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STUDY OF ANKLE BRACHIAL INDEX IN SYSTEMIC HYPERTENSION

General Medicine

Dr.S.Lakshmi Bai Professor and HOD department of General medicine. Government Medical College. Kadapa

Dr.M.Theja Post graduate . Department of General medicine.Government Medical College. Kadapa

Dr.B.Prathap* Assistant professor. Department of General medicine.Government Medical College. Kadapa*Corresponding Author

Dr.T.Balakrishna Department of General medicine.

KEYWORDS

INTRODUCTION

Hypertension is one of the primary causes of morbidity around the world. Hypertension is responsible for 7.6 million deaths (13–15 percent of all deaths) and 92 million disability-adjusted life years worldwide.[1]Cardiovasculardisease, renal failure, and peripheral arterial disease are all increased by hypertension.[2] If other risk factors are present, it adds to the entire load of cardio vascular risk factors. Despite stable global age-standardized prevalence, the number of people aged 30–79 years with hypertension doubled from 1990 to 2019, from 331 million women (95 percent CI 306–359) and 317 (ranging from 292 and 344) million men in 1990 to 626 (ranging from 584 and 668) million women and 652 (ranging from 604 and 698) million men in 2019.[3]The key structures that contribute to the development of hypertension are blood vessels. At the same time, they are the organs that are affected by long-term high blood pressure. Future cardiovascular events are observed to be higher with peripheral artery disease among those with hypertension.

Hypertension is to blame for the majority of coronary heart disease and stroke mortality in India.[4] As a result, early detection and treatment of complications is critical in the high-risk population to prevent morbidity and mortality. Hypertension is a known risk factor for PAD .The ankle brachial index (ABI) is a quick and painless means to check for peripheral artery disease.[5] It shows that atherosclerosis has developed in a peripheral blood artery. It's a strong predictor of atherosclerotic disease in general, including coronary arteries.

The three main reason to diagnose PAD are[6],
1. To recognize patients with higher risk of stroke or myocardial infarction or stroke regardless of symptoms of PAD
2. To manage the symptoms of PAD
3. To decrease the functional disability and limb loss.

Intermittent claudication is a common symptom of peripheral artery disease.[7] Because atherosclerosis represents the primary pathology in other channels as well, peripheral artery disease becomes a sign for systemic vascular disease. As a result, it aids in the recognition of continued atherosclerosis in systemic systems such as coronary, cerebral, and renal vessels, which can lead to an increased risk of myocardial infarction (MI), stroke, and mortality[8].The Ankle Brachial Index (ABI) is a tool that aids in the accurate detection of peripheral artery disease. The ankle brachial index is a ratio in which the numerator is the systolic blood pressure in the ankle and the denominator is the systolic pressure in arm.[9] ABI can be measured easily with a blood pressure machine and a hand-held Doppler probe. Low ABI is defined as an ABI of less than 0.9. It's a sign that indicates peripheral artery disease.

Patients with lower-limb peripheral artery disease (PAD) have a greater risk of early death due to cardiovascular events, regardless of symptoms.[10] As a result, early diagnosis of peripheral artery disease is critical, as these patients will benefit from changes in cardiovascular risk factors.Along with diabetes and smoking, hypertension is a recognized risk factor for peripheral arterial disease (PAD).[11] The ABI measurements is simple to do. It is non-invasive and safe, making it suitable for patients. As a result, it can be used to screen hypertensive individuals for lower limb ischemia.

AIM: To determine the prevalence of Asymptomatic PAD in Hypertension individuals who do have any co-morbidities.

MATERIALS AND METHODS

Study design: This study was an observational study
Study setting: This study was conducted at Government General Hospital, Kadapa

Study duration: The study was conducted from January 2020 to June 2021 after the approval of hospital ethical committee.

Study population:
Totally 100 hypertensive patients who visit Department of Medicine were enrolled for the study after excluding the exclusion criteria.

Inclusion criteria:
- Hypertensive according to JNC 7

Exclusion criteria:
Patients with
Diabetes mellitus
Chronic kidney disease
Coronary artery disease
dyslipidemia
Patients who are smokers
Patients with symptoms of peripheral artery disease

Procedures:
The data of each patient was collected on a proforma specially designed for this study. This proforma included name, age, weight and height of the patient, systolic and diastolic blood pressure of the patient and duration of hypertension and ankle brachial index.

Data collection:
The study was started after obtaining Institutional ethical approval. The purpose and procedure of the study was explained to the patients in their local language. Patient information sheet and informed written consent was obtained from the patients before initiating the study.

Ethical consideration:
Institutional Ethical Committee approval was obtained before starting the study. The participants were explained that the data collected in this study will be used only for research purposes. The participants were explained about the freedom of withdrawal from the study at any time without penalty or loss of benefits. The confidentiality of the data collected from the enrolled participants was maintained in all the phases of the study. The study participants who required medical attention during the period of intervention will be given appropriate medical care.

