Biomedical Letters
2017 | Volume 3 | Issue 1|Pages 1-9

RESEARCH ARTICLE OPEN ACCESS

Correlation of Ankle Brachial Index and Severity of Coronary Artery Diseases

Muhammad Arif Anwar[1], Khawar Ali Shahzad[2], Muhammad Ahmed Javed[3], MD Ruhul Amin[3], Ma Gen Shan*[1]

[1]Department of Cardiology, The Affiliated Zhong Da Hospital of Southeast University, No. 87 Dingjiaqiao, Nanjing, China.
[2]Department of Microbiology and Immunology, Medical School, Southeast University, No. 87 Dingjiaqiao, Nanjing, China.
[3]School of medicine, Southeast University, No. 87 Dingjiaqiao, Nanjing 210009, China.

Abstract
The sharing of a similar network of systemic vasculature, detection of peripheral arterial disease (PAD) indicates the presence of a high risk of coronary heart diseases (CAD). PAD, diagnosed with a low value of Ankle-Brachial Index (ABI) such as ≤0.90, has a strong correlation with the complexity of coronary heart diseases. A total of 62 patients were recruited in this prospective study.The ABI Assessment, coronary artery angiography (CAG) and baseline data was collected. SYNTAX score was used to quantify the CAD severity. Spearman's correlation was used for statistical analysis. Patients diagnosed with CAD had lower values of ABI and high values of SYNTAX score calculated from CAG reports, the gold standard for diagnosing ischemic heart diseases (IHD). Meanwhile, patients with high ABI value and low SYNTAX score had less severe CAD, which demonstrates a strong correlation between ABI and SYNTAX score. The correlation coefficient of Spearman's rho for ABI and SYNTAX score is 0.886, which was highly significant ($p < 0.0001$). The lower value of ABI especially ≤0.90 is associated with high risk of CAD, confirmed by gold standard CAG. In a nutshell, patients having significantly lower ABI value which is cost-effective and non-invasive diagnostic modality indicates high-risk coronary artery diseases. These patients can be further referred to more definitive diagnostic and therapeutic approach such as CAG and PCI.

Keywords: Ankle-brachial index, coronary artery diseases, primary coronary intervention, peripheral arterial disease, SYNTAX score.

Received December 26, 2016; **Revised** January 24, 2017; **Accepted** February 13, 2017
***Correspondence:** Ma Gen Shan **Email** magenshan@hotmail.com, **Contact**: +8613002580569

To cite this manuscript: Anwar MA, Shahzad KA, Javed MA, Amin MDR, Shan MG. Correlation of Ankle Brachial Index and Severity of Coronary Artery Diseases. Biomed Lett 2017; 1(1):1-9.

Introduction

The relationship between cardiovascular diseases(CVD) and peripheral arterial diseases(PAD) with events of chronic complications and death have already been proven in previous studies[1]. Disease severity with increasing age is found to be highly related to clinical signs as well as symptoms of CVD in early 2nd or 3rd decades of life[2]. Developed countries are prone to disability and death by coronary heart disease(CHD). As a result of latest diagnostic and therapeutic techniques for early detection and suitable management to treat CHD, the mortality rate in patients with more than 35 years of age, this disease has decreased rapidly in the last 40 years within developed countries such as USA, and many others[3].

A chronic disease which affects the systemic arteries, and causes many clinical complications, as well as mortality in patients, is atherosclerosis[4]. Various aspects such as genetic predisposition, dyslipidemia, aging, diabetes mellitus, hypertension, a sedentary lifestyle, immune system, smoking, inflammations and other additional risks are associated with clinical, pathophysiological, and etiological factors of atherosclerosis[5-8]. Atherosclerosis can affect any systemic artery such as aorta, lower limb(LL) arteries, carotid, and coronary arteries and are highly prone to develop atheroma[4, 9].

A cost-effective, easy to perform, inexpensive, non-invasive and very simple diagnostic tool known as ankle brachial index(ABI), is used for early detection of peripheral arterial diseases(PAD)[10, 11]. The patients with low values of ankle-brachial index(ABI) especially <0.9 has sensitivity around 90% and specificity around 98% for detection of lesion with >50% reduction in lumen of lower limbs arteries[12], can be at high risks for developing cardiac and cerebral events such as MI and stroke, respectively.

As it has been proved in previous studies that patient having CAD could be at higher risks of suffering from have extremity ischemia, opened a new horizon for early detection of CAD by the evaluation of peripheral arterial diseases(PAD)[13]. However, it is found that the prediction of cardiac patient involvement is not being assessed exactly by this technique[14]. SYNTAX score(SYNergy between PCI with TAXUS; SS) shows us that we are completely reliant on lesion characteristics and coronary angiographic anatomy[14].

The present study was planned to evaluate the association of ABI and the severity of CAD by using SS. The objective of our research was to evaluate the severity of diseases related to coronary arteries in hypertensive patients by combined assessment of diagnostic coronary angiography and the ankle brachial index (ABI) parameters in their early stages.

