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ORGINAL REASEARCH

STUDY OF ANKLE BRACHIAL INDEX IN SYSTEMIC HYPERTENSION_A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Patients who suffer from systemic hypertension frequently have peripheral arterial disease (PAD). Ankle brachial index is a simple approach for detecting asymptomatic PAD. PAD is indicated by an ABI of 0.9. PAD predicts a significant cardiovascular risk and is a sign of atherosclerosis.

Aim: To study the effect of systemic hypertension on ankle brachial index and to assess the effect duration of hypertension and blood pressure on ankle brachial index.

Materials and Method: Present study was a prospective cross-sectional study conducted in Department of general medicine, SreeMookambika Institute of Medical Sciences, Kulasekharam for a period of 8 months. A total of 75 patients with hypertension attending general medicine out-patient department were included in the study. Patient details were recorded which included age, sex, BMI, duration of hypertension, blood pressure and ankle brachial index. Results were analysed using SPSS 20.0 version and the association was tested using Chi square test.

Results: Prevalence of asymptomatic PAD was 52%. Of the 39 patients with ABI was ≤0.9, 28(71.8%) were males and 11(28.2%) were females. Statistically significant association was

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found between ABI and age, gender, duration of hypertension and BMI. As the systolic and diastolic BP increases the ABI decreased.

Conclusion: In patients with high blood pressure, low ABI is a reliable indicator of mortality. The assessment of the overall cardiovascular risk in the hypertensive population may be aided by the diagnosis of PAD in hypertensives.

Keywords: Blood pressure, Body Mass Index, Hypertension, Peripheral artery disease.

INTRODUCTION:

Hypertension is a noncommunicable disease that is regarded as one of the primary causes of morbidity worldwide. Both developing and developed nations are affected by hypertension. Worldwide, hypertension is responsible for 7.6 million fatalities (13–15 percent of all deaths) and 92 million years of life with a disability.[1]

The following definitions can be utilised in the blood pressure evaluation, according to the Seventh Joint National Committee[2] on the Prevention, Detection, Evaluation, and Management of High Blood Pressure (BP). (Table 1)

	Systolic BP (mm Hg)	**Diastolic BP (mm Hg)**
Normal	<120	< 80
Prehypertension	120 to 139	80 to 89
Stage 1 hypertension	140 to 159	90 to 99
Stage 2 hypertension	> 160	> 100

Table 1: Definition of BP based on Seventh Joint National Committee

Hypertension is an independent risk factor for coronary artery disease, cardiac failure, stroke, kidney failure, and PAD. The key physical components causing the development of hypertension are blood vessels. Patients with peripheral artery disease who are hypertensive have an increased risk of cardiovascular events in the future.[3]

Patients with PAD will experience limb colour changes, changes in skin temperature, decreased hair development, muscle atrophy, and hypertrophy of the nails.[4]PAD is diagnosed using the Ankle brachial index (ABI), segmental pressure approach, transcutaneous oximetry, Doppler study, and arteriography.[5]

The easy and non-invasive ABI test can be used to evaluate peripheral artery disease. ABI is a ratio where the numerator is the systolic BP measured in ankle and the denominator as systolic blood pressure measured in arm. A hand-held Doppler probe and a blood pressure monitor are all that are needed to measure ABI. Low ABI is defined as having an ABI of less than 0.9. It suggests the presence of PAD. It aids in the accurate identification of peripheral arterial disease by demonstrating the existence of atherosclerosis in peripheral blood vessel.[6,7]

Regardless of the presence of symptoms, patients with PAD of the lower extremities have an increased risk of from cardiovascular diseases. Because many patients will benefit from modifying their cardiovascular risk factors, early diagnosis of PAD becomes crucial.[7]

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AIMS AND OBJECTIVES:

- To study the effect of systemic hypertension on ankle brachial index and to assess the effect duration of hypertension and blood pressure on ankle brachial index.

MATERIALS AND METHODS:

Present study was a prospective cross-sectional study conducted in Department of general medicine, SreeMookambika Institute of Medical Sciences, Kulasekharam for a period of 8months from May 2022 to December 2022.

All patients with hypertension attending general medicine out-patient department were included in the study. Patients with diabetes, coronary artery disease, chronic kidney disease, dyslipidemia, smoking history and having symptoms of PAD were excluded from the present study.

A total of 75 patients who satisfy the inclusion criteria were included. Clinical data included gender, age, height, weight, blood pressure, and ABI. A sphygmomanometer was used to check the blood pressure of patients. After allowing the patient to relax for at least five minutes while wearing a blood pressure cuff on their arm, it was measured. Both upper limbs were measured while seated, with the measuring device placed at the level of the heart. For data analysis, the mean of two separate readings at least two minutes apart was used. The formula used to determine pulse pressure was systolic BP - diastolic BP.

ABI is a ratio. Systolic BP in the arm serves as the denominator while systolic BP in the ankle serves as the numerator. With the patient supine, the ankles and arms of patients were assessed for blood pressure in order to calculate ABI. A blood pressure cuff and a Doppler device were used to measure the systolic blood pressure in both arms in the ante cubital fossa. Systolic pressure was recorded at the right and left dorsalis pedis arteries. The blood pressure cuff was placed on the ankle, just above the medial malleoli. ABI was graded[7] according to table 2.

