

RECENT PATTERN OF CORONARY ARTERY DISEASE AND ITS RISK FACTORS: COMPARISON IN GENDER AND AGE GROUPS

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ABSTRACT

Objectives: To determine the various pattern and risk factors of coronary artery disease and to find their association in age groups (young and old) and gender.

Materials and Methods: This cross-sectional study was conducted in a tertiary care hospital, in Peshawar from April to Sep 2021. Patients being 20-45 years of age are considered young and 46-85 years as old age group. Total 153 coronary artery disease patients with history of recent myocardial infarction were included, whereas with history of PCI/CABG, congenital coronary artery disease, and contraindications for angiography were excluded. All the data collected after angiography via questionnaire and analyzed on SPSS version 23.

Results: The mean age of 153 coronary artery disease patients was 58.59 ± 9.68 years. Patients were more in old age group. Coronary artery disease risk factors seen more in old aged and males but significant association ($p < 0.05$) found between hypertension and old aged group, and also males coronary artery disease patients are highly likely to be smoker and have family history. On angiography Left anterior descending artery disease was found in majority 123 (80.3%) and triple vessel disease was found more in old aged group and males but no association ($p > 0.05$) found between various pattern of CAD with either age groups and gender.

Conclusion: CAD with its various pattern and risk factors are commonly found in old age and males, also a non-ignorant concern in young age and females.

Key words: Coronary artery disease, coronary angiography, MI, risk factors

INTRODUCTION

Coronary artery disease (CAD) develops due to the formation of atherosclerotic plaque in the intimal walls of the coronary arteries, gradually narrowed by the atherosclerotic plaque and results in decreased myocardial blood supply leading to angina, heart attack and sudden cardiac death¹. CAD risks factors like dyslipidemia, diabetes, high BP, smoking, and others have a major role in atherosclerotic plaque

formation².

Coronary artery disease is a lethal problem among cardiovascular system (CVS) diseases, cause greater than 4.5 million deaths worldwide in developing countries, and three out of four global deaths occurs due to coronary heart disease (CHD) in the low and middle-level income countries³. Pakistan is at the highest risk of developing CAD and more 30% of people age greater than 45 years affected by the disease, also CAD is rising in Khyber-Pakhtunkhwa due to lack of control on risk factors, lack of health education, and deficiencies in health facilities⁴ and still study of concern in young aged people.

Atherosclerotic plaque is a mixture of cellular

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debris, inflammatory cells, calcium (Ca), cholesterol crystals and smooth muscles, the cap of the plaque weakens with time, ruptures resultant in thrombus formation and occlusion of coronary arteries⁵. This atheromatous occluded plaque results in acute myocardial infarction (AMI) and within four hours after AMI symptoms, angiography shows complete coronary artery occlusion in 84% patients⁶.

Framingham heart study in 1957 first studied, published and presented the association of CAD with modifiable risk factors like cigarette smoking and presented that the risk of CAD, myocardial infarction (MI), and sudden cardiac death are more in cigarettes smokers, and risk of these increases in proportion to the number of cigarettes smoked every day⁷. CAD morbidity and mortality risk decreases by limiting smoking immediately and it takes more than 20 years to reverse all the associated risk by complete smoking cessation⁸.

Diabetes mellitus is linked with a greater risk of death due to cardiovascular problems and is associated with an increase in the number of CAD patients, hyperglycemia mediated glycation end products (AGE) and reactive oxygen species (ROS) have role in building CAD but the association of CAD and glucose homeostasis is still center of basic research concern⁹. Dyslipidemia (hypercholesterolemia, hypertriglyceridemia, high LDL, low HDL cholesterol and triglycerides) increases the plaque formation inside coronary arteries, may lead to MI¹⁰.

Persistent increased blood pressure (hypertension) may damage intima of arteries making risk of development of atherosclerosis, and is directly proportional to CAD in younger/middle-aged people and above 60 years age¹¹. Study shows that about 4 million people die every year due to obesity and overweight, also weight reduction and maintenance of normal body weight in obese patients alters and improves CAD morbidity and mortality¹².

The concept in our community due to various social and cultural beliefs are, that the different CAD risk factors has no such deleterious effect on health, also many believes that CAD only happens in people having much older age, and young aged people are considered highly safe¹². The rationale the study is to educate, motivate community to timely control the CAD risk factors, CAD progression and prevention in both gender and various age groups by factually

determining the pattern of CAD and its risk factors in different age groups focusing on young and old aged groups.

MATERIALS AND METHODS

This cross-sectional study was conducted in tertiary health care, Northwest General Hospital and Research Center, Peshawar from April to Sep 2021. At 95% confidence interval, 5% margin of error, and using 11.2%¹³ of CAD in Peshawar, Khyber-Pakhtunkhwa, Pakistan, 153 sample size was calculated using WHO calculator according to study design. Patients been 20-45 years age considered as young aged and 46-85 years as old aged group. Patients were selected by consecutive sampling, and having age >20 years old, irrespective of genders (male/female) with a history of myocardial infarction (MI) were included in the current study, while patients having age <20 years, previous history of percutaneous coronary intervention (PCI), congenital coronary heart diseases, coronary artery bypass grafting history, and patients not suitable for coronary angiography were excluded from the current study. Approval for conducting the study was obtained from the concerned ethical committee and prior informed consent was the first step before data collection and volunteer CAD patients were selected after coronary angiography.

