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Original Article

Prevalence and Stratification of Polyvascular Disease in Acute Myocardial Infarction Patients: A Cross-Sectional Study at Mayo Hospital, Lahore

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ABSTRACT

Polyvascular Disease, that encompasses peripheral artery disease and cerebrovascular disease, has gained prominence due to expanded clinical focus and research, primarily driven by its association with major adverse cardiovascular events (MACEs) like myocardial infarction, cardiovascular death, and ischemic stroke. **Objective:** To determine the patients of PVD in patients with acute myocardial infarction (AMI). **Methods:** A cross-sectional study was designed and conducted at Department of Cardiology, Mayo Hospital, Lahore. between August 3, 2022 and February 2, 2023. 183 patients with AMI of either gender, age above 25 years and up to 80 years were included. Data were analyzed statistically using SPSS version 25.0. **Results:** Our study reported PVD in 57.4% of the patients with AMI. According to the stratification of PVD with numerous variables, notable variations emerged concerning age and symptom duration ($p<0.05$), whereas gender, BMI, type of AMI, and socio-economic status showed insignificant differences. **Conclusions:** Our findings demonstrated that the PVD was highly prevalent among patients with AMI.

INTRODUCTION

Polyvascular Disease (PVD) is a widespread ailment that has gained attention due to the recent extension of clinical and research efforts to encompass non-coronary atherosclerosis, particularly peripheral artery disease (PAD) and cerebrovascular disease (CVD) [1, 2]. Major adverse cardiovascular events (MACEs), a composite end objective that includes myocardial infarction (MI), cardiovascular death, and ischemic stroke, are the main reasons why PVD is relevant [3]. Extracardiac vascular bed atherosclerotic involvement is common and is thought to be a sign of systemic atherosclerosis, which raises the risk of further ischemic episodes [4, 5]. Over years, atherosclerotic plaques progressively develop. The buildup of saturated fat and low-density lipoprotein cholesterol in the intima, or inner layer, of blood arteries is where they start [6]. Leukocyte adherence to endothelium, inflammation, and penetration into the intima, where they gather lipids and transform into foam cells, occur next. Rich

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sources of pro-inflammatory mediators can be found in foam cells. A fatty streak is the term for the lesion up to this point, which may be somewhat reversible. Smooth muscle cells migrate from the media throughout subsequent evolution, proliferate, and deposit extracellular matrix, which includes elastin fibres, interstitial collagen, and proteoglycans [7]. Apoptosis is seen in some of the smooth muscle cells in advanced plaques. As plaques progress, calcified patches frequently appear. The plaque first develops as the artery remodels itself from the outside in, then it encroaches on the arterial lumen [8]. Angina can eventually result from the stenosis's ability to restrict flow in situations of elevated demand. Previous research has demonstrated that after an acute MI, NSTEMI patients with PVD have worse in-hospital outcomes [9, 10]. In addition, there seems to be a risk gradient according to the number of impacted arterial beds. Patients who have atherosclerotic involvement in all three arterial beds are at a higher risk than those who only have involvement in two of the beds, while those who only have coronary bed involvement are at the lowest risk [8]. A study found that 25.34% of individuals with acute myocardial infarction (AMI) had PVD [11]. Previous literature reports that only 5.6% of individuals with AMI had PVD [12]. Bhatt *et al.*, reported that 65.5% of patients with AMI had PVD [13]. According to the study performed by Jönelid *et al.*, 13.8% of patients with AMI had PVD [14]. Despite the fact that many research have been conducted globally, there is variation in the findings that are published. The present study was conducted to determine the frequency of PVD in patients presenting with AMI.

