because the distribution of respondents who mostly had no history of diabetes mellitus both in case groups and control groups. In addition, the previous study also did not include some other factors that could also be a factor that affected the outcome of stroke.

3.2.3 Heart Abnormality

Table 5. Heart abnormality CrosTabulation with Clinical Outcome in Patient with Ischemic Stroke

Heart Abnormality	Clinical Outcome		p-value	OR	CI 95%
	Severe outcome	Moderate outcome			
Yes	21 (38,2%)	19 (34,5%)	0,039	1,17	0,538-2,574
No	34 (61,8%)	36 (65,5%)			
Total	55 (100%)	55 (100%)			

The presence of cardioembolic was the most common cause of ischemic stroke associated with worsening stroke outcome compared to other ischemic stroke types⁽¹¹⁾. In this study, it found that there was significant effect between heart abnormalities on stroke outcome. These results were in accordance with the results of research conducted by Scheitz, et al in 2012 which explained that increased levels of cTnT affected the prognosis of patients with stroke in the short term⁽¹²⁾. The cTnT level was related to the presence of abnormalities in a person's heart. Another study conducted by Bill et al, in 2012 showed that ischemic stroke caused by cardioembolic most patients experienced clinical deterioration.

3.2.4 History of stroke/TIA

Table 6. History of stroke/TIA CrosTabulation with Clinical Outcome in Patient with Ischemic Stroke

History of Stroke/TIA	Clinical Outcome		p-value	OR	CI 95%
	Severe outcome	Moderate outcome			
Yes	15 (27,3%)	12 (21,8%)	0,196	1,34	0,561-3,216
No	40 (72,7%)	43 (78,2%)			
Total	55 (100%)	55 (100%)			

Based on the results of the study, it found that there was no significant effect between the history of stroke/TIA to clinical outcomes of stroke. These results did not match with some studies that found an association between a history of stroke with a clinical outcome of stroke. One of the studies was conducted by Scheitz et al. (2012), suggesting that the risk of recurrent stroke and / or death was higher in the minor ischemic stroke (moderate ischemic stroke) despite the

significant differences only in death. The apparent prognostic differences might be due to good prognosis in patients with Amaurosis fugax among patients with transient ischemic attack ⁽¹²⁾.

3.3. Therapeutic Time Window

Table 7. Therapeutic time window CrosTabulation with Clinical Outcome in Patient with Ischemic Stroke

Therapeutic Time Window	Clinical Outcome		p-value	OR	CI 95%
	Severe outcome	Moderate outcome			
>6 Hour	34 (61,8%)	31 (56,4%)	0,050	1,25 3	0,585- 2,684
<6 Hour	21 (38,2%)	24 (43,6%)			
Total	55 (100%)	55 (100%)			

Ischemic stroke had a variety of etiologies, but principally was caused by athero thrombosis or embolism, which would interfere with or terminate cerebral blood flow (CBF). If CBF drops to <10 ml/mg/minute there would be a failure of homeostasis, which would cause rapid calcium influx, protease activity, that was a cascade or an excitotoxic chain process and ultimately the death of neurons. If a CBF disorder occurred between 15-30 ml/100 mg/minute, then the ischemic state could be restored if the therapy was performed early on. There was significant effect of therapeutic time window on clinical outcome of stroke. This was consistent with research conducted by Adja in 2015 which explained that patients who came at >6 hours had more clinical worsening than patients who came on the onset of <6 hours.

The meta-analysis study of 9 studies conducted by Saini (2009) and cited by Adja (2015) found patients who came within 8 hours to 72 hours of onset of stroke experienced significant clinical and statistically deterioration. The worsening of acute stroke at the beginning of its development (within 48-72 hours of onset) was potentially serious and had long-term clinical implications of deterioration for the patient. Underlying mechanisms included the presence of systemic factors, proliferative blood vessel occlusion, cerebral edema, hemorrhagic transformation and seizures ^(8,19,20).

4. CONCLUSION

Regarding to the analysis results, it obtained factor related to of clinical outcomes of patient with ischemic

stroke that age, gender, history of hypertension heart abnormality and therapeutic time window. So that the socialization of all layers of society, both health workers and the general public to increase understanding of the importance of prehospital stroke treatment were very important to reduce mortality and disability caused by stroke.

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