IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 4 Ser. 18 (April. 2019), PP 70-74
www.iosrjournals.org

Evaluation of the Relationship between Peripheral Artery Disease Risk Factors and Ankle Brachial Index in Patients Who Applied to Family Medicine Policlinic

Fatma Tufan Altuncu [1], Hüseyin Balcıoğlu [2], Celal Civil [3]
[1]*(Mahmudiye Family Health Centre, Eskişehir, Turkey)*
[2]*(Eskişehir Osmangazi University Medical Faculty Department of Family Medicine, Eskişehir, Turkey)*
[3]*(İstanbul Gelişim University School of Health Sciences Department of Physiotherapy and Rehabilitation, İstanbul, Turkey)*
Corresponding Author: Hüseyin Balcıoğlu

Abstract:
Introduction and Aim: *Peripheral arterial disease (PAH) is an ischemic manifestation of atherosclerotic stenosis or occlusion of the lower extremity arteries. Noninvasive diagnostic methods for PAH include Ankle Brachial Index (ABI). ABI is the ratio of the highest brachial systolic blood pressure to the highest systolic blood pressure in both ankles. ABI in the diagnosis of PAH; hand Doppler and sphygmomanometer. The aim of this study was to determine the relationship between risk factors of peripheral arterial disease and ankle brachial index in asymptomatic patients.*
Material and Method: *150 patients were included in our study. The rates of smoking, HL, DM and HT were significantly different compared to the groups. According to HT types, there is a statistically significant difference between ABI levels. ABI levels greater than 0.9 were found statistically significant in all pre hypertensive patients.*
Results: *Smoking, HL, DM and HT incidence rates were significantly different compared to the groups. Moreover, as the risk increases, their rates increase. There is a statistically significant difference between ABI levels according to HT types. Glucose measurements show significant difference according to risk groups.* ***Discussion and Conclusion:*** *In our study, the average ABI of the prehypertension group was found to be significantly higher than the average ABI of Stage 1 and Stage 3 hypertensive patients. As a result of this study; the relationship between peripheral artery disease risk factors and Ankle Brachial Index is the first study to demonstrate in Turkey. In family medicine applications; the noninvasive diagnostic method Ankle Brachial Index method can be used to diagnose and treat peripheral arterial disease.*
Keywords: *Ankle Brachial Index, Family medicine, Hypertension, Peripheral arterial disease*

Date of Submission: 15-04-2019 Date of acceptance: 30-04-2019

I. Introduction

Peripheral arterial disease (PAH) is an ischemic manifestation of atherosclerotic stenosis or occlusion of the lower extremity arteries. The frequency of PAH increases with advancing age and cardiovascular risk factors (Smoking, hyperlipidemia (HL), hypertension (HT), diabetes mellitus (DM)). Approximately 40% of patients with coronary artery disease or cerebrovascular disease have PAH. Noninvasive diagnostic methods for PAH include Ankle Brachial Index (ABI).

ABI is the ratio of the highest brachial systolic blood pressure to the highest systolic blood pressure in both ankles. The ABI method used in the diagnosis of PAH is an easy, noninvasive diagnostic method that can be used in family health centers by hand Doppler or sphygmomanometer. ABI has a 95% sensitivity, 99% specificity for the diagnosis of PAH and shows a high risk of cardiovascular ischemic event (1,2). Cardiovascular diseases are the cause of nearly 30% of deaths in western countries (3). In some studies, the normal ABI value was found to be between 0.9 and 1.5 in healthy subjects. Low and high ABI values were associated with atherosclerotic heart disease. In recent years, the relationship between mortality rate and ABI value is higher than 1.5 (4). The aim of this study is; to determine the relationship between the risk factors of peripheral arterial disease and ankle brachial index in asymptomatic patients.

II. Material and Method

Our study was carried out between May 2011 and July 2011 in 150 patients in Eskişehir Mihalıççık Gün Sazak District Hospital Family Medicine policlinic. Patients were divided into 4 groups according to their risk factors such as smoking, hyperlipidemia, hypertension and diabetes mellitus. The control group was the group without risk factors. Among the groups; demographic characteristics, anthropometric measurements, biochemical values and ABI values were compared. ABI value <0.9 was considered high risk for peripheral arterial disease (5). Patients who were 50 years and over and had at least one risk factor for PAH were included in the study. Written informed consent was obtained from the patients included in the study. The consent was obtained from the ethics committee for the study on April 7, 2011, numbered 9258. Patients with known atherosclerosis with resting and exercise, leg pain, and abnormal leg pulse examination were excluded from the study.

