GENDER DISTRIBUTION OF CORONARY ARTERY LESIONS IN PATIENTS AGED 50 YEARS AND BELOW

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ABSTRACT

OBJECTIVE:

This study was designed to compare the gender differences in the pattern of coronary artery lesions in young Pakistani population.

Material and Methods:

A series of 120 consecutive patients (60 females/60 males), 50 years or less of age, with significant coronary artery lesions, were analyzed and compared for distribution of significant lesions in coronary arteries at National Institute of Cardiovascular Diseases, (NICVD) Karachi.

RESULTS:

The mean age of female patients was 45 + 5.8 years and male patients 44 + 5.9 years. Single vessel disease (SVD), mid-LAD (left anterior descending artery) lesion and ejection fraction were significantly higher in females. In males, a higher trend for triple vessel disease was observed. In both genders with single vessel disease, the predominant vessel involved was left anterior descending artery. Almost equal incidence of double vessel disease (DVD) was noted in both genders.

INTRODUCTION

Coronary Artery Disease (CAD) is the leading cause of death among women in industrial countries. One in nine women, 45 to 64 years of age, develops symptoms of cardiovascular disease according to the National centre for health statistics. After the age of 65, the proportion increases to one in three women[1].

Despite the obvious predominance of coronary heart disease in middle aged men, cardiovascular diseases including coronary heart disease and cerebrovascular accidents are currently the major causes of death in women. Before menopause, coronary heart disease is infrequent which suggests that female hormone and metabolism offer protection. Without hormone replacement therapy after menopause, women have almost the same incidence of coronary heart disease as men[2]. Recent research has documented a growing understanding of the magnitude of the problem of cardiovascular diseases (CVD) in women[3,1]. Growing awareness of CVD as the leading cause of death in women is associated with preventive action[4-6].

Clinical and natural history studies suggest that CAD is anatomically less severe and may be less amenable to coronary revascularization in women[7]. However the underestimation of CAD severity in women with consequent diagnostic delay contributes to the under-use of coronary revascularization and causes poorer cardiac event free survival rates after myocardial infarction[8,9,11] or Coronary artery bypass graft surgery[19,20,21]. Women with CAD frequently have coronary risk factors[2] and functional limitations [(11)] and they develop disease at more advance age than men do.

A 1987 study reporting that men with positive nuclear exercise tests for myocardial ischemia were 6.3 times more likely to be referred for cardiac catheterization than women[10,13]. This gave rise to concerns that female patients were receiving

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inadequate or inappropriate care[12,14]. Studies show that coronary angiography is performed in 28 to 45% and revascularization 15 to 27% more often in men than women with a diagnosis of CAD[5,11,14]. In past, diagnostic evaluation of CAD in women was hampered because of:

1. Test limitation or premature test termination due to clinical misperception that women have a lower pretest probability for CAD.

2. No validated gender equivalent testing procedures with similar diagnostic accuracy in men and women were available. Gender based discrepancies in the use of diagnostic studies still exist[1,10,14].

Gender differences in treatment outcomes including mortality and recovery time after coronary artery bypass surgery are reported. Benefits of early invasive management strategy in women were noted.[18-19, 22-23]

Large volume of data obtained from coronary arteriography as well as postmortem studies are available describing the distribution of obstructive lesions in the coronary arteries. A few reports from Pakistan describe these lesions in only specific groups of patients.[15-16]

Coronary arteriographic findings in women under age 50 were reported in 1974 Cleveland Clinic, Ohio in which LAD was most frequently involved and RCA was most often totally occluded lesion. A similar study was conducted in Pakistan at National Institute of Cardiovascular Diseases (NICVD), Karachi by Samad et al in 1991 where retrospective analysis of women age 45 years or below, showed similar incidence of LAD involvement as other studies but the Left main involvement was higher in Western women.

With the increasing rise of Ischemic heart disease in perimenopausal women in Pakistan, a cross-sectional study was desirable to see whether there is a significant difference in the distribution of significant coronary artery lesions in female and male coronary heart disease patients.

METHODS

Selection Criteria: Patients of either sex with clinical diagnosis of Ischemic Heart Disease (IHD) and age 50 years or below were considered. Only patients with significant lesions in coronary arteries according to CASS Criteria were selected. Patients with Congenital Heart Disease, Cardiomyopathy, Post CABG Angina, Rheumatic Heart Disease were excluded.

Study Design: One hundred and twenty patients (60 male, 60 female) who met the criteria were selected in consecutive order and studied between January, 1996 and November, 1997. Each patient had detailed physical examination and history. Myocardial perfusion stress and redistribution scintinigraphy with Thallium 201 was recorded in each case. Routine laboratory investigations included hemoglobin, lipid profile, blood sugar, serum potassium and sodium. Fresh ECG and X-Ray Chest were reviewed prior to cardiac catheterization.

