CORONARY ANGIOGRAPHIC CHARACTERISTICS OF CORONARY ARTERY DISEASE IN YOUNG ADULTS UNDER AGE FORTY YEARS COMPARE TO THOSE OVER AGE FORTY

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ABSTRACT

Objective: To compare the coronary angiographic characteristics of coronary artery disease in young patients of less than and equal to 40 years of age with those of more than 40 years of age.

Patients and Methods: Observational study conducted from Sept to Jan 2003-2004.

A total of 299 patients of Coronary Artery Disease were included in the study. 102 patients were in less than and equal to 40 years of age (group 1) and 197 patients were in greater than 40 years of age (group II).All patients were selected according to inclusion and exclusion criteria. All demographic and clinical variables and laboratory investigations were recorded for each patient. Coronary angiographic characteristics were recorded and analyzed for each group.

Results: Study result showed that more patients in group I had single vessel disease than patients in group II 39% vs 15% respectively, which was statistically significant P=0.001, while patients in group II had more double, triple and LM disease as compared to group I 35% vs 20% (P=0.04), 25% vs 12% (P=0.03) and 9% vs 2% (P=0.03) respectively. There was statistically no significant difference between the groups in terms of baseline demographic and clinical variables except for angina class and DM. Group I had more angina class-I patients 51% vs 25% than group II (P=0.003), while group II had more patients with DM 36% vs 14% than in group I (P=0.002). There was no difference between the groups in terms of length of lesions and types of lesions determined by coronary angiography and predilection for invovment. The most common effected vessel was LAD followed by RCA and CX.

Conclusion: It is evident from present study that young patients of CAD have less extensive disease. CAD in young person is more prevalent in those who smoke and had deranged lipid profile.

Key words: Atherosclerosis, Coronary Disease, Risk Factor, Coronary Angiography, Young Adult.

INTRODUCTION

At present heart disease is leading cause of mortality in USA, Europe and much of Asia[1]. World wide projected deaths from cardiovascular diseases between 1990 and 2020 increase from 28.9% to 36.3%, as a cause of premature death and disability, it will rise from fifth to first[2].

Prior to world war II Coronary Artery Diseases was considered to be uncommon in less than 40 years of age, but interest was stimulated in this subject by Yater and Co workers after the war. Several more reports have discussed various aspect of coronary artery disease in less than 40 years of age[5,6,7,8,9,10,12]. Studies in the west emphasized that the manifestation of Coronary Artery Disease may become apparent in young age group [10,11]. Welch and co worker were the first to publish results of coronary angiographic studies in patient of coronary artery disease less them 40 years of age[7]. Although coronary artery disease usually manifest clinically in middle and older age groups, its presentation in less than 40 years of age is particularly disturbing as repercussions on the entire family structure ensue. The incidence of coronary artery disease in less than 40 years of age is reported to be between 3-6% of the coronary population[5,33]. Although the data for coronary artery disease are few

in Pakistan, the incidence of coronary artery disease is rising since documented by Prizade[13] in 1962 from Mayo Hospital, Lahore, followed by reports by Beg[14] 1967 from Karachi and Nasiruddin Azam Khan[15] (1973) Faruqui[16] (1983) indicating increased hospital admission from ischemic heart disease. Coronary artery disease is now a leading cause of death in Pakistan and its prevalence is as high as develop world[17,18,19]. The Coronary artery disease follows a accelerated course with coronary events occurring a decade earlier in Pakistani population[20]. Before the advent of coronary angiography the presence of myocardial infarction was generally accepted as a manifestation of severe diffuse coronary artery disease. Now with coronary angiography severity and extent of coronary artery disease can be defined.

There are difference in risk factor profile and coronary artery disease characteristic in young patients as compare to old patients[21,22]. The Framingham heart study[27] played a vital role in defining the contribution of risk factor to coronary artery disease occurrence in general population.

Very few studies have been conducted in Pakistan regarding the coronary artery disease and angiographic characteristics of young patients of coronary artery disease[23,24]. Coronary angiography studies done in Pakistan have confirmed that coronary artery disease is more diffuse and effects a relatively much younger age group[25,26]. More local data is needed for primary as well as secondary prevention of coronary artery disease in young patients of coronary artery disease. The purpose of this study is to assess the risk factor profile and angiographic characteristics of coronary artery disease in young patients, comparing with the older patients. The study is conducted at National Institute of Cardiovascular Diseases, Karachi.

