

# Prevalence of and risk factors for peripheral arterial disease in Saudi Arabia

## *A pilot cross-sectional study*

Sultan O. Al-Sheikh, MBBS, MD, Badr A. Aljabri, MD, Lubna A. Al-Ansary, MBBS, FRCGP, Laila A. Al-Khayal, MBBS, Musaad M. Al-Salman, MD, FRCSC, Mohammed A. Al-Omran, MD, MSc.

### ABSTRACT

**Objectives:** To determine the prevalence of and the risk factors for Peripheral arterial disease (PAD) in a primary health care setting in Saudi Arabia.

**Methods:** We conducted a prospective cross-sectional study of Saudi patients aged  $\geq 45$  years, who attended the primary health care center at King Khalid University Hospital between February 2006 and March 2006. A pre-designed questionnaire was used for each patient. Peripheral arterial disease was diagnosed, if the Ankle-Brachial index by Doppler were  $< 0.90$  and if the patient had signs or symptoms suggestively for PAD. Prevalence was estimated with 95% confidence intervals (CI), and multivariable logistics regression analyses were preformed to identify factors associated with PAD.

**Results:** A total of 471 patients were recruited. The mean age was 56 years and 32.3% were women. The prevalence of PAD was 11.7% (95% CI: 8.9-14.9%), and 92.7% of them were asymptomatic. Patients with PAD were slightly older than patients without PAD, suffered more often from diabetes, hypertension, lipid disorders, smoking, cerebrovascular event, and coronary artery disease.

**Conclusion:** Prevalence of and risk factors for PAD in Saudi Arabia seem to be higher. A nationwide screening program is needed to confirm these results.

*Saudi Med J 2007; Vol. 28 (3): 412-414*

*From the Division of Vascular Surgery (Al-Sheikh, Aljabri, Al-Salman, Al-Omran) and the Department of Family and Community Medicine (Al-Ansari, Al-Khayal), King Saud University, Riyadh, Kingdom of Saudi Arabia.*

*Received 10th September 2006. Accepted 12th November 2006.*

*Address correspondence and reprint request to: Dr. Mohammed Al-Omran, Division of Vascular Surgery, Department of Surgery, King Khalid University Hospital, PO Box 7805 (37), Riyadh 11472, Kingdom of Saudi Arabia. Tel. +966 (1) 4679097 Fax. +966 (1) 4679493. E-mail: m\_alomran@hotmail.com*

Peripheral arterial disease (PAD) is an arteriosclerotic occlusive disease of the aortoiliac, femoral, popliteal, and tibial arteries. Clinical manifestations of this disease typically begin with intermittent claudication (IC), and may progress in a small percentage of patients to disabling pain at rest, gangrene, and ultimately limb loss.<sup>1-3</sup> The risk factors for PAD are the same as those for atherosclerosis generally, and include male gender, advanced age, cigarette smoking, hypertension, diabetes, and hyperlipidemia.<sup>4,5</sup> The prevalence of IC varies from 0.4-14.4%.<sup>6-9</sup> This wide variation in prevalence can be explained by age, gender, and geographical location of the population studied and by the diagnostic technique used to identify patients with IC. Generally, patients with either symptomatic or asymptomatic PAD have widespread arterial disease, and therefore, at a significantly increased risk of stroke, myocardial infarction, and cardiovascular death.<sup>10</sup> Moreover, patients with PAD have a 6-fold increased risk of cardiovascular disease mortality compared to patients without PAD.<sup>11</sup> Although, the adverse outcomes for patients with PAD are well-documented, the awareness of this information among physicians, patients, and decision makers are felt to be low. This had led a group of experts to advocate for creation of an international PAD public awareness program in order to improve cardiovascular health. This program includes screening, prevention, and treatment measures.<sup>12</sup> Limited population-based data are available on the prevalence of and risk factors for PAD in Saudi Arabia.<sup>13</sup> Therefore, we sought to determine the prevalence of and risk factors for PAD in a pilot cross-sectional study in a primary care setting. Conducting such a study could act as

an impetus for establishing a broader picture on the widespread of PAD and the associated risk factors. Such information may help in decision making for the provision of vascular services and improve the adverse outcomes in these patients. In addition, it may serve as a basis for a nationwide screening program to determine the prevalence of and risk factors for PAD in Saudi Arabia.

