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Original Article

Evaluation of Risk Factor in Iraqi Patients with Angiographically Documented Peripheral Vascular Disease and the Effect of Specific Risk Factor on Specific Site or Vessel

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Abstract

Introduction: The prevalence of lower extremity peripheral arterial disease (PAD) varies across populations, based on the groups studied and the detection methods used. Patients with PAD have significantly increased functional impairment and elevated rates of functional decline relative to those without PAD. **Objective:** This study was designed to determine the prevalence of risk factor in Iraqi patients with angiographically documented peripheral vascular disease (PVD) and effect of specific risk factor on specific vessel or area. **Materials and Methods:** In this case–control study from January 2010 to June 2011, 111 consecutive patients who attend care at the Iraqi center of heart disease with angiographically confirmed PVD were studied. They had clinical assessment including special documentation of risk factors. Luminal arterial narrowing of 50% or more is considered as a significant vascular lesion. **Results:** One hundred and eleven patients were included in this study, of whom 81 (73%) were male and 30 (27%) were female, with a mean age of 58.6 years. Of those patients, fifty-one had done coronary angiography. All the patients have significant PAD. Aging, gender, smoking, hypertension, diabetes mellitus, hyperlipidemia, and renal impairment are significantly associated risk factors for PAD. No statistically significant relation was found between specific risk factor and specific vessel involved. **Conclusion:** PVD prevalence increases with an increased number of risk factors. PVD prevalence increases with increased age. PVD was more prevalent in males. There was no relation between specific risk factors and specific anatomical area or vessel

Keywords: Angiographic, peripheral arterial disease, peripheral vascular disease, risk factor

Introduction

Peripheral arterial disease (PAD) generally refers to a disorder that obstructs the blood supply to the lower or upper extremities.[1]

PAD is commonly caused by atherosclerosis. It may also result from thrombosis, embolism, vasculitis, fibromuscular dysplasia, or entrapment. The term peripheral vascular disease (PVD) is less specific because it encompasses a group of diseases affecting blood vessels, including other atherosclerotic conditions such as renal artery disease and carotid artery disease, as well as vasculitides, vasospasm, venous thrombosis, venous insufficiency, and lymphatic disorders.

PAD correlates strongly with risk of major cardiovascular events, as it frequently associates with coronary and cerebral atherosclerosis.[2] Moreover, symptoms of PAD, including intermittent claudication, jeopardize the quality of life and independence for many patients. PAD is commonly underdiagnosed and undertreated.

The well-known modifiable risk factors associated with coronary atherosclerosis also contribute to atherosclerosis of the peripheral circulation.

Cigarette smoking, diabetes mellitus, dyslipidemia, and hypertension increase the risk of PAD.[3]

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Materials and Methods

In this case–control study from January 2010 to June 2011, 111 patients of different ages and sexes with angiographically documented chronic PVD and variable cardiovascular risk factor in two specialized centers (Iraqi center for cardiovascular disease and Babel center for cardiovascular disease) were studied for the prevalence of risk factor of PVD and the effect of specific factor on specific vessels.

Of the total number of patients, 51 of them had undergone coronary angiography to study the coexistent coronary artery disease (CAD) and the correlation between different risk factors and CAD.

All patients were subjected to:

Detailed history

- Age and occupation, in addition to that the patients were interrogated for their symptoms such as intermittent claudication, rest pain at night, paresthesia, and numbness
- Smoking status, presence of hypertension, diabetes, and hypercholesterolemia, and past medical history of ischemic heart disease, stroke, or TIA.

All these patients underwent detailed physical examination including body mass index (BMI), evidence of hypovascularity of lower (color changes, presence of gangrene and ulcer, hair loss, and brittle nail) and pulsation in femoral, popliteal, posterior tibial, and dorsalis pedis of both lower limbs. The ankle-brachial pressure index was then measured in both sides.

Laboratory investigation includes hemoglobin, blood sugar, blood urea, serum creatinine, lipid profile including total cholesterol and low-density lipoprotein, standard 12-lead resting electrocardiogram (ECG) (all ECGs were view for evidence of ischemia, infarction, or any abnormality), and Doppler study of the lower limb to all patients.

