Journal of
Cardiology and Vascular Medicine

Research Open Access

Peripheral Arterial Disease (PAD) Prevalence and Incidence with Cardiovascular Risk Factors in the Rural Population of Gueoul (Senegal)

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Received Date: August 12, 2019 **Accepted Date:** October 14, 2019 **Published Date:** October 16, 2019

Citation: L P Thiombiano (2019) Peripheral Arterial Disease (PAD) Prevalence and Incidence with Cardiovascular Risk Factors in the Rural Population of Gueoul (Senegal). J Cardio Vasc Med 5: 1-8.

Abstract

Introduction

PAD is the third most frequent atheromatous disorder sharing the same risk of mortality with coronary artery disease and cerebrovascular disease [1]. It is often discovered at the stage of complication because underdiagnosed and its acute form represents an emergency quickly hindering the functional prognosis. The vital prognosis when it is hindered by its emboligenic and infectious complications. PAD is a narrowing of the caliber of the arteries towards the lower limbs leading to a loss of its hemodynamic load with or without clinical translation. His best indicator is a drop in the ankle-brachial index (ABI) [2]. ABI is a simple, inexpensive diagnostic technique for taking blood pressure to the upper and lower limbs and making the report. An ankle/arm blood pressure ratio of less than 0.9 indicates a PAD with a sensitivity of 95% and a specificity of approximately 100%, thus detecting a stenosis of more than 50%, which is objectified by angiography [3]. Its etiologies are those of coronary disease and thus easily related to cardiovascular risk factors [4, 5].

The objective of this study was to determine the prevalence of PAD in the rural population of Gueoul and to assess its frequency of association with cardiovascular risk factors.

Patients and Methods

We carried out a comprehensive observational, cross-sectional, descriptive study on Senegalese aged 35 years or more, residing in Gueoul for at least 06 months. The measurement of the ABI was systematically performed using a Diadop pocket Doppler and an arterial pressure cuff after marking of the humeral, posterior and pedal tibial arteries in a patient at rest after 10-15min. Other cardiovascular risk factors (hypertension, diabetes, tobacco, dyslipidemia) were systematically sought. The samples were taken after 12 hours of a diet.

Results

The diagnosis of PAD by the measurement of ABI was found in 28.6% of the cases with a mediacalcosis in 13% of the cases. It was associated with calf pain in 30% of cases. The ABI was low in our population without significant differences related to sex (28.3% of women vs 29.2% of men p = 0.7). We did not find any correlation between sedentary lifestyle and PAD (p = 0.31). The risk of PAD increased significantly with age regardless of gender with more than 50% low ABI after 85 years (p = 0.011). There was no significant positive correlation between smoking and the occurrence of PAD (40% vs 28.3% p = 0.053). Diabetics were more likely to have a normal or high ABI than with no significant difference (p = 0.68). Hypertension was more likely to have a PAD than normotensive, with no statistically significant difference (30.1% vs 27.2% p = 0.014). There was no significant correlation between obesity and a low ABI (p between 0.25 and 0.45). Dyslipidemia is taken in full by considering each component of the lipid balance did not influence the occurrence of a PAD.

Conclusion

In summary, the results of this survey, can make us say that cardiovascular risk factors are a worrying and worrying problem. However, despite its fundamental role in the genesis of atheroma, dyslipidemia does not increase the risk of a PDA. Its occurrence would then be linked to a constellation of cardiovascular risk factors (tobacco, age, hypertension…).

Keywords: Prevalence; Peripheral Arterial Disease (PAD); Ankle-Brachial Index (ABI); cardiovascular risk factors; Gueoul; Dakar; Senegal.

Introduction

Subclinical atherosclerosis makes it possible to better stratify the coronary risk, especially that of subjects at apparently intermediate risk [5]. The new markers of subclinical or silent atherosclerosis are intima-media thickening, peripheral carotid or arterial plaques, carotid calcifications and ankle-brachial index. In 2006 the High Authority of Health (HAS) defined it as "a narrowing of the size of the arteries for the lower limbs, which leads to a loss of hemodynamic load, with or without clinical translation, the best control of which is a fall in the ankle-brachial index (ABI<0 ,9) [6]. Its clinical manifestations are calf pain that limits the walking area and can lead to skin lesions. It is under-diagnosed with significant complications that interfere with functional and vital prognosis. Its acute form is a diagnostic emergency and its management is very expensive and often even impossible in our regions due to the lack of a technical platform. North American learned societies have collaborated to develop a guide to recommendations for PAD and have been recommending since 2011, to measure ABI in patients with suspected PAD [3].

