

## The Relationship Between Hypertension and Ischemic Stroke Occurrence at Less Than 45 Years Old People

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### Abstract

Ischemic stroke that occurs at less than 45 years old people continuously increases. One of the main causes is hypertension. The purpose of this study is to determine the relationship between hypertension with ischemic stroke occurrence at less than 45 years old people. The type of research used in this study is observational analytic research by case control study approach. The sampling technique is consecutive sampling with total sample consists of 43 cases and 43 controls. Data analysis that used in this study is chi-square test. The result of the analysis shows that there is a significant relationship between hypertension with ischemic stroke occurrence at less than 45 years old people ( $p=0.001$ ,  $OR=4.308$ , and  $95\% CI=1.745-10.635$ ). The conclusion of this study is there is a relationship between hypertension and ischemic stroke occurrence at less than 45 years old people.

**Keywords:** Ischemic stroke, Hypertension

### I. INTRODUCTION

Stroke is one of the non-infectious diseases that can cause death and disability. Based on WHO data, there are 15 million people in the world suffered stroke every year. Among them, it was found the number of deaths as many as 5 million people and 5 million others suffered permanent disability.<sup>1</sup> Stroke is a cerebrovascular disease that is found not only in developed countries but also in developing countries. Stroke is a major cause of disability in western countries. In the Netherlands, stroke is ranked third as the cause of DALY's (Disability Adjusted Life Years = loss of years of productive age).<sup>2</sup>

The comparison of stroke death rates between developing countries and developed countries is 5 to 1. In 2020, it is estimated that 7.6 million people will die because of stroke. Stroke recurrence that tends to occur in people with diastolic pressure reaches more than 95%. A study abroad showed that 29% reduction occurred in the risk of stroke recurrence of patients receiving anti-hypertensive treatment than those who did not. Every year about 0.2% of the population has a stroke, for about a third of them dying within the next 12 months, another a third being permanently disabled, and another a third recovering their independence.<sup>3</sup>

Stroke is rare in people under the age of 45, when it happens that the main cause is high blood pressure. Lately stroke not only attacks the old age people but also young people who are still productive. The number of stroke patients around the world under the age of 45 years continuously increases. At a conference of international neurologists in the UK reported that there are more than 1000 stroke sufferers age in less than 30 years old. The World Health Organization predicts that deaths from stroke will increase with deaths from heart disease and cancer about 6 million in 2010 become 8 million in 2030.<sup>4</sup> Based on O'donnell's study, *et al.*, conducted in 22 countries from 2007 to 2010 found that from 300 cases, it consists of 78% ischemic stroke patients and 22% intracerebral haemorrhagic, thus showing the proportion of ischemic stroke incidence is higher than hemorrhagic stroke.<sup>5</sup>

In Asia, most of developing countries have more stroke than that in developed countries. About 1.5-2 million stroke disease occurs in China every year. Ischemic stroke is a major type of stroke, a complex disease caused by genetic factors, environmental factors, and the relationship of both.<sup>6</sup> Studies in Iran suggested that the incidence of ischemic stroke at a young age of 8/100,000, the frequency of young stroke (15-45 years) was 21% of the 3,055 stroke patients. Several studies of ischemic stroke in Asia suggested men were more dominant than females (71-76%).<sup>7</sup> The prognosis of ischemic stroke at the young age is better than that of older people, with lower mortality and recurrence rates, and better functional recovery. The risk of patients with ischemic stroke in the survival of people age between 15-45 years old in Madrid society, showing a negative impact on survival to suffer an ischemic stroke at the young age. However, the deaths of young adults with ischemic stroke are much lower than that in older patients, as survival at five years is over 90% at younger ages and only 40% in old age.<sup>8</sup>

In Indonesia, it is estimated that every year, there are 500,000 people affected by stroke, about 2.5% or 125,000 people died, and the rest are minor or serious defects. In general, it can be said the incidence of stroke is 200 per

