MYOCARDIAL INFARCTION IN YOUNG VERSUS OLDER ADULTS: CLINICAL CHARACTERISTICS AND ANGIOGRAPHIC FEATURES

S. Sadiq Shah, Lubna Noor*, Syed Habib Shah, Shahsawar*, Shahab Ud Din*, Zahid Aslam Awan*, Muhammad Hafizullah†**

Department of Cardiology, Bacha Khan Medical College, Mardan, *PGMI, Hayatabad Medical Complex, Peshawar, **Kohat University of Science and Technology, Kohat, †PGMI, Lady Reading Hospital, Peshawar, Pakistan

Background: Coronary artery disease is now frequently encountered in young adult population. However, being a relatively uncommon entity, not many studies are available in this regard. Therefore, the present study was designed to evaluate the clinical characteristics and angiographic features of patients less than 40 years of age with a history of myocardial infarction and compare them to patients older than 40 years. **Methods:** A total of 281 patients who underwent coronary angiography from April, 2009 to December, 2009, were included in this study. The patients were divided into two groups on the basis of age. Group A included patients 40 years of age or younger. Group B included patients older than 40 years. Both the groups were compared with respect to gender, hypertension, diabetes mellitus and extent and severity of coronary artery disease as assessed on coronary angiography. **Results:** Of the total 281 patients, 45 (16%) were ≤40 years old (Group-A) and 236 (84%) were older than 40 years (Group-B). There was no significant difference between the two groups with respect to the risk factors like gender, hypertension and diabetes mellitus. On coronary angiography, the two groups neither differed in the number of totally occluded vessels, nor in the severity of the culprit lesion. There were only 3 patients in group-A (6.7%) and 5 patients in group-B (2.1%) with normal coronaries (p=NS). Majority (60%) of the patients in group-A had no significant disease or single vessel disease while majority (69%) of the patients in group-B had two or more vessels involved (p<0.001). As far as the number of lesions in the coronary arteries is concerned, 62.3% patients had 2 or lesser lesions in group-A while 68.6% patients in group-B had three or more lesions (p=0.001). **Conclusion:** These data suggest that in our study, young patients with MI do not have significantly high prevalence of normal coronaries compared to older patients. Young patients are similar to the older patients with respect to severity of CAD. Lesser number of coronaries is involved and there is lesser number of lesions per patient in young patients compared to older ones.

Keywords: Coronary Artery Disease (CAD), Myocardial infarction (MI), Coronary Angiography, Risk Factors

INTRODUCTION

Myocardial infarction (MI) is usually a disease of old age. However, it is infrequently encountered in young adults. Some histopathological studies have shown that in young patients, atherosclerotic plaques are characterised by a large amount of lipid containing foam cells and relative lack of fibrous tissues, suggesting that the plaque may have been present for a short period than in older patients which have a large content of fibrous tissue.[1,2]

In the West, a significant number of young patients presenting with MI are cocaine and amphetamine abusers. These patients usually have normal coronaries.[3–7] In Pakistan, these risk factors for coronary artery disease (CAD) in young are almost non-existent. In spite of this difference, CAD has been found to be more prevalent and occurs at a younger age in South Asians.[8,9] With an obvious difference in the presence and prevalence of risk factors, we expect a difference in the angiographic features of coronary artery disease in young patients in our society.

Therefore, we designed this study to investigate the clinical characteristics and angiographic features of CAD in patients 40 years and younger and compare with those of older patients undergoing coronary angiography after myocardial infarction.

MATERIAL AND METHODS

In our study, we included all the patients who had sustained first episode of MI and underwent coronary angiography in the Catheterization Laboratory of PGMI, LRH, Peshawar, from April 2009 to December 2009. Those patients, who had prior history of revascularisation procedure before the MI, were excluded from the study. The selected patients were divided into two groups on the basis of age. One group consisted of patients forty years or younger in age (Group-A), while the second group consisted of patients older than forty years (Group-B). The coronary angiograms of these patients were reviewed by two cardiologists and reported.

Severity of coronary artery disease was classified as luminal irregularity, insignificant disease (<50% stenosis), significant disease (≥50% stenosis)

and total occlusion. Extent of disease was analysed according to the number of vessels involved and also according to the number of lesions present in each patient. A vessel was considered to be diseased if there was more than 50% reduction in diameter compared to normal segment.