Statistical analysis:
The collected data was checked for completeness before entering into the Microsoft excel spread sheet. The validation of the data was checked at regular intervals. Data analysis was performed with an intention to treat approach using Statistical Package for Social Sciences (SPSS IBM) 21. The quantitative data was expressed in frequency and percentage.

Results

The present study has shown that 48% of the study participants had Ankle Brachial Index less than or equal to 0.9. The Present study has shown that correlation trend line indicates that there is decline of ABI with increase in age.

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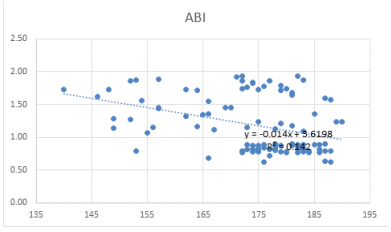
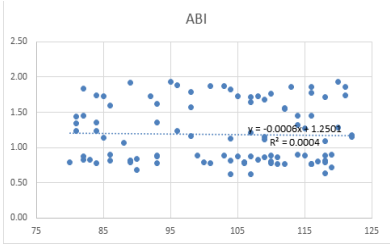
The present study has shown that correlation trend line indicated that the ABI decreases with increase in BMI. Majority of the participants with >0.9 were overweight.

Table 1:Association between hypertension duration and ABI

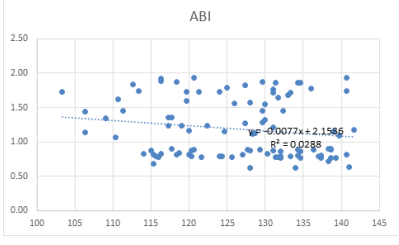
S no	Duration	<=0.9	>0.9	P value
1	1-5	4	17	<0.001
2	6-10	8	27	
3	11-15	21	5	
4	16-20	9	2	
5	21-25	4	1	
6	26-30	2	0	



Graph 1:Correlation between SBP and ABI



Graph 2 : Correlation between DBP and ABI



Graph 3: Correlation between PP and ABI

In the table 1, it was observed that, among those with ABI less than 0.9, 4%, 8%, 21%, 9%, 4% and 2% had hypertension for 1-5, 6-10, 11-15, 16-20, 21-25 and 26 – 30 years respectively. Similarly, among those with ABI more than 0.9, 17%,27%, 5%, 2%, and 1% had hypertension for 1-5, 6-10, 11-15, 16-20, and 21-25 respectively. As the duration increases, percentage of patients with lower ABI increases.

Graphs 1,2,3 shows the there is negative correlation between the SBP,DBP and PP with ABI.

Discussion:

The current study shows that there is negative correlation between the SBP, DBP and PP with ABI.

The current study findings were similar to the study by Ana Tereza do Nascimento Sales et al which also shows Spearman coefficients for correlations between ABI and the following variables: age, diabetes duration (time in years since the date of diagnosis, as reported by the patient), SBP and DBP. Correlations between these variables and ABI were significant and the correlation coefficients were negative in all cases. [12]

In a study done by Luo YY et al13to assess the risk factors of PAD and relationship between ABI and mortality among CVD, it showed that 27.5% of the 3047 patients with hypertension at baseline were in the low-ABI group. Low ABI was linked to older age, female gender, higher triglyceride levels in the blood, lower high-density lipoprotein levels in the blood, diabetes, and smoking history. There were 252 deaths during the course of the 13-month follow-up, 100 of which were due to cardiovascular disease. Low ABI was linked to all-cause and CVD mortality, with an adjusted relative risk of [1.619].

One other study done by Albuquerque PF et al14, to assess the association between ABI, LVH, FC and FRS in men with arterial hypertension, the results showed that Group I consisted of 33 patients (82.5%) with normal ABI values, while Group II consisted of seven individuals (17.5%) with abnormal ABI values. At the ECO, the left ventricular mass index (LVMI) was 111.18 34.34 g/m2 in Group I and 150.29 34.06 g/m2 in Group II. LVH was found in 4% of Group I and 35.3 percent of Group II, indicating a substantial difference between the two groups.

Another study showed that PAD was found to be prevalent in 14.4% of the population (ABI 0.9). ABI of 0.91-0.99 was detected in 15.6 percent of the patients, while high ABI (>1.3) was measured in 9.4 percent of the patients. The prevalence of low ABI was 8.1, 11.1, 16.3, and 26 percent in the low, moderate, high, and very high Systematic Coronary Risk Evaluation risk groups, respectively. PAD was found to be less common among hypertensive patients who met their blood pressure goals (9.6% versus. 16.8%)[15]

In a study done by Myslinki W et al16 among 51 hypertensive patients with history of cardiac disease and 30 hypertensive patients without cardiac disease as controls, the results showed that the research groups did not differ in terms of age, BMI, blood pressure, or time since hypertension was diagnosed. There were no differences in blood lipids or eGFR, however the study group's hsCRP was considerably higher. In both groups, the left ventricular mass index was similar. Myocardial infarction patients had considerably higher IMT and lower ABI. Only ABI was found to be the most significant predictor of ACS in the study group after statistical analysis.

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