100,000 populations. In one year, among 100,000 residents, 200 people will suffer a stroke. The incidence of ischemic stroke is approximately 80% of the total stroke cases, whereas the incidence of hemorrhagic stroke is only about 20% of the total stroke case.<sup>9</sup> The prevalence of stroke in Indonesia reached 8.3 per 1,000 population. The areas with the highest prevalence of stroke were Nanggroe Aceh Darussalam (16.6 per 1000 population) and the lowest were Papua (3.8 per 1000 population)<sup>10</sup>

Based on medical record data, in 2015 at the Regional Public Service Agency of Cut Nyak Dhien Meulaboh Regional General Hospital of West Aceh District there were 85.8% of patients with ischemic stroke and 14.2% of haemorrhagic stroke patients. Among them were 10.4% ischemic stroke at age less than 45 years old, and 3 people died. Whereas in 2016 there were 86.3% of ischemic stroke patients and 13.7% of haemorrhagic stroke patients. Among them were 12.3% ischemic stroke at age less than 45 years, and 1 people died. The purpose of this study was to determine the relationship between hypertension with ischemic stroke occurrence at less than 45 years old people.

## II. METHODS

The type of research used in this study was observational analytic research by case control study approach, that was comparing between case group and control group. The study was conducted from July to August 2017 at the Regional Public Service Agency of Cut Nyak Dhien Meulaboh Regional Hospital. The study population was ischemic stroke patients less than 45 years old. Sampling was done by consecutive sampling with total sample consist of 43 cases and 43 controls. Inclusion of ischemic stroke patients aged less than 45 years and control inclusion of neurological patients who are not stroke patients. Data analysis was done by Chi-square test.

## III. RESULT

Table 1. Distribution of hypertension by case and control

Hypertension	Case		Control	
	n	%	n	%
Hypertension	30	69.8	15	34.9
Not hypertension	13	30.2	28	65.1
Total	43	100.0	43	100.0

Based on table 1, it shows that most of the respondents who suffer from hypertension were more in the case group (69.8%) than the control group (34.9%). While respondents who do not suffer from hypertension were more in control group (65.1%) than case group (30.2%).

Table 2. The relationship between hypertension and ischemic stroke occurrence at less than 45 years old people

Hypertension	Case		Control		OR	95% CI	P
	n	%	n	%			
Hypertension	30	69.8	15	34.9	4.308	1.745-10.635	0.001
Not hypertension	13	30.2	28	65.1			
Total	43	100.0	43	100.0			

Based on table 2, it shows that there was a significant relationship between hypertension with ischemic stroke occurrence at less than 45 years old. It was showed by Chi-square test results obtained p value = 0.001.

## IV. DISCUSSION

The result of this study indicates a significant relationship between hypertension with ischemic stroke occurrence at less than 45 years old. Based on chi-square test, p value was 0.001 ( $p < 0.05$ ), OR=4.308, and 95% CI=1.745-10.635, it means that people who have a history of hypertension risk 4.308 times greater occurrence of ischemic stroke compared with people who not have hypertension. The results of this study are in line with the study of Sofyan, *et al.*, which stated a relationship between hypertension with stroke ( $p=0.000$ ).<sup>11</sup> This study also in line with Kristiyawati and Saefulloh's research which showed that hypertension was the most dominant risk factor associated with stroke incidence with OR=22.767.<sup>12</sup> A study by Adil, *et al.*, found that 2,590 children treated with

arterial ischemic stroke: 156 (6%) had a diagnosis of hypertension and 10% of hypertension children also had renal failure. Among patients with arterial ischemic stroke, hypertension was associated with increased mortality (7.4% vs. 2.8%;  $p = 0.01$ ). Hypertension showed a correlation with risk of death in hospital for children with arterial ischemic stroke.<sup>13</sup>

Hypertension accelerates the process of arteriosclerosis, thereby increasing the likelihood of cerebral lesions associated with stenosis and emboli derived from large extracranial vessels, aortic arch and from the heart. Hypertension speeds up the process of arteriosclerosis that usually begins in the larger extracerebral artery, especially in carotid bifurcation. The process spreads to the willis circle and over time the smaller intracerebral arteries will also be involved. High levels of carotid stenosis can compromise the cerebral circulation, and emboli from plaque in the carotid and vertebral arteries can lead to transient ischemic attacks and cerebral infarction.<sup>14</sup> Baidya, *et al.*, in his study stated that hypertension was the most important risk factor for increasing the incidence of acute ischemic stroke in young adults.<sup>15</sup>