III. Statistical Analysis

For statistical analysis, the Statistical Software (Utah, USA) program was used for the NCSS (Number Cruncher Statistical System) 2007 & PASS (Power Analysis and Sample Size 2008). In the evaluation of the data, descriptive statistical methods (Average, standard deviation, frequency), as well as comparison of quantitative data, normal distribution of parameters, Oneway Anova test and Tukey HDS test were used to determine the group that caused the difference. Kruskal Wallis test was used for the comparison of the parameters which did not show normal distribution and Mann Whitney U test was used for the determination of the group that caused the difference. The paired sample t test was used for intragroup comparisons of the parameters with normal distribution and Wilcoxon sign test was used for intra-group comparisons of parameters that did not show normal distribution. Chi-Square test and Fisher's Exact Chi-Square test were used to compare qualitative data. The results were evaluated at 95% confidence interval and p <0.05 at significance level.

IV. Results

Our study included 150 patients, 48.7% (n = 73) male and 51.3% (n = 77) female. The patients were between 50 and 89 years of age and the average age was 70.63 ± 8.42. If the groups had 1 risk factor in determining the first group, the second group had 2 risk factors, the third group had 3 risk factors and the fourth group had 4 risk factors. The control group was determined as patients without risk factors. There was no statistically significant difference between groups according to their age and gender (p> 0.05) (Table 1).

Table 1. Distribution of descriptive characteristics

		1 risk	2 risk	3 risk	4 risk	Control	$^{+}$p
		Average ± SD	**Average ± SD**	**Average ± SD**	**Average ± SD**	**Average ± SD**	
Age		71,63±8,03	71,77±7,03	68,43±9,39	71,57±8,26	69,77±9,24	**0,453**
BMI		29,03±6,64	30,27±8,64	29,55±6,37	31,38±7,58	28,48±6,45	**0,566**
Waist circumference		94,97±12,02	95,90±13,56	93,97±12,28	100,33±15,29	90,50±13,58	**0,083**
		n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	$^{++}$**p**
Gender	**Male**	16 (%53,3)	14(%46,7)	15(%50,0)	16(%53,3)	12(%40,0)	**0,828**
	Female	14(%46,7)	16(%53,3)	15(%50,0)	14(%46,7)	18(%60,0)	
Age	**< 55**	1 (%3,3)	0 (%0)	3 (%10)	1 (%3,3)	2 (%6,7)	**0,770**
	56-64	3 (%10)	5 (%16,7)	8 (%26,7)		8 (%26,7)	
	65-74	15 (%50)	16 (%53,6)	11 (%36,7)		10 (%33,3)	
	75-84	10 (%33,3)	8 (%26,7)	6 (%20)		9 (%30)	
	> 85	1 (%3,3)	1 (%3,3)	2 (%6,7)		1 (%3,3)	

$^{+}$ *Oneway anova test* $^{++}$ *Chi-Square test*

There was no significant difference between the average ABI levels of the groups (p> 0.05). The rates of smoking, HL, DM and HT showed a significant difference compared to the groups, and as the risk increased, their rates increased (p <0.01) (Table 2).

Table 2. Ratio of PAH risk factors and ABI values in groups

	1 risk	2 risk	3 risk	4 risk	Control	$^{+}$p
	Average ± SD	**Average ± SD**	**Average ± SD**	**Average ± SD**	**Average ± SD**	
Average ABI	1,01±0,11	1,09±0,16	1,14±0,12	1,12±0,14	1,14±0,15	**0,514**
Risk factor	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	$^{++}$**p**
Average ABI<0,9	1 (%3,3)	4 (%13,3)	1 (%3,3)	2 (%6,7)	2 (%6,7)	**0,523**
Average ABI>0,9	29 (%96,7)	26 (%86,7)	29 (%96,7)	28 (%93,3)	28(%93,3)	
Smoking	5(%16,7)	13(%43,3)	11(%36,7)	30(%100)	0(%0)	**0,001****
HL	1(%3,3)	12(%40,0)	28(%93,3)	30(%100)	0(%0)	**0,001****

DM	1(%3,3)	2(%6i7)	22(%73,3)	30(%100)	0(%0)	**0,001****
HT						
Normal	0	2(%6,7)	5(%16,7)	2(%6,7)	5(%16,7)	**0,046***
Pre HT	10(%33,3)	10(%33,3)	9(%30,0)	8(%26,7)	6(%20)	
Stage 1 HT	11(%36,7)	10(%33,3)	7(%23,3)	4(%13,3)	14(%46,7)	
Stage 3 HT	9(%30,0)	8(%26,7)	9(%30,0)	16(%53,3)	5(%16,7)	

$^{+}$ *Student t test* $^{++}$ *Chi-Square test* **p<0,05* ***p<0,01*

There was no statistically significant difference between the risk factors of smoking, hyperlipidemia and patients with and without diabetes mellitus (p> 0.05) (Table 3).