ABI	Disease grading	Disease severity
>1.3	0	Non compressible
0.95 – 1.30	0	Normal
0.60 – 0.94	1	Minimal
0.50 – 0.59	2	Mild
0.26 – 0.49	3	Mild to moderate
0.20 – 0.25	4	Moderate
0 – 0.19	5	Severe

Table 2: ABI grading

Data entered in excel sheet. Statistical Analysis was carried out using SPSS 20.0 version. Significance is assessed at 5% level of significance. Chi-square test was done to assess statistical significance. A p value less than 0.05 was considered statistically significant.

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OBSERVATION AND RESULTS:

The age group of patients in the present study ranged from 38 to 78 years. The mane age was 58±8.4 years. The most common age group affected in the study was 51 to 60 years seen in 33(44%) patients followed by 41 to 50 years in 21(28%) patients. Of the 75 patients 48(64%) were males and 27(36%) were females. There were 39(52%) patients with normal BMI. There were 29(38.67%) of patients were overweight and 7(9.33%) were obese. The duration of hypertension was given in table 3.

Duration (years)	Frequency %
1 – 5	6 (8%)
6 – 10	19 (25.33%)
11 – 15	24 (32%)
16 – 20	13 (17.33%)
21 – 25	9 (12%)
>25	4 (5.34%)

Table 3: Distribution of hypertension duration

Percentage of patients with ABI ≤ 0.9 was 39(52%) and those with >0.9 was 36(48%). Percentage of patients with ABI ≤ 0.9 increases as age increases.Of the 39 patients with ABI was ≤0.9, 28(71.8%) were males and11(28.2%) were females. According to the study, ABI declined as BMI increased. With a p value of 0.004, this change is determined to be statistically significant. As the duration of hypertension lengthens, ABI values decreased. With a p value of 0.0001, this was determined to be statistically significant.

The average systolic BP was 158.44±7.98 mmHg. Systolic BP ranged from 144 to 186 mm Hg. Additionally, it showed a statistically significant association in ABI when Systolic BP increased ($p = 0.011$). The range of the diastolic BP was 90 to 102 mmHg, with a mean of 94.12±4.68 mmHg. ABI readings decreased as diastolic blood pressure increased, and this was considered to be statistically significant with a p value of 0.029.

DISCUSSION:

Clinical signs of lower extremity PAD result in limb amputation, elevated mortality risk, and a decline in functional capacity along with quality of life. According to the most recent 2018 ESC/ESH guideline for the management of hypertension, an ABI of less than 0.9 in asymptomatic patients can be considered hypertension-mediated organ damage, and patients are classified as being at extremely high risk if they have verified PAD (either clinically or unambiguously on imaging).[8]

Worldwide, the prevalence of PAD in the lower limbs rises with age, notably in persons over 65 (20%), with many cases being asymptomatic and going untreated as a result.[9] In the study, patients between the ages of 51 and 60 made up 33 (or 44%) of the patients.

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Patients who smoked or had diabetes had a higher incidence of PAD; those who had experienced renal hypertension, abdominal aortic aneurysm, or atherothrombotic event had a reduced incidence. It may be important to note that measurement of arterial BP or LDL cholesterol were better predictors of PAD than cardiovascular risk factors.[10]

In their study, Ushalakshmi S et al.[11] observed that 47% of people had asymptomatic PAD. This was comparable to the present study, which found a prevalence of 52%. In the study conducted by Cacoub P et al.12, the prevalence of PAD was 27.8%, with the prevalence varying from 10.4% among individuals with cardiovascular risk factors solely to almost 38% in each other subgroup.

Present study found a statistically significant association was found between ABI and age, gender, duration of hypertension and BMI. As the systolic and diastolic BP increases the ABI decreased. This was similar to the study done by Ushalakshmi S et al.[11] ABI was ≤ 0.9 in 46.8% of males. ABI was ≤0.9 in 47.8% of females. The study found a strong correlation between BMI, systolic and diastolic BP, pulse pressure, and duration of hypertension with ABI.

In their study, Diehm C et al.[13] found that patients with low ABI (PAD), who are easily recognised in a primary care context, have a markedly higher risk of dying and experiencing serious vascular events. Patients who have an ABI around 1.1 and 0.9 should be treated as borderline PAD patients and monitored.

In their study, Ishida A et al.[14] found that participants with a high-normal ABI (1.20-1.39) had significantly higher adjusted odds ratios for developing hypertension than participants with a normal ABI (1.00-1.19), both before and after multivariate adjustment for traditional risk variables (odds ratio, 2.17, 95% confidence interval of 1.20-3.95).

Sun J et al.[15] reported that myocardial infarction patients had significantly reduced ABI and increased carotid intima-media thickness. ABI was found to be the primary indicator of acute coronary syndrome in the study group.

According to Armas-Padrón AM et al.[16], the ABI ≤0.9 group (n = 16) had a larger percentage of prior cardiac disease other than PAD, mortality, and hospitalisations, as well as a worse lipid, metabolic, and renal profile than the ABI > 1.4 group (n = 41). ABI ≤ 0.9 has an inverse association with cardiovascular health score. An ABI of less than 0.9 was independently related with both diabetes and chronic kidney disease (CKD). ABI ≤0.9, cholesterol, diabetes, CKD, age, and gender were associated to significant outcomes.

CONCLUSION:

Patients with hypertension frequently have PAD even when they do not already have other co-morbid conditions. An effective way to identify patients who have a higher cardiovascular risk is to measure the ABI. The recommendation of preventative steps to lower risk would be beneficial to the treating physician. Due to its safety, simplicity, and patient-friendliness, the ABI should be a standard procedure in primary care settings. In hypertensive patients, measuring ABI may considerably lower future cardiovascular events.

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CONFLICTS OF INTEREST:

There are no conflicts of interest

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