To this end, a study was carried out among the population of the rural community of Guéoul, with the objective of:

- determine the prevalence of PAD
- provide a profile of subjects with low ABI
- to look for a relationship between PAD and other cardiovascular risk factors.

Patients and method

Our study took place in the rural community of Gueoul located in the Louga region and more precisely in the department of Kebemer in Senegal. It is an observational, cross-sectional, comprehensive descriptive study. It took place over a one-month period from 3 November to 3 December 2012 on Senegalese nationals who were 35 years old or older at the time of the survey and had been residing in Guéoul for at least 06 months.
The ABI was measured using a Diadop pocket Doppler and a blood pressure cuff after identifying the humeral, posterior tibial and pedal arteries in a resting subject after 10-15 minutes. An ankle/arm blood pressure ratio of less than 0.9 indicated a low ABI. The interrogation, clinical and paraclinical examinations looked for cardiovascular risk factors (hypertension, diabetes, tobacco, dyslipidemia, etc.). Samples were taken after 12 hours of fasting.

These biological data were analyzed using a BTS 350 spectrophotometer.

The data collected were entered using a questionnaire developed with the Epi Info 3.5 software. The analysis of the database was done using the Analysis module of the Epi info 3.5 software and then SPSS. The graphs were created using the Excel module of Microsoft Office 2007.

The bivariate analysis was done using Chi 2 tests for proportion comparisons. The difference was considered statistically significant for a threshold of 5%.

Results

General population characteristics and symptomatology: We measured the ABI on both sides. It was low in 28.6% (403/1411) of cases. Mediacalcosis was found in 13% of cases, i.e. 183 people, 56.6% of the ABI measurements were normal (Figure 1).

The ABI was low in 403 women or 28.3% and 105 men or 29.2% with an insignificant difference (p=0.7). Half of the subjects over 85 years of age had a low ABI compared to 26.7% before 45 years of age with a statistically significant difference (p=0.011) (Figure 2).

Localized calf pain was found in only 89 subjects (6%). It was associated with PAD in 30% of cases and without PAD in 69% of cases. The difference was not statistically significant (p= 0.7) PAD and cardiovascular risk factors" Among the 35 smokers, we found in Gueoul, only 14 had a POA, or 40% compared to 28.3% PAD without smoking. The difference was not statistically significant (p=0.053). 23.5% of diabetics had a low ABI and 29% of low ABI was found in non-diabetics with no significant difference (p=0.68). 30.1% of hypertensive patients had a low ABI and 27.2% of low ABI was found in normotensive subjects. The difference was not statistically significant (p=0.22). The different prevalence's of the PAD related to the cardiovascular risk factor is shown in Figure 3.

