

An Overview of Peripheral Artery Disease in the Elderly: A Study in a Tertiary Hospital Southern Nigeria

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Abstract

Background: The incidence of Peripheral Artery Disease (PAD), one of the manifestations of atherosclerosis, is increasing worldwide with significant effects on the quality of life. The disease is a strong prognostic marker for future cardiovascular events in people over 60 years, but relatively little is known about the condition among the elderly in sub-Saharan Africa. **Objective:** The objective of this study was to determine the prevalence and pattern of peripheral artery disease in elderly patients. **Materials and Methods:** A cross-sectional hospital-based study was carried out among elderly patients aged 60 years and above attending the Geriatric Clinic of the Department of Family Medicine of University of Benin Teaching Hospital, Edo State, Nigeria, from September to November 2017. Using systematic random sampling technique, 370 respondents were recruited from a sampling frame of 2160 respondents and a sampling fraction of 6. A structured questionnaire was administered to collect data on sociodemographic characteristics, lifestyle variable, and medical history. The ankle-brachial index (ABI) and toe-brachial index (TBI) were used to assess for PAD. The analysis was done using descriptive statistics. **Results:** The mean age was 69.3 ± 7 years comprising 76.5% females, 50% of the respondents were married, while 47% were widowed. The ABI showed 35.4% prevalence of PAD, while TBI for respondents with elevated ABI was 45.0%. **Conclusion:** The study showed a point prevalence of PAD to be 37.8%. From the total respondents, 45.7% had mild, while 2.9% had severe PAD. Routine screening for PAD is recommended for the early detection and management.

Keywords: Ankle brachial index, elderly, peripheral artery disease, toe brachial index

INTRODUCTION

Globally, 202 million people were reported to have peripheral artery disease in 2010.¹ About 69.7% of them were in low- and middle-income countries (LMIC), including 54.8 million in Southeast Asia and 45.9 million in the Western Pacific Region.¹ This number has increased by 28.7% in LMIC and 13.1% in high-income countries in the past decades.¹ A South African study on respondents with an average age of 62 years revealed a prevalence of 29.3%.¹ This shows there is a higher prevalence of PAD in countries with lower per-capital income and also among geriatric persons.²

The prevalence of PAD according to the previous studies done in Nigeria ranges from 25% to 40%.³⁻⁵ However, majority of these studies were carried out on adult respondents without focusing on the elderly.

Thus, it is important that PAD be screened in the elderly, especially given their predisposition to it. The aim of this study was to determine the prevalence and pattern of peripheral

artery disease in elderly patients attending a tertiary hospital in Nigeria so as to enhance its screening among the elderly and prevent complications such as rest pain, trophic ulcers, critical limb ischemia, and autoamputation.

MATERIALS AND METHODS

Study area

The study was carried out in the General Practice Clinic of University of Benin Teaching Hospital (UBTH), Benin City, Nigeria. The facility, which was established in 1973, is an 800-bedded federal government tertiary hospital with 60%–80% occupancy rate that offers both inpatient and outpatient services.⁶

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It receives referrals from five neighboring states such as Ondo, Delta, Bayelsa, Anambra, and Kogi States. The clinic is managed by the department of family medicine as an outpatient clinic. On average, 180 elderly patients are seen weekly, contributing to 24% of the total population of attending patients seen weekly.

Subject recruitment

The subjects recruited for the study were aged 60 years and above.⁷ Recruitment was done from September to November 2017. Their primary reasons for coming to the hospital were addressed before the recruitment. Patients previously diagnosed with PAD were excluded from the study.

Study design and protocols

Respondents were interviewed to obtain information on their demographic data such as age, gender, smoking, and alcohol intake. Anthropometric measurement was done using requisite equipment. Measurement of blood pressure: An Accosson[®] mercury sphygmomanometer was used in measuring the brachial and ankle blood pressure of each respondent. Measurement of the ankle-brachial index (ABI) was done using a handheld Doppler (Hadeco Smartdop 45, made in Japan). A handheld Doppler (Hadeco Smartdop 45, made in Japan) with its photoplethysmograph probe was used in measuring the toe-brachial index (TBI).

The body mass index (BMI) was calculated using the formula:

$BMI = \frac{W}{H^2}$. where W is the weight in kg and H is the height in m. The unit is kg/m².