**Methods.** We conducted a prospective cross-sectional study of consecutive Saudi patients aged  $\geq 45$  years, who attended at the King Khalid University Hospital's primary health care clinics over a period of 6 weeks (between February 2006 and March 2006) and were willing to participate in this study. A research resident for each patient filled a pre-designed questionnaire based on WHO/Rose questionnaire.<sup>14</sup> A Doppler test called Ankle-Brachial index (ABI) was performed for each patient. An ABI is a highly specific and sensitive test in diagnosing PAD.<sup>15,16</sup> In this test, the systolic blood pressure is measured at the brachial artery, dorsalis pedis artery, and posterior tibial artery, the ABI is calculated by dividing the higher systolic reading in the pedal artery (either posterior tibial or dorsalis pedis) over the brachial artery reading. Patients were considered of having PAD if the ABI was  $< 0.90$  and if the patient was having one of the following; 1. Previous history of leg arterial bypass for PAD indication. 2. Previous history of leg angioplasty for PAD indication. 3. Previous history of leg amputation for PAD indication. 4. A current leg rest pain secondary to PAD. 5. Current tissue loss (leg ulcer, gangrene) secondary to PAD. 6. Current intermittent claudication symptoms. Other variables of interest include hypertension, which was defined as systolic blood pressure of  $\geq 140$  mm Hg, diastolic blood pressure of  $\geq 90$  mm Hg, physician diagnosis, or medication use. Hypercholesterolemia was defined as a total cholesterol level  $\geq 240$  mg/dL, physician diagnosis, or medication use. Diabetes was defined as self-reported physician diagnosis, use of diabetes medication, fasting glucose of  $\geq 126$  mg/dL, or non-fasting glucose of  $\geq 200$  mg/dL. Patients acclaimed to have "borderline diabetes" or had a diagnosis of gestational diabetes were considered non-diabetic. A research resident in the interview filled information on age, gender, and smoking based on the (WHO/Rose) questionnaire. Smoking status was determined using answers to the questions, "Have you smoked cigarettes in your life?" and "Do you now smoke cigarettes?" Participants were also asked questions on their history of congestive heart disease, coexisting vascular disease: coronary artery disease (CAD), angina, previous myocardial infarction, percutaneous transfemoral angioplasty and previous coronary artery bypass graft. We also asked on cerebrovascular disease

(CVD); stroke, transient ischemic attack or previous carotid end arterectomy. Patients were also asked on chronic obstructive pulmonary disease and on chronic renal failure or insufficiency.

**Statistical analysis.** Prevalence was estimated with 95% confidence intervals (CI 95%), and multivariable logistics regression analyses were performed to identify factors associated with PAD. Analyses were conducted with the use of Statistical Analysis System (SAS) software.

**Results.** A total of 471 patients voluntary participated. Their mean age was 56 years, and 32.3% were women. The prevalence of PAD was 11.7% (95% CI 8.9-14.9%), and 92.7% of them were asymptomatic. The prevalence increased with age and there was no difference in PAD prevalence observed between males and females. The prevalence of PAD among patients having cardiovascular disease (coronary heart disease, congestive heart failure, or a stroke) was 15.9%. Patients with PAD were slightly older than patients without PAD (mean age 57.5 versus 55.5  $p=0.12$ ). In our multivariable logistic regression analyses, we found that the prevalence of cardiovascular risk factors was higher among patients with PAD who suffered more often from diabetes, hypertension, lipid disorders, smoking, cerebrovascular event, and CAD (**Table 1**).

Patients having at least one of these cardiovascular disease risk factors were almost reaching 95%, and 69% had 2 or more risk factors. Cardiovascular diseases (CAD, congestive heart failure, or CVD, or both) were reported in 23.6% of persons with PAD.

**Discussion.** Although, PAD is a marker of advanced atherosclerosis with an elevated risk of cardiovascular mortality and morbidity,<sup>12</sup> limited population-based data are available on the prevalence of and risk factors for PAD in Saudi Arabia. In order to improve the outcomes in patients with PAD, first, we need to identify how large is the problem in the society. Then identify the gaps in delivering the

**Table 1** - Characteristics of patients with peripheral arterial disease (PAD) compared to patients without PAD.

	PAD %	Non-PAD %	Odds ratio	95% confidence interval
Diabetes Mellitus	78.2	47.6	4.1	2.1-8.3
Hypertension	61.8	46.1	1.2	0.83-1.8
Lipid disorders	56.4	48.8	1.1	0.56-1.50
Smoking	25.6	23.8	0.86	0.43-1.7
Coronary artery disease	16.4	12.1	1.3	0.60-2.9
Cerebrovascular disease	7.3	3.6	1.3	0.60-2.6

appropriate management by identifying the knowledge and treatment gaps in these high-risk patients. The identifications of these issues will help in providing the appropriate strategies to improve the adverse outcomes in these patients.

In this study, we undertake the first step by identifying how large is the problem. This study can give an idea on the estimates of PAD in Saudi Arabia's adult population. According to the Saudi census in 2001,<sup>17</sup> approximately 3,331,435 Saudis were >45 years; translating our estimated prevalence to this population will lead to an estimate of almost 390,000 adults (95% CI 296497-496383) aged ≥45 years who would be classified as having PAD. Therefore, PAD seems to be an important health issue in Saudi Arabia that needs to be addressed. If these patients are not identified and managed appropriately, early during their disease by controlling their risk factors, treat their local disease, and screen them for cardiac and carotid diseases, they will suffer from the adverse cardiovascular outcomes and we will have a great burden on the health care system.

