

# The Prevalence of Undiagnosed Peripheral Arterial Disease in Diabetic Patients

Mohammed Alandejani<sup>1</sup>, Mohammed Babgi<sup>2</sup>, Abeer Nafadi<sup>3</sup>, Abdulaziz Aldahlawi<sup>4</sup>, Ahmed Alem<sup>5</sup>, Arwa Alghamdi<sup>6</sup> and Abdulhalim Jamal Kinsara<sup>7\*</sup>

<sup>1-6</sup> College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, King Abdullah International Medical Research Center, Saudi Arabia

<sup>7</sup> King Saud bin AbdulAziz University for Health Sciences, COM-J King AbdulAziz Medical City-WR. King Faisal cardiac center, Saudi Arabia

Received: January 08, 2018; Accepted: February 09, 2018; Published: March 17, 2018

\*Corresponding author: Abdulhalim Jamal Kinsara, Associate professor, King Saud bin AbdulAziz University for Health Sciences, COM-J King Abdul-Aziz Medical City-WR, King Faisal cardiac center. Mail code 6599, Jeddah 21423, Saudi Arabia; E-mail: akinsara@yahoo.com

## Abstract

**Introduction:** Peripheral arterial disease (PAD) affects 12 million persons in the US, and 11.7% in Saudi Arabia. Diabetes Mellitus (DM) has a significant correlation with PAD. The risk of amputation in patients with both PAD and DM is higher than in PAD alone. Our study aimed to measure the prevalence of PAD among diabetics, and to explore quality of management by determining the frequency of ankle-brachial index (ABI) measurement among them. Moreover, it aimed to educate people about PAD and its risk factors.

**Methods and Materials:** A cross-sectional study that included 161 diabetics from three primary care centers in Jeddah, Saudi Arabia. They were interviewed using a questionnaire on demographics, past medical history, and habitual history. A second part was for physical examination of lower limbs and ABI Measurements; where values less than 0.9 or more than 1.3 were considered abnormal.

**Results:** Among 161 diabetic patients enrolled in our study, 104 (64.6%) were females with mean age of  $55.3 \pm 11.472$  years, and  $59.39 \pm 12.974$  years for males. Out of the subjects, 55.9% were receiving treatment for hypertension, and 75.8% were receiving treatment for hypercholesterolemia. 18(11.2%) were smokers, 14 (77.8%) of those were males. 64 (39.8%) of the subjects were doing regular exercises in which 38 (59.4%) were females. 32 (19.9%) were found to have an ABI < 0.9. 24 (75%) of them were females with mean age of 59 years, while 66 years for males. Among subjects with low ABI, 7(23.3%) were symptomatic. The most common presentation was numbness and tingling sensation. Also, 31(96.9%) of PAD patients had co morbidity other than diabetes. 24 (77.4%) of them were females, with hypercholesterolemia being the most common co morbidity. 3 (9.4%) of PAD patients were smokers.

**Conclusion:** In Saudi Arabia, one fifth of DM patients had PAD; the majority is asymptomatic and was females. Large percent of the subjects were not checked by ABI, or the patient was not well informed about PAD, which urge all physicians to consider a periodic check-up for PAD using ABI. Majority of subjects had multiple co morbidities.

**Keywords:** Peripheral arterial disease; Diabetes Mellitus; Atherosclerosis; Ankle Brachial Index; Prevalence

## Introduction

Peripheral arterial disease (PAD) affects 12 million people in the United States of America [1]. Those who acquire the disease have a greater risk to develop ischemic heart disease, stroke, or in extreme situations may need amputation of the affected limb [1, 2]. In addition, patients with PAD remain asymptomatic for a long period of time and by the time of diagnosis, and the revascularization is difficult and the prognosis is poor [3, 4]. Diabetes Mellitus (DM) alters the function and structure of the arteries, initiates various inflammatory processes, and alters some of the coagulation mechanism, leading to changes to the vascular tonicity [5]. The prevalence of DM in Saudi Arabia is 30% according to a study that was conducted in 2009 among 6024 subjects [6]. DM is one of the strongest risk factors for PAD [7]. Diagnosing PAD in DM patients is difficult due to the loss of

nociceptors in chronic DM patients which explains why many are asymptomatic. In addition, the absence of periodic investigations that should be done by the physicians is also a contributing factor.