Patient & Method

National institute of Cardio vascular diseases (NICVD) is a tertiary care hospital. Patient came from all the country and even from neighboring countries like Iran & Afghanistan. A detailed Performa has been filled for all patients. It contains the clinical features including risk factors and angiographic study information.

This was a prospective observational study conducted from Sep to Jan 15, 2003-2004. A total of 299 patients were included in the study. Patient admitted in ward and out patients are both included. The patient included were angina refractory to medical treatment, patients with evidence of Ischemia on non invasive testing, symptomatic patients in whom there was need to confirm diagnosis, patients with post myocardial infarction status having angina or non invasive evidence of LV systolic dysfunction, heart failure and sign of ischemia after stress test.

Those patients were excluded who had valvular heart disease, congenital heart disease, hypertrophic cardiomyopathy and coronary artery anomalies.

Percutaneous techniques usually from femoral and radial artery are used. It require selective cannulation of the ostium of Right and left coronary artery and LV angiogram.

• The angogiographic plaque morphology is classified on Ambrose classification[28].

• Percent Stenosis: It is defined as the ratio of reference luminal diameter divided by the reference diameter of the vessel. (proximal part). The proximal shoulder of the lesion defining the location. Percentage stenosis is calculated by digital caliper on the computer programme. Significant disease was taken as 50 to 69% (moderate coronary artery disease) whereas 70% (obstructive) coronary artery disease. For left main it was 30 to 49 % and 50% respectively. Cororonary Anatomy Nomenclature was used as in CASS[29].

• Single plane angiography machine panders 1200A of Toshiba Corporation DFP-200A(2B305-646E*A) and Philips Angiography Image Intensifier based system with 9 inch II ALLURA 9 F was used with ancillary equipment for pressure recording and visual display.

Statistical Method. All the variable in performa were entered in Statistical package for Social Sciences (SPSS) version 8. Comparative analysis of data is done by paired T test & Chi square test. P=0.05 is taken as significant where as P=0.001 is taken as highly significant.

RESULTS

The total number of patients included in the study was two hundred ninety nine (299). The patients were divided into two main groups for comparison. The patients in group I were those who were less than and equal to 40 years of age. The patients in group II were those who were greater than or equal to 41 years of age. The youngest patient was 27 years of age and the eldest was 75 years of age. Out of total two hundred and ninety nine patients (299) one hundred and two (34%) were in group I and one hundred and ninety seven (66%) were in group II Fig No 1.

Fig - I
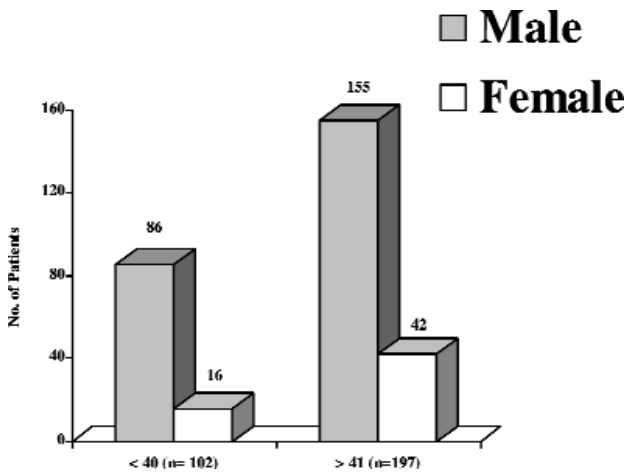
The baseline clinical variables of patients in both the group were summarized in (Table1). The predominant symptom was angina in both the groups. The patients in group I were more with angina class I

Table I - Baseline Characteristics of Patients

	Age < 40 (n=102) [no.(%)]	Age>41 n=197 [no.(%)']	
Male	86 (84)	155 (79)	
Female	16 (16)	42 (21)	
History of MI	42(41)	71 (36)	0.569
Angina Class			
I	53(51)	50(25)	0.003
II	25(26)	70(36)	0.204
III	24(23)	71(36)	0.121
IV	0 (0)	6(3)	0
Predominant Symptoms			
Typical Chest Pain	60(59)	118(60)	0.927
Atypical Chest Pain	27(26)	37(18)	0.297
Angina equivalent	2(2)	13(7)	0.096
No Angina	13(13)	29(15)	0.705
Type of Angina			
Stable	64(63)	104(53)	0.353
Unstable	38(37)	93(47)	0.275

MI= Myocardial infarction.