The two groups of patients were compared according to gender, presence of hypertension (HTN), diabetes mellitus (DM) and severity and extent of coronary artery disease. Data was analysed using SPSS-13. Associations were calculated using Chi-square.

RESULTS

Clinical characteristics of the patients are given in Table-1. A total of 281 patients were included in our study. Mean±SD age of the patients was 51.89±10.63 years (Range 22–80 years). Two hundred and nineteen patients (77.9%) were male. Forty-five patients (16%) were in the age group 40 years and younger (Group-A), while 236 patients (84%) were more than 40 years of age (Group-B).

Table-2 shows the comparison between the clinical characteristics and angiographic characteristics of the two groups (Group-A and Group-B). Thirty-six (80%) of the patients in Group-A and 183 (77.5%) of the patients in Group-B were male (p=NS). In Group-A, 27 (60%) patients were non-hypertensive and non-diabetic, 9 (20%) were hypertensive, 4 (8.9%) were diabetic and 5 (11.1%) were both hypertensive and diabetic. In Group-B, 128 (54.2%) patients were non-hypertensive and non-diabetic, 43 (18.2%) were hypertensive, 26 (11%) were diabetic and 39 (16.5%) were diabetic and hypertensive (p=NS).

Among the angiographic characteristics, we compared the two groups on the basis of severity of lesion in vessel expected to be the cause of MI, the number of coronary arteries diseased, the total number of lesions present, patients with normal coronaries. When looking at the severity of lesion in the vessel expected to be involved in MI, there were 3 (6.7%), 0 (0%), 4 (8.9%), 22 (48.9%) and 16 (35.6%) patients in Group-A, and 12 (5.1%), 4 (1.7%), 11 (4.7%), 127 (53.8%), and 82 (34.7%) patients in Group-B with normal vessel, luminal irregularities, insignificant disease, significant disease and total obstruction respectively (p=NS). A significant number of patients in Group-A had non-significant disease and single vessel disease compared to Group-B (p<0.001). 7 (15.6%), 20 (44.4%), 11 (24.4%) and 7 (15.6%) in Group-A, and 11 (4.7%), 60 (25.4%), 72 (30.5%) and 93 (39.4%) in Group-B had no significant disease, single vessel, two vessel and three vessel disease respectively. Only 8 patients had completely normal coronaries in the whole study population, 3 (6.7%) were in Group-A and 5 (2.1%) were in Group-B (p=NS).

Fewer numbers of lesions were encountered mostly in Group-A as compared to Group-B. Most of the patients (60%) in Group-A had a single or non-significant lesion, while in Group-B, most (68.6%) had two and more lesions on coronary angiography (p=0.001).

Table-1: Characteristics of study population

Characteristics	Results
Total number of patients	281
Age in years (Mean±SD)	51.89±10.63
Male : Female	1 : 3.5
Hypertension (HTN)	52 (18.5%)
Diabetes Mellitus (DM)	30 (10.7%)
HTN+DM	44 (15.7%)

Table-2: Comparison of clinical and angiographic characteristics of the two groups

Characteristics		Age group ≤40 yrs (n=45) n (%)	Age group >40 yrs (n=236) n (%)	p
Male:Female		1:4	1:3.45	NS
Risk factors	Normotensive Non-diabetic	27 (60)	128 (54.2)	NS
	HTN	9 (20)	43 (18.2)	
	DM	4 (8.9)	26 (11)	
	HTN+DM	5 (11.1)	39 (16.5)	
Severity of lesion in expected vessel involved	Normal	3 (6.7)	12 (5.1)	NS
	Luminal irregularities	0 (0)	4 (1.7)	
	Insignificant	4 (8.9)	11 (4.7)	
	Significant	22 (48.9)	127 (53.8)	
	Total	16 (35.6)	82 (34.7)	
Number of coronaries involved	None	7 (15.6)	11 (4.7)	<0.001
	One vessel	20 (44.4)	60 (25.4)	
	Two vessels	11 (24.4)	72 (30.5)	
	Three vessels	7 (15.6)	93 (39.4)	
Number of lesions	None	3 (6.7)	5 (2.1)	0.001
	One	16 (35.6)	32 (13.6)	
	Two	9 (20)	37 (15.7)	
	Three	3 (6.7)	33 (14)	
	Four	7 (15.6)	40 (16.9)	
	Five	4 (8.9)	31 (13.1)	
	Six and more	3 (6.7)	58 (24.6)	

DISCUSSION

Myocardial infarction is an acute event with a potentially devastating effect on both the patient and his family. More so, if it occurs at an unexpectedly younger age, the further potential implications of loss of productive years of life on the society and health system, are cumbersome. Myocardial infarction in young has been described as a different entity by many cardiologists with a strong emphasis on the higher prevalence of normal coronary angiograms.[5,6,10] However, in our study, the patients with MI at a younger age were found to be similar to older patients in quite many respects than they were different.