Materials and Methods

We performed a single-centered, analytical and prospective study during March 1, 2015, to March 31, 2016. Sixty-two patients were recruited in this study. The ethical principles of clinical research were strictly followed to conduct this study and all the parameters were approved by the clinical research ethics committee of Zhongda Hospital affiliated with Southeast University, Nanjing, China. All patients were selected from the department of cardiology with typical signs and symptoms and were planned to be assessed by CAG and ABI.

Patients with clinical diagnosis of CAD, age ≥18 years, indications for non-emergent invasive CAG, having hypertension were selected. Additional risk factors such as diabetes mellitus, smoking, and moderate or severe ischemia on myocardial scintigraphy (therefore with an indication for coronary angiography) were considered as well and written informed consent was taken.

Exclusion criteria include the presence of severe lung or liver co-morbidities (life expectancy <35 years), established diagnosis or relevant clinical suspicion of cancer, prior CABG or PCI and previous of revascularization to treat PAD. ABI >1.4 indicating calcification of peripheral arteries causing falsely high ABI results and severe lower limb ischemia having ischemic ulcers or gangrene or ABI <0.4, AMI for 24h from the onset, renal dysfunction requiring dialysis, and unwillingness to participate were excluded.

Hand-Held Doppler method was performed by using portable 8MHz×8 vascular Doppler scanner to measure ABI. The measurements of the dorsalis pedis and posterior tibial arterial systolic pressures were taken. To obtain the value of ABI, the uppermost value of these pressures was divided by the highest systolic pressure found in the brachial artery of the upper limbs. Patients with an ABI >1.4 were not included in the statistical analysis.

SYNTAX scoring system is used to grade the severity of CAD on lesion-based angiography. The scoring criteria include the degree of stenosis, presence or absence of total lesion, affected branches or segments of each vessel, the position of the lesion (ostial, proximal, mid, or distal) and the presence of calcification or thrombus. The information was entered by physicians and score was calculated by an online system (http://ir-nwr.ru/calculators/syntaxscore.htm). A confirmation of the score accuracy was also rechecked manually [15].

The questionnaire includes the data, such as smoking, diabetes mellitus, hypertension, history of PAD, dyslipidemia, and history of CHD. The assessment of ischemia or MI was done by electrocardiogram. Ejection fraction and wall motion was assessed by findings of echocardiography. For the evaluation of CHD severity coronary angiography was performed. A neutral cardiologist was requested to analyze each angiogram. The study protocol wasn't discussed with interventional cardiologists (**Figure 1**).

Data was analyzed as mean ±SD for quantitative variables and frequency for categorical variables. Statistical analysis was performed by using descriptive statistic to calculate frequencies, normal and non-normal distribution of two main variables including SYNTAX scores and ABI values. Spearman's rank correlation was used for evaluation of the correlation between two qualitative and categorical variables namely SYNTAX scores and ABI values. A multinomial logistic regression model was selected to assess potential independent predictor of CAD. Odds ratios (OR) and their respective 95% confidence intervals (CI) were used to quantify the analyses. The variables included in the model were: age, sex, hypertension, dyslipidemia, diabetes mellitus, smoking, lipoprotein-a(LPA), homocysteine(Hcy), cTnI, alcohol history, stroke history, FH CAD, HF LVDD and ABI measurement. SPSS® version 20.0 statistical software was used for all analyses.

Results

The study population was composed of 62 patients in total, 27 females (43.5%) and 35 males (56.5%) with a mean age of 70.84±10.72 years and the patients were assessed for their health status and baseline clinical characteristics as shown in **Table 1**. The effectiveness of ankle-brachial index (ABI) for

