ORIGINAL ARTICLE
CORONARY ARTERY DISEASE PATTERN: A COMPARISION AMONG DIFFERENT AGE GROUPS

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Background: Angiographic studies have shown that the extent of disease and severity is less in younger population with comparatively fewer number of coronary arteries affected than that of older age groups. This study was conducted to compare the pattern of coronary artery disease (CAD) in young adults under 40 years and those more than 40 years of age with significant coronary artery disease on coronary angiography. **Methods:** This cross-sectional study was conducted in Angiography Laboratory of Punjab Institute of Cardiology, Lahore, from 1st April, 2013 to 1st April, 2014. Patients from Angiography Laboratory of Punjab institute of cardiology Lahore were enrolled in the study. A Joint Committee of consultants reported the coronary lesions (stenosis). Single vessel disease (SVD), Double vessel disease (DVD) and Tripple vessel disease (TVD) was noted down. **Results:** Out of total 400, patients of age ≤40 years (Group-A) were 48 (12%) and >40 years (Group-B) were 352 (88%). There were 77% male patients and 22.5% females. Mean age of patients was 52.78±10.02. Significant CAD was present in 48 (10.75%) patients of Group-A and in 306 (76.5%) patients of group-B. Frequency of SVD, DVD and TVD in Group-A was 24 (50%), 10 (20.8%) and 9 (18%) respectively while frequency of SVD, DVD and TVD in group-B was 98 (27%), 88 (25%) and 120 (34%) respectively with *p*-value of 0.002, 0.53 and 0.03 among SVD, DVD and TVD between the two groups. **Conclusion:** Young (age <40 years) patients who have coronary artery disease, have less extensive coronary artery disease, with a high incidence of angiographically normal vessels and relative paucity of left main coronary arterial involvement.
Keywords: Pattern, coronary artery disease, myocardial infarction, young

INTRODUCTION

Coronary heart disease (CHD) is a major cause of death and disability in developed countries. Although CHD mortality rates have declined over the past four decades in the United States (and elsewhere), CHD remains responsible for about one-third of all deaths in individuals over age 35.[1,2] It has been estimated that nearly one-half of all middle-aged men and one-third of middle-aged women in the United States will develop some manifestation of CHD.[3] More than 50% of the 1.2 million people who suffer an acute myocardial infarction (AMI) or coronary death each year in the United States die in an emergency department (ED) or before reaching a hospital within an hour of symptom onset.[4]

The World Health Organization (WHO) estimates that by 2020 the global number of CAD will rise from 7.1 in 2002 to 11.1 million.[5] Three-fourth of global deaths due to CHD occurred in the low and middle income countries.[6] Indo-Pakistani populations have one of the highest risks of CAD in the world and it is therefore unsurprising that CAD is now the leading cause of death in the Indo-Pakistan subcontinent.[7] Younger patients <40 years of age with an acute coronary syndrome have different clinical characteristics and a different prognosis than older patients.[8] Smoking is a strong and quite common coronary risk factor in the young ACS (Acute Coronary Syndrome) patients who are 40 years or less. Risk factor identification and control is very crucial in the primary and secondary prevention in young patients with CAD.[9] Patients with premature CHD commonly have unheralded acute onset of symptoms, less extensive CHD and better short-term prognosis than the older ones.

Angiographic studies have also shown that the extent of disease and severity is also less in younger population with comparatively fewer number of coronary arteries affected than that of older age groups.[10] In a large series of 823 young patients with CHD, single vessel disease was present in 55–60%. Young patients also have a good long-term outcome after MI.[11] The main culprits in the presentation of involvement of more diseased vessels with increasing age are wall thickening and prominent structural changes involving large elastic arteries. Diabetes, dyslpidemia, high blood pressure, smoking, genetic factors all interrelate with process of aging of vessels and set in motion the formation of atherosclerotic plaque. Experimental studies provided

evidence that atherogenic diet resulting in the same elevation of plasma lipids caused markedly more severe atherosclerotic lesions in older versus younger rabbits.[7]

Very few studies have been conducted in Pakistan regarding the coronary artery disease and angiographic characteristics of young patients of coronary artery disease. More local data is needed for primary as well as secondary prevention of coronary artery disease in young patients of coronary artery disease.[12]

CAD is one of the leading and emerging diseases with special threat to relatively younger age groups in our population. The pattern of CAD involvements are important to know as outcome and management of such involvement is different in different patterns. Only two studies have been done in our population comparing these two groups and there is significant difference between the patterns of CAD in the West and Pakistan. Hence, this study was conducted to compare the pattern of CAD young adults under 40 years and those more than 40 years of age on coronary angiography with significant coronary artery disease.