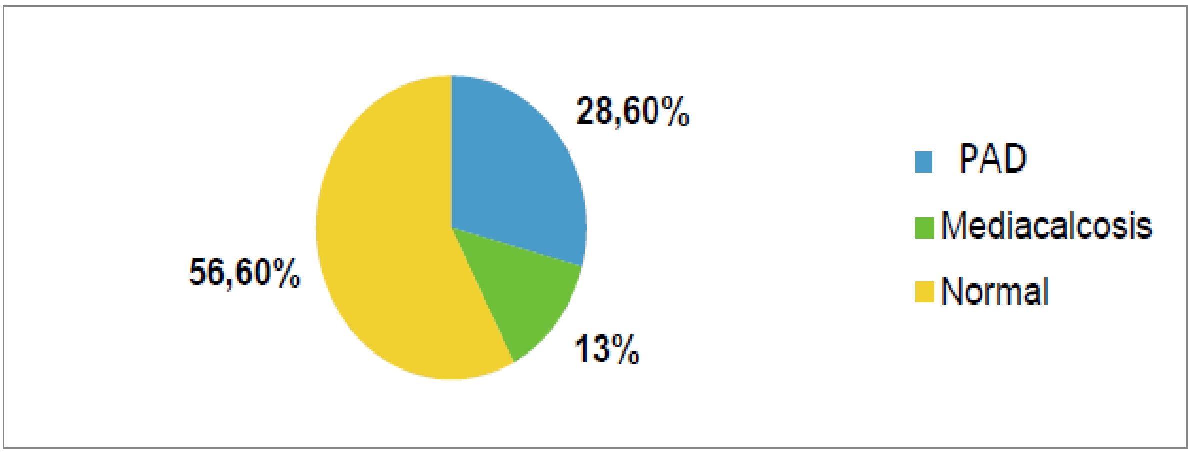

Figure 1: Prevalence of ABI anomalies

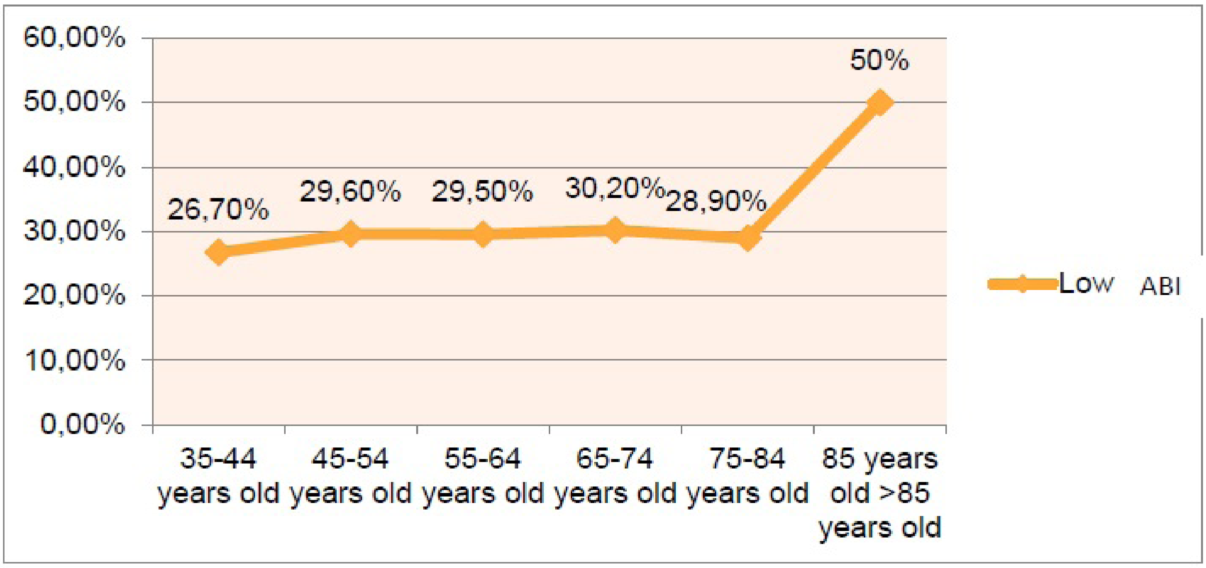

Figure 2: Prevalence of low ABI by age group

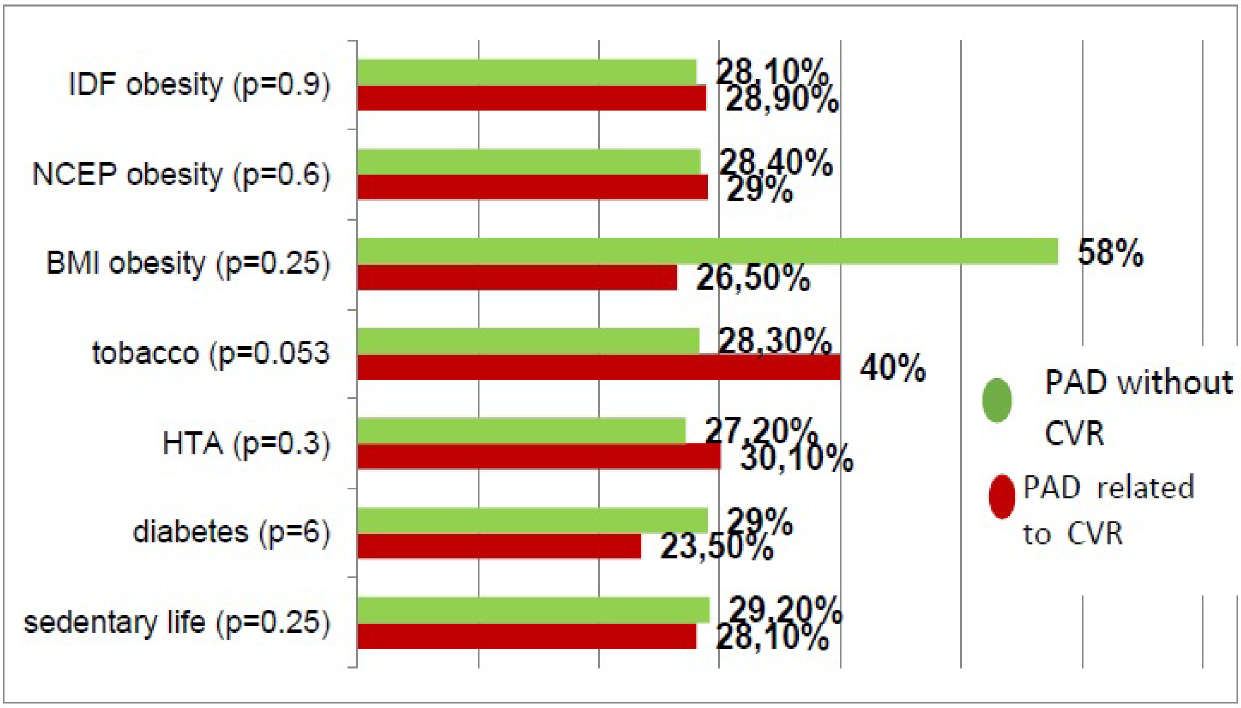

Figure 3: Correlation between PAD and cardiovascular risk factors

PAD and dyslipidemia: 61.3% (n=864) of the population had dyslipidemia; pure hypercholesterolemia was noted in half the population (n=705). Twenty (20) subjects (2.3%) were aware of their dyslipidemia. The screening rate was 59.8% (n=844). The most common type was hypoHDLemia (45.6%). Low ABI was slightly more frequent in individuals with dyslipidemia (29.8% versus 26.6%). The difference was not statistically significant (p=0.19). When we take subjects with total hypercholesterolemia (50%) we found 27.4% who had a low ABI versus 29.7% who had aPADwithout hypercholesterolemia (not significant difference: p=0.3). Among those with hypertriglyceridemia (2.8%), 28.2% had PAD compared to 28.6% without PAD with no statistically significant difference (p=0.9). 27.8% of hyper LDLemia had PADcompared to 28.9% of PADwith normal LDL. This was not statistically significant (p=0.7). Among the 45% of people with hypoHDLemia, 30.6% had PAD compared to 28.5% of PADwith normal HDL with no statistically significant difference (p=0.6).
Figure 4 shows the prevalence of PAD when it is associated or not with lipid abnormalities

Comment

Age and gender: PAD was less frequent in women (28.3%) than in men (29.2%) with no statistically significant difference (p=0.7) and corroborates most studies that regain male dominance. Indeed, in Senegal, Guene [7], and Gaye [4] regained a male predominance with a prevalence of 12.7% vs 11.8% and 33.33% vs 22.09% respectively.

In the literature, PAD is reported to affect men 1.3 times more often than women overall [10]. In arteriopathy patients, there is a male/female ratio between 1 and 2 and this increases to 3 for more advanced stages [10, 11].

The prevalence of PADincreases with age in both men and women. Among men under 50 years of age, the prevalence of intermittent claudication is about 1-2%, while among those over 50 years of age, the prevalence is 5%. A similar trend is observed among women [12]. The prevalence of low ABI is highest after 85 years (50%) with a statistically significant difference (p=0.011). Guene [7] found a linear relationship between the low ABI and the increase in age (p=0.0019) in Saint-Louis. Houenassi in Cotonou [13] also found a significant correlation between age and PADwith prevalence increasing from 25% before age 40 to 38% after age 60 (p=0.002). Our results are in complete agreement with those of the literature [8, 7, 13, 9].