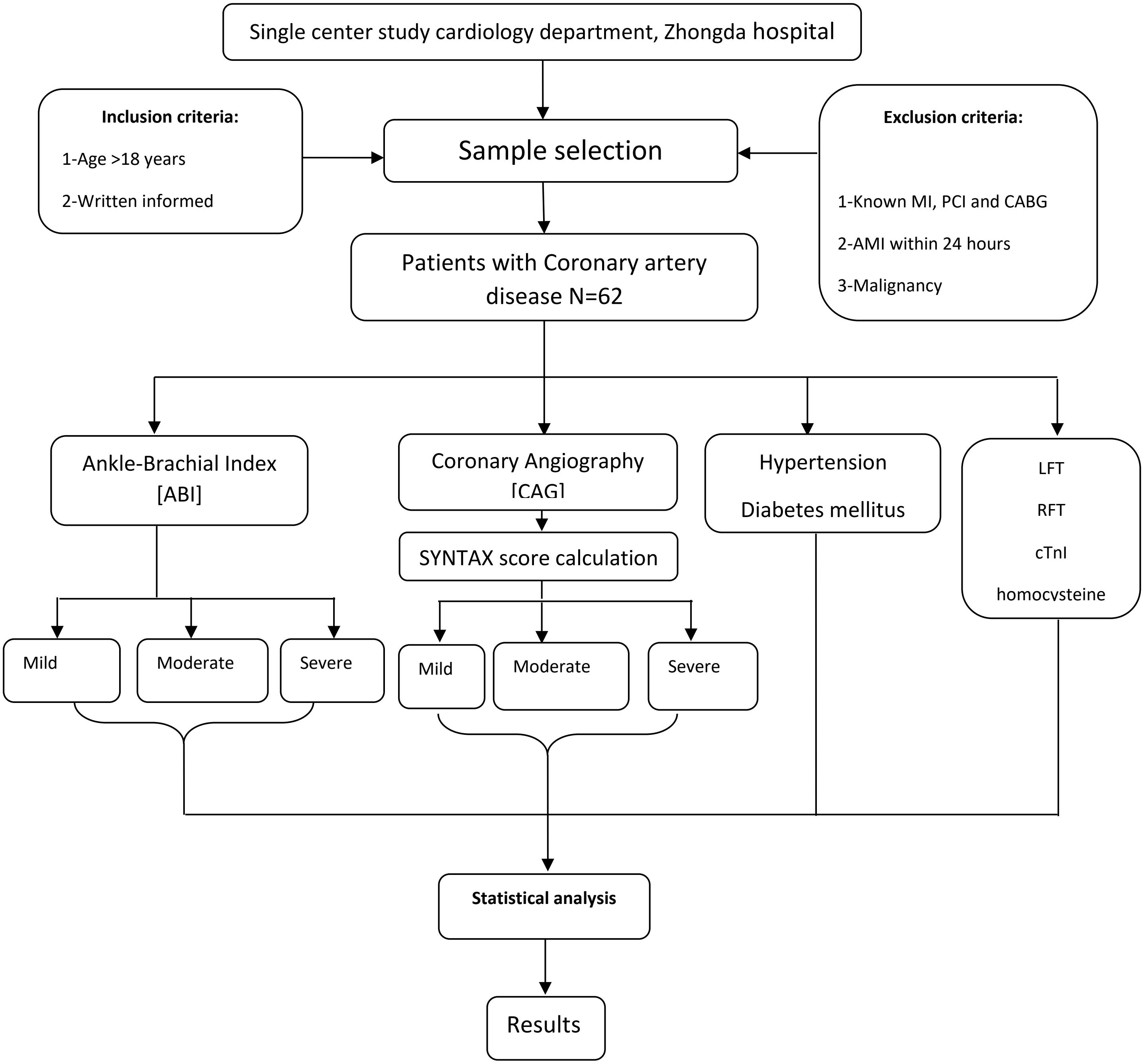

Figure 1: The figure demonstrates the study layout and its parameters used.

predicting the coronary artery disease severity was analyzed with calculation of correlation between SYNTAX scores and ABI values by Spearman's rank correlation as shown in Table 2. The correlation coefficient also known as Spearman's rho between two variables was ρ= 0.886 (p-value <0.0001). The data analyzed was not normally distributed as shown in Figure 2 graph A and B. So this data was categorized into ordinal numbers such as mild, moderate and severe based on their respective score of SYNTAX and ABI.

Table 1: Assessment of Health status and baseline clinical characteristics

		Ankle Brachial Index (ABI) score			
Variables		**Mild**	**Moderate**	**Severe**	
No. of patients	N=62	35(56.45%)	11(17.74%)	16(25.80%)	
Demography					
Age (average)	70.84±10.71 (SD)				
Sex					
Male	Total N=35 (56.5%)	22 (35.48%)	5 (8.06%)	8 (12.90%)	
Female	Total N=27 (43.5%)				
		13 (20.96%)	6 (9.67%)	8 (12.90%)	
Risk factors					**Total patients**
Hypertension					
Grade 1		7	3	1	N=11(17.74%)
Grade 2		11	1	4	N=16 (25.80%)
Grade 3		17	7	11	N=35 (56.45%)
Diabetes mellitus					
Non-DM		20	4	8	N=32 (51.61%)
T2DM		15	7	8	N=30 (48.87%)
Alcohol Hx					
Non-alcoholic		33	10	12	N=55 (88.70%)
Alcoholic		2	1	4	N=7 (11.29%)
Smoking Hx					
Non-smokers		28	10	10	N=48(77.41%)
Smokers		7	1	6	N=14 (22.58%)
Total cholesterol		2	0	0	N=2 (3.22%)
Triglyceride		10	6	16	N=32 (51.61%)
LPA		15	9	15	N=39 (62.90%)
Hcy		12	5	8	N=25 (40.32%)
CVA		10	3	5	N=18 (29.03%)
FH CAD		2	1	0	N=3 (4.83%)
cTnI		9	5	4	N=18 (29.03%)
HF LVDD		16	6	7	N=29 (46.77%)

Note: N= No. of patients, CVA= Cerebrovascular Accident, LPA= Lipoprotein (a), Hcy= Homocysteine, FH CAD= Family history of coronary artery disease, cTnI= cardiac troponin I, HF LVDD= Heart failure with left ventricular diastolic dysfunction.