Data regarding this study were collected after conventional coronary angiography via a self-administered questionnaire by including all the research variables. Angiography was performed through various approaches like radial and femoral by using suitable diagnostic catheters in line with local setup protocol and reported by two cardiology experienced expert (Cardiologist) in the catheterization lab in Department of Cardiology, Northwest General Hospital and Research Center, Peshawar. The stenosis severity was defined as comparing the maximum stenosis percentage and normal coronary artery segment, i.e. minimum diameter of diseased segment and the diameter of an adjacent normal coronary segment in a single projection, which was as perpendicular as possible to the axis of the radiographic beam, and reported single vessel disease if one coronary artery involved, double vessel disease if two vessel involved and triple vessel disease if three coronary vessel involved, also significant lesions considered as >50% coronary artery diameter reduction¹⁴.

Obtained data was entered and analyzed on SPSS

version 23 using descriptive and inferential statistical tools for variables like age, gender, diseased coronary artery, pattern of coronary vessel disease ad risk factors. Mean and standard deviation calculated for continuous variables, frequency tables and graphs used for gender and categorical variables. Moreover to find any association between variables chi-sqaure test used and p-value of <0.05 considered as statistically significant association.

RESULT

Out of total 153 CAD patients, 107 (69.9%) were male and 46 (30.1%) were females. Participated minimum and maximum age was 35 and 85 years respectively, and the mean age was 58.59 ± 9.68 years. Age was further divided into six groups having different numbers of subjects, i.e. 26-35 years group having 1 (0.6%) participants, 8 (5.2%) in group 36-45 years, 58 (37.9%) in 46-55 years, 59 (38.5%) in 56-65 years, 17 (11.1%) in 66-75 years, and 10 (6.5%) in 76-85 years age group respectively. Only 9 (5.8%) had ≤45 years age and remaining 144 (94.1%) subjects had ≥46 years age. Most common CAD risk factors were hypertension 101 (66.0%) and dyslipidemia 72 (47.0%) (Table 1).

Among various CAD risk factors in the both age groups (young/old) and gender (male/female), family history was found in majority of young (5) and hypertension in majority of old (99) age group. Among gender hypertension was more in both male and female (70/31). Significant association (p <0.05)

Table 1: Coronary artery disease major risk factors among research participants (n=153)

Risk factors	Yes	No
Smoker	44 (28.7 %)	109 (71.2 %)
Diabetic	69 (45.0 %)	84 (54.9 %)
Dyslipidemia	72 (47.0 %)	81 (52.9 %)
Family History	51 (33.3 %)	102 (66.6 %)
Hypertension	101 (66.0 %)	52 (33.9 %)
Obesity	52 (33.9 %)	101 (66.0 %)

Table 3: Diseased coronary artery (n=153)

Diseased coronary artery	Yes	No
Left main stem	21 (13.7%)	132 (86.2%)
Left anterior descending artery	123 (80.3%)	30 (19.6%)
Left circumflex artery	97 (63.3%)	56 (36.6%)
Right coronary artery	109 (71.2%)	44 (28.7%)

found between hypertension and old aged group, and among gender significant association (p <0.05) found between male with smoking and family history (Table 2).

Left anterior descending (LAD) coronary artery in 123 (80.3%) was the most common involved vessel having disease (Table 3). Among all the CAD patients significant CAD was found in 125 (81.7%) and in 28 (18.3%) patients CAD observed as non-significant (Fig 1).

Pattern of coronary artery disease were found as: single vessel disease (SVD) 30 (19.6%), double vessel disease (DVD) 52 (33.9%), and triple vessel disease (TVD) in 71 (46.4%) patients respectively. Among the various pattern of CAD in age groups (young vs old) and in gender (male vs female), Triple vessel disease was found in majority of both but no significant association (p >0.05) found between pattern of coronary artery disease with either age groups or gender (Table 4).

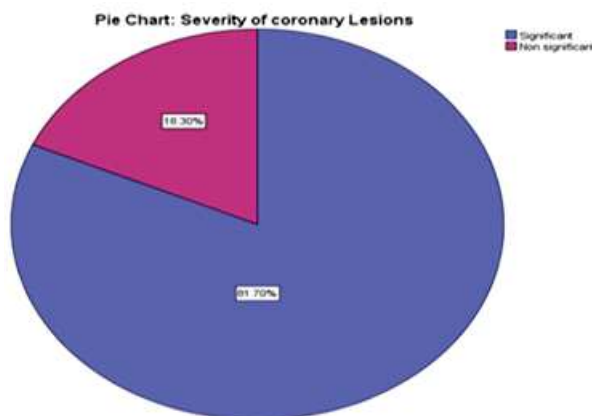


Fig 1: Pie chart showing percentage of significant and non-significant coronary artery lesions

Table 4: Comparision of Pattern of coronary artery disease in Age groups (young/old) and Gender (n=153)

Age groups	Single vessel disease		Double ves-sel disease		Triple vessel disease	
	Yes	No	Yes	No	Yes	No
21-45	3	6	1	8	5	4
46-85	27	117	51	93	66	78
p value	0.380		0.168		0.734	
Gender						
Male	21	86	34	73	52	55
Female	9	37	18	28	19	27
p value	0.993		0.378		0.407	

DISCUSSION

In this study 107 (69.9%) were male and 46 (30.0%) were female, the gender distribution here is nearly same to study of Khan HU et al¹⁵ in which 77% were male and 22.5% were females respectively.