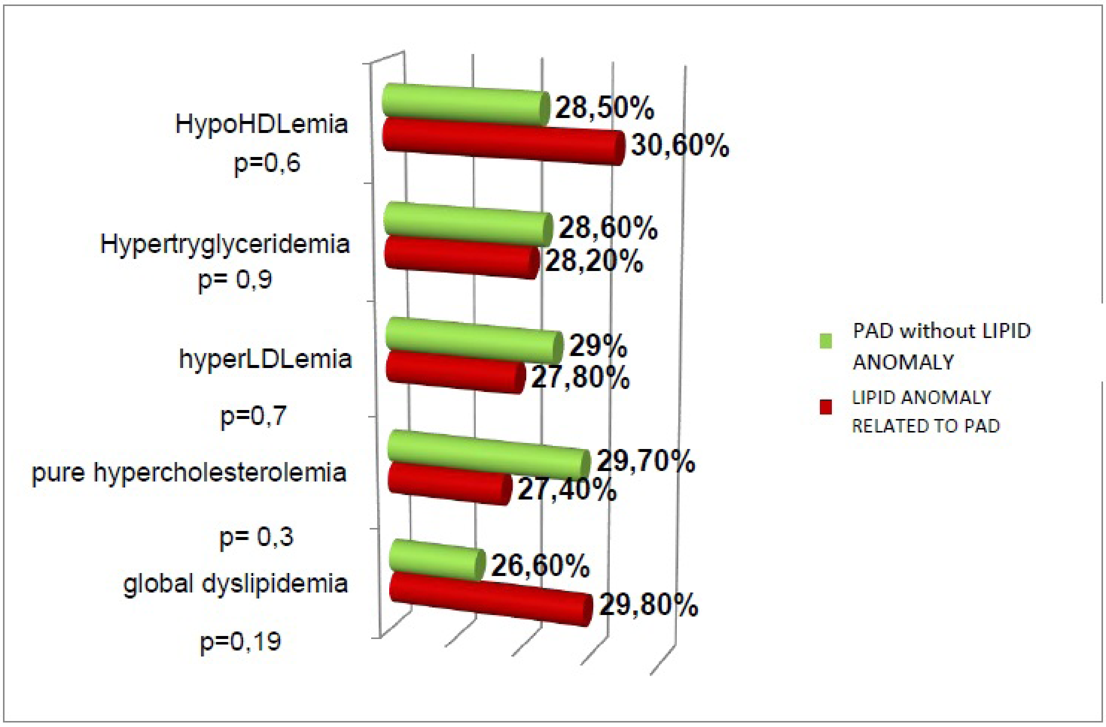

Figure 4: Prevalence of PAD when associated or not with lipid abnormalities

Dyslipidemia and low ankle-brachial index

In our study, 29.8% of low ABI was associated with dyslipidemia and 26.6% without lipid abnormalities with a statistically insignificant difference (p=0.19). A study conducted in Brazzaville in 2009[9] found a low ABI prevalence of 3.8% in subjects over 65 years of age with dyslipidemia. Our results agree with those in the literature [14, 15] and related to the role of cholesterol in the genesis of atheroma plaque. The statistically insignificant difference may be consistent with the findings of some studies that do not find a correlation between dyslipidemia and PAD [7,13].

In the total hypercholesterolemia population, 27.4% had a low ABI compared to 29.7% who had a PAD with normal total cholesterol without statistically significant difference (p=0.3). Our results are in contradiction with some studies [4]. Framingham's study found that a total cholesterol level > 2.7 g/l (7 mmol/L) doubles the incidence of intermittent claudication; the strongest predictor of POA is represented by the total cholesterol/HDL cholesterol ratio [16, 11]. The risk of developing the obstructive arterial disease of the lower limbs increases by about 5 to 10% for every 10 mg/dl increase in total cholesterol levels [17].

However, other studies have made the same observation as we have. Guene [7] found that the proportion of low ABI tended to decrease with total cholesterol level (12.8% for normal cholesterol and 11.8% for hypercholesterolemia). The difference was not statistically significant (p=0.26) Total hypercholesterolemia is, according to the literature, a risk factor to have a lower PAD than hypertension and diabetes [18, 2, 19].