Table2: Correlation between ABI and SYNTAX score

Correlations

			ABI	**SYNTAX**
Spearman's rho	**ABI**	Correlation Coefficient	1.000	.886**
		Sig. (2-tailed)	.	.000
		N	62	62
	syntax	Correlation Coefficient	.886**	1.000
		Sig. (2-tailed)	.000	.
		N	62	62

** Correlation is significant at the 0.01 level (2-tailed)

If there is no repeated data value then perfect Spearman's correlation of +1 or -1 occurs, which indicate a perfect positive linear correlation or inverse or negative correlation between two variables Figure 2 graph C and D. Multinomial logistic regression model was used to identify the potential independent predictor of disease. There are more than two dependent nominal variables so this is more suited to it.

Hypertension grade-3 (180/110mmHg) was significant risk factor for mild-ABI group when compare with grade-1(140~159/90~99mmHg) and grade-2(160~179/100~109mmHg) and keeping severe-ABI as reference category (p=0.021, OR=20.593, CI=1.58, 266.87). T2DM was not significant risk factor for mild-ABI group (p=0.161, OR=5.268, CI=0.516, 53.728). High level of LPA(lipoprotein-a) was found significant for atherosclerotic CAD(p=0.009, OR=100.341, CI=3.187, 3159.374). Increased level of homocysteine was also risk factor for development of CAD (p=0.042, OR=16.934, CI= 1.102, 260.141). Increased level of cardiac troponin-I (cTnI) isn't significant risk factor for mild-ABI group (p=0.282, OR=4.277, CI=0.303, 60.419). Smoking was not significant for mild-ABI group (p=0.777), alcohol (p=0.202), total cholesterol (p=0.999) and LDL(p=0.254) are all non-significant statistically (**Table 3**).

Hypertension grade-3 was also risk factor for moderate-ABI group when compare with grade-1 and grade-2 while keeping the mild-ABI as a reference category (p=0.012, OR=0.003, CI=3.66, 0.287). T2DM was risk factor for moderate-ABI (p=0.027, OR=0.045, CI=0.003, 0.699). High level of LPA was risk factor for atherosclerotic CAD and stroke (p=0.028, OR=0.021, CI=0.001, 0.664). High level of homocysteine was risk factor for moderate group (p=0.026, OR=0.021, CI= 0.001, 0.634). Increased level of cTnI has risk factor for moderate-ABI group (p=0.019, OR=0.020, CI=0.001, 0.531). Smoking wasn't significant risk factor for moderate-ABI group (p=0.071), alcohol (p=0.110), total cholesterol(p=0.999) and LDL-C(p=0.775) are all non-significant statistically.

Hypertension grade-3 was a risk factor for sever-ABI group while keeping mild-ABI as a reference category (p=0.020, OR=0.045, CI=0.003, 0.616). LPA (p=0.008, OR=0.009, CI= 0.000, 0.297), Hcy (p=0.041, OR=0.049, CI=0.003, 0.886). T2DM, LDL, total cholesterol, cTnI, alcohol, and smoking are not statistically significant (p=0.161), (p=0.194), (p= 0.996), (p=0.276), (p= 0.238), and (p= 0.699), respectively.

Lipoprotein-A (LPA) (p=0.031, OR=7.443, CI= 1.206, 45.924), Homocysteine (Hcy) (p=0.048, OR=6.208, CI=1.015, 37.982), total cholesterol (p<0.0001, OR=5.475, CI= 5.492, 5.457) and alcohol (p=0.030, OR=60.152, CI=1.475, 2453.64) were found to be well defined risk factor for mild-SYNTAX group. All of the following risk factors are not statistically significant hypertension (p=0.106), T2DM (p=0.189), LDL-C (p=0.859), cTnI (p=0.514) and smoking (p= 0.334).

The evaluation of independent predictor of CAD was analyzed by selecting mild-group as a reference category and none of the previously mentioned risk factors found to be statistically significant. These independent predictors had significance level as following; hypertension (p=0.787), T2DM (p=0.990), LDL (p=0.421), PLA (p=0.218), Hcy (p=0.235), total cholesterol (p=0.175), cTnI (p=0.097), alcohol (p=0.996) and smoking (p=0.539).

Some of the risk factors had good level of significance for severe-SYNTAX score group as following LPA: (p=0.031, OR=0.134, CI=0.022, 0.829); Hcy: (p=0.048, OR=0.161, CI=0.026, 0.986) and alcohol: (p=0.030, OR=0.017, CI=0.000, 0.678). None of the following mentioned risk factors found to be statistically significant such as hypertension (p=0.106), T2DM (p=0.189), LDL (p=0.859), cTnI (p=0.514), and smoking (p=0.334) (**Table 4**).

