Original Article

Frequency of peripheral arterial disease in patients presenting with acute coronary syndrome at a tertiary care centre in Karachi

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Abstract

Objective: To determine the frequency of symptomatic and asymptomatic peripheral arterial disease (PAD) in patients presenting with acute coronary syndrome (ACS) at a tertiary care center in Karachi.

Methods: A total of 350 consecutive patients presenting with ACS were recruited in this cross-sectional study. All patients were enrolled from the emergency department of the National Institute of Cardiovascular Diseases (NICVD), Karachi.

Results: PAD, determined by presence of claudicant symptoms on interview and/or an ankle-brachial index (ABI) score less than 0.90, was present in 17.7% of patients, of whom 9.1% had no symptoms of intermittent claudication (IC) and 11.7% had no rest pain.

Conclusions: Concomitant PAD is frequent among ACS patients in our study. ABI screening is simple and yields a high proportion of patients with extensive atherosclerosis who may require more aggressive atherosclerosis risk management (JPMA 60:171; 2010).

Introduction

Peripheral Arterial Disease (PAD) refers to atherosclerotic and thromboembolic processes that affect the aorta, its visceral arterial branches and arteries of the lower extremities.[1] The evidence that both symptomatic and asymptomatic PAD represent an independent risk for cardiovascular morbidity and mortality[2] has triggered resurgence in epidemiological and clinical interest in PAD. The prevalence of coronary artery disease (CAD) is on the rise in the developing world including Pakistan. It is well established that a significant proportion of patients suffering from CAD also have underlying PAD. Approximately 30% of patients with CAD may have PAD as the only clinical manifestation of cardiovascular disease (CVD).[3] PAD is a systemic atherosclerotic process associated with high morbidity and mortality and significant impairment of quality of life, yet it remains under diagnosed and under treated.[4] Traditional risk factors for PAD are similar to those that lead to atherosclerosis in the carotid, coronary and other vascular beds. Patients with PAD are at increased risk of myocardial infarction or stroke since multiple vascular beds, beyond the extremities are likely to be affected by atherosclerosis.

For epidemiological purposes, the most useful noninvasive test to screen for PAD is the ankle-brachial index (ABI) measured by a hand-held Doppler probe. ABI is the ratio between systolic BP in the ankle and systolic BP in the arm.[5] The lower the ABI, the higher the prevalence of 3 or 4 vessel CAD and the lower the prevalence of 1 vessel CAD.[6] In clinical terms, PAD is evident as intermittent claudication (IC) which is defined as ischaemic pain in the calves or gluteal muscles which comes on walking and gets relieved with rest, and more advanced stages are considered as critical (lower) limb ischaemia. The normal value of the ABI ranges from 0.9 to 1.3. PAD is defined as an ABI of less than 0.9. There is a strong value of PAD for subsequent all-cause mortality, due to a sharply increased risk of CAD and cerebrovascular disease mortality. Notably, among PAD patients, lower ABI predicts greater mortality and cardiovascular morbidity.[7] Measurement of ABI is easy to perform, is inexpensive and has a high sensitivity and specificity for PAD. PAD carries a risk that is at least as high as stable angina pectoris. However, PAD is often under diagnosed and the risk underestimated by cardiologists. Measuring the ABI is a useful tool in this respect, helping physicians both in larger scale population studies as well as during consultation. Unfortunately, there is no available data from our country addressing this issue. The rationale of our study, therefore, was to look for PAD in patients presenting with CAD so that these patients are treated even more aggressively in order to achieve a significant morbidity and mortality reduction.

The primary objective of this study was to determine the frequency of peripheral arterial disease (PAD) in patients presenting with acute coronary syndrome (ACS), at a tertiary care centre in Karachi.

The secondary objective was to determine the association of PAD with different risk factors of coronary artery disease (CAD) like diabetes, hypertension (HTN), smoking and family history of CAD.

Patients and Methods

This study was conducted at the National Institute of

Cardiovascular diseases (NICVD), Karachi. Patients were enrolled from the emergency department of the NICVD. The duration of this study was 8 months.