MATERIAL AND METHODS

This cross-sectional study was conducted in Angiography Laboratory of Punjab Institute of Cardiology, Lahore, from 1st April, 2013 to 1st April, 2014. Sample size of 400 cases was calculated with 95% confidence level, 4% margin of error and taking expected percentage of patients who are less than 40 years of age with Double vessel disease (DVD)35.7% and 25.4% in more than 40 years patients.[8,13] Patients were recruited in by non-probability consecutive sampling technique. Patients of ages >20 years of either gender with history of myocardial infarction were included in study. Patients with previous history of percutaneous coronary intervention, previous history of coronary artery bypass grafting and contraindication for coronary angiography were excluded from the study. Procedure of research was explained to the patients and informed consent was taken. Demographic data and predisposing factors were recorded on a pro forma. Coronary angiography was performed by Senior Registrars and Consultants. A Joint Committee of consultants reported the coronary lesions (stenosis). Single vessel disease (SVD), DVD and triple vessel disease (TVD) was noted down. Both femoral and radial artery access was used for the procedure. Patients were put in supine position. Femoral or radial artery was punctured under aseptic conditions and sheath was passed through which catheters were passed and dye injected into the coronary arteries.

Bias of visual impression of the quantification of lesion was addressed by having reporting of angiography done by the Joint Committee.

Data were entered in SPSS-16. Quantitative variables like age were presented in the form of mean±SD. Qualitative variables like pattern of coronary involvement and risk factors were presented in the form of frequencies, graphs and percentages. Data were stratified for risk factors like smoking, diabetes, hypertension, family history and hyperlipidemia to address confounders. To know significant difference between the CAD pattern in different ages and genders, chi-square test at 5% significance level was used.

RESULTS

Out of total 400, patients of age ≤40 years (Group-A) were 48 (12%) and >40 years (Group-B) were 352 (88%). There were 77% male patients and 22.5% females. Mean age of patients was 52.78±10.02.

Frequencies of smoking, diabetes mellitus, hypertension, family history of IHD and hyperlipidemia were 41%, 39.8%, 53%, 21.8% and 9% respectively (Table-1). Significant CAD was present in 48 (10.75%) patients of Group-A and in 306 (76.5%) patients of Group-B. Frequency of SVD, DVD and TVD in Group-A was 24 (50%), 10 (20.8%) and 9 (18%) respectively while frequency of SVD, DVD and TVD in Group-B was 98 (27%), 88 (25%) and 120 (34%) respectively with *p*-value of 0.002, 0.53 and 0.03 among SVD, DVD and TVD between the two groups (Table-2).

Frequencies of significant involvement of individual coronary arteries like left anterior descending (LAD), left circumflex (LCX), right coronary artery (RCA), ramus intermedius (RI) and left main stem artery (LMS) were 65.5%, 54.2%, 54.5%, 3.2%, 2.0% respectively. Frequencies of LAD, LCX, RCA, RI and LMS in Group-A were 31, 25, 13, 3 and 0 number of patients while in Group-B were 231, 192, 205 and 10 respectively with *p*-value of 0.88, 0.74, 0.001, 0.21 and 0.29 respectively (Table-3).

Table-1: Frequencies of risk factors of IHD

Risk factors		Number. of patients		Total
		Yes	No	
Smoking	Yes	16	148	164
	No	32	204	236
Diabetes	Yes	11	148	159
	No	37	204	241
Hypertension	Yes	17	196	213
	No	31	156	187
Family History	Yes	17	70	87
	No	31	282	313
Hyperlipidaemia	Yes	7	28	35
	No	41	324	365

Table-2: Pattern of coronary artery disease

Pattern of CAD		Number of patients		Total
		Yes	No	
SVD	Yes	24	98	122
	No	24	254	278
DVD	Yes	10	88	98
	No	38	264	302
TVD	Yes	9	120	129
	No	39	232	271

Table-3: Frequencies of involvement of coronary arteries

Stenosed coronary Artery		Number of patients		Total
		Yes	No	
LAD	Yes	31	231	262
	No	17	121	138
LCX	Yes	25	192	217
	No	23	160	183
RCA	Yes	13	205	218
	No	35	147	182
RI	Yes	3	10	13
	No	45	342	387
LMS	Yes	0	8	8
	No	48	344	392

DISCUSSION

Coronary Heart disease (CHD) is a global epidemic which is associated with significant morbidity and mortality. CHD comprises more than half of all cardiovascular events in men and women under age 75.[14] The World Health Organization (WHO) estimates that by 2020 the global number of coronary artery disease (CAD) will rise from 7.1 in 2002 to 11.1 million.[15]