Discussion

Peripheral arterial disease is an occlusive disease of the arteries distal to the aortic bifurcation[16]. This term is often preferred to describe the lower extremity diseases of arterial network of chronic pattern especially secondary to atherosclerosis. Atherosclerotic changes are the major etiology for the development of lower extremity arterial vasculature problems[17]. The major pathology assigned by WHO study group was atherosclerotic obliterans[18]. The measurement of ABI had been established as a reliable index to identify patients with asymptomatic PAD. Some of the landmark studies like Edinburgh Artery Study (1992), Framingham Study (1970–

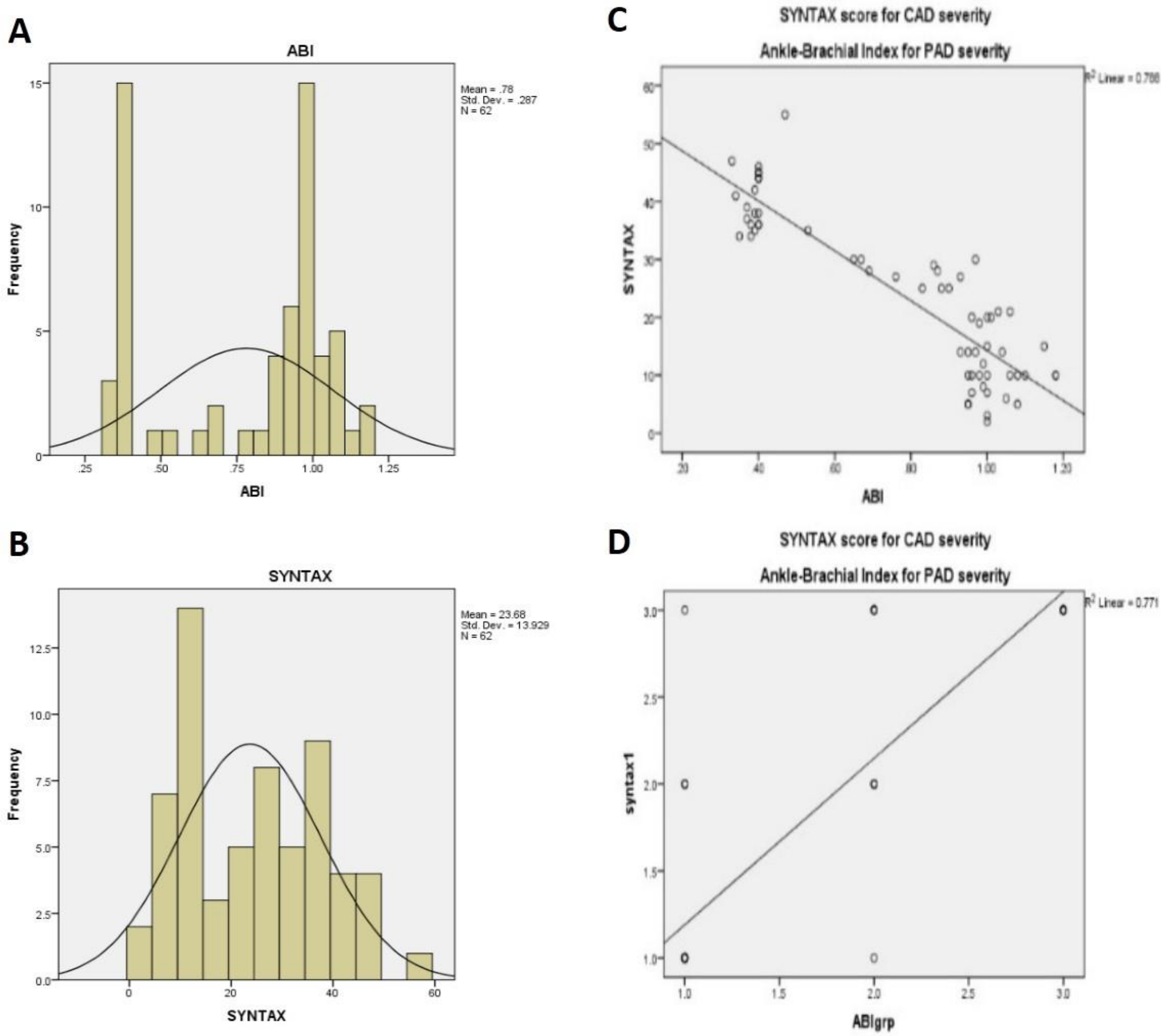

Figure 2. Distribution of ABI value, SYNTAX score, and the correlation between ABI and SYNTAX score. The distribution of ABI value and SYNTAX score in the graph (A) and (B) presents the non-normal distribution of data. Graph (C) shows an inverse correlation between ABI values and SYNTAX scores when data is plotted in original form which indicates that with increasing SYNTAX score the corresponding ABI values decreases. Graph (D) presents the positive correlation between ABI values and SYNTAX scores when data is plotted in an ordinal form which indicates with increasing disease severity of PAD shown by ABI value the corresponding disease severity of CAD shown by SYNTAX scores also increases.