Sample size determination

The sample size was calculated using the appropriate statistical formula for a cross-sectional study: $n = z^2pq/d^2$ where n = the desired sample size, z = standard normal deviate, sets at 1.96 which corresponds to 95% confidence level. P = the prevalence of peripheral artery disease in the elderly in a study done in South West Nigeria was 38.2%³, $q = 1 - p$.

d = degree of precision = 5% = 0.05, $q = 1 - p$, d = degree of precision = 5% = 0.05

$$n = \frac{(1.96)^2 \times 0.382 \times 0.618}{(0.05)^2} = 362.8 \approx 363.$$

Thus, the minimum sample size for this study was 363 participants. A total of 370 participants were recruited to make it a round figure.

Ethical consideration

Ethical clearance with a protocol number ADM/E22/A/VOL. VII/1460 was obtained from the Ethical Committee of UBTH. All participants were educated on the purpose and benefits of the study before recruitment. Their participation in the study was totally voluntary and unwillingness to participate was without prejudice. Their confidentiality was ensured as no name was included in the questionnaire. The hardware for the storage of data was passworded to prevent unauthorized access. Written informed consent was obtained from each participant.

Data analysis

The data were recorded in a data spreadsheet on the Statistical Package for Social Sciences Version 21.0, International Business Machines (IBM), Chicago, IL, USA. Categorical variables such as gender and marital status were summarized using frequencies and percentages. Numerical data such as age, duration of hypertension, diabetes, and smoking were represented using mean and standard deviation (SD) if normally distributed, while the median and range were used for data that were not normally distributed.

The Chi-square test was used to determine the statistical association between categorical variables (Fisher's exact test was used when >20% cells had an expected frequency of <5) and $P < 0.05$ indicated statistical significance.

RESULTS

The mean age of the respondents was 69.3 ± 7.4 years SD and 29.2% of them were of age range 65–69 years constituting the highest frequency [Table 1]. Most of the respondents (76.5%) were female and 50% of the total respondents were married. The highest proportion of total respondents (42.2%) had primary education. Majority of the total respondents were Christians (97.3%) and the predominant ethnic group was Benin (68.9%) [Table 1].

The association of age and marital status with PAD was not statistically significant ($P = 0.348$, $P = 0.592$), while the association of gender and educational level with PAD was statistically significant ($P = 0.045$, $P = 0.010$) [Table 2].

Furthermore, the prevalence of PAD using ABI alone was 35.4% excluding those with calcification. When those with calcification and PAD as determined by TBI were added, the total prevalence became 37.8%. This represents the total prevalence of PAD [Table 3].

PAD was higher among respondents aged ≥ 80 years (50.0%) and in women with a prevalence of 40.6% [Table 4]. Respondents that were divorced had PAD prevalence of 50.0% and those with no formal education had a prevalence of 48.4% [Table 4].

Subsequently, the study revealed that 45.7% of the total respondents with PAD had a mild form of PAD. Only 2.9% of them had the severe form [Figure 1].

DISCUSSION

Peripheral arterial disease (PAD) reflects systemic atherosclerosis. The risk factors include age, diabetes, hypertension, obesity, smoking, and dyslipidemia.⁸⁻¹⁰ The prevalence of PAD may vary with age and method of diagnosis and possibly with the gender of the population studied.¹¹⁻¹³ The total number of respondents in this study was 370, out of which females constituted 76.5%. The preponderance of females may be due to the fact that females tend to have higher morbidity than males and they have a better health-seeking behavior.¹⁴⁻¹⁶ Furthermore, in this study, respondents <70 years constituted 58%, while those aged

Table 1: Sociodemographic characteristics of respondents (n=370)

Variables	Frequency, n (%)
Age (years)	
60-64	106 (28.6)
65-69	108 (29.2)
70-74	73 (19.7)
75-79	43 (11.6)
80 and above	40 (10.8)
Sex	
Male	87 (23.5)
Female	283 (76.5)
Marital status	
Married	185 (50.0)
Single	1 (0.3)
Divorced	2 (0.5)
Separated	8 (2.2)
Widower/widow	174 (47.0)
Educational status	
None	126 (34.1)
Primary	156 (42.2)
Secondary	33 (8.9)
Tertiary	55 (14.9)
Religion	
Christianity	360 (97.3)
Islam	2 (0.5)
Traditionalist	8 (2.2)
Ethnicity	
Bini	255 (68.9)
Ishan	44 (11.9)
Etsako/owan	14 (3.8)
Igbo	22 (5.9)
Yoruba	2 (0.5)
Hausa	1 (0.3)
Urhobo/Isoko/Ijaw	23 (6.2)
Ika/Kwale	9 (2.4)