Cardiac Catheterization: Selective coronary angiography was performed by seldinger's technique (Right Femoral Artery) under strict aseptic measures, using siemens-Elema, Coroskop-C and L-biplane equipment. Patients were kept with overnight fasting, except diabetics who were allowed to take light breakfast early in the morning. With 6 French size Judkins left and right coronary catheter 3.5 or 4 cm curve and 100 cm length were used.

After selective engagement of coronary ostia, a rapid hand injection of 6-9ml contrast for LCA (Left coronary artery) and 3-6 ml for RCA (Right coronary artery) was given in each projection. Coronary angiograms were performed in multiple views. Left coronary artery was viewed in 4-6 projections: 30o-45o right anterior oblique (RAO), 30o-RAO with 15o caudal angulations, 45o-60o left anterior oblique (LAO) with 15o-20o caudal angulations. Direct anterior posterior and left lateral views were less frequently used. Right coronary artery was viewed in 2-3 projections: 30o RAO, LAO and/or 20o-30o RAO cranial/caudal angulations.

RESULTS

The mean age of female patients was 45.1 + 5.8 years

(Mean + SD), with median age of 42 years (range 19-50 years). In male patients the mean age was 43.6 + 5.9 years, with a median age of 40 years (range 27-50 years). There was no significant difference in the distribution and mean age of male and female patients when tested by student t-test (Table - I). In both genders the prevalence of the disease was most frequent in 45-50 years of age group.

Distribution of the number of vessels involved in either sex is shown in Table II. Single Vessel Disease (SVD) was significantly higher in female patients. There was tendency for higher Triple Vessel Disease (TVD) in males but it was not statistically significant. None of the patients had isolated left main coronary artery disease. Distribution of lesions in coronary arteries in either sex is shown in Table - III. In both genders, the predominant vessel involved was left anterior descending (LAD) artery. In males, no isolated left circumflex (LCx) lesion was noted. There was almost equal incidence of DVD in both sexes. However, combination of (LCx) with LAD was significantly higher in males while the combination of LCx with RCA was significantly higher in females.

Distribution of sites of coronary artery lesions in either sex is shown in Table-IV. Mid-LAD lesions were significantly higher in females compared to males. At other sites the difference was not significant.

Females had significantly higher ejection fraction than male counter-parts as shown in Table - V.

TABLE - I
Gender Distribution of Age

Age	Females	%	Males	%	Total	P-Value
15-26	1	(1.66)	0	(0)	1	-
27-32	0	(0)	2	(3.3)	2	-
33-38	6	(10)	12	(20)	18	N.S.
39-44	13	(21.6)	14	(23.33)	27	N.S.
45-50	40	(66.66)	32	(53.33)	72	N.S.

% = Percentage

TABLE - II
Angiographic Presentation of Coronary Artery Disease
Number of Vessels Involved in Either Sex

Age	Females	%	Males	%	Total	P-Value
SVD	31	(51.66)	21	(35)	52	< 0.05*
DVD	14	(23.33)	16	(26.66)	30	N.S.
TVD	13	(21.66)	20	(33.33)	33	N.S.
ALM	2	(3.33)	3	(4.98)	5	N.S.

SVD = Single Vessel Disease % = Percentage
DVD = Double Vessel Disease
TVD = Triple Vessel Disease
ALM = Associated Left Main Disease
*P <0.05 = Significant

TABLE - III
Distribution of Lesions in Coronary Arteries

No. of Vessel	Females	% of Total	Males	% Total	P-Value
SVD	**31**	**(51.66)**	**21**	**(35)**	**< 0.05***
1. LAD	24	(77.41)	18	(85.71)	N.S.
2. LCx	3	(9.67)	0	(0)	<.03*
3. RCA	24	(12.90)	3	(14.28)	N.S.
DVD	**14**	**(23.33)**	**16**	**(26.66)**	**N.S.**
1. LAD + LCx	3	(21.42)	7	(43.75)	<.01*
2. LAD + RCA	6	(42.85)	9	(43.75)	N.S.
3. RCA + LCx	5	(35.71)	2	(12.50)	<.01*
TVD	**13**	**(21.66)**	**20**	**(33.33)**	**N.S.**

LAD = Left Anterior Descending
LCx = Left Circumflex
RCA = Right Coronary Artery
*P<0.05 = Significant

TABLE - IV
Distribution of SITE of Lesions in Coronary Arteries

	Females	% of	Males	%	P-Value
LAD					
Total	58	(81.60)	62	(88.33)	N.S.
1. Prox	36	(73.46)	43	(81.13)	N.S.
2. Mid	20	(40.81)	12	(22.64)	<.05*
3. Dist.	2	(4.08)	7	(13.20)	N.S.
LCx					
Total	28	(41.66)	31	(50.00)	N.S.
1. Prox	18	(72.00)	25	(83.33)	N.S.
2. Dist.	10	(40.00)	6	(20.00)	N.S.
RCA					
Total	32	(50.00)	36	(56.66)	N.S.
1. Prox.	19	(63.33)	18	(52.66)	N.S.
2. Mid	10	(33.33)	14	(41.17)	N.S.
3. Dist.	3	(10.00)	4	(11.76)	N.S.