People with high blood pressure have a great chance of having a stroke. Even hypertension is the biggest cause (etiology) of the stroke itself. It is caused in the case of hypertension can occur disruption of blood flow in the body where the blood vessel diameter in the future will shrink (vasokonstriksi) so that blood flowing to the brain will decrease. With the reduction of cerebral blood flow (CBF), the brain will lack of oxygen supply and also glucose (hypoxia) because of the supply reduced continuously so the brain tissue will die long.<sup>16</sup>

## V. CONCLUSION

Based on the results of this study, it can be concluded that there is a relationship between hypertension with ischemic stroke occurrence at less than 45 years old people. People who have a history of hypertension risk 4.308 times greater occurrence of ischemic stroke compared with people who are not have hypertension.

## REFERENCES

1. WHO. Global Burden of Stroke. 2010 [11 Januari 2017]; Available from: [http://www.who.int/cardiovascular\\_diseases/en/cvd\\_atlas\\_15\\_burden\\_stroke.pdf](http://www.who.int/cardiovascular_diseases/en/cvd_atlas_15_burden_stroke.pdf).
2. Janssen AWM, de Leeuw FE, Janssen MCH. Risk factors for ischemic stroke and transient ischemic attack in patients under age 50. *Journal of thrombosis and thrombolysis*. 2011;31(1):85-91.
3. Feigin V. Panduan bergambar tentang pencegahan dan pemulihan stroke. Jakarta: PT. Buana Ilmu Populer Kelompok Gramedia; 2011.
4. Lloyd-Jones D, Adams RJ, Brown TM, et al. Heart disease and stroke statistics— 2010 update. *Circulation*. 2010;121(7):e46-e215.
5. O'Donnell MJ, Xavier D, Liu L, et al. Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study. *The Lancet*. 2010;376(9735):112-23.
6. Xu C, Wang F, Wang B, et al. Minor Allele C of Chromosome 1p32 Single Nucleotide Polymorphism rs11206510 Confers Risk of Ischemic Stroke in the Chinese Han Population. *Stroke*. 2010;41(8):1587-92.
7. Wasay M, Kaul S, Menon B, et al. Ischemic stroke in young Asian women: risk factors, subtypes and outcome. *Cerebrovascular Diseases*. 2010;30(4):418-22.
8. Varona JF. Long-Term Prognosis of Ischemic Stroke in Young Adults. *Stroke Research and Treatment*. 2011;2011.
9. Yayasan Stroke Indonesia. Yastroki Tangani Masalah Stroke Di Indonesia. 2012 [15 Februari 2017]; Available from: <http://www.yastroki.or.id/read.php?id=20>
10. Badan Penelitian dan Pengembangan Kesehatan, Riset Kesehatan Dasar. Jakarta: Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan RI; 2007.
11. Sofyan AM, Sihombing IY, Hamra Y. Hubungan Umur, Jenis Kelamin, dan Hipertensi dengan Kejadian Stroke. *Medula*. 2013;1(1):24-30.
12. Kristiyawati SP, Irawati D, Hariyati TS. Faktor Risiko Yang Berhubungan Dengan Kejadian Stroke Di Rumah Sakit Panti Wilasa Citarum Semarang. *Jurnal Ilmu Keperawatan dan Kebidanan*. 2009;1(1):1-7.
13. Adil MM, Beslow LA, Qureshi AI, et al. Hypertension Is Associated With Increased Mortality in Children Hospitalized With Arterial Ischemic Stroke. *Pediatric Neurology*. 2016;56(Supplement C):25-9.
14. Johansson BB. Hypertension Mechanisms Causing Stroke. *Clinical and Experimental Pharmacology and Physiology*. 1999;26(7):563-5.
15. Baidya OP, Tiwari S, Usman K. Acute ischemic stroke in young adults-a hospital based study in North India. *International Journal of Biomedical Research*. 2015;6(2):113-7.
16. Russel DM. Bebas dari 6 Penyakit Paling Mematikan. Jakarta: MedPress; 2011.