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# Role of Ankle Brachial Index to Predict Peripheral Arterial Disease, An Experience of NICVD, Bangladesh

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***Abstract:***
***Objectives:****Thepresence of peripheral arterial disease (PAD) is associated with higher cardiovascularmorbidity and mortality, regardless of gender or its clinical form of presentation (symptomatic orasymptomatic). The ankle brachial index (ABI) is a sensitive and cost-effective screening tool for PAD. ABI is valuable for screening of peripheral artery disease in patients at risk and for diagnosing the disease in patients who present with lower-extremity symptoms.Normal cut-off values for ABI are between 0.9 and 1.4. Therefore, ABI can be considered as a generalized atherosclerotic predictor, identifying patients at high risk for developing cardio or cerebrovascular events and should be incorporated into routine clinical practice.*
***Material & Methods:*** *50 Cases having the history of pain and weakness in the lower limb and/or associated with blackening or ulceration of footwere selected purposively and were divided into two groups. Ankle brachial pressure and serum lipid profile of all patients was measured. Doppler study of the lower limbs of all patients were done.*
***Result:*** *Those patients having blackening or ulceration had high lipid level, doppler findings were positive for PAD and ABI was below 0.9 or above 1.4. Those without blackening or ulceration had comparatively lower lipid level, doppler negative and ABI was between 0.9-1.4.*
***Conclusion:*** *ABI is a simple, noninvasive, less expensive test, which can be routinely determined in all patients.In comparison to socio-economic condition of our population, if we can do ABI of suspected patients routinely, we can predict the presence of PAD. It will help in early diagnosis and treatment of patients, and by this, many limbs can be saved.*

***Keywords:*** *Ankle Brachial Index (ABI); Peripheral Arterial Disease (PAD).*

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## I. Introduction

The presence of peripheral arterial disease (PAD) is associated with higher cardiovascular morbidity and mortality, regardless of gender or its clinical form of presentation (symptomatic or asymptomatic). PAD is considered an independent predictor for cardiovascular mortality, more important for survival than clinical history of coronary artery disease.[1] Diagnosis of PAD includes history, clinical examination and investigations including duplex scanning, conventional angiogram or CT/MR angiogram. These investigations are costly and angiogram is an invasive procedure as well. Not all symptomatic patients are suffering from PAD, other disease might be neurological, diabetes, diseases of bone and joints, arthritis etc. Doing investigations for all symptomatic patients create huge physical and financial burden.The ankle brachial index (ABI) is a sensitive and cost-effective screening tool for PAD. ABI is valuable for screening of peripheral artery disease in patients at risk and for diagnosing the disease in patients who present with lowerextremity symptoms. Normal cut-off values for ABI are between 0.9 and 1.4 (Table 1). An abnormal ankle-brachial index- below 0.9 - is a powerfulindependent marker of cardiovascular risk.[2]

| | |
|---|---|
| **ABI =** | **highest systolic BP of the 2 ankle** |
| | **highest systolic BP in both arms** |

There is an inverse correlation between ABI values, non-fatal cardiac events (myocardial infarction,stroke and heart failure exacerbation) and mortality (cardiovascular and global), the relationbeingnonlinear, patients with very low ABI (<0.3) having a significantly higher additional risk.[3] Also, ABI values over 1.3-1.4 correlate with major adverse cardiovascular events.[4] Therefore, ABI can beconsidered a generalized atherosclerotic predictor, identifying patients at high risk for developingcardio or cerebrovascular events and should be incorporated into routine clinical practice.

## II. Material& Methods

50 Cases having the history of pain and weakness in the lower limb and/or associated with blackening or ulceration of foot were selected purposively and were divided into two groups. Ankle brachial pressure and serum lipid profile of all patients was measured. Dopplerstudy of the lower limbs of all patients wasdone.The tools to perform the ABI measurement include ahandheld 5–10 MHz Doppler probe and a blood pressure cuff.The ABI is measured by placing the patient in a supineposition for 5 min. Systolic blood pressure is measured in botharms, and the higher value is used as the denominator of theABI (Figure 1). Systolic blood pressure is then measured in the dorsalispedis and posterior tibial arteries by placing the cuff justabove the ankle. The higher value is the numerator of the ABIin each limb (Figure 2).

## III. Result

Among 50 patients 6 were (12%) female and 44were (88%) male.According to the ESC Guidelines 2011, the incidence in women was around half of that in men, but was more similar at older ages.[5]In a study done by Pandya and Bhansali, 2015 it was found that 34% were >60 years, 32% were between 50 and 60 years, 18% were between 40 and 50 years, 12% were between 30 and 40 years, and only 4% were between 20 and 30 years of age.[6]In our study, of the total patients, 20 (40%) were >60 years,13 (26%) were between 50 and 60 years, 8(16%) were between 40 and 50 years, 7 (14%)were between 30 and 40 years, and only 2 (4%)were between 20 and 30 years of age.According to doppler study, In Group A, 13 were(52%) SFA occlusive disease, 8 were (32%)Aorto-iliac occlusive disease, 4 were (16%)Femoro-popliteal occlusive disease.In Group B, 11 were (44%) Tibial artery occlusivedisease, 9 were (36%) Femoro-poplitealocclusive disease, 5 were (20%) SFA occlusivedisease.In Medicine Update 2005, Khanna NN wrote that Aortoiliac disease was present in 23.2%, femoropopliteal disease in 40%, and below knee arteries were involved in 37% cases in India.[7]In both groups serum lipid profile was altered. Serum Cholesterol was 178.53 $\pm$ 35.18 mg/dl in Group A and 192.47 $\pm$ 37.43 mg/dl in Group B. Serum Triglyceride was 145.36 $\pm$ 59.22 mg/dl in Group A and 188.52 $\pm$ 47.98 mg/dl in Group B. HDL was 36.92 $\pm$ 4.85 mg/dl in Group A and 36.16 $\pm$ 4.57 mg/dl in Group B(Table 2). According to measurement of ABI, in group A, 64% patients had mild to moderate PAD, 16% had severe PAD and 12% had rigid arteries. In Group B, 56% patients had severe PAD, 24% had mild to moderate PAD and 20% had rigid arteries (Table 3).