It was a cross-sectional study and the calculated sample size 323. This was calculated by keeping the expected prevalence around 30% a figure identified in a previous study.[3] However, 27 more patients were registered in the specified study duration giving a final sample size of 350 patients.

Non probability, purposive sampling technique was used in patient selection. Only those patients, who currently presented with the diagnosis of acute coronary syndrome, were included in the study. The other inclusion criteria were:

Patients of either sex, between 30 and 80 years of age, with any of the following features:

Typical chest pain, with either ECG changes or positive biomarkers for AMI, Regional wall motion abnormality on Echocardiography, and Coronary artery stenosis seen on diagnostic LHC.

The exclusion criteria were:

Patients with chronic renal failure (CRF), Patients with angiographically proven normal epicardial coronary arteries, Patients with myocarditis, and Patients with sepsis.

Presence of ACS was defined as symptoms suggestive of ischaemia (central chest pain with or without radiation to left or right shoulder, accompanied by sweating and sensation of impending doom). The underlying pathophysiological diagnosis was confirmed by either ECG, Trop-I, Echo, CK-MB or diagnostic left heart catheterization (LHC).

Peripheral arterial disease was defined as atherosclerotic and thromboembolic processes that affect the aorta, its visceral arterial branches and arteries of the upper and lower extremities.[1] Clinically, it presents as intermittent claudication which is defined as pain in the legs that comes on walking and gets relieved after taking rest. This can progress to a stage when the blood vessel narrowing is so severe that there is pain even at rest. This stage is also known as critical limb ischaemia.

Acute coronary syndrome was taken as a unifying term representing a common end result; acute myocardial ischaemia, which is usually but not always caused by atherosclerotic plaque rupture, fissuring, erosion or a combination, with superimposed intracoronary thrombosis, and is associated with an increased risk of cardiac death and myonecrosis. It encompasses acute myocardial infarction resulting in ST elevated myocardial infarction (STEMI), non-ST elevated myocardial infarction (NSTEMI) in which the cardiac biomarkers (CK-MB or Troponin-I) are raised and unstable angina (UA) in which the cardiac biomarkers are not released into the blood.[8]

After taking an informed consent, patients were interviewed and examined by a physician and information regarding the demographics, comorbids, past history, family history and relevant clinical examination was collected and recorded in a proforma. Systolic blood pressures of both arms at the brachial arteries and both lower limbs at the dorsalis pedis arteries were taken with the help of sphygmomanometer

PROFORMA

- Name:
- Sex:
- Age:
- Address:
- Informed consent:
- Chest pain:
- Duration of chest pain:
- Intermittent claudication:
- Pain in the calves at rest:
- Hypertension:
- Diabetes:
- Smoking:
- Family history of coronary artery disease (cad):
- Past history of cad.
- Hyperlipidaemia:

Examination:

- Anaemia:
- Jaundice:
- Jugular venous pulse:
- Oedema:
- Pulse:
  - Rt. Radial:
  - Lt. Radial:
  - Rt. Brachial:
  - Lt. Brachial:
  - Rt. Femoral:
  - Lt. Femoral:
  - Rt. Popliteal:
  - Lt. Popliteal:
  - Rt. Dorsalis pedis:
  - Lt. Dorsalis pedis:
- Blood Pressure: (mm Hg)
  - Rt. Brachial:
  - Lt. Brachial:
  - Rt. Dorsalis pedis:
  - Lt. Dorsalis pedis:
- Ankle-Brachial Index (ABI):
  - Rt. Dorsalis Pedis Systolic BP/ RT. Brachial Sys. BP
  - Lt. Dorsalis Pedis Systolic BP/ LT. Brachial Sys. BP
- ABI = Higher of the above two readings.
- Heart sounds:
- Chest auscultation:
- ECG:
- CK-MB:
- TROP-I:
- ECHO:
- Coronary angiogram:
- LDL-C:
- HDL-C:
- TG:
- Total cholesterol:

and a hand-held Doppler probe and recorded in the proforma. The higher of the two systolic pressures recorded at the ankle was divided by the highest of the systolic pressures recorded in the arms to get the ankle-brachial index. Ankle-Brachial Index measurement was performed in these patients using the standard protocol, with the help of an ED80I Elite 200 Doppler with 8 MHz vascular probe.