(P=0.003) where as group II patients had more severe angina.

Baseline characteristics for coronary artery disease were analyzed by age groups. (Table 1)

Smoking were prevalent in both the groups (Table II). The second most common prevailing risk factor in the study is dyslipidemia. Family history of coronary artery disease was also not uncommon. Hypertension was the third most common risk factor in the study population. Diabetes Mellitus a major risk factor for coronary artery disease was more prevalent in group II (p-0.002). The Table II showing patients with one & two risk factors are more common.

Table II - Distribution of Risk Factors

Age < 40 (n=102) [no.(%)]	Age >41 n=197 [no.(%)']	P value
Smoking		
Current 63(62)	118 (60)	0.928
Former 8(8)	30 (15)	0.144
Never 31(30)	49 (25)	0.500
Family history 31(30)	52(26)	0.593
HTN 35(34)	83(42)	0.395
Diabetes Mellitus		0.002
14(14)	71(36)	0.845
* Dyslipidaemia 38(53)	72(51)	
BMI		
18.5 – 24.9 31(31)	60 (31)	1.00
25 – 29.9 55(53)	101(51)	0.922
30 or > 16(16)	36(18)	0.602
Risk Factor Presence in individual Patients		
No Risk Factor 21(21)	26(13)	0.223
One Risk Factor 31(30)	73(37)	0.392
Two Risk Factor 33(32)	63(32)	1.00
Three or more Risk factor 17(17)	35(18)	0.886

* 71 % Patients had lipid profile done in group I 72 patients and in group II 140 patients.

The Table III showing distribution of coronary anatomy and coronary artery disease according to age subsets, percentages and p value.The coronary system had dominance for right coronary artery. In patients of group I (59%) as compared to group II (50%).Balance circulation of the coronary system was seen in group I (21%), where as in group II (27%). The rest were left dominant coronary artery patients.

The 72% patients in group 1 revealed presence of coronary artery disease as compared to group II

Table III - Coronary Anatomy of the Patients

	Age < 40 (n=102) [no.(%)]		Age >41 n=197 [no.(%)']	P value
Dominance				
Right		60(59)	98(50)	
Left		20(20)	46(23)	
Balance		22(21)	53(27)	
ModerateCAD110(20)		42(55)	68(45)	0.317
Obstructive CAD 105(39)		431(80)	326(61)	0.016
Normal		28(28)	32(16)	0.07
SVD		40(39)	30(15)	0.001
DVD		20(20)	68(35)	0.043
TVD		12(12)	50(25)	0.033
LM		2(2)	17(9)	0.035
LV Angiogram				
Normal		28(28)	63(32)	0.606
Akinetic		7(7)	17(9)	0.617
Hypokinetic		23(22)	48(24)	0.768
Dyskinetic		1(1)	0	--
Aneurysm		0	6(3)	--
Not done		44(43)	63(32)	--

SVD = Single Vessel Disease DVD = Double Vessel Disease
TVD = Triple Vessel Disease   LV = Left ventricle

(84%). Out of all patients having disease coronary artery for atherosclerotic heart disease most common pattern was single vessel disease in group I (39%) P=0.001). The patients in group II the most common pattern for coronary artery disease is double vessel disease, triple vessel disease and left main vessel 35% (P=0.043), 25% (P=0.033) and 9% (P=0.035) respectively.

The LV angiogram showed LV dysfunction with mostly hypokinesia. The left ventricular wall motion dysfunction did not differ significantly with age in coronary artery diseases patients of both the group .
On analysis of coronary angiogram (Table IV) the anatomic distribution of coronary artery disease was almost similar in the both group I and group II. Most

Table IV - Distribution of coronary artery disease

	Age < 40 (n=147) [no.(%)]		Age >41 n=394 [no.(%)']	P value
Moderate CAD				0.317
110(20)		42(55)	68(45)	
LAD		30(71)	25(37)	
CIRC		2(5)	13(19)	
RCA		10(24)	30(44)	0.016
Obstructive CAD		105(39)	326(61)	
431(80)			154(47)	
LAD		50(47)	73(23)	
CIRC		11(10)	99(30)	
RCA		45(43)		
Lesion Length Distribution.				
<10		55(38)	168(43)	0.579
10-20		68(46)	172(43)	0.750
> 20		24(16)	54(14)	0.715
Type of Lesion (Ambrose)				
I		31(21)	83(21)	1.00
II		53(36)	115(29)	0.385
III		40(27)	109(28)	0.893
IV		23(16)	87(22)	0.330

