Original Article

Association of Asymptomatic Coronary Heart Disease in Patients Presented with Peripheral Arterial Disease Undergoing Angiography

Asymptomatic Coronary Heart Disease with Peripheral Arterial Disease

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ABSTRACT

Objective: Association of coronary artery disease in peripheral artery disease patients.
Study Design: Retrospective observational study
Place and Duration of Study: This study was conducted at the Iraqi Center of Heart Disease, Iraq from 1st April 2024 to 31 March 2025.
Methods: This is a retrospective observational study, with 300 peripheral arterial disease patients with computerized tomography angiography and/or peripheral angiography at the Iraqi Center of Heart Disease, Iraq and none of them had any previous symptoms and/or had ever experienced coronary artery disease. Asymptomatic coronary artery disease was detected by means of comprehensive checks, such as electrocardiogram, echocardiography, and coronary angiography.
Results: The silent coronary artery disease was high with 72% of patients having peripheral arterial disease. Diabetes mellitus was also significantly correlated as 77.4% patients with coronary artery disease were asymptomatic (p= 0.008). Another highly predictive factor was reduced ejection fraction; 84.7% of ejection fraction less than 50% individuals had coronary artery disease (p=0.0001). Patients with coronary artery disease were more likely to develop lower limb peripheral arterial disease (83.2, p=0.0001). The age factor also predisposed the possibility of identifying asymptomatic coronary artery disease, and the risk was also elevating at a steady rate, 0.0512/year.
Conclusion: A significant load of asymptomatic coronary artery disease in peripheral arterial disease patients, including older people, diabetics and low-ejection-fraction. Cardiovascular screening should be a routine in this high-risk group in order to prevent the emergence of complications in the future and better the clinical outcomes.
Keywords: Peripheral arterial disease, Coronary heart disease, Angiography

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INTRODUCTION

The two related conditions discussed include peripheral arterial disease (PAD) and coronary heart disease (CHD), which are manifestations of the same systemic atherosclerosis that is a progressive vascular disorder with endothelial dysfunction, formation of plaque, and arterial constriction.

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Whereas PAD is mostly localized in the arteries that serve the limbs, and the majority of cases are lower extremity, CHD is located in the coronary arteries which serve the myocardium. Although the two conditions differ in terms of their anatomy, they both exhibit similarities in their risk factors, including diabetes, hypertension, dyslipidemia, aging, and smoking, which are characteristics of their underlying pathophysiological processes.[1,2]

Atherosclerosis may occur in any arterial bed with a result of inconsistent clinical manifestations of the obstruction location. PAD can be in the form of intermittent claudication, rest pain, or critical limb ischemia as a result of an inadequate supply of blood to the extremities. CHD on the contrary normally shows in the form of angina, myocardial infarction or sudden cardiac death. Nevertheless, a large number of people might have a prominent and undetected coronary artery disease (CHD) that poses a high risk upon the occurrence of the condition. The detection of CHD asymptomatic patients with PAD has been gaining

more importance, since this group of patients has been thought to have a substantially higher risk of occult coronary involvement.[3-5]

Computed tomography angiography (CTA) and peripheral angiography are commonly used to assess PAD as they offer a specific anatomical imaging of arterial structure and stenosis, along with the burden of plaque. Whereas these imaging modalities emphasize peripheral arteries, they can also emphasize on the level of systemic atherosclerosis and therefore further assessment of silent coronary disease is made where appropriate.[6,7] Various researchers have examined prevalence and predictors of asymptomatic CHD in PAD patients in modalities like coronary angiography and coronary CTA. These investigations substantially reveal that silent coronary artery involvement in the PAD populations is high, supporting the systemical aspect of atherosclerosis and utility of complete cardiovascular assessment in clinical practice.[8-11]

The stenosis of arteries and the elevated vulnerability of the cardiovascular system to cardiovascular events like myocardial infarction, stroke and ischemia of limbs can be explained by the fact that the deposition of lipids, cholesterol and inflammatory debris in the arterial walls triggers atherosclerosis.[12] CTA is one of the most important methods of imaging that provides non-invasive and high-resolution and 3D arterial imaging following contrast administration.[13,14] With this background, this study attempts to examine association between PAD, as confirmed by CTA and /or peripheral angiography, of upper or lower limbs, and asymptomatic coronary artery disease with the view of enhancing risk assessment and early detection among this high-risk group.