Table 3. Evaluation of average ABI levels according to risk factors

Risk factors		**Average ABI**		$^{+}$**p**
		Average	**SD**	
Smoking	**Yes**	1,13	0,14	**0,466**
	No	1,11	0,13	
HL	**Yes**	1,13	0,13	**0,565**
	No	1,11	0,14	
DM	**Yes**	1,14	0,13	**0,307**
	No	1,11	0,14	

$^{+}$ *Student t test*

There was a statistically significant difference between ABI levels according to HT type (p <0.01). No significant difference was found between the normal group and prehypertension, stage 1 and stage 3 hypertension groups (p> 0.05); The average ABI of the prehypertension group was found to be significantly higher than that of the Stage 1 and Stage 3 hypertensive patients (p = 0.034; p = 0.001) (Table 4).

Table 4. Evaluation of average levels of ABI according to HT status

HT	**Average ABI**		***p***
	Average	**SD**	
Normal	1,13	0,08	***0,001*****
Pre HT	1,18	0,12	
Stage 1 HT	1,10	0,14	
Stage 3 HT	1,07	0,12	

Oneway Anova test ***p<0,01*

According to the risk groups, there was no statistically significant difference between total cholesterol, HDL, LDL and triglyceride measurements (p> 0.05). Glucose measurements show a significant difference according to the risk groups (p <0.01). When the meaningfulness of the group is examined; glucose levels of patients with 1 risk were found to be significantly lower than those with 3-risk and 4-risk groups (p = 0.024; p = 0.011). Glucose levels of 2 risk-bearing cases were found to be significantly lower than those with 3-risk and 4-risk groups (p = 0.009; p = 0.004). There was no statistically significant difference between the other paired comparisons (p> 0.05) (Table 5).

Table 5. Evaluation of biochemical measurements of groups

	1 risk	**2 risk**	**3 risk**	**4 risk**	**Control**	$^{+}$***p***
	Average ± SD	**Average ± SD**	**Average ± SD**	**Average ± SD**	**Average ± SD**	
Total cholesterol	211,63±37,31	217,13±34,38	221,53±47,25	228,40±37,83	207,87±48,24	***0,336***
HDL cholesterol	56,93±15,97	53,67±11,27	60,23±14,48	62,03±14,63	62,23±2286	***0,199***
LDL cholesterol	126,03±32,84	134,30±30,71	133,50±41,99	136,40±38,03	121,37±42,59	***0,490***
Triglyceride	144,77±59,47	147,97±29,80	141,20±34,87	156,33±75,31	122,70±44,63	***0,143***
Glucose	109,60±26,94	105,33±30,92	150,27±72,90	153,63±71,44	130,63±37,38	***0,001*****

Oneway Anova test ***p<0,01*

There was no significant difference between BMI and waist circumference measurements according to ABI classification (p> 0.05). No statistically significant difference was found between Smoking, HL, Type 2 DM and blood pressure stages according to ABI classification of normal, Stage 1 and stage 3 hypertension (p> 0.05); It was statistically significant that ABI levels of all cases with prehypertension were greater than 0.9 (p> 0.05) (Table 6).

Table 6. Evaluation by ABI classification

	ABI		^{+}p
	< 0,9 (n=10)	**> 0,9 (n=140)**	
	Ort ± SD (Median)	**Ort ± SD (Median)**	
BMI	29,37±5,21 (29,60)	29,77±7,30 (29,06)	*0,830*
Waist circumference	97,60±14,88 (97)	94,96±13,54 (95)	*0,615*
	n (%)	**n (%)**	^{++}p
Smoking	3 (%30)	56 (%40)	*0,532*
Hyperlipidemia	5 (%10)	66 (%47,1)	*0,861*
Tip 2 DM	3 (%30)	52 (%37,1)	***0,651***
Blood Pressure Staging			
Normal	0 (%0)	14 (%10)	***0,312***
Pre HT	0 (%0)	43 (%30)	***0,038****
Stage 1 HT	5 (%50)	41 (%29,3)	***0,170***
Stage 3 HT	5 (%50)	42 (%30)	***0,188***

$^{+}$ *Mann Whitney U test* $^{++}$ *Chi-Square test* *$p<0,05$

V. Discussion and Conclusion

Central systolic blood pressure and pulse pressure as measured by noninvasive methods and cardiovascular risk assessment were first performed in end-stage renal disease (6,7). These studies; Central systolic blood pressure and pulse pressure are strong markers for all causes and mortality due to cardiovascular causes. In our study, the average ABI of the prehypertension group was found to be significantly higher than the average ABI of Stage 1 and Stage 3 hypertensive patients.