1996), The San Diego Study (1992), and The Rotterdam Study (1998) using the ABI have shown that there is a high incidence of PAD without specific clinical symptoms as compared to the population having well defined clinical symptoms[16]. The measurement of ABI is the single most useful diagnostic tool in the evaluation of PAD[19].

The PARTNERS program which studied the population aged between 50 years and 69 years with diabetes or smoking and age >70 years found a prevalence of 29%[20]. The Rotterdam study with a study population <55 years of age had a prevalence of 19%[21]. The Edinburgh Artery Study studied the age-stratified sample between 55-74 years and found a prevalence of 9%. However, the Swiss Ather othrombosis Survey carried out on a population >55 years of age with stroke, TIA, CAD or two or more risk factors found a prevalence of only 6.4%[22]. All the compared studies used ABI as the diagnostic parameter. In our study, 22.58% were smokers and all of them were males. Occurrence of PAD among smokers was significantly higher than

Table 3: Risk factors for ABI

ABI	Risk factor	ODD RATIO(OR)	95% CONF. INTERVAL Lower Bound	Upper Bound	P-VALUE
MILD (N=35)	1.Hypertension	20.593	1.58	266.87	0.021
	2.Lipoprotein	100.341	3.187	3159.374	0.009
	3.Homocysteine	16.934	1.102	260.141	0.042
	4.T2DM	5.268	0.516	53.728	0.161
	5.LDL-C	0.129	0.004	4.359	0.254
	6.C Tn I	4.277	0.303	60.419	0.282
	7.Alcohol Hx	13.623	0.246	754.177	0.202
	8.Smoking Hx	0.718	0.072	7.157	0.777
	9.Total cholestrol	3.48	0.000	-	0.999
MODERATE (N=11)	1.Hypertension	0.003	3.66	0.287	0.012
	2.Lipoprotein	0.021	0.001	0.664	0.028
	3.Homocysteine	0.021	0.001	0.634	0.026
	4.T2DM	0.045	0.003	0.699	0.027
	5.LDL-C	1.585	0.067	37.281	0.775
	6.C Tn I	0.020	0.001	0.531	0.019
	7.Alcohol Hx	0.013	5.89	2.68	0.110
	8.Smoking Hx	39.087	0.734	281	0.071
	9.Total cholestrol	243	242	242	0.999
SEVERE (N=16)	1.Hypertension	0.045	0.003	0.616	0.020
	2.Lipoprotein	0.009	0.000	0.297	0.008
	3.Homocysteine	0.049	0.003	0.886	0.041
	4.T2DM	0.176	0.016	1.99	0.161
	5.LDL-C	12.522	0.277	566	0.194
	6.C Tn I	0.219	0.014	3.359	0.276
	7.Alcohol Hx	0.073	0.001	5.6	0.238
	8.Smoking Hx	1.699	0.116	24.9	0.699
	9.Total cholestrol	4249	-	-	0.996

Table 4: Risk factors of Syntax

SYNTAX	Risk factor	ODD RATIO (OR)	95% CONFIDENCE INTERVAL LOWER BOUND	UPPER BOUND	P-VALUE
MILD (N=32)	1.Hypertension	5.434	.697	42.372	.106
	2.Lipoprotein	7.443	1.206	45.924	***.031***
	3.Homocysteine	6.208	1.015	37.982	***.048***
	4.T2DM	2.895	.594	14.123	.189
	5.LDL-C	.810	.079	8.320	.859
	6.C Tn I	2.004	.248	16.211	.514
	7.Alcohol Hx	60.152	1.475	2453.640	***.030***
	8.Smoking Hx	.288	.023	3.596	.334
	9.Total cholestrol	5.475	5.492	5.457	***.000***
MODERATE (N=7)	1.Hypertension	.698	.051	9.520	.787
	2.Lipoprotein	.171	.010	2.851	.218
	3.Homocysteine	.154	.007	3.366	.235
	4.T2DM	.984	.083	11.667	.990
	5.LDL-C	3.875	.143	105.086	.421
	6.C Tn I	.085	.005	1.561	.097
	7.Alcohol Hx	139851.923	.000	.[c]	.996
	8.Smoking Hx	2.791	.105	73.842	.539
	9.Total cholestrol	.041	.000	4.118	.175
SEVERE (N=23)	1.Hypertension	.184	.024	1.435	.106
	2.Lipoprotein	.134	.022	.829	***.031***
	3.Homocysteine	.161	.026	.986	***.048***
	4.T2DM	.345	.071	1.685	.189
	5.LDL-C	1.235	.120	12.691	.859
	6.C Tn I	.499	.062	4.036	.514
	7.Alcohol Hx	.017	.000	.678	***.030***
	8.Smoking Hx	3.476	.278	43.444	.334
	9.Total cholestrol	1019426.726	17705.475	58695450.124	***.000***