METHODS

A cross-sectional study was designed and conducted at Department of Cardiology, Mayo Hospital, Lahore from August 3, 2022 to February 2, 2023. Non-probability consecutive sampling was done. Sample size of 183 was calculated using the WHO sample size calculator using confidence level (1-α) as 95% with absolute precision (d) as 5% and anticipated population proportion (P) as 13.8%.14 Patients of either gender, age above 25 years and up to 80 years, patients with acute myocardial infraction were included. Patients who suffered from sensory aphasia, GCS < 10/15, cardiogenic shock requiring inotropic supports, had a history of previously IHD and any cardiac intervention/CABG/Valve replacement were excluded from the study. After taking permission from the hospital's Ethical Committee, this study was conducted at the Cardiology Department. After informed written consent, all 183 patients were admitted to the Cardiology Ward with acute myocardial infraction on the basis of the clinical and ECG as in operational definition underwent detailed history and examination. Demographic features recorded; included age and gender. PVD was assessed as per operational definition. Conorary Artery Disease (CAD) was labeled as >50% reduction in coronary lumen seen during angiography. Normal ABI values are between 1.00 and 1.40. Abnormal ABI values are 0.90 or less and Peripheral Arterial Disease (PAD) was labelled. The patients were considered having extra-cranial carotid artery if peak systolic velocity (PSV) ≥2.3 m/s and internal carotid to common carotid artery (IC/CC) systolic ratio was more than 4 assessed on Doppler ultrasound. Data were entered and analyzed using SPSS version 25.0. Mean and standard deviation was calculated for quantitative variable like age, duration of AMI and BMI. Frequencies and percentages were calculated for qualitative variables like gender, socio-economic status, type of AMI and PVD. Effect modifiers like gender, age, BMI, socio-economic status, type of AMI and duration of myocardial infraction were studied. Post-stratification, Chi-square test was applied taking p-value ≤0.05 as significant.

RESULTS

In this study, 183 patients with AMI were enrolled. Among these patients, 110(60.1%) were males, while 73(39.9%) were females. Age range in this study was from 25 to 80 years with mean age of 49.19±13.221 years. Majority of the patients 104(56.8%) had ages between 51-80 years, while 79(43.2%) patients had ages between 25-50 years. Mean BMI of patients was 28.6±5.74 kg/m2. Among patients, 56(30.6%) had normal BMI, while 98(53.6%) and 29(15.8%) were overweight and obese respectively. According to type of AMI distribution, 85(46.4%) had STEMI and 98(53.6%) patients had NSTEMI. Mean duration of symptoms was 13.4±2.5 hours. According to duration of symptoms distribution, 58(31.7%) had symptoms for ≤10 hours, while 125(68.3%) had for >10 hours. According to socio-economic status distribution, 68(37.2%) had normal BMI, while 64(35.0%) and 51(27.9%) patients had middle and high incomes respectively. Frequency distribution of these variables is described in Table 1.

Table 1: Frequency of the Demographic Variables for Sample Population (N=183)

Demographic variables	Frequency (%)
Gender	
Male	110 (60.1)
Female	73 (39.9)
Age groups	
25-50 years	79 (43.2)
51-80 years	104 (56.8)

