



# ASSOCIATION OF ANKLE-BRACHIAL INDEX WITH ISCHEMIC STROKE OUTCOME IN DIABETIC PATIENTS: A CASE-CONTROL STUDY

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## Introduction

Ankle brachial index (ABI) is used to predict peripheral arterial disease (PAD). Patients with PAD demonstrate more severe ischemic stroke during treatment than those without. This mechanism is still unclear. Ankle brachial index is a strong predictor of stroke outcome especially in patients with history of Diabetes Mellitus (DM).

## Objectives

This study investigated the association of ankle-brachial index (ABI) with short outcomes in acute ischemic stroke patients with and without diabetes mellitus (DM).

## Materials & Methods

In a case-control study, we studied 30 first-time ischemic stroke patients with DM and 30 without DM. ABI measured by an automatic device. during hospitalization in Ulin hospital and Ansari Saleh hospital Banjarmasin, Indonesia. Patients were categorized into the normal ( $\geq 0.90$ ) and abnormal ( $< 0.90$ ) ABI group. Basic characteristics of subject and stroke outcome were measured using modified Rankin Scale (mRS) on discharge day and were compared between the groups. Poor functional outcome was defined as modified Rankin Scale score  $> 3$ .

## Results & Discussion

Patient subjects were predominantly late adulthood. In the group of stroke patients with DM was found to be more dominant in ABI  $< 0.9$ , while in the group of stroke patients without DM the number of ABI  $< 0.9$  was the same as the number of ABI  $\geq 0.9$ . Bivariate analysis showed that the group of DM patients was very dominant with poor outcomes, while the group without DM the number was relatively similar between two groups. Many poor outcomes occur at low ABI, and vice versa. The difference was statistically significant between two groups. ( $p < 0.05$ ). After adjustment for many variables in the logistic regression analysis, ABI was an independent factor associated with poor outcome in acute ischemic stroke with DM.

Table 1. The Characteristics of the Study Subjects.

Variable	Category	ABI		p value*
		<0.9 (n=41)	$\geq 0.9$ (n=19)	
Age (year)	$\leq 45$ , n(%)	6 (14.6)	5 (3.5)	0.301
	$> 45$ , n (%)	35 (85.4)	14 (73.7)	
DM	Yes, n (%)	26 (63.4)	4 (21.1)	0.002*
	No, n (%)	15 (36.6)	15 (78.9)	
Sistolic BP	$< 140$ mmHg	10 (24.4)	3 (15.8)	0.522
	$\geq 140$ mmHg	31 (75.6)	16 (84.2)	
Diastolic BP	$< 90$ mmHg	9 (22.0)	4 (21.1)	1.000
	$\geq 90$ mmHg	32 (78.0)	15 (78.9)	
Temperature	$> 37.2^\circ\text{C}$	4 (9.8)	2 (10.5)	1.000
	$\leq 37.2^\circ\text{C}$	37 (90.2)	17 (89.5)	

Table 2. Bivariate analysis relationship variable and outcome stroke

Variable	Category	Outcome (mRS)		p value*	OR (CI 95%)
		$> 3$ (n=39)	$\leq 3$ (n=21)		
Age (year)	$> 45$	33 (84.6)	16 (76.2)	0.493	1.719 (0.455-6.489)
	$\leq 45$	6 (15.4)	5 (23.8)		
DM	Yes, n (%)	25 (64.1)	5 (23.8)	0.003*	5.714 (1.724-18.944)
	No, n (%)	14 (35.9)	16 (76.2)		
Sistolic BP	$< 140$ mmHg	9 (23.1)	4 (19.0)	1.000	0.784 (0.210-2.935)
	$\geq 140$ mmHg	30 (76.9)	17 (81.0)		
Diastolic BP	$< 90$ mmHg	7 (17.9)	6 (28.6)	0.349	1.829 (0.523-6.389)
	$\geq 90$ mmHg	32 (82.1)	15 (71.4)		
ABI	$< 0.9$	34 (87.2)	7 (33.3)	0.000*	13.600 (3.686-50.180)
	$\geq 0.9$	5 (12.6)	14 (66.7)		
Temperature	$> 37.2^\circ\text{C}$	5 (12.8)	1 (4.8)	0.412	2.941 (0.320-26.998)
	$\leq 37.2^\circ\text{C}$	34 (87.2)	20 (95.2)		

## Conclusions

1. Abnormal ABI relative frequency is higher in ischemic stroke patients with DM group compared to controls.
2. Lower ABI is associated with poor short-term outcomes in acute ischemic stroke with DM.
3. Therefore, ABI can be simple and reliable methods for identifying patients with an increased risk of poor short and long-term outcomes in acute ischemic stroke with DM