Exclusion criteria

1. Acute arterial thrombosis
2. Traumatic induce arterial obstruction
3. Embolic cause of arterial obstruction.

The findings in peripheral angiography were arranged in three classifications:

Anatomical classification

- lesion considers when more than 50% of luminal vessel diameter was involved, starting from abdominal aorta, common iliac artery (CIA), external iliac artery (EIA), common femoral artery, superficial femoral artery, popliteal artery, anterior tibial artery, popliteal artery, and posterior tibial artery
- Both in right and left sides.

Morphological stratification of iliac lesions

TASC type A iliac lesions:

1. Single stenosis <3 cm of the CIA or EIA (unilateral/bilateral)

TASC type B iliac lesions:

2. Single stenosis 3–10 cm in length, not extending into the common femoral artery (CFA)
3. Total of 2 stenoses <5 cm long in the CIA and/or EIA and not extending into the CFA
4. Unilateral CIA occlusion

TASC type C iliac lesions:

5. Bilateral 5- to 10-cm-long stenosis of the CIA and/or EIA, not extending into the CFA
6. Unilateral EIA occlusion not extending into the CFA
7. Unilateral EIA stenosis extending into the CFA
8. Bilateral CIA occlusion

TASC type D iliac lesions:

9. Diffuse, multiple unilateral stenoses involving the CIA, EIA, and CFA (usually more than 10 cm long)
10. Unilateral occlusion involving both the CIA and EIA
11. Bilateral EIA occlusions
12. Diffuse disease involving the aorta and both iliac arteries.
13. Iliac stenosis in a patient with an abdominal aortic aneurysm or other lesions requiring aortic or iliac surgery.

Morphological stratification of femoropopliteal lesions

TASC type A femoropopliteal lesions:

1. Single stenosis < 3 cm of the superficial femoral artery or popliteal artery

TASC type B femoropopliteal lesions:

2. Single stenosis 3–10 cm in length, not involving the distal popliteal artery
3. Heavily calcified stenosis up to 3 cm in length
4. Multiple lesions, each < 3 cm (stenosis or occlusions)
5. Single or multiple lesions in the absence of continuous tibial runoff to improve inflow for distal surgical bypass

TASC type C femoropopliteal lesions:

6. Single stenosis or occlusion longer than 5 cm
7. Multiple stenoses or occlusions, each 3–5 cm in length, with or without heavy calcification

TASC type D femoropopliteal lesions:

8. Complete common femoral artery or superficial femoral artery occlusions or complete popliteal and proximal trifurcation occlusions.

Classification according to the zone or area involved

- Upper zone Inflow disease refers to the presence of stenotic or occlusive lesions in the suprainguinal vessels, most commonly defined as the infrarenal aorta and iliac arteries
- Middle zone or outflow disease represents the presence of stenotic or occlusive lesions in the lower extremity arterial tree below the inguinal ligament from the common femoral artery to the level of the infrapopliteal trifurcation
- Lower zone or runoff disease is usually defined in the context of stenotic or occlusive lesions in the trifurcation vessels (anterior tibial, posterior tibial, and peroneal arteries) to the pedal arteries that cross the ankle.

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All this type of classification was chosen in order to show the effect of specific risk factor on specific vessel or area and to show the relation of risk factor to severity of vascular lesion.

Ethical consideration

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patients' verbal and analytical approval before the sample was taken. The study protocol and the subject information and consent form were reviewed and approved by a local ethics committee.

Statistical analysis

All data were coded and entered to the computer using the Statistical analysis was carried out using SPSS version 21 (SPSS, IBM Company, Chicago, IL 60606, USA).

Summarization of data was done using number, percentage, and mean ± standard deviation.

Association between different variables was measured using Chi-square test.

$P < 0.05$ was considered as a level of significance.

Results

During the study period, 111 patients with angiographically documented chronic PVD were studied. Eighty-one (73%) patients are male and 30 (27%) patients are female, with a mean age of 58.6 and a mean BMI of 25.

A number of smokers were 79 (71%) patients, diabetic patients were 61 (55%), hypertensive patients were 57 (51%), and patients with abnormal lipid profile were 47 (42%).

The study has shown that 84 (75%) patients have two or more risk factors, 24 (22%) patients have only one risk factor, and only 3 (2.7%) patients have no classical risk factor.

The distribution of PVD according to anatomical location showed that the most common arteries involved in the order of average frequency are the SFA (58% of the total patients), CIA (28.5%), PTA (28.5%), ATA (27%), POP (17%), CFA (16.5%), EEA (15.5%), and the least one the peroneal artery (13.5%) [Table 1].