among non-smokers which is a direct risk factor for all kind of cardiovascular network related problems. Smoking as a risk factor had a statistically significant but in our study we failed to find the special association and statistical significance which might be due to small sample size of the study population. The present study had recruited all the patients who had a history of hypertension and 29% of the total population was belonged to PAD free category or just having the borderline disease and all of them had to be grouped into the mild category for purpose of comparison with SYNTAX score. In accordance with the Framingham Heart Study, hypertension doubles the risk of PAD[23]. However, Reunanen et al. showed that hypertension was not significantly related to PAD[24]. In our study occurrence of PAD in 3rd-grade hypertension was more significant as compared to 1st and 2nd-grade hypertension group especially moderate and severe-ABI groups with a significance of p=0.012 and p=0.020 correspondingly. However, the occurrence of CAD among patients who had PAD was higher than those without PAD. A strong correlation was found to occur between PAD and CAD ($p<0.0001$; statistically significant) and depicted by Spearman's rank correlation of *p*= 0.886 which is a very strong correlation between PAD and CAD.

We demonstrated that patients with PAD had an increased incidence of obstructive CAD than patients without PAD, referred for coronary angiography for suspected coronary artery disease. This was a common finding in our study that found the patients with PAD especially those who had ABI values in lower ranges had much more complex CAD severity which was clearly defined by higher SYNTAX score. Vogt et al.[25] showed in healthy elderly women that patients with an ABI ≤ 0.90, at 4-years follow-up, found to have a 3.1 time higher prevalence of overall mortality, a 3.7 times high prevalence of mortality for heart-related issues and a 4.0 times greater mortality rate for fatal cardiac events than old women with a normal ABI. Newman et al.[26] showed in a subgroup of 1,537 persons of having isolated systolic hypertensive in an old population that persons with an ABI ≤ 0.90, at 4-year, follow-up, with a high prevalence of overall mortality by 2.8 times and by 3.3 times high prevalence of cardiovascular fatal events than persons with an ABI >0.90. In our study, we also found that there was a rising trend of higher SYNTAX score in the patients having ABIs ≤0.90 and also for those patients who had borderline ABIs ranging from 0.90 to 0.99, in comparison with patients had ABIs in a normal range of 1.0 to 1.20 or above.

Our study results are in favor of supporting the fact that low ABIs values are highly associated with atherosclerotic diseases especially CAD. This study also enhances the reliability of findings that are in favor of supporting that low ABI could be a better marker for the evaluation of increased burden of atherosclerotic diseases. In this study we also used some additional and very specific markers such as lipoprotein-A(LPA) (p=0.008) and homocysteine(Hcy) (p=0.026)which are considered to be the highly sensitive and specific markers of presence of atherosclerosis and gradual development of atherosclerotic diseases such as coronary artery diseases and stroke and they are considered markers of CAD as well. It is also noteworthy to mention that traditional risk factors for CAD like LDL-C (p= 0.194) and smoking (p=0.071) were not statistically significant in our study and it might be because of small sample of study population and the effect of lipid lowering medication that patients often used on long-term bases in cardiac related management. Another important finding in our study was that different categories of disease severity such as mild, moderate and severe form of peripheral arterial diseases have different impacts of independent predictors in terms of risk factors e.g. type-2 DM was not significant statistically for mild-ABI group(p=0.161) but it became significant in moderate-ABI group(p=0.027) and this difference among groups could be due to the impact of type-2 DM on blood vessels which are mainly because of macro-vascular complications of diabetes that gradually becomes severe along the natural course of disease. Similarly, cardiac troponin-I(cTnI) wasn't significant in the mild-ABI group(p=0.282) but it was found to be significant in the moderate-ABI group(p=0.019) which could be due to longer duration of disease and greater damage of target organ. On the other hand, alcohol was only found significant statistically in mild and severe-SYNTAX groups, and both groups had a significant p-value of 0.03. This effect of alcohol was more pronounced on the coronary arterial network as compared to the peripheral arterial network which indicates the more damaging effect of alcohol on the heart as compared to other systems of the body.

Conclusion

In a nutshell, ABI is very effective for the determination of lesions with regards to its severity, not only in the peripheral arterial tree especially extremities e.g lower legs but also it is very helpful in the prediction of disease severity in other parts of systemic circulatory networks such as coronary artery lesions. The examination and diagnosis of PAD with the measurement of Ankle-Brachial Index (ABI) is easy to perform, highly acceptable because of its cost-effectiveness and has high patient compliance due to its non-invasive nature, in routine clinical practice. It is a good independent predictor of peripheral arterial narrowing and also depicts the presence of coronary artery stenosis with high sensitivity and specificity. The low values of ABIs especially <0.9 is very sensitive and specific for revealing the cardiac problems mainly related to coronary artery diseases and this association is also evident with high SYNTAX score in those patients who had low ABIs. The SYNTAX score is very specific and accurate scoring system for coronary artery lesions and gives a high accuracy of the significant lesion anatomically. As a result, Ankle-Brachial Index(ABI) is proved to be the better predictor for the assessment of global atherosclerosis in systemic vasculature and has greater efficacy for evaluating the patients who are at high risk of developing coronary artery disease or CVA events especially stroke, so it can be included in routine clinical examination to increase the predictive values of such diseases.