LAD = Left Anterior Descending Coronary Artery
RCA = Right Coronary Artery
Cx = Circumflex
Prox = Proximal
Mid = Middle
Dist = Distal
*P <0.05 = Significant

TABLE - V
Angiographic Ejection Fraction

	M ± SD	Maximum	Minimum	Median	P-Value
F (60)	55.25 ± 5.01	80	25	60	<0.05*
M (60)	50.20 ± 5.13	72	30	50	
T (120)	52.72 ± 11.65	80	25	60	

F = Female M = Mean
M = Male SD = Standard Deviation
*P<0.05 = Significant

DISCUSSION

Few studies have examined gender differences in the pattern of coronary artery lesions. This cross-sectional study was conducted to analyze coronary angiographic findings in young Pakistani females with significant coronary artery lesions and compared with age match Pakistani males.

Comparative angiographic studies in Cleveland Clinic, Samad et al and ours are shown in tables VI and VII.

Single Vessel Disease (SVD) is more common in both genders in all studies. Single vessel disease (SVD) in females is more prevalent in our study as compared to males which is the same as Cleveland Clinic. However, in Samad et al study, male patients had greater prevalence for single vessel disease. Similarly left main in females in our study was similar to Cleveland Clinic, but, no left main disease patient was observed in young age group by Samad et al.

Among single vessel disease, left anterior descending (LAD) lesion was the most common in all studies followed by right coronary artery and left circumflex. In double vessel disease LAD+RCA was most common in Cleveland series as well as in present study. LAD+LCx was more prevalent in Cleveland Clinic followed by RCA+RCx, while this order was reverse in our study.

The frequency of individual vessel involvement in females 50 years and below is only comparable with studies of Cleveland Clinic. In Samad et al study, younger and very small number of male patients were studied.

In the study of C. Charles Welch et al the youngest female age group with coronary artery disease was observed between 25-29 years and maximum number of female patients were in 45-49 years range.

In the study of Samad et al the mean age of females was 50.67 + 9.08 years (range 30-75 years). There were 25 (21.7%) patients in less than 45 years group with mean age 38.94 + 3.87 years (range 30-44 years) and in second group there were 90 (78.3%) patients with a mean age of 54.12 years (range 45-75 years).

In another study of Samad et al, 20.4% patients were 40 years of age or below with a mean age of 35.1 + 5.05 years while 79.6% patients were above the age of 40 years with a mean age of 53.09 + 7.5 years. Females were 11% and males were 89%. Only 2.6% females were 40 years or below and all others were above 40 years of age. As expected; in our study more frequent patients were found in older age group in either sexes which is similar to results of C. Charles Welch et al and Samad et al. None of the

TABLE - VI
Comparison of No. of Vessels Involved in Different Studies

	Samad et al PJC, 1992 ≤ 40 years		Cleveland Clinic ≤ 50 years	Present Study ≤ 50 years	
	Females	Males	Females	Females	Males
SVD	7 (27%)	51 (40%)	91 (43%)	51.66%	21 (35%)
DVD	--	46 (33%)	63 (28%)	14 (23.66%)	16 (26.66%)
TVD	3 (11.5%)	31 (22%)	57 (25%)	13 (21.66%)	20 (33.33%)
ALM	--	07 (05%)	14 (4%)	2 (3.33%)	3 (4.98%)

SVD = Single Vessel
DVD = Double Vessel Disease
TVD = Triple Vessel Disease
ALM = Associated Left Main Disease

TABLE - VII
Comparison of Distribution of Lesions in Coronary Arteries in Different Studies

	Present Study in Females < 50 years	Cleveland Clinic < 50 years Females	Samad et al 1992
SVD	31 (52%)	91 (43%)	
LAD	24 (77.41%)	60 (66%)	67 (41.10%)
LCx	3 (9.67%)	10 (11%)	48 (29.31%)
RCA	4 (12.90%)	21 (23%)	48 (27.31%)
DVD	14 (23%)	63 (28%)	
LAD+LCx	3 (21.42%)	17 (7.2%)	
LAD+RCA	6 (42.85%)	30 (12.7%)	
RCA+LCx	5 (35.71%)	16 (6.8%)	
TVD			
LAD+RCA+LCx	13 (21.66%)	57 (25%)	

SVD = Single Vessel Disease
DVD = Double Vessel Disease
TVD = Triple Vessel Disease
RCA = Right Coronary Artery
LCx = Left Circumflex
LAD = Left Anterior Descending

studies compared similar number of age matched patients in both genders.

CONCLUSION

In Conclusion, present study showed a clear gender difference in the pattern of coronary lesions. Female patients had less severe coronary disease and better ventricular function in the study sample. The limitations of this study are that the findings were not adjusted for multiple statistical testing. Therefore, some of the findings may be due to chance. Due to small sample volume, no race, ethnic and sub-population analysis was possible. Results may not apply equally to all population. Future studies should be conducted with larger sample volume and multi-factorial risk factors correlation study. This will help in establishing/explaining gender differences and risk stratification of the sub-groups in this age group.

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