METHODS

The retrospective and observational study was carried out in the Iraqi Center of Heart Disease, Iraq from 1st April 2024 to 31 March 2025 vide letter No. 4545/QM/Approval/SJKDH379 dated 9th March, 2024. This research sought to explore the correlation between peripheral arterial disease (PAD) and the presence of asymptomatic coronary artery disease (CAD) in patients who had come to seek CT angiography and or peripheral angiography. It addressed the patients presenting with PAD to find out the prevalence of silent CAD in this group.

The patients with PAD chosen in the study were 300 patients that had CT or peripheral angiography of the lower or upper limbs. Of them, 62 were upper limb PAD and 238 were lower limb PAD. Clinical assessment was done elaborately to all patients and the risk factors that were included age, gender, smoking, hypertension, diabetes, dyslipidemia, and the family history of CAD. Cardiac abnormalities were detected by a 12-lead ECG, and cardiac structure and ejection fraction was determined by echocardiography. Asymptomatic CAD was identified through invasive coronary angiography where the lesions of the coronary arteries could be observed. Medical records with demographics, clinical and test results were used to obtain data that was accurate and confidential.

The analysis of the data was performed with the help of SPSS version 26. The t-test or ANOVA was used to assess the continuous variables, chi-square test was used to assess the categorical variables and multiple logistic regression was used to determine predictors of silent CAD as independent variables and significance was measured using $p<0.05$.

RESULTS

There were 62 (20.7%) patients presented with upper peripheral arterial disease, while significant majority of 238 (79.3%) patients were diagnosed with lower peripheral arterial disease.

Table No. 1: Demographic and clinical features of study population (n=300)

Variable	No.	%
Sex		
Male	192	64.0
Female	108	36.0
Diabetes		
No	114	38.0
Yes	186	62.0
Hypertension		
No	138	46.0
Yes	162	54.0
Smoking		
No	142	47.3
Yes	158	52.7
Arterial fibrillation		
No	159	53.0
Yes	141	47.0
Ejection Fraction ≥50		
No	150	50.0
Yes	150	50.0

The cohort that a higher prevalence of males (192,64%) compared to females (108, 36%). The mean age of the patients was 62.45 years with a standard deviation of 11.553 and an age range of 38 to 84 years. A significant portion of the population had diabetes (186, 62%), hypertension (162, 54%), and smoking history (158, 52.7%). Additionally, 141 patients (47%) had arterial fibrillation, and the ejection fraction was equally distributed among patients with values above and below 50% (150 patients each, 50%) [Table 1, Fig. 1).

Figure 2 reveals that out of 300 PAD patients, the majority of them 216 patients (72%) were found to have positive findings for coronary artery disease while 84 patients (28%) had negative findings. Figure 3 clearly show the difference in the prevalence of asymptomatic CAD between patients with lower limb

PAD and those with upper limb PAD showing a significant association between the limb affected by PAD and the likelihood of having asymptomatic CAD.

Table 2 illustrates the relationship between various demographic and clinical features and the presence of coronary artery disease (CAD) among the study population. The data reveals that there was no significant difference between males and females regarding both negative and positive CAD findings with a p value of 0.385. Diabetes was significantly associated with a higher prevalence of CAD, with 77.4% of diabetic patients showing positive CAD findings compared to 63.2% in non-diabetic patients (P=0.008). Hypertension, smoking, and arterial fibrillation did not show significant differences in CAD prevalence. However, ejection fraction was notably significant, with 84.7% of patients with an ejection fraction below 50% having positive CAD findings compared to 59.3% with an ejection fraction of 50% or higher (P=0.0001).