Among those with hypertriglyceridemia (2.8%), 28.2% had PAD versus 28.6% without hypertriglyceridemia (p=0.9). There is no correlation between the increase in triglycerides and the occurrence of PAD.

This agrees with most studies [7]. AFSSAPS [6] pointed out in 2005 that hypertriglyceridemia was a lower risk factor for atherosclerosis. 27.8% of hyperLDLemia had PAD compared to 28.9% of PADwith normal LDL. This was not statistically significant (p=0.7). Guene [8] in Saint Louis made the same observation by finding that low ABI was more frequent in subjects with normal LDL cholesterol (12.5% versus 10.8%), with no statistically significant difference (p=0.25). Our results are in contradiction with most of the results in the literature [8]. Similarly, Whitehall and Speedwell Prospective Heart studies found a correlation between LDL cholesterol levels and the existence of PAD [3, 15].

Among the 45% of people with hypoHDLemia, 30.6% had PAD compared to 28.5% of PAD with normal HDL (p=0.6). We find a slight increase without significant difference in PAD related to hypoHDLemia. Epidemiological studies have also shown that HDL cholesterol levels are lower in patients with PAD compared to the control group [4, 20]. This is due to the protective role of HDL, which, when it is higher than 0.4 in humans, reduces the cardiovascular risk score by one point.

Smoking and PAD

The main risk factor for PAD is smoking, which increases its risk by a factor of 5. Framingham's study found that 78% of intermittent claudications were attributable to tobacco [16]. Diehm C. et al [21] estimated the prevalence of active smoking at 15.9% and former smoking at 42.9% among patients with PAD, compared to 7.9% and 35.3% among patients without PAD (p<0.001). Some studies have even found a smoking prevalence of more than 80% among patients with intermittent claudication [15]. In our study, there were very few active smokers, 2.5% (n=35) with a male prevalence (9.4%, vs. 0.2%, p=0.0001) consistent with the socio-cultural characteristics of sub-Saharan countries [22, 23, 24]. The 40% of these smokers had a PAD compared to 28.3% of PAD without tobacco (p=0.053). Also, in Senegal, Guene [8] found 16.7% of PAD associated with smoking compared to 13% without tobacco (p=0.07). All the authors agree that PAD is more related to tobacco than to lipid abnormalities, a relationship that is probably not statistically significant because of the low smoking rate generally found in Senegal[7, 25]. This low smoking rate could be explained by the predominance of women in our sample, by the habits of life still influenced by social morality and the Muslim religion.

Hypertension and PAD

We do not find a correlation between hypertension and PAD. Indeed, among the 46.4% of hypertensive patients, 30.1% had PAD compared to 27.2% of PAD without hypertension (p=0.22). This correlation was positive for the other studies conducted in Senegal [4, 9]. The Framingham study showed that the risk of intermittent claudication was multiplied by 2.5 in a hypertensive man and 3.9 in a hypertensive woman and that it was proportional to the severity of hypertension [21]. In Brazzaville, there was a 76.7% prevalence of POA related to hypertension [17].

Diabetes and PAD

All studies agree that diabetes significantly increases the risk of PAD. Norgreen et al [20] found intermittent claudication twice as frequent in diabetics as in non-diabetics, as did other authors [4, 9 14]. Newman A.B. et al [19] assessed the relative risk of PAD at 4.05 in diabetes (CI=95% [2.789-5.90], p<0.0001). In the *United Kingdom Prospective Diabetes Study* (*UKPDS*), Adler A.I. et al [26] showed that each 1% increase in glycated hemoglobin (HbA1c) was associated with a 28% increase in the risk of PAD.

In our study, we find the opposite: 23.2% of PADwere associated with diabetes and 29% without diabetes. We can mention as an explanation the limits of ABI measurement in case of the stiffness of the arterial wall and mediacalcosis. The latter is related to diabetes resulting in a falsely normal or high ABI. In these cases, an effort test or plethysmography is required to diagnose PAD.

Conclusion

PAD is a frequent, serious pathology and is often diagnosed at the complication stage. This is unfortunate considering that its diagnosis by ABI requires little equipment and is inexpensive. With this study, we want to popularize the measurement of ABI in our consultations and signal its necessity for any patient at risk in accordance with the 2011 recommendations [3].

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