70 years and above were 42%. The finding of a reduction in the proportion of participants aged 70 years and above possibly reflects the higher mortality rates at older ages, with fewer individuals aged 70 years and above less likely to be alive and present in hospital for medical care. In developing countries such as Nigeria, the relatively low life expectancy (53.4 years) could explain this observed trend in the pattern of age distribution.¹⁷ This has been similarly reported in other studies among the elderly.^{15,16} Most of the respondents had only primary level of education. About a third of the respondents had no formal education. Yet, education is a key variable in the adoption of healthy lifestyle behaviors and utilization of health-care services. The proportion of participants who reported that they ever smoked in this study was 1.4%. This was in line with the low smoking prevalence in the Nigerian population.¹⁸ The study indicated a history of alcohol use in 11% of the participants. This was lower than those found in previous similar studies.^{18,19}

The lower proportion reporting alcohol use found in this study could be due to social desirability where individuals

may less likely report alcohol use in the hospital setting so as to appear to be living healthy. In this study, the prevalence of PAD was higher among females and those with no formal education. The higher prevalence among women could be due to a combination of hormonal differences between males and females and a higher risk of cardiovascular risk factors such as sedentary lifestyle, high fat diet, and higher lipid levels.²⁰

The higher PAD among women has also been reported by Subramaniam *et al.*¹² and Desormais *et al.*²¹ However, Ishida *et al.*, in Japan, and Kumar *et al.*, in South Africa, found a lower prevalence in women.^{11,22} By contrast, Weragoda *et al.* and He *et al.* found no significant difference between males and females.^{23,24} In this study, there was significant association between PAD and age, and the highest proportion with PAD was found among those aged 80 years and above. This is similar to other studies which found that PAD significantly increases with age.^{1,25} The prevalence of PAD in this study was 37.8%, of which 2.9% of the respondents had severe PAD, 45.0% moderate PAD, and 45.7% mild PAD, while 6.4% had calcification. The PAD prevalence in this study was higher than what was reported in the previous studies.^{25,26} The proportion with PAD (mild, moderate, or severe) in the present study was higher than the figures from other African countries where PAD was found in less than a third of the participants. A recent systematic review of PAD reported a prevalence of 3.1%–24% among adults aged 50 years and above.²⁶ Desormais *et al.* reported a prevalence of 14.8% among the elderly population in urban and rural populations of Central Africa.²¹ The low prevalence in both studies could be attributed to the inclusion of younger age groups in their study population. In rural Ecuador, Del Brutto *et al.* in a community sample aged 40 years and above found a prevalence of PAD of 33%.²⁷ This is like the PAD prevalence of this study despite the inclusion of younger respondents. This could be ascribed to their lifestyle practices such as smoking, which was significantly higher than smoking prevalence in our study. In addition, several differences in the study design characteristics between this study and other studies could explain variations in the prevalence of PAD. For example, some studies were conducted in the community, while this present study was done in an outpatient hospital setting.

Limitations

This study is one of the very few that have been done to study PAD among the elderly in sub-Saharan Africa, especially without specific diseases such as diabetes or hypertension. Some of the observed limitations to the study are:

1. Some of the responses about behavior such as alcohol and tobacco use may be subject to social desirability bias and recall bias, as the elderly participants may not accurately remember some of the events that may have happened decades ago
2. The cross-sectional design was utilized in this study. Prospective longitudinal studies will be required to more accurately evaluate the association between PAD and sociodemographic characteristics
3. Selection bias could not be completely avoided because this study was conducted in a hospital setting and not in

Table 2: Relationship between sociodemographic characteristics and PAD in the study population

Variables	PAD			χ^2	P
	Absent (n=230), n (%)	Present (n=140), n (%)	Total (n=370), n (%)		
Age (years)				4.454	0.348
60-64	68 (64.2)	38 (35.8)	106 (100.0)		
65-69	73 (67.6)	35 (32.4)	108 (100.0)		
70-74	44 (60.3)	29 (39.7)	73 (100.0)		
75-79	25 (58.1)	18 (41.9)	43 (100.0)		
80 and above	20 (50.0)	20 (50.0)	40 (100.0)		
Sex				4.007	0.045*
Male	62 (71.3)	25 (28.7)	87 (100.0)		
Female	168 (59.4)	115 (40.6)	283 (100.0)		
Marital status				2.797	0.592
Married	120 (64.9)	65 (35.1)	185 (100.0)		
Single	1 (100.0)	0 (0.0)	1 (100.0)		
Divorced	1 (50.0)	1 (50.0)	2 (100.0)		
Separated	6 (75.0)	2 (25.0)	8 (100.0)		
Widow	102 (58.6)	72 (41.4)	174 (100.0)		
Educational status				11.433	0.010*
None	65 (51.6)	61 (48.4)	126 (100.0)		
Primary	101 (64.7)	55 (35.3)	156 (100.0)		
Secondary	26 (78.8)	7 (21.2)	33 (100.0)		
Tertiary	38 (69.1)	17 (30.9)	55 (100.0)		