According to the TEKHARF study, the prevalence of hypertension in our country was found to be 33.7% and its frequency was found to increase with age (8). In our study, the rate of people under 55 years of age and 4 risk factors was 6.7%, 26% between 56-64 years of age and 33% between 65-74 years of age. As the age progresses, the proportion of those with 4 risk factors increases, therefore the proportion of people with HT and the associated risk of PAH increase significantly.

Mortality in patients with type 2 diabetes is quite high compared to non-diabetic individuals and cardiovascular diseases are the most important cause of mortality (9). Dziemidok et al. examined the ABI values of 175 people with type 2 diabetes mellitus. They found high ABI in 37% of these patients. Şarer Yürekli et al. compared patients with high ABI values to those with normal ABI. They found that HbA1c was significantly lower in the high ABI group compared to the normal group (4). In our study, it is known that as the blood glucose level increases, the number of risk factors for PAH increases and this contributes significantly to mortality. In addition, blood glucose levels of 4 risk factors are higher than those with single risk factors.

Şatiroğlu Ö. et al. in their study on the relationship between the prevalence of peripheral arterial disease and risk factors for atherosclerotic diseases, they found that 48% of the patients with PAH were smoking. In the same study, they found 58% HT, 26% DM and 49% hypercholesterolemia in patients with PAH (10). In our study, the rate of smoking was 30%, Stage 1 and Stage 3 HT were 66%, DM ratio was 30% and HL was 30% in patients with 4 risk factors for PAH. In both studies, the risk of PAH increases significantly as the ratio of these 4 parameters increases.

As a conclusion, our study is very valuable because it is the first study to reveal the relationship between peripheral arterial disease risk factors and Ankle Brachial Index in family medicine applications. Peripheral artery disease can be diagnosed and treated by Ankle Brachial Index method which is noninvasive method in family medicine applications. Thus, cardiovascular complications can be reduced. The widespread use of non-invasive and easy methods such as ABI for atherosclerotic diseases, which is an important health problem in terms of mortality and morbidity, will inform the patients with risk and inform them closely. It will also provide significant benefits for community health and provide doctors with important clues about patients.

References

[1] Chobanian AV, Bakris GL, Black HR, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 Report. JAMA. 2003; 289:2560-2572

[2] Hankey GJ, Norman PE, Eikelboom JW. Medical treatment of peripheral arterial disease. JAMA. 2006 Feb 1;295(5):547-53.

[3] Pehlivanoglu Ozkan EF. Balcioglu H. Unluoglu I. 2019. Turkish Validation and Reliability of Mediterranean Diet Adherence Screener, Osmangazi Journal of Medicine, Doi:10.20515 /504188.

[4] Yürekli, Banu Şarer, et al. "Is the ankle-brachial index directly associated with current glycemic control in diabetic patients?" Turkish Journal of Vascular Surgery.2018, 27(3): 117-23.

[5] Hirsch AT, et al. J Am Coll Cardiol. 2006;47: e1-e192.

[6] Safar, M. E. et al. (2002) Hypertension 39, 735– 738.

[7] London, G. M.et al. (2001) Hypertension 38, 434– 438.

[8] Onat A, Karabulut A, Yazıcı M, Can G, Sansoy V. Türk yetişkinlerde hiperkolesterolemi ve hipertansiyon birlikteliği: sıklığına ve kardiyovasküler riski öngördürmesine ilişkin TEKHARF çalışması verileri. Türk Kardiyoloji Derneği Arşivi 2004; 32:533-41.

[9] Cardoso C, Salles G, Bloch K, Deccache W, Siqeira-Filho AG: clinical determinants of increased QT dispersion in patients with diabetes mellitus. Int J Cardiol. 2001 Jul; 79(2-3): 253-62.

[10] Şatiroğlu, Ömer, et al. Periferik arter hastalığı yaygınlığıyla aterosklerotik risk faktörleri arasında ilişki. Selçuk Üniv Tıp Derg. 27.4 (2011): 213-8.

Fatma Tufan. "Evaluation of the Relationship between Peripheral Artery Disease Risk Factors and Ankle Brachial Index in Patients Who Applied to Family Medicine Policlinic." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 04, 2019, pp 70-74.