Declaration

All authors have disclosed no conflicts of interest.

References

[1] Heald CL FF, Murray GD, Price JF, Ankle Brachial Index Collaboration. The risk of mortality and cardiovascular disease associated with the ankle-brachial index: systematic review. Atherosclerosis. 2006 Nov 30;189(1):61-9.

[2] Malcom GT MC, McGill HC Jr, et al. Pathobiological, group. doaiyPr, disease Aoatlwch, 2009;203(2): rfiypA, 515-521.

[3] Rosamond W FK, Furie K, et al. Heart disease and stroke, association suarftAh, subcommittee. class, 2008;117(4):e25-e146. C.

[4] Roger VL GA, Lloyd-Jones DM, Benjamin EJ, Berry, JD BW, Bravata DM, et al. Heart disease and, American ss--uarft, 2012;125(1):e2-e220. HAC.

[5] Wyss CA NM, Altwegg L, Spanaus KS, Yonekawa, K WM, Corti R, et al. Cellular actors, Toll like, receptors alcpiac, 2010;31(12):1457-1469. sEHJ.

[6] Bentzon JF OF, Virmani R, Falk E. Mechanisms, Res. opfarC, 2014;114(12):1852-1866.

[7] Libby P TI, Fredman G, Fisher EA. Inflammation, syndromes. airadoac, 2014;114(12):1867-1879. CR.

[8] Geng YJ LPPoaas, Vasc bdapAT, 2002;22(9):1370-1380. B.

[9] Najjar SS SA, Lakatta EG. Arterial aging: is it, Hypertension. air, 2005;46(3):454-462.

[10] McDermott MM LK, Criqui MH, Ruth K, Goff D, Saad MF WC, et al. Ankle-brachial index and subclinical, of cacdtm-es, 2005;162(1):33-41. aAJE.

[11] Lau JF WM, Olin JW. Peripheral artery disease. Part 1:, 2011;8: ceandNRC, 405e418.

[12] Doobay AV ASSasot, outcomes: a-bitpfc, Vasc asrAT, 2005;25(7):1463-1469. B.

[13] Hertzer NR BE, Young JR, et al. Coronary artery disease, 1000 ipvpAco, Ann caarosm, 1984;199:223-233. S.

[14] Metzler B WBS, STS and EuroSCORE—, heart hgatfreia, disease [published online ahead of print December 21, doi:10.1160/TH11-06-0399 TH.

[15] Chakrabarti AK GCTssu, limitations, 2011;23(12): afdJIC, 511-512.

[16] Lanzer P, Topol EJ. Pan vascular medicine: integrated clinical management: Springer; 2013.

[17] Halperin JL. Evaluation of patients with the peripheral vascular disease. Thrombosis research. 2002;106: V303-V11.

[18] Stary HC, Chandler AB, Dinsmore RE, Fuster V, Glagov S, Insull W, et al. A definition of advanced types of atherosclerotic lesions and a histological classification of atherosclerosis A report from the Committee on Vascular Lesions of the Council on Arteriosclerosis, American Heart Association. Circulation. 1995;92:1355-74.

[19] Leng G, Fowkes F, Lee A, Dunbar J, Housley E, Ruckley C. Use of ankle brachial pressure index to predict cardiovascular events and death: a cohort study. BMJ. 1996;313:1440-3.

[20] Hirsch AT, Criqui MH, Treat-Jacobson D, Regensteiner JG, Creager MA, Olin JW, et al. Peripheral arterial disease detection, awareness, and treatment in primary care. Jama. 2001;286:1317-24.

[21] Meijer WT, Hoes AW, Rutgers D, Bots ML, Hofman A, Grobbee DE. Peripheral Arterial Disease in the Elderly The Rotterdam Study. Arteriosclerosis, thrombosis, and vascular biology. 1998;18:185-92.

[22] Tomson J, Lip GY. Peripheral arterial disease: A high risk–but neglected–disease population. BMC cardiovascular disorders. 2005;5:1.

[23] McKee PA, Castelli WP, McNamara PM, Kannel WB. The natural history of congestive heart failure: the Framingham study. New England Journal of Medicine. 1971;285:1441-6.

[24] Reunanen A, Takkunen H, Aromaa A. Prevalence of intermittent claudication and its effect on mortality. Acta Medica Scandinavica. 1982;211:249-56.

[25] Vogt MT, Cauley JA, Newman AB, Kuller LH, Hulley SB. Decreased ankle/arm blood pressure index and mortality in elderly women. Jama. 1993;270:465-9.

[26] Newman AB, Tyrrell KS, Kuller LH. Mortality over four years in SHEP participants with a low ankle-arm index. Journal of the American Geriatrics Society. 1997;45:1472-8.