*Statistically Significant. PAD - Peripheral artery disease

Table 3: Prevalence of peripheral artery disease using ankle-brachial index in the study population

	Frequency (%)
ABI	
Normal	219 (59.2)
PAD	131 (35.4)
Calcification	20 (5.4)
Total	370 (100.0)
TBI (n=20) (calcification)	
Normal	11 (55.0)
PAD	9 (45.0)
Total	20 (100.0)
Total ABI/TBI	
Normal	230 (62.2)
PAD	140 (37.8)
Total	370 (100.0)

ABI - Ankle-brachial index; PAD - Peripheral artery disease;

TBI - Toe-brachial index

the general public therefore unlikely for the study to be generalizable

- The study duration of 3 months was short; considering the logistics and financial constraint, it would have been more appropriate to conduct this study for a longer period.

Recommendations

- Physicians should have a higher index of suspicion when evaluating patients with low educational status and women, as this study showed a significantly higher risk of PAD among these groups of elderly subjects
- Further studies are required in the community settings,

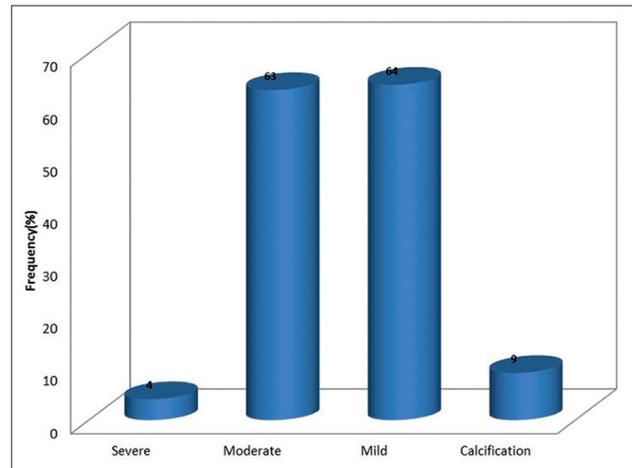


Figure 1: Pattern of ankle-brachial index among the respondents with PAD in the study population

including multicenter studies for more accurate estimations of PAD and to ensure greater generalizability of study results.

CONCLUSION

This study found a PAD prevalence of 37.8% with 45.7% of the respondents having mild PAD, 45% with mild PAD, while 2.9% had a severe form of PAD. The finding that over a third (37.8%) of the elderly participants had PAD underscores the importance of this condition among elderly participants attending the outpatient departments in Nigerian hospitals. Given that this sample was among elderly participants

Table 4: Prevalence of peripheral artery disease using sociodemographic variables of respondents

Variables	PAD		
	Absent (n=230), n (%)	Present (n=140), n (%)	Total (n=370), n (%)
Age (years)			
60-64	68 (64.2)	38 (35.8)	106 (100.0)
65-69	73 (67.6)	35 (32.4)	108 (100.0)
70-74	44 (60.3)	29 (39.7)	73 (100.0)
75-79	25 (58.1)	18 (41.9)	43 (100.0)
80 and above	20 (50.0)	20 (50.0)	40 (100.0)
Sex			
Male	62 (71.3)	25 (28.7)	87 (100.0)
Female	168 (59.4)	115 (40.6)	283 (100.0)
Marital status			
Married	120 (64.9)	65 (35.1)	185 (100.0)
Single	1 (100.0)	0 (0.0)	1 (100.0)
Divorced	1 (50.0)	1 (50.0)	2 (100.0)
Separated	6 (75.0)	2 (25.0)	8 (100.0)
Widow	102 (58.6)	72 (41.4)	174 (100.0)
Educational status			
None	65 (51.6)	61 (48.4)	126 (100.0)
Primary	101 (64.7)	55 (35.3)	156 (100.0)
Secondary	26 (78.8)	7 (21.2)	33 (100.0)
Tertiary	38 (69.1)	17 (30.9)	55 (100.0)
Religion			
Christianity	223 (61.9)	137 (38.1)	360 (100.0)
Islam	2 (100.0)	0 (0.0)	2 (100.0)
Traditionalist	5 (62.5)	3 (37.5)	8 (100.0)

PAD - Peripheral artery disease

attending the outpatient clinic for different conditions, the prevalence of PAD is likely to be higher among high-risk groups. Therefore, interventions aimed at prevention, early detection, and prompt management must be put in place at primary, secondary, and tertiary levels of healthcare.

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Conflicts of interest

There are no conflicts of interest.

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