Sixteen percent of the patients in our study, were 40 years or younger in age. This is a very high percentage of patients compared to previous studies. Fournier *et al*[11] studied patients with definite MI aged

≤40 years. Of the total admissions for myocardial infarction, only 4.1% of the patients were ≤40 years. Two obvious factors seem to contribute to this difference. Firstly, in our study, we have enrolled the patients from the CathLab where they presented for coronary angiography and not from the actual admissions for acute MI. Secondly, the mean age for first MI among south Asians is lower compared to individuals in other countries.[8]

We studied both the groups of patients in our study with respect to the gender distribution, presence of hypertension and diabetes mellitus. Twenty percent of the patients in group A and 22.5% in group B were females. The prevalence of female sex in young patients varies from 3–25% in previous studies.[11–16] Interestingly, there were very few studies in the past which have compared the gender distribution among young and older patients with MI. Doughty *et al*[12] divided the patients into three groups: <46 years, 46–54 years and >54 years. Although there were more females in the older age group, however, the difference among the 3 groups was not significant. The male:female ratio in our study has also remained the same in both the groups.

The frequencies of hypertension and diabetes mellitus in both the groups in our study were similar. Chen *et al*[17] found a similar pattern of distribution of hypertension and diabetes mellitus. They had compared 100 male patients with CAD at age ≤45 years and 100 male patients with CAD at age ≥60 years. There was no significant difference between the two groups when compared for frequency of hypertension and diabetes mellitus. Zimmerman *et al*[18] however, found that both hypertension and diabetes mellitus were more prevalent in older patients. Whether this difference is due to the geographic location of the two study populations or selection pattern of the population, is not clear.

We also studied the lesion severity in the coronary vessel expected to be involved based on the location of MI according to the ECG changes. It was found that almost half of the patients in both the groups (48.9% of group-A and 53.8% of group-B) had significant stenosis of the culprit vessel. Similarly, about 35% of the patients in both the groups had total occlusion of the culprit vessel. It implies that the severity of the lesion in the vessel involved in MI and the re-canalisation rate of the obstructed vessel are similar in both young and older patients.

Young patients in our study have less extensive disease than their older counterparts, both with respect to the number of vessels involved and the number of lesions per patient. The present finding of predominantly normal coronaries and single vessel disease in young patients versus multivessel disease in the older patients is in accordance with the previous studies.[17–19] The normal coronaries labelled in our study were defined as vessels without significant disease (<50% stenosis). However, when we looked for patients with coronaries that had no obvious disease, both the groups were similar with 6.7% in group A and 2.1% in group B (p=NS). This is in contrast to well established findings in various studies in the west which showed that a significantly higher percentage of patients with MI in the younger population have normal coronaries compared to older population.[13,18,19] Two very important factors appear to cause such a gross deviation from the established results. First, the younger patients in our study had hypertension and diabetes mellitus as frequently as the older ones. Secondly, abuse of cocaine and amphetamines appear to be a major cause of MI in young patients with normal coronaries.[3–7] Such abuse of alcohol and cocaine is almost non-existent in our society. Thus, normal coronaries in young patients with MI are as infrequent in our study as in older patients.

CONCLUSION

Sixteen percent of the patients who present for coronary angiography after sustaining an MI are in age group lesser than 40 years. Both young and old patients are similar with respect to gender, hypertension and diabetes mellitus. The severity of lesion in the vessel expected to be involved in MI, is similar in both the young and old patients. Younger patients have less extensive disease and lesser number of lesions than their older counterparts. Unlike the patients in the West, younger patients in our setup, do not have a higher frequency of normal coronaries.

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Address for Correspondence:

Dr. S. Sadiq Shah, Senior Registrar, Bacha Khan Medical College, Mardan, Pakistan. **Res:** House # 188, Bilal Lane, New Arbab Colony, Tehkal Bala, Peshawar, **Cell:** +92-333-9626859
Email: ssadiqshahpk@yahoo.com