Ankle brachial index (ABI) is used as a diagnostic tool for PAD. ABI is a highly sensitive and specific measurement for diagnosing PAD, noninvasive, and reproducible procedure [7]. Its normal values are between 0.9 to 1.3, any measurement above or below this range are considered abnormal [1]. When an ABI value is more than 1.3, it suggests a calcified vessel, however if the ABI value is below 0.9, it is diagnostic for occlusive peripheral arterial disease [1]. In a study that was conducted in Riyadh, Saudi Arabia, where they investigated the prevalence and risk factors for peripheral arterial disease of a total of 471 people aged  $\geq 45$  years old, the prevalence of PAD was 11.7%, of which 92.7% were asymptomatic and mostly suffered from diabetes, hypertension, lipid disorders,

smoking, cerebrovascular event, and coronary artery disease [9]. Wuhan, Central China, investigated the prevalence of PAD in type 2 DM patients, where they enrolled 2010 patients using ABI as a measurement tool and the prevalence of PAD was found to be 24.1% in elderly diabetic patients [8]. In this study, we aim to estimate the prevalence of PAD among DM patients in Saudi Arabia and to reflect the importance of raising the awareness and promoting early diagnosis of PAD among DM patients in our region.

## Method

This is a cross-sectional study that was conducted in National Guard’s primary healthcare centers. This study was approved by King Abdullah International Medical Research Center (KAIMRC) internal review board (IRB). Subjects above 18 years of age and who have type 1 or type 2 diabetes mellitus were included, while subjects with incomplete data, who left before finishing the examination, were excluded. Patients were recruited through a period of two months after gaining their consents. Questionnaires were filled by the investigators while asking the patients. The questionnaire mainly focused on demographics, habitual history, and the final part was specified for examination and ABI findings. ABI was measured using a sphygmomanometer and a duplex ultrasound. All patients were educated about PAD, and further explanation was provided to patients with abnormal findings after the conclusion of the examination. Moreover, we recommended those patients to inform their physicians about the test results. Microsoft Office Excel software was used for data entry and Statistical Package for the Social Sciences (SPSS) version 22, USA software for analysis. For the qualitative data, frequency and percentages were reported as descriptive statistics. A p-value of < 0.05 was considered statistically significant.

## Result

Among 161 type 1 & 2 diabetic patients enrolled in our study, 32 (19.9%) were found to have an ABI < 0.9, while 118 (73.2%) had a normal ABI. 8 patients were type 1 and 153 (95.3%) patients were type 2 diabetes mellitus. 153 (95%) of our subjects have

**Table 1:** Characteristics of Population (Diabetic patients)(n=161)

Variable	Percentage
Age (mean/Std. Dev.), yr	56.75 ± 12.144
Females	104 (64.6%)
Males	57 (36.4%)
Comorbidity	
Receiving treatment for hypercholesterolemia	122 (75.8%)
Receiving treatment for hypertension	90 (55.9%)
No co morbidities other than diabetes	25 (15.52%)
Smokers	18 (11.2%)
Regular exercise	64 (39.8%)
No previous ABI measurement	153 (95%)

never been investigated for PAD. All subjects participated were > 20 years old. The mean age for our subjects was 55.3 ± 11.472/ 59.39 ± 12.974 for females and males respectively [Table 1]. For patients with ABI < 0.9, symptomatic presentation was relatively rare, and the common presentation was tingling sensation. Most of the participants with ABI < 0.9 had co morbidities other than diabetes, with hypercholesterolemia being the most common co morbidity among them [Table 2].

**Table 2:** Characteristics of patients with ABI < 0.9 by gender (n=32)

Parameters	Females	Males
No. of Subjects	24 (75%)	8 (25%)
Age (mean), yr	59	66
Symptomatic	5 (15%)	2 (6.25 %)
Comorbidity	24 (75%)	7 (21.9%)
Smoking	1 (3.1%)	2 (6.3%)
Regular exercise	5 (15.6%)	2 (6.3%)
No previous ABI measurement	100%	

15 (35%) patients of 41 with abnormal ABI had ABI > 1.4 indicating a probable calcification in the peripheral artery. Many publications have linked this value with an increased risk of cardiovascular disease. Although calcification is more likely to happen in old age, older diabetic patients are likely to develop occlusion in the arteries rather than calcification.

## Discussion

The results of our study show a high prevalence among diabetic patients. Therefore, it necessitates the inclusion of a routine ABI measurement to all diabetic patients to detect early PAD and plan appropriate therapy. Such recommendation is based on the high association, and patients being asymptomatic with under detection by healthcare providers urge actions.