common artery involved was left anterior descending (LAD) In the LAD artery most common site for lesion is mid segment followed by the proximal segment in both the group. Next commonly involved artery was right coronary artery (RCA). RCA was involved equally in the proximal and distal segment in group I . But in group II most common site was proximal RCA followed by mid distal segments. In the circumflex artery the involvement by atherosclerotic artery disease was least common. The most common site of involvement in circumflex artery is proximal segment in group I. But in group II the site for involvement of coronary artery disease is equally distributed in proximal and distal segments.

The length of the lesion and type of lesion as classified by Ambrose were also analyzed and no significant difference was noted (Table IV).

Multiplicity of risk factor for coronary artery disease was also common among patients of study population. (Table V)

Table V - Multiplicity of Risk Factor & Severity of Coronary Artery Disease

	Age < 40 (n=102) [no.(%)]		Age >41 n=197 [no.(%)']	P value
No Risk Factor		21(21)	26(13)	0.170
Normal		8 (38)	9(34)	0.637
SVD		7 (33)	5(19)	0.052
DVD		4 (19)	9(35)	0.029
TVD		1 (5)	1(4)	0.739
LM		1 (5)	2(8)	0.405
One Risk Factor		31(30)	73(37)	0.392
Normal		9(29)	17(23)	0.405
SVD		12 (39)	10(14)	0.001
DVD		5 (16)	24(33)	0.015
TVD		5 (16)	19(26)	0.123
LM		0 (0)	3(4)	
Two Risk Factor 33(32)			63(32)	1.00
Normal		9 (27)	3(5)	0.000
SVD		14 (43)	13(21)	0.006
DVD		7 (21)	23(36)	0.047
TVD		3 (9)	19(30)	0.001
LM		0 (0)	5(8)	
Three or More Risk Factor 17(17%)			35(18)	0.866
Normal		2 (12)	3(9)	0.513
SVD		7 (41)	2(6)	0.000
DVD		4 (24)	12(34)	0.189
TVD		3 (18)	11(31)	0.063
LM		1 (5)	7(20)	0.003

DISCUSSION

At present atherosclerotic coronary artery disease is one of the leading cause of mortality and morbidity in USA, Europe and much of Asia[1,2]. Coronary artery

disease often strike at the peak of working carriers. As the manifestation of coronary artery disease may become apparent in young age group, it is now recognized as a major problem in younger age group[6,30] in the developing countries along with Pakistan[6,30,16,23,24]. The incidence of coronary artery disease is reported to be between 3-6% of coronary population[33].

Although the data for coronary artery disease are few in Pakistan, the incidence of coronary artery disease is rising since reported by Pirzada[13] and Beg[14].The coronary events are occurring at a decade earlier in Pakistan population[20]. There are large body of evidence that shows association of risk factor with coronary artery disease. The framinghum heart study has clearly demonstrated the multifactorial nature of coronary artery disease. Follow up data of multiple risk factor intervention trial[31], indicate that about 85% of excess risk of premature coronary artery disease can be explained by major risk factors. Major risk factors contribute significantly to our patient population of established coronary artery disease as well. The increased incidence of coronary artery disease in Pakistan has created interest to study for risk factor in Pakistan. Studies in Pakistan have shown high prevalence of HTN, dyslipidaemia and smoking in our population[17,18,19,32].

Coronary angiographic studies carried out in Pakistan so far has confirmed that coronary artery disease is more diffuse and effects relatively much younger age group[25,26]. This study has been carried out in patients at NICVD and tends to define the charecterestics of coronary artery disease in Pakistani population. The incidence of coronary artery disease in young patient is relatively higher as compared to the similar age group in Western would[6,26]. We have found an increased percentage of patients with history of cigarette smoking hypertension dyslipidemia, diabetes mellitus and positive family history for premature coronary artery disease. Cigarette smoking at younger age had greater risk[34] when compare to healthy age match control subjects. The studies have shown a high prevalence of coronary artery disease in young patients of cigarette smoking[13,14,15,16,36] with smoking found in 73-90% of subject of coronary artery disease in less than 40 years of age.

