

## Assessment of Ankle Brachial Index among Stroke and Non-stroke patients in a Tertiary care hospital

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### Abstract:

**Background:** Stroke is an important cause of premature death and disability in developing countries such as India. A low ankle-brachial index (ABI) is predictive of peripheral arterial disease. Early assessment of the patient may be beneficial in rapid identification of severe cases, treatment and most importantly, disability limitation.

**Objectives:** 1.To estimate and compare ABI among stroke and non- stroke patients .2.To study association of ABI and NIHSS score among study population.

**Methodology:** A case control study was conducted among 50 patients of ischaemic stroke and 50 patients having no previous history of stroke. The study variables included Age, Gender, Ankle brachial index (ABI), NIHSS score etc. Data analysis was done using MS Excel and relevant statistical tests were applied. **Results:** Majority of the study participants were in the age groups of 51-70 years; 82 % were males; 22% of stroke patients had low ABI and 64% had normal ABI as compared to 82% of non-stroke patients; Mean NIHSS score was 22.5 among patients who had low ABI.

**Conclusion:** Normal range of Ankle brachial index was observed to be significantly higher among non-stroke patients as compared to stroke patients. Patients with low ABI values presented with severe stroke.

**Keywords:** Ischaemic Stroke, Ankle brachial index, NIHSS score, Peripheral artery disease.

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### I. Introduction

Stroke is becoming an important cause of premature death and disability in low-income and middle-income countries like India, largely driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors. [1] As a result, developing countries are exposed to a double burden of both communicable and non-communicable diseases. The estimated adjusted prevalence rate of stroke varies between 84-262/100,000 in rural and 334-424/100,000 in urban areas [2]. The incidence rate is 119-145/100,000 based on the recent population based studies [3]. Majority of stroke survivors continue to live with disabilities due to the lack of early detection.

Ankle brachial index (ABI), which is ratio of the systolic blood pressure of the Posterior Tibial artery to the systolic blood pressure of the brachial artery, is known to be a measure of lower limb peripheral artery disease [PAD] as well as a marker for other cardiovascular disease events. [4]. In middle-aged and older adults a low ABI has been reported to be associated with an increased risk of death, total cardiovascular disease (CVD), coronary heart disease (CHD), congestive heart failure, and symptomatic peripheral arterial disease[5]. Ankle brachial index of 0.8-0.9 indicate some arterial disease and 0.5 – 0.8 indicate moderate arterial disease. ABI under 0.5 indicates severe arterial disease and needs urgent specialist referral [6].

Many studies have been conducted to determine any possible relation between ABI and the initial severity of stroke as well as its outcome .ABI is a simple and non-invasive test that can not only be applied to diagnose PAD, but also to provide important prognostic information. This test is mostly underutilized by medical practitioners. Early assessment of the patient may be beneficial in rapid identification of severe cases, treatment and most importantly, disability limitation [7, 8].

Having stated the above findings, the present study has been taken up to estimate ABI among stroke patients and also to compare the ankle brachial index among stroke and non stroke patients attending a tertiary care hospital.

### II. Materials And Methods

A case control study was conducted at the Medicine and Neuromedicine departments of King George Hospital, a tertiary care centre in Visakhapatnam, Andhra Pradesh. Data was collected for a period of 3 months from 1<sup>st</sup> April 2014 to 30<sup>th</sup> June, 2014.

A total of 50 patients admitted due to ischaemic stroke were included in the study. For the purpose of randomisation, every patient with an odd IP number was considered for the study. Comparison group includes

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50 patients admitted in the same wards who had no history of stroke or PAD. Age and Gender were matched. Informed consent was obtained from the study subjects. A pretested questionnaire was used for obtaining data from the patients. Systolic blood pressure of the posterior tibial and brachial artery was measured using an automated oscillometric blood pressure measurement device and the ankle brachial index was calculated. ABI was divided as <0.9(abnormal low), 0.9-1.4(normal) and >1.4(abnormal high). Severity of stroke was assessed by using the National Institute of Health Stroke Scale (NIHSS). The study variables were Age, Gender, NIHSS score etc.