Table No. 2: Demographic features and their association with coronary artery disease

Variable		Coronary Artery Disease				P value
		Negative (n=84)		Positive (n=216)		
		No.	%	No.	%	
Sex	Male	57	29.7	135	70.3	0.385
	Female	27	25.0	81	75.0	
Diabetes	No	42	36.8	72	63.2	0.008
	Yes	42	22.6	144	77.4	
Hypertension	No	36	26.1	102	73.9	0.496
	Yes	48	29.6	114	70.4	
Smoking	No	37	26.1	105	73.9	0.477
	Yes	47	29.7	111	70.3	
Arterial fibrillation	No	46	28.9	113	71.1	0.703
	Yes	38	27.0	103	73.0	
Ejection fraction ≥50	No	23	15.3	127	84.7	0.0001
	Yes	61	40.7	89	59.3	

Table No. 3: Prevalence of peripheral artery disease in patients with and without coronary artery disease

Peripheral artery disease		Coronary artery disease				P value
		Negative (n=84)		Positive (216)		
		No.	%	No.	%	
PAD Limb	Upper	44	52.4	18	8.4	0.0001
	Lower	40	47.6	198	91.6	

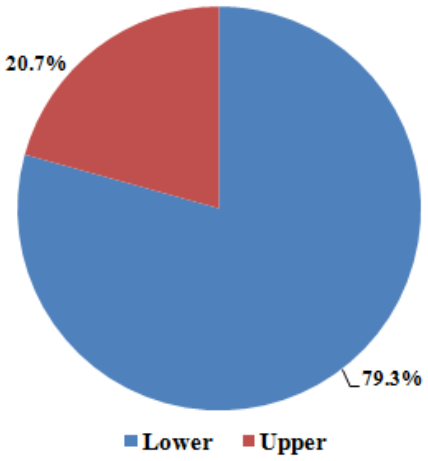

Figure No. 1: Distribution of peripheral arterial disease patients

Table 3 shows a significant difference, that lower limb PAD is much more prevalent in patients with CAD compared to those without CAD, where a super limb PAD is more common in patients without CAD.

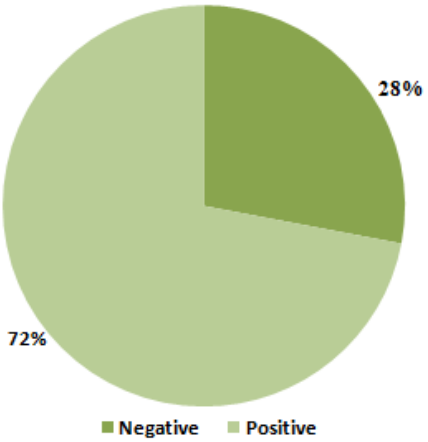

Figure No. 2: Prevalence of coronary artery disease

Among patients without CAD (CAD Negative, No=84), 71.0% have upper limb PAD and 16.8% have lower limb PAD. In contrast, among patients with CAD (CAD

Positive, No=216), only 29.0% have upper limb PAD, whereas a striking 83.2% have lower limb PAD. The p-value of 0.0001 indicates that these differences are statistically significant.