In Pakistan cigarette smoking habits in younger

population of coronary artery disease is found to be between 50-60%. The present study showed that 62% of group I and 60% of group II are current smoker. The incidence reported in lower social class is around 70% while 20% in higher social class[35]. Dyslipidemia in younger patients are more reliable predictor for future coronary artery disease[18,37,38]. There was reduced level of HDL in both the groups which has a inverse relationship with coronary artery disease[39]. The prevalence of hypertension is same as the studies carried out previously in Pakistan [18,21,17,40]. The incidence of Coronary Artery Disease correlate more closely with the duration than severity of DM.

The prevalence of Diabetes Mellitus is about 10-15% in different studies conducted in the western world for younger subject[36,42]. The local data showing a prevalence rate of 13 to 28% in different studies conducted[18,3541,43]. In our study the prevalence for diabetes mellitus in coronary artery diseases in group I is 14% but in group II it was 36%.

The data for western world showing family history presence in 45-67% of younger population & 20-40% in older population[44,45]. In Pakistan the prevalence of coronary artery disease in association with family history is 15-60%[14,15,46]. In our study the family history for coronary artery disease is present in accordance the with the available data..Coming to incidence of obesity group I 16% & group II had 18%. Interestingly the majorities of patient in both categories are over weight 53% & 51% for group I and group II receptively. This incidence of obesity varies in different studies conducted with reported incidence of 13-70%[15,27].

As far as local literature is concerned a few studies have been reported documenting the pattern of coronary artery disease in our population[15]. In angiographic characteristics it was noted in the study that 28% in group I had normal coronary arteries where as group II had 16% normal coronary artery and this difference in absence of coronary artery disease on angiography is reported in literature between 9-17% in younger population[7,10,11,47,48,49], Present study showed that young patient had more angiographically normal coronary arteries as compare to old patients (P=0.07).

Young patients with significant coronary artery

obstruction show less extensive disease than patient of old age group in this study which are comparable to other studies[19,25,26,39,49,36]. Proving that atherosclerosis is gradual and progressive disease.The patients of group I had 39% SVD as compared to 15% of group II (P=0.001). The incidence is 36% in study done by Welch[7], 32% by Mathew[50] but it is found to be 60% in study of Davia[10]. and 51% in study by Lloyed[5]. The incidence of SVD is low 15% in CASS that may be due to cases selected for CABG. Where as only 20% had DVD and 12% had TVD. in group I and 35% & 25% of DVD and TVD in group II (P=0.043 & P=0.033) respectively. The predilection toward multivessel coronary artery diseases in greater than 40 years of age is reported in literature[25,26,23,39,49] Similar is the case with the LM disease which is more in older patient (P=0.035) [26,34]. It was observed on comparison that most common pattern in coronary artery is single vessels diseases 39% followed by normal coronary angiography (28%) in group I where as pattern was DVD (35%) followed by TVD (25%) in group II patients.

The vessel involve most commonly was left anterior descending followed by the right coronary artery and the circumflex artery in both the groups of group I and group II and is comparable to other studies[7,10,19,25]. This analysis showed that the distribution of coronary lesion is age independent.

This study also showing that most of the patients had multiplicity of risk factor. As many risk factor are synergetic to each other were shown in various studies.[14,15,17,18,19,25,27,39,21,36,] In our study 79% patient in group I had one or more risk factors compare to 87% in group II . The most common risk factors are smoking followed by dyslipidaemia in both the groups.

In conclusion this study showed that SVD is more common in young age group (P=0.001) where as DVD (P=0.04), TVD (P=0.033) and LM disease (P=0.03) is the common pattern in the older population. Patients of older age group had more diabetes mellitus (P=0.002).Smoking, dyslipidaemia, HTN, are the most common risk factor for Coronary Artery Disease in patient population in both the groups. Most of the patients of CAD have multiplicity of risk factor and severity of CAD

increase with multiplicity of risk factors.

As the prevalence of CAD is on the rise with the limited medical facilities in Pakistan, understanding the pathophysiology of Atherosclerosis and role of risk factors in CAD is essential for developing strategies for primary and secondary prevention of disease. Preventive efforts should target each major risk factor. The Coronary Artery Disease management requires insight into the entire spectrum of disease manifestation from initiation through progression and culminating into acute illness. The commitment should be now is to reduce adverse outcome by favorably modifying risk factor. Although benefit is definitely there in older people, but evidence for benefit of risk factor reduction in younger age group is overwhelming.

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