## IV. Conclusion

ABI is a simple, noninvasive, less expensive test, which can be routinely determined in all patients.In this study ABI was found beyond thenormal limit in both the groups, ie, in bothmild to moderate and severe cases.As a diagnostic tool ABI can be used to detectPAD.In comparison to socio-economic condition of ourpopulation, if we can do ABI of suspected patientsroutinely, we can predict the presence of PAD. Itwill help in early diagnosis and treatment ofpatients, and by this, many limbs can be saved.

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**Figure: 1**

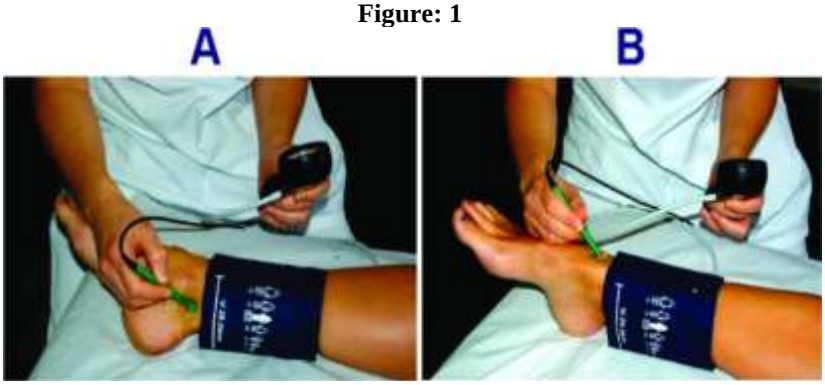


**Figure 1:** Measuring ABI in lower limb

**Figure: 2**

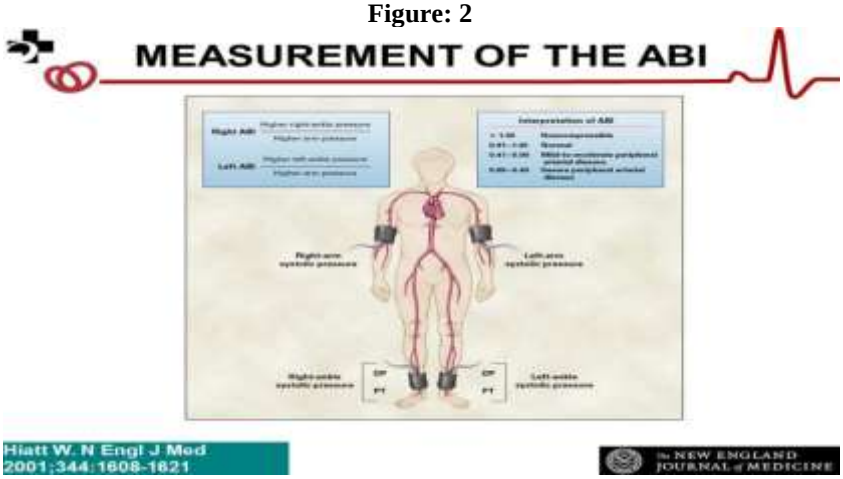


**Figure 2:** Measurement of the ABI
(Ref: Hiatt W. N Engl J Med 2001;344: 1608-1621[8])

Table 1: Interpretation **of Ankle Brachial Index (ABI)**

| | | |
|---|---|---|
| Generally normal | 0.91-1.3 | |
| Mild-moderate disease | 0.41-0.90 | Pain in the foot, leg, or buttock may occur during exercise due to some narrowing of the arteries |
| Severe disease | ≤0.40 | Symptoms may occur even while resting; danger of limb loss |
| Rigid arteries | >1.3 | Calcified vessels: Need an ultrasound test to check for peripheral artery disease instead of an ankle-brachial index test |

Ref: Grenon SM et al. N Engl. J. Med. 2009, 361 e40[9]

**Table 2:** Estimation of S. Lipid Profile

| S. Lipid Profile | Group A | Group B |
|---|---|---|
| **S. Cholesterol (mg/dl)** | 178.53 ± 35.18 | 192.47 ± 37.43 |
| **S. Triglyceride** | 145.36 ± 59.22 | 188.52 ± 47.98 |
| **HDL** | 36.92 ± 4.85 | 36.16 ± 4.57 |
| **LDL** | 98.11 ± 27.15 | 102.63 ± 31.12 |

**Table 3:** Measurement of ABI

| ABI | Group A | Group B |
|---|---|---|
| 0.91-1.4 | 2 (8%) | 0 |
| 0.41- <0.9 | 16 (64%) | 6 (24%) |
| <0.40 | 4 (16%) | 14 (56%) |
| >1.41 | 3 (12%) | 5 (20%) |

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