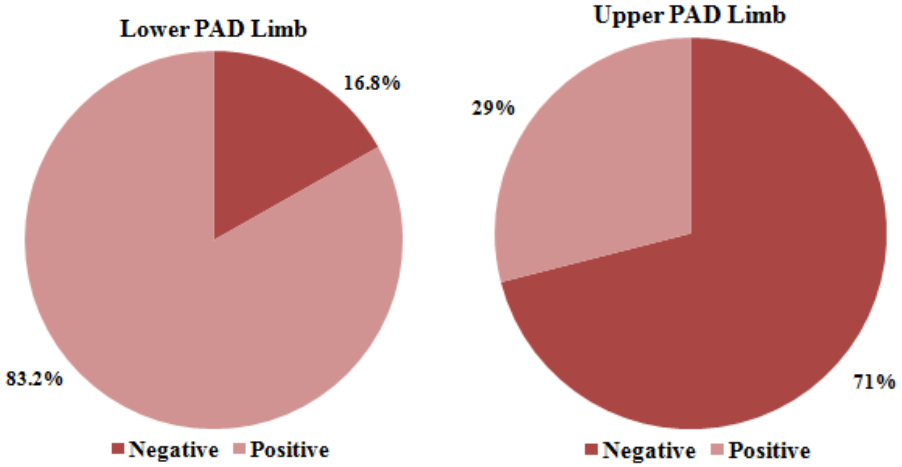

Figure No. 3: Proportion of a symptomatic CAD among PAD limbs

DISCUSSION

The current research examined the association between the peripheral arterial disease (PAD) location and the occurrence of an asymptomatic coronary artery disease (CAD). Good correlation was found, which demonstrates that lower limb PAD is highly associated with more silent CAD, and it proves the idea that atherosclerosis is a system disorder. Out of 300 patients, 79.3% were lower limb PAD and 20.7% were upper limb PAD. The prevalence of CAD in lower limb PAD patients (83.2) was significantly greater than upper limb PAD patients (29.0), showing that lower limb involvement is a more significant atherosclerotic burden systemically. Roy et al[15] also reported similar results when they found that in lower limb PAD, concurrent CAD was observed in 75.18 percent of cases and Mehta et al[16] found that in high-risk individuals, asymptomatic PAD was progressive. In addition, Saleh et al[17] and Hicks et al[18], too, provided the evidence of the close relation between PAD and either multi-vessel or severe CAD.

Aly et al[19] observed that PAD complication is similar to CAD in diabetic populations. There were also significant correlations between clinical parameters. Lower ejection fraction (EF less than 50) was linked to more prevalence of CAD (84.7%), as was the case with Liu et al[20], Trevisan et al[21], Sutton et al[22], and Gloria-Bottini et al[23], who all reported the prognostic value of EF in CAD. Another significant predictor was diabetes mellitus, as diabetics had high prevalence of CAD (77.4%), which is consistent with findings by Trevisan et al.[21] The age factor had a significant role with CAD-positive patients being older (around 70 years) and the prevalence of CAD progressively increasing with age. These findings are consistent with Madhavan et al[24] and Hosseini et al[25], who reported higher CAD occurrence in the geriatric populations. The results of the gender-based analysis demonstrated that there were similar tendencies in both male and female, which showed that the association between lower limb PAD and CAD is non-sex-specific. This result is confirmed by previous observations by Saleh et al[17], pathological reports by Narula et al[26], and clinical reports by Taimur et al[27], Manfrini et al[28] and Sharma et al.[29] Age and diabetes as independent predictors were found in multivariate analysis, as was also stated by Xu et al.[30] and Mousavinasab et al[31], whereas preserved EF (>50%) was correlated with good results, as it was claimed by DeVore et al.[32] The predictive implications in the study are in line with the proved models by Aerts et al[33] and advanced machine-learning by Chang et al.[34]

CONCLUSION

The presence of a great number of asymptomatic CAD in PAD patients especially lower limb PAD, and the necessity of thorough cardiovascular examinations to avoid complications. Age and ejection fraction are also important predictors where older age and low ejection favour the increased risk of CAD. The findings emphasize the relevance of specific interventions in older patients and individuals with impaired cardiac function to lessen the CAD burden and enhance the outcomes in this vulnerable segment of the population.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Hussein Nassir Hussein Al Okbi, Mazin Basil Alkarkhi
Drafting or Revising Critically:	Abdullah Hussein Nassir, Murtada Ali Jassim
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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