Our results show a relatively higher prevalence than in other similar study that was conducted in Saudi Arabia, in which it showed a PAD prevalence of 11.7% among 471 patients [9]. Moreover, the prevalence of PAD was 16% among 200 diabetic patients in a study that was conducted in Kuala Lumpur, Malaysia [7]. However, our prevalence appeared to be lower comparing to a study conducted in China, among 2010 patients, which has estimated the prevalence to be 24.1% [8]. In our patients, exercise has a strong effect on the development of PAD in diabetic patients. It has been shown that regular exercise programs such as high intensity walking 5 times per week have the greatest benefits in regards of PAD symptoms and prognosis [10]. Furthermore, female patients have higher PAD prevalence comparing to males among our subjects. This could be associated with the low level of physical activity among Saudi females [11]. Smoking is another factor that was established in several researches to have an effect on PAD development and progression [1]. However, in our study the total number of smokers was only 11.2%, yet the result could have been underestimated as some participants may hide their smoking habit, which has been unacceptable socially. Also, for the same reason, this may be linked to the higher number of females

included in our study since there is low smoking prevalence among females in the Saudi Community [12]. Therefore, smoking did not have a significant impact on our data.

Our study was limited by the small sample size, limited number of duplex ultrasound that were available, and absence of data about the patients' HbA1C level over the year; which could have helped providing a good reflection on the patient's diabetic control and compliance to medication. Nonetheless, this data provides a general idea on the prevalence and significance of this disease in our diabetic society.

## Conclusion

PAD is a common and a threatening complication in diabetic patients, accounting for about 19.9%. Exercising is associated with less prevalence of PAD in diabetic patients. Majority of diabetic patients with abnormal ABI findings had other co morbidities. Routine ABI measurement is a simple and effective tool to assess for PAD that is not performed in 95% of diabetic patients, whom considered at increased risk for PAD.

## Acknowledgement

We thank Ms. Sara Monshi for her kind contribution in methodology and in data collection assistance, Dr.Basem Alsaywid for his assistance in writing the proposal, and Dr.Lama Ramal for her assistance in methodology.

## References

1. Peripheral Arterial Disease in People with Diabetes. *Diabetes Care*. 2003;26(12):3333-3341. Doi.org/10.2337/diacare.26.12.3333
2. William R Hiatt. Medical Treatment of Peripheral Arterial Disease and Claudication. *New England Journal of Medicine*. 2001;344(21):1608-1621. DOI:10.1056/NEJM200105243442108
3. Akram J, Aamir AU, Basit A, Qureshi MS, Mehmood T, Shahid SK, et al. Prevalence of peripheral arterial disease in type 2 diabetics in Pakistan. *JPMA. The Journal of the Pakistan Medical Association*. 2011;61(7):644-648.
4. Thiruvoipati T, Caitlin E Kielhorn, Ehrin J Armstrong. Peripheral artery disease in patients with diabetes: Epidemiology, mechanisms, and outcomes. *World Journal of Diabetes*. 2015;6(7):961-969. Doi: 10.4239/wjd.v6.i7.961
5. Veves A, Akbari C, Primavera J, Donaghue V, Zacharoulis D, Chrzan J et al. Endothelial dysfunction and the expression of endothelial nitric oxide synthetase in diabetic neuropathy, vascular disease and foot ulceration. *Diabetes*. 1998;47(3):457-463. Doi.org/10.2337/diabetes.47.3.457
6. Aljabri K, Bokhari S, Alqurashi K. Prevalence of diabetes mellitus in a Saudi community. *Annals of Saudi Medicine*. 2011;31(1):19-23. Doi: 10.4103/0256-4947.75773
7. Rabia K, Khoo EM. Prevalence of peripheral arterial disease in patients with diabetes mellitus in a primary care setting. *Medical Journal of Malaysia*. 2007;62(2):130-133.
8. Wang L, Du F, Mao H, Wang HX, Zhao S. Prevalence and related risk factors of peripheral arterial disease in elderly patients with type 2 diabetes in Wuhan, Central China. *Chinese medical journal*. 2011;124(24):4264-4268.
9. Al-Sheikh SO, Aljabri BA, Al-Ansary LA, Al-Khayal LA, Al-Salman MM, Al-Omran MA. Prevalence of and risk factors for peripheral arterial disease in Saudi Arabia. A pilot cross-sectional study. *Saudi Med J*. 2007;28(3):412-414.
10. Haas TL, Lloyd PG, Yang HT, Terjung RL. Exercise training and peripheral arterial disease. *Comprehensive Physiology*. DOI: 10.1002/cphy.c110065
11. Al-Eisa E, Al-Sobayel H. Physical Activity and Health Beliefs among Saudi Women. *Journal of Nutrition and Metabolism*. 2012:1-6. DOI: 10.1155/2012/642187.
12. Jarallah J, Al-Rubeaan K, Al-Nuaim A, Al-Ruhaily A, Kalantan K. Prevalence and determinants of smoking in three regions of Saudi Arabia. *Tobacco Control*. 1999;8(1):53-56.