Table 2 shows the distribution of PVD according to morphological stratification of iliac lesions. This indicates that in the order of frequency, TASK O is the most common, found in 57 patients (51%), followed by TASK 1 found in 19 patients (17%), TASK 4 seen in 14 patients (12%), TASK 2 in 11 patients (10%), and TASK 3 seen in 10 patients (9%).

Table 3 shows the distribution of PVD according to morphological stratification of femoropopliteal lesions in which TASK 4 is the most frequently seen in 48 patients (43%), followed by TASK 3 seen in 22 patients (20%), then TASK 0 seen in 18 patients (16%), then TASK 2 seen in 13 patients (12%), and finally, TASK 1 seen in 10 patients (9%).

This indicates that the severity of vascular lesion more in femoropopliteal area and less in the aortoiliac area.

Table 1: Distribution of peripheral vascular disease according to anatomical location

Peripheral angiography	*n* (%)
CIA-R	30 (27)
EIA-R	23 (20)
CFA-R	20 (18)
SFA-R	57 (51)
POP-R	22 (19)
ATA-R	32 (28)
PERON-R	12 (11)
PTA-R	33 (30)
CIA-L	33 (30)
EEA-L	12 (11)
CFA-L	17 (15)
SFA-L	59 (53)
POP-L	19 (17)
ATA-L	29 (26)
PERON-L	18 (16)
PTA-L	31 (27)

R: Right, L: Left, EIA-L: External Iliac Artery, PTA: Percutaneous transluminal angioplasty, CFA: Common femoral artery, ATA: Anterior tibial artery, CIA: Common iliac artery, SFA: Superficial femoral artery, PERON: Peroneal artery, POP: Popliteal artery

Table 2: Distribution of peripheral vascular disease according to morphological stratification of iliac lesions

AI TASK	*n* (%)
TASK 0	57 (51)
TASK 1	19 (17)
TASK 2	11 (10)
TASK 3	10 (9)
TASK 4	14 (12)

AI: Aortoiliac

Table 3: Distribution of peripheral vascular disease according to morphological stratification of femoropopliteal lesions

FP TASK	*n* (%)
TASK 0	18 (16)
TASK 1	10 (9)
TASK 2	13 (12)
TASK 3	22 (20)
TASK 4	48 (43)

FP: Femoropopliteal

The distribution of PVD according to zone involved showed that Zone 2 is the most common area involved (R Zone 2 = 72% and L Zone 2 = 64%), the second common area affected Zone 3 (R Zone 3 = 50% and L Zone 3 = 49%), and finally, Zone 1 is the least common area (R Zone 1 = 40% and L Zone 1 = 31%).

Table 4 demonstrates the anatomical distribution of PVD of the study groups according to gender; this shows that there was no statistically significant difference between males and females in different vessels in the lower limb.

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Table 4: Anatomical distribution of peripheral vascular disease of the study group according to gender

	Male, *n* (%)	Female, *n* (%)	*P*
CIA-R	25 (30)	5 (17)	0.102
EEA-R	20 (25)	3 (10)	0.7
CFA-R	17 (21)	3 (10)	0.144
SFA-R	41 (51)	16 (53)	0.48
POP-R	16 (20)	6 (20)	0.58
ATA-R	23 (28)	9 (30)	0.52
PERON-R	14 (17)	8 (27)	0.42
PTA-R	26 (32)	7 (23)	0.25
CIA-L	21 (26)	4 (13)	0.122
LEIA-L	10 (12)	2 (7)	0.31
CFA-L	12 (15)	5 (17)	0.5
SFA-L	44 (54)	15 (50)	0.42
POP-L	13 (16)	6 (20)	0.4
ATA-L	20 (25)	9 (30)	0.37
PERON-L	14 (17)	4 (13)	0.42
PTA-L	24 (30)	7 (23)	0.34

R: Right, L: Left, EIA-L: External Iliac Artery, PTA: Percutaneous transluminal angioplasty, CFA: Common femoral artery, ATA: Anterior tibial artery, CIA: Common iliac artery, SFA: Superficial femoral artery, PERON: Peroneal artery, POP: Popliteal artery

Table 5: Anatomical distribution of peripheral vascular disease of the study group according smoking state