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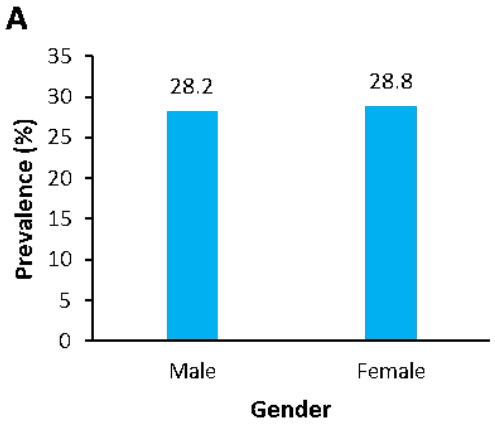
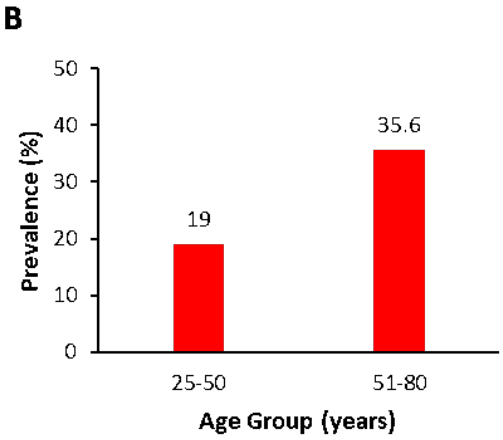
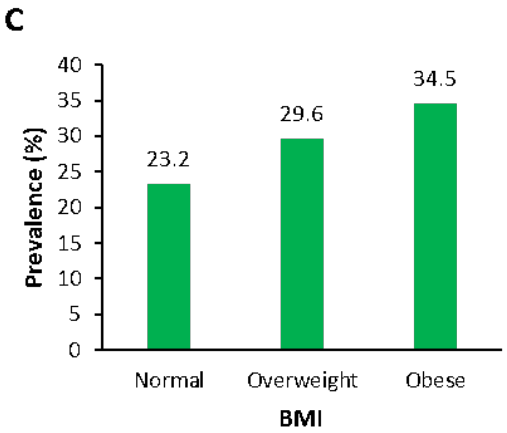
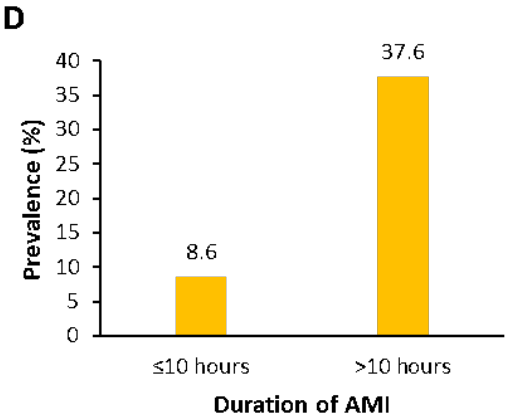
Body mass index	
Normal	56 (30.6)
Overweight	98 (53.6)
Obese	29 (15.8)
Type of AMI	
STEMI	85 (46.4)
NSTEMI	98 (53.6)
Duration of AMI	
≤10 hours	58 (31.7)
>10 hours	125 (68.3)
Socio-economic status	
Low	68 (37.2)
Middle	64 (35.0)
High	51 (27.8)
Poly-vascular disease	
Yes	52 (28.4)
No	131 (71.6)

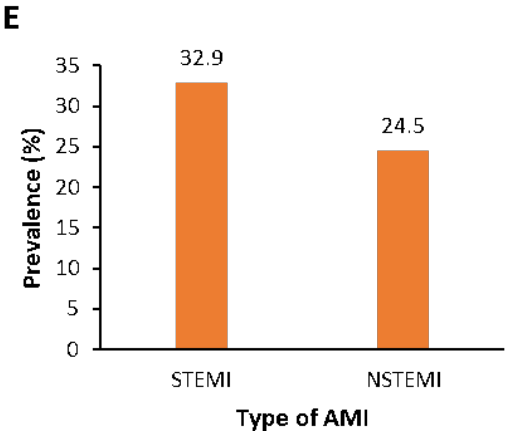
According to stratification of poly-vascular disease prevalence, significant difference was seen in poly-vascular disease with respect to age and duration of symptoms ($p<0.05$), while insignificant difference was seen gender, BMI, type of AMI and socio-economic status ($p>0.05$)(Figure 1).