All data was recorded in the proforma for statistical analysis. Discrete data was presented in percentages, whereas age and ABI of the patients was presented as mean ± SD. Chi square test was used to analyze the significant difference in the discrete data. P-value <0.05 was considered as statistically significant. SPSS version 15 was used for the data calculation and analysis.

Results

A total of 350 patients presenting with ACS were included in this study after obtaining informed consent. Out of 350 patients, 247 (70.6%) were males and 103 (29.4%) were females. All the patients were between 30 and 80 years of age. PAD was present in 62 (17.7%) patients. A total of 196 males and 92 females had ABIs >0.90, thereby, refuting the diagnosis of PAD. Among patients with an ABI of <0.90, 51 (14.6%) patients were male and 11 (3.1%) were female.

Table-1: Baseline Characteristics of Study Variables (n = 350).

Variables	n (n%)	Mean ± SD
Age	350	53 ± 10.2
ABI	350	1.03 ± 0.2
PAD (ABI <0.9)	62 (17.7%)	
Male	247 (70.6%)	
Female	103 (29.4%)	
Smoker	119 (34%)	
Tobacco Chewing	68 (19.4%)	
Diabetes Mellitus	120 (34.3%)	
Hypertension	202 (57.7%)	
Hyperlipidaemia	136 (38.9%)	
Family History of CAD	137 (39.1%)	
Intermittent Claudication	112 (32%)	
Rest Pain	38 (10.9%)	
STEMI	64 (18.3%)	
Unstable Angina (TROP-I Negative)	11 (3.1%)	
NSTEMI	275 (78.6%)	

Among patients of both the sexes with PAD, males had a statistically significant increased frequency of PAD over their female counterparts (p = 0.026). A total of 119 patients in this trial were smokers while 231 were non-smokers. PAD was present in 32 smokers (9.1%) and in 30 non-smokers (8.6%), while 87 smokers (24.9%) and 201 non-smokers (57.4%) had an ABI of >0.90. There was a statistically significant increase in the frequency of PAD among smokers as compared to non smokers (p = 0.001). Among the 120

Table-2: Comparison of study variables between patients with PAD and no PAD (n = 350).

Variables	PAD (ABI < 0.9) Yes n (n%)	PAD (ABI < 0.9) No n (n%)	P-value
Male	51 (14.6%)	196 (56%)	0.026
Female	11 (3.1%)	92 (26.3%)	
Smokers	32 (9.1%)	87 (24.9%)	0.001
DM	29 (8.3%)	91 (26%)	0.022
HTN	44 (12.6%)	158 (45.1%)	0.020
Hyperlipidaemia	21 (6%)	115 (32.9%)	NS
Family history of CAD	26 (7.4%)	111 (3.2%)	NS
Intermittent Claudication (I.C)	30 (8.6%)	82 (23.4%)	0.002
Rest Pain	21 (6%)	17 (4.9%)	<0.001
STEMI	15 (4.3%)	49 (14%)	NS
Unstable Angina (TROP-I Negative)	1 (0.3%)	10 (2.9%)	NS
NSTEMI	46 (13.1%)	229 (65.4%)	NS

Table-3: Comparison of Symptomatic and Asymptomatic Disease in patients who had PAD and who did not have PAD.