Pakistanis are part of an ethnic group which suffers from the highest prevalence rates of coronary artery disease.[16] One in five middle aged adults in urban Pakistan may have underlying CAD.[17]

In this study we included 400 patients. Out of total 400, patients of age ≤40 years (Group-A) were 48 (12%) and >40 years (Group-B) were 352 (88%). This is in accordance to the results of study done by Shah SS, et al[13] in which the frequencies of age ≤40 years and >40 years were 16% and 84% respectively. There were 77% male patients and 22.5% females with male: female ratio of 1:3.4 which shows clear male preponderance which is same as calculated by Shah SS, et al[13] and was 1:3.5. This was also the same result as study done by Akhtar P, et al[7] in which this ratio was 1:3.9 suggesting that it is predominantly a disease of men. The females represented 22.5% which is much higher percentage as compared to study done in Bangladesh done by Akanda MAK, et al[18] Mean age of patients was 52.78±10.02 which is same as determined by Shah SS, et al[13] and was 51.89±10.63 and also by Akanda MAK, et al[18] which was 50.15±8.80 years but 62±5 in COURAGE trial[19] conducted in USA which means

that in our population CAD occurs at younger age groups as compared to Western countries.

In current study frequencies of smoking, diabetes mellitus, hypertension, family history of IHD and hyperlipidaemia were 41%, 39.8%, 53%, 21.8% and 9% respectively. Significant CAD was present in 48 (10.75%) patients of Group-A and in 306 (76.5%) patients of Group-B. Thus total percentage of significant CAD was 87.25% which is nearly same as determined by Akanda MAK, et al[18] which was 74.4%. Nesligul[20] and Wolfe et al[21], reported prevalence of significant coronary artery lesion to be 3.3% and 14.3% respectively among young patients with CHD. The frequency of SVD, DVD and TVD as a whole was 30%, 24.5% and 32.25% respectively. These results are comparable to study done by Akhtar P, et al[7] in which the frequency was 24.9%, 25.7% and 43.5% and by Shah I, et al[22] in which the frequency was 18%, 26% and 45% respectively. Frequency of SVD, DVD and TVD in Group-A was 24 (50%), 10 (20.8%) and 9 (18%) respectively while frequency of SVD, DVD and TVD in Group-B was 98 (27%), 88 (25%) and 120 (34%) respectively with p-value of 0.002, 0.53 and 0.03 among SVD, DVD and TVD between the two groups. Shah SS, et al[13] studies showed that Group-A has frequencies of SVD, DVD and TVD as 44.4%, 24.4% and 15.6% and in Group-B 25.4%, 30.5% and 39.4% respectively. Siddique MA, et al[8] studies showed that Group-A has frequencies of SVD, DVD and TVD as 42%, 22% and 18% and in Group-B 24%, 24% and 46% respectively.

Frequencies of significant involvement of individual coronary arteries like LAD, LCX, RCA, RI and LMS were 65.5%, 54.2%, 54.5%, 3.2%, 2.0% respectively. Study by Ahmed M, et al[23] shows these frequencies as 63.75%, 45.75% and 52.5% respectively which correlates to our study. Most studies have shown LAD to be the vessel most commonly involved,[21,24–26] in agreement with our study showing the predilection for LAD followed by RCA. The LCx was the least involved artery. Frequencies of LAD, LCX, RCA, RI and LMS in Group-A were 64.5%, 52.7%, 27%, 6.25% and 0 while in Group-B were 65.6%, 54.5%, 58.2%, 2.8% and 2.2% respectively with p-value of 0.88, 0.74, 0.001, 0.21 and 0.29 respectively. These results are comparable to those of Siddique MA, et al[8] which shows the percentages as 36%, 34% and 40% in younger ages and 68%, 56% and 66% respectively. Shaikh MY, et al[27] studies shows LMS involvement of 4.5% which is same as of our study.

CONCLUSION

Although acute coronary syndrome is an uncommon entity in young adults aged 40 years or less, it constitutes an important challenge for both the patient and the treating physician. It has a devastating effect

on the more active life of young patients. These young patients also have a different risk factor profile in comparison with older patients. Smoking is a strong and quite common coronary risk factor in the young ACS patients who are 40 years or less. Risk factor identification and control is very crucial in the primary and secondary prevention in young patients with CAD. We strongly suggest that coronary angiography ought to be mandatory for any young patient sustaining acute coronary event, We found that young (age <40 years) patients who have CAD, have less extensive coronary artery disease, with a high incidence of angiographically normal vessels and relative paucity of left main coronary arterial involvement.

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