Vessel	Number of smoker, *n* (%)	Number of nonsmoker, *n* (%)	*P*
CIA-R	22 (28)	8 (9)	0.48
EEA-R	20 (25)	3 (9)	0.48
CFA-R	13 (17)	7 (22)	0.33
SFA-R	43 (54)	14 (44)	0.20
POP-R	15 (19)	7 (22)	0.45
ATA-R	23 (29)	9 (28)	0.55
PERON-R	6 (8)	6 (19)	0.08
PTA-R	21 (21)	12 (36)	0.18
CIA-L	19 (24)	6 (19)	0.37
EEA-L	10 (13)	2 (6)	0.27
CFA-L	12 (15)	5 (16)	0.58
SFA-L	43 (54)	16 (50)	0.41
POP-L	12 (15)	7 (22)	0.28
ATA-L	18 (23)	11 (34)	0.15
PERON-L	15 (19)	3 (9)	0.17
PTA-L	22 (28)	9 (28)	0.58
Total number	79/111	32/111	

R: Right, L: Left, EIA-L: External Iliac Artery, PTA: Percutaneous transluminal angioplasty, CFA: Common femoral artery, ATA: Anterior tibial artery, CIA: Common iliac artery, SFA: Superficial femoral artery, PERON: Peroneal artery, POP: Popliteal artery

Table 5 shows the anatomical distribution of PVD of the study groups according to smoking. This shows that there is no statistically significant effect of smoking among the two groups regarding specific anatomical area of vessel affected in the lower limb.

Table 6 demonstrates the anatomical distribution of PVD of the study group according to diabetic state. They show that there is no statistically significant effect of diabetes among the two groups on the area of vessel or zone affected in the lower limb.

Table 7 demonstrates the anatomical distribution of PVD of the study group according to blood pressure, which shows that there is no statistically significant effect of increased blood pressure among the two groups on specific vessel affected.

Table 8 shows the anatomical distribution of PVD in the study group according to lipid profile. This table reveals that there is no statistically significant effect of abnormal lipid profile among the two groups on specific area of vessel affected in the lower limb.

Discussion

In this study, we found a direct relation between PVD and the number of risk factors as 75% of the patients have two or more risk factors.

In comparison with Framingham study,[4] our study results were comparable in that this disease is more predominant in males, with a male/female ratio of 4:1.

In this study, there is a tendency of PVD to occur in the elderly population (69% of the patients were above age 60 years and 28% of all samples were above 70 years) that documents PVD increase with aging. This results were in accordance with other studies like Miller *et al*.,[5] and almost on part with study done by Voget *et al*., who studied the lower extremity arterial disease and the aging process[6] which revealed that the prevalence of PVD rises with age.

Furthermore, our study results were similar to the result of Selvin and Erlinger,[7] in which that smoking is the most common prevalent modifiable risk factor for PVD (71% of the patients), diabetes mellitus (DM) is the second prevalent (55%), hormonal replacement therapy (HRT) is the third factor (42%), hyperlipidemia is the fourth factor (42%). And different from the work that was carried out by Al-Sheikh *et al*. in in Saudi Arabia who conducted a prospective cross-sectional study of Saudi patients aged > 45 years and concluded that the prevalence of risk factors for PAD in Saudi Arabia seems to be higher and show that DM is first frequent risk factor then hypertension, then lipid disorder and then smoking.[8]

This study showed that the most common arteries involved in the order of frequency were the SFA, CIA, PTA, ATA, POP, CFA, EEA, the least EEA, and peroneal artery.

Our study reals that in aortoiliac lesions, TASK O and TASK 1 are the more prevalent lesions in the aortoiliac vessels, whereas in femoropopliteal lesions, TASK 4 and TASK 3 are the most prevalent lesions. Another finding in our study reveals that Zone 2 is the most prevalent area, Zone 3 is the least prevalent area, and Zone 3 in between.

Furthermore, our study reveals that there is no relationship between specific site of PVD lesion and specific risk factors,

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Table 6: Anatomical distribution of peripheral vascular disease of the study group according to diabetic state

Vessel	Number of DM, *n* (%)	Number of non-DM, *n* (%)	*P*
CIA-R	16 (26)	14 (28)	0.5
EEA-R	12 (20)	11 (22)	0.47
CFA-R	11 (18)	9 (18)	0.6
SFA-R	34 (56)	23 (46)	0.2
POP-R	10 (16)	12 (24)	0.22
ATA-R	21 (34)	11 (22)	0.1
PERON-R	7 (12)	5 (10)	0.52
PTA-R	17 (28)	16 (32)	0.4
CIA-L	13 (21)	12 (24)	0.46
EEA-L	5 (8)	7 (14)	0.25
CFA-L	11 (18)	6 (12)	0.27
SFA-L	33 (54)	26 (52)	0.48
POP-L	10 (16)	9 (18)	0.5
ATA-L	15 (25)	14 (28)	0.42
PERON-L	8 (13)	10 (20)	0.24
PTA-L	18 (30)	13 (26)	0.42
Total number	61/111	50/111	