All those patients from whom consent could not be obtained and whose blood pressure could not be measured were excluded from the study. Smokers and Diabetics were also excluded as these conditions are also responsible for low ABI. Hemorrhagic stroke cases were also not included in this study due to the emergency condition of those patients. Data analysis was done using MS Excel sheet and relevant tests of significance were applied.  $p < 0.05$  was considered as statistically significant.

### III. Results

Majority of the study population were males (82%) and the rest 18% were females. The age of the study participants ranged from 31- 84 years. Majority (66%) were in the age group of 51-70 years, 14% in the age group of 41-50 years and 2 patients were between 31-40 years of age. Among the stroke cases, 40% hailed from rural background and the rest hailed from urban areas. Of the test subjects, 17% of the cases had low BMI (< 18.5), while 47% of them had normal BMI (18.5-22.9) and the rest were either pre-obese or obese.

**Table 1:** Age-wise distribution of subjects in the study and control group

Age in years	Study group	Control group
31-40	2	2
41-50	7	7
51-60	15	15
61-70	18	18
>71	8	8
Total	50	50

**Table 2:** Ankle and brachial mean blood pressure levels among stroke and control group

Blood pressure	Study group Mean values(mm Hg)		Control group Mean values(mm Hg)	
	Systolic	Diastolic	Systolic	Diastolic
Ankle	126.7	92	131.3	99
Brachial	120.4	83.2	122.6	84.3

The Brachial systolic blood pressure ranged from 80-140mm Hg with a mean of 120.4 mm Hg in the study group and 92-132 mm Hg with a mean of 122.6 mm Hg in the control group. Brachial diastolic blood pressure varied from 45-104 mm Hg with a mean of 83.2 mm Hg in the study group and 72-110 mm Hg with a mean of 84.3 mm Hg in the control group.

**Table 3:** Comparison between ABI of the study and control groups

Ankle brachial index(ABI)	Study group	Control group	p value
<0.9	11(22%)	5(10%)	$P > 0.05(Z = 1.66)$
0.9-1.4	32(64%)	41(82%)	$P < 0.05(Z = 2.19)$
>1.4	7(14%)	4(8%)	$P > 0.05(Z = 0.96)$
Total	50(100%)	50(100%)	

More than 1/5<sup>th</sup> (22%) of stroke patients had low ABI (<0.9) as compared to 10 % in the control group. Normal ABI ( 0.9-1.4) was seen in 82 % of the non-stroke patients as compared to 64% of stroke patients and this difference was found to be statistically significant (  $z = 2.19$  and  $p < 0.05$  ).

**Table 4:** ABI vs. mean NIHSS stroke score in the stroke patients

Ankle brachial index (ABI)	Mean NIHSS stroke score
< 0.9	22.5
0.9-1.4	8.3
>1.4	8

In our study, among those who had ABI less than 0.9, the mean NIHSS score was 22.5 indicating severe stroke whereas it was 8.3 among patients having normal ABI.

#### **IV. Discussion**

Most to the study population (60%) belonged to urban background while 40% of the patients belonged to rural areas. The urban population had higher BMI in comparison with the rural population. This may be attributed to altering life style and lack of physical exercise [12]. . Males were higher in number than females indicating the male predominance of Stroke. 66% of the cases belonged to the 5th and 6th decade of life as in other studies [10].

The presence of abnormal ABI in ischaemic stroke patients was found to be 22 %. This finding is slightly higher than in previous studies conducted on ischaemic stroke patients [9]. In our study, patients with low ABI presented with more severe ischaemic stroke and this finding is in concurrence with Lee AJ et al, where they stated that low ABI was independently associated with higher NIHSS score[6]. Similarly Zheng et al observed that low ABI levels particularly of < 0.9 are indicative of generalised atherosclerosis [5].

#### **V. Conclusion**

Normal range of Ankle brachial index was observed to be significantly higher among non-stroke patients as compared to stroke patients. Patients with low ABI values presented with severe stroke. Ankle brachial Index can easily be measured in a primary care setting and could be used as part of assessment of cardiovascular risk in individuals.

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