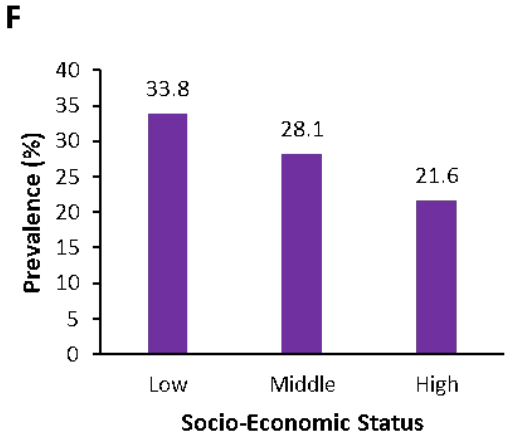


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Figure 1: Stratification of the Prevalence of Poly-vascular disease in Relation to Different Variables (A. Gender; B. Age Group; C. BMI; D. Duration of AMI; E. Type of AMI; F. Socio-Economic Status)

DISCUSSION

In the current investigation, PVD was evident in 28.4% of patients who had been sent to our facility for an AMI. The frequency of risk factors of atherosclerosis in different groups, the diagnostic techniques employed, and the population under study all have an impact on the prevalence of PVD.Vidakovic *et al.*, found that 29% of patients with PAD had damage to one vascular region and 71% of patients had PVD in research evaluating the frequency of PVD in PAD patients [16]. It may have resulted from the use of ultrasonography to detect atherosclerosis, which may have identified some patients without any symptoms. Patients with atherosclerosis in one artery region had a 35% increased risk of the illness in one or more other arterial regions, according to the 24-country AGATHA research (A Global Atherothrombosis Assessment) [17]. Suarez *et al.*, conducted a study in Europe that included individuals 45 years of age or older who had at least three predetermined atherosclerotic risk factors, verified CAD, cerebrovascular illness, or PAD. Of these patients, 77% had a single vascular disease and 23% had PVD [18]. More recent investigations have also indicated a similar prevalence of PVD, that ranged from 21.2% to 27.9% [19, 20]. Colette *et al.*, found that 21.7% of high-risk coronary patients had asymptomatic multisite artery dysfunction [21]. PVD was found to be prevalent in 16%, 17%, and 13% of three major clinical trials performed by different institutes and organizations [22-24]. This prevalence was 6% in the Gulf-Race-2 research (2nd Gulf Registry of Acute Coronary Events), although it was only evaluated in individuals who had acute coronary syndrome [12]. Multi-site artery disease, also known as PVD, is common in patients with atherosclerotic involvement in one vascular bed and ranges from 10% to 15% in patients with coronary artery disease to 60% to 70% in patients with severe carotid stenosis or PAD, according to recent joint guidelines of ESC and ESVS (the European Society of Cardiology and European Society for Vascular Surgery), which were supported by the European Stroke Organization (USO) [25]. It is widely acknowledged that atherosclerosis in any arterial region raises the risk of any cardiovascular event, notwithstanding these variations in the frequency of PVD [26]. The fact that PVD was only evaluated in patients with PAD and carotid disea m se, whose frequency is higher than in patients with CHD, may account for the relatively high prevalence of PVD in our study. According to Vidakovic *et al.*, there is a clear correlation between male sex, older age, a BMI of 25 kg/m2 or above, and greater levels of hs-CRP and PVD [16]. Suarez *et al.*, found that the PVD patients tended to be older, had higher rates of diabetes, hypertension, and diabetic nephropathy, and were more likely to be current or past smokers [18]. In the present study, the risk profile of PVD patients depended on the older age and duration of AMI. Our study reported PVD in 57.4% of the patients with AMI. In research by Subherwal *et al.*, 25.34% of patients with AMI had PVD [11]. In the study by Al-Thani *et al.*, only 5.6% of individuals who experienced an AMI had PVD [12]. Similarly, according to Bhatt *et al.*, PVD was noted in 65.5% patients of AMI [13]. Jönelid *et al.*, noted PVD in 13.8% patients of AMI [14].

CONCLUSIONS

According to our findings, PVD was found to be highly prevalent in patients suffering from AMI

Authors Contribution

Conceptualization: AT
Methodology: MAA1, AT
Formal analysis: MAA2, ASHA
Writing-review and editing: MAA1, AT, MAA2, WA, ASH, AS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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