R: Right, L: Left, EIA-L: External Iliac Artery, PTA: Percutaneous transluminal angioplasty, CFA: Common femoral artery, ATA: Anterior tibial artery, CIA: Common iliac artery, SFA: Superficial femoral artery, PERON: Peroneal artery, POP: Popliteal artery, DM: Diabetes mellitus

Table 7: Anatomical distribution of peripheral vascular disease of the study group according to blood pressure

Vessel	Number of patients with HRT, *n* (%)	Number of patients without HRT, *n* (%)	*P*
CIA-R	14 (25)	16 (30)	0.35
EEA-R	9 (16)	14 (26)	0.139
CFA-R	10 (18)	10 (19)	0.54
SFA-R	31 (54)	26 (48)	0.32
POP-R	12 (21)	10 (19)	0.46
ATA-R	19 (33)	13 (24)	0.193
PERON-R	9 (16)	3 (6)	0.75
PTA-R	24 (42)	9 (17)	0.03
CIA-L	11 (19)	14 (26)	0.27
EEA-L	4 (7)	8 (15)	0.155
CFA-L	9 (16)	8 (15)	0.54
SFA-L	32 (56)	27 (50)	0.32
POP-L	9 (16)	10 (19)	0.49
ATA-L	16 (28)	13 (24)	0.4
PERON-L	9 (16)	9 (17)	0.55
PTA-L	16 (28)	15 (28)	0.57
Total number	57/111	54/111	

R: Right, L: Left, EIA-L: External Iliac Artery, PTA: Percutaneous transluminal angioplasty, CFA: Common femoral artery, ATA: Anterior tibial artery, CIA: Common iliac artery, SFA: Superficial femoral artery, PERON: Peroneal artery, POP: Popliteal artery, HRT: Hormone replacement therapy

namely gender, smoking, DM, HRT, and dyslipidemia, and to our knowledge, no worker has found such relationship.

Regarding patients with diabetes, our results were different from the study conducted by Wattanakit et al. who studied the

Table 8: Anatomical distribution of peripheral vascular disease in the study group according to lipid profile

Vessel	Number of patients with abnormal lipid profile, *n* (%)	Number of patients with normal lipid profile, *n* (%)	*P*
CIA-R	13 (28)	17 (26)	0.5
EEA-R	11 (23)	12 (19)	0.3
CFA-R	10 (21)	10 (16)	0.3
SFA-R	26 (55)	31 (48)	0.3
POP-R	8 (17)	14 (22)	0.35
ATA-R	12 (26)	20 (31)	0.3
PERON-R	5 (11)	7 (11)	0.6
PTA-R	14 (30)	19 (30)	0.6
CIA-L	11 (23)	14 (22)	0.5
EEA-L	4 (9)	8 (13)	0.4
CFA-L	7 (15)	10 (16)	0.6
SFA-L	23 (49)	36 (56)	0.28
POP-L	6 (13)	13 (20)	0.2
ATA-L	10 (21)	19 (30)	0.2
PERON-L	5 (11)	13 (20)	0.13
PTA-L	11 (23)	20 (31)	0.24
Total	47/111	46/111	

R: Right, L: Left, EIA-L: External Iliac Artery, PTA: Percutaneous transluminal angioplasty, CFA: Common femoral artery, ATA: Anterior tibial artery, CIA: Common iliac artery, SFA: Superficial femoral artery, PERON: Peroneal artery, POP: Popliteal artery

risk factors for peripheral arterial disease incidence in persons with diabetes[9] and they found that the involvement of the femoral and popliteal arteries resembles that of nondiabetic persons, but distal disease affecting the tibial and peroneal arteries occurs more frequently.

The explanation for this may be related to small sample volume with availability of multiple risk factors in our study.

Conclusion

PVD prevalence increases with an increased number of risk factors. PVD prevalence increases with increased age. PVD was more prevalent in males. There was no relation between specific risk factors and specific anatomical area or vessel.

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Conflicts of interest

There are no conflicts of interest.

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