The strength of this study include that population studied was on a primary care setting and it is the largest ever executed in Saudi Arabia. However, our findings must be interpreted in the context of data limitations. The prevalence of PAD in this study may overestimate the true prevalence in the population as it was carried out in a hospital based primary care center. The use of self-reported data for some risk factors could underestimate the prevalence, however, following up in the patient's files may overcome this limitation.

In conclusion, this study shows that PAD prevalence seems to be higher in the Saudi population; PAD is higher in older patients, smokers, and diabetics. Also, 95% of patients with PAD have at least one cardiovascular risk factor, and two-thirds has 2 risk factors. A nationwide screening program is needed to confirm these results and will help in the estimation of the burden of the disease in the general population.

## References

1. Reunanen A, Takkunen H, Aromaa A. Prevalence of intermittent claudication and its effect on mortality. *Acta Med Scand* 1982; 211: 249-256.
2. Hughson WG, Mann JI, Garrod A. Intermittent claudication: prevalence and risk factors. *Br Med J* 1978; 1: 1379-1381.
3. Imparato AM, Kim GE, Davidson T, Crowley JG. Intermittent claudication: its natural course. *Surgery* 1975; 78: 795-799.
4. Fowkes FG, Housley E, Riemersma RA, Macintyre CC, Cawood EH, Prescott RJ, et al. Smoking, lipids, glucose intolerance, and blood pressure as risk factors for peripheral atherosclerosis compared with ischemic heart disease in the Edinburgh Artery Study. *Am J Epidemiol* 1992; 135: 331-340.
5. Kannel WB, McGee DL. Update on some epidemiologic features of intermittent claudication: the Framingham Study. *J Am Geriatr Soc* 1985; 33: 13-18.
6. Criqui MH, Fronek A, Barrett-Connor E, Klauber MR, Gabriel S, Goodman D. The prevalence of peripheral arterial disease in a defined population. *Circulation* 1985; 71: 510-515.
7. Dormandy J, Mahir M, Ascady G, Balsano F, De Leeuw P, Blombery P, et al. Fate of the patient with chronic leg ischaemia. A review article. *J Cardiovasc Surg (Torino)* 1989; 30: 50-57.
8. Schroll M, Munck O. Estimation of peripheral arteriosclerotic disease by ankle blood pressure measurements in a population study of 60-year-old men and women. *J Chronic Dis* 1981; 34: 261-269.
9. Selvin E, Erlinger TP. Prevalence of and risk factors for peripheral arterial disease in the United States: results from the National Health and Nutrition Examination Survey, 1999-2000. *Circulation* 2004; 110: 738-743.
10. The TASC Working Group. Management of Peripheral Arterial Disease (PAD); Trans Atlantic Inter-Society Consensus (TASC). *J Vasc Surg* 2001; 31: S1-S288.
11. Criqui MH, Langer RD, Fronek A, Feigelson HS, Klauber MR, McCann TJ, et al. Mortality over a period of 10 years in patients with peripheral arterial disease. *N Engl J Med* 1992; 326: 381-386.
12. Hirsch AT, Gloviczki P, Drooz A, Lovell M, Creager MA. Mandate for creation of a national peripheral arterial disease public awareness program: an opportunity to improve cardiovascular health. *J Vasc Surg* 2004; 39: 474-481.
13. Al-Zahrani HA, Al-Bar HM, Bahnessi A, Abdulaal AA. The distribution of peripheral arterial disease in a defined population of elderly high-risk Saudi patients. *Int Angiol* 1997; 16: 123-128.
14. Leng GC, Fowkes FG. The Edinburgh Claudication Questionnaire: an improved version of the WHO/Rose Questionnaire for use in epidemiological surveys. *J Clin Epidemiol* 1992; 45: 1101-1109.
15. Feigelson HS, Criqui MH, Fronek A, Langer RD, Molgaard CA. Screening for peripheral arterial disease: the sensitivity, specificity, and predictive value of noninvasive tests in a defined population. *Am J Epidemiol* 1994; 140: 526-534.
16. Greenland P, Abrams J, Aurigemma GP, Bond MG, Clark LT, Criqui MH, et al. Prevention Conference V: Beyond secondary prevention: identifying the high-risk patient for primary prevention: noninvasive tests of atherosclerotic burden: Writing Group III. *Circulation* 2000; 101: 16-22.
17. World Health Organization. WHO Statistical Information System (WHOSIS). Available from: URL: [http://www3.who.int/whosis/life/life\\_tables/life\\_tables\\_process.cfm?path=whosis\\_bod,life,life\\_tables&language=english](http://www3.who.int/whosis/life/life_tables/life_tables_process.cfm?path=whosis_bod,life,life_tables&language=english). Accessed on 25 August 2006.