	PAD (ABI < 0.9) Yes	PAD (ABI < 0.9) No	P-value
Symptomatic (Intermittent Claudication + Rest Pain)	9 (2.6%)	4 (1.1%)	< 0.001
Asymptomatic (No IC & No RP)	20 (5.6%)	193 (55.1%)	< 0.001
Only Intermittent Claudication	21 (6%)	78 (22.3%)	NS
Only Rest Pain	12 (3.4%)	13 (3.7%)	< 0.001
Total	62 (17.7%)	288 (82.3%)	

patients with DM, 29 patients had an ABI of <0.90 while 33 of the total 230 non diabetics also had PAD. There was a statistically significant increase (p = 0.022) in PAD among the diabetics in this study. There were 202 hypertensive and 148 normotensive patients in this trial. PAD was present in 44 (12.6%) patients with HTN while 18 (5.1%) patients with normal blood pressures also had PAD. There was a statistically significant increase in the frequency of PAD (p-value= 0.020) among the hypertensive cohort with ACS. No significant association of PAD with hyperlipidaemia or family history of CAD was found in this study. No symptoms of intermittent claudication were found in 32 (9.1%), while 30 (8.6%) had symptoms of intermittent claudication with ABI of <0.90. Pain in the lower limbs at rest was present in 38 patients of which 21 (6%) had PAD while 41 (11.7%) asymptomatic patients also had an ABI of <0.90. The frequency of PAD was highest among the 51-60 years age group. Thirty six (10.3%) patients with no family history of CAD had PAD while 26 (7.4%) patients with family history of CAD had PAD. NSTEMI was the most common ACS presentation, followed by STEMI and UA.

Discussion

PAD was present in 17.7% of patients in this study which is a reasonably high percentage of the population at risk for adverse cardiovascular events. A similar study by Hasimu et al.

showed the prevalence of PAD at 25.4%.[9] Males had a higher frequency (14.6%) of PAD than females (3.1%), supporting the earlier publications. In our study, PAD was present in less than 18% of patients with CAD as shown in the earlier trial by Sukhija et al.[6] The ABI, as a marker of asymptomatic PAD, provides important information in respect to sub clinical atherosclerosis, as well as constituting an important predictor of cardiovascular events.[10] Moreover, in this study, ABI shows strong correlation between the established CAD risk factors such as smoking, hypertension and diabetes. The role of ABI in predicting cardiovascular outcomes in CAD adds support to the importance of using ABI as an independent predictor for assessing the risk for cardiovascular events. Our results agree with the data reported by Iglezias et al.[11] and Brevetti et al,[12] demonstrating a strong influence of cardiovascular risk factors in the development of atherosclerotic and coronary atherothrombotic phenomena. Lu et al,[13] demonstrated smoking as an important risk factor not only for CAD, but for PAD also. The results found in our study agree with published results as the frequency of smoking was greater both in individuals with CAD and in those with PAD. Our study shows that there is a strong association of PAD with systemic hypertension, and agrees with the data presented in the Framingham study.[14] Our study also showed a significant association between DM and PAD, agreeing with the prior publication by Murabito et al.[15] What is interesting is that more than half of patients with an abnormally decreased ABI do not have symptoms of PAD, a finding also noted in a previous study.[16] Yet a diagnosis of concomitant PAD is significant to the patient. According to another study, the combined risk of ischaemic stroke, MI or vascular death in patients with atherothrombotic involvement of two vascular beds was 25% higher than in patients with a single bed affected, and 51% higher in patients with involvement of three vascular beds compared with those with single bed disease.[17] Indeed, an abnormal ABI itself may serve as a prognostic tool. Leng and colleagues[18] found that in patients with an ABI of <0.90, the relative risk of non-fatal MI, stroke and cardiovascular death in five years post-baseline was 1.38, 1.98 and 1.85 respectively, compared with subjects in whom the ABI was >0.90. The CAPRIE investigators found a 10.2% increase in relative risk of cardiovascular events and deaths for every 0.1 decrease in ABI.[9] Since the ACEP Treatment panel 3 has classified PAD as a CAD equivalent, this subgroup of patients should be diagnosed and treated as early as possible.

Conclusion

This study concludes that a reduced ABI (<0.90) constitutes a possible marker of coronary artery disease in patients with a risk of atherosclerotic cardiovascular disease. Due to the high concomitance between PAD and coronary artery disease found in this study (17.7%), the importance of determining the ABI for coronary artery disease must be stressed. The number of study participants was small which may be responsible for the lower incidence of PAD. The study was conducted in one centre and the results cannot be generalized. Elderly patients above 70 years age were very few and the results of this group are inconclusive.

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