Patients of age ≤ 45 years (young) were 9 (5.8%) in numbers and >46 years (old) were 144 (94.1%) in this study, these are close to the findings of the study done by Khan HU et al¹⁵ that shows 12% young and 88% old respectively, the minor difference may be due to age groups because in that study they considered CAD patients below and above 40 years age. Another study by Shah SS et al¹⁶ shows nearly the same findings mentioned above. Mean age in this study was 58.59 ± 9.68 , is little higher as compared to another study done by Mak A et al¹⁷ in Bangladesh, in that the mean age of patients was 52.78 ± 10.02 and also higher than from Shah SS et al¹⁶ (51.89 ± 10.63), these little differences here may be due to the difference in selection criteria of age groups, i.e. in this study 20-85 years aged CAD patients were selected.

A study done in Iran having 3000 research participant, some close to the findings of this study that shows prevalence of CAD risk factors as, diabetic in 6.3% participants, smoker 21.6%, positive family history and 15% dyslipidemia. i.e. total cholesterol level >200 mg/dL in 61%, triglyceride >200 mg/dl in 32%, LDL-C >130 mg/dl in 47.5%, systolic BP >140 mmHg in 13.7%, diastolic BP >90 mmHg in 9.1% and physically inactivity in 87% research participants respectively shown in a study by Hatmi ZN et al¹⁸ The frequencies of some of the risk factors were nearly close to the findings of Khan HU et al¹⁵ in which the frequencies of hypertension, DM, smoking, hyperlipidemia and family history of IHD were 39.8%, 41%, 53%, 9%, and 21.8% respectively.

Another study determined the prevalence of controllable CVD risk factor in 321 men of age <60 years with premature CHD, only 3% had no risk factors and CAD patients were distributed into age groups (40 to 49 and 50 to 59) years, no significant differences were observed in the prevalence of risk factors between the young and older patients and the prevalence of cigarette smoking was (67 vs 26%, $p < 0.001$), diabetes mellitus (12 vs 1.1%, $p < 0.001$), systemic hypertension (41 vs 19%, $p < 0.001$), HDL cholesterol <35 mg/dl (63 vs 19%, $p < 0.001$), and the prevalence of LDL cholesterol <160 mg/dl was 26%¹⁹.

Significant CAD in this study was found in 125 (81.7%) patients which is nearly similar to the findings of another study 87.25%¹⁵, and also comparable with little difference with findings of Cook DG et al²⁰ of 74.4%, that also shows the prevalence of significant coronary artery lesion in 14.3% among young CHD patients, this difference may be due to the only young age group population in that study.

The frequency of SVD, DVD, and TVD in this study was 30 (19.6%), 52 (33.9%), 71 (46.4%) respectively, these findings were close to findings of another study where the frequencies shows 24.9%, 25.7% and 43.5%²¹ but comparable with Khan HU et al¹⁵ that shows 30%, 24.5%, and 32.25% respectively. These findings are also comparable with the study done by Akhatr P et al²¹ results of 24.9%, 25.7%, and 43.5% and also comparable to Shah SS et al¹⁶ that shows 18%, 26% and 45% frequencies of SVD, DVD, and TVD respectively.

Frequencies of individual coronary arteries having a significant disease like LMS, LAD, LCX, and RCA were found in 21 (13.7%), 123 (80.3%), 97 (63.3%), 109 (71.2%) in this study, these findings are comparable to study done by Khan HU et al¹⁵ in

Table 2: Comparison of risk factors in young age groups and gender (n=153)

Age Groups	Smokers		Diabetes		Dyslipidemia		Family History		Hypertension		Obesity	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
21-45 Years	3	6	3	6	4	5	5	4	2	7	3	6
46-85 Years	41	103	66	78	68	76	46	98	99	45	49	95
p value	0.717		0.514		1.00		0.161		0.008		1.00	
Gender												
Male	43	64	43	64	54	53	29	78	70	37	35	72
Female	1	45	26	20	18	28	22	24	31	15	17	29
p value	0.000		0.063		0.198		0.013		0.813		0.611	

which 2.0%, 65.5%, 54.2% and 54.5% significant CAD was found in LMS, LAD, LCX and RCA respectively, the study by Ahmed M et al²² which shows these frequencies as: 63.75%, 45.75%, and 52.5% respectively which correlates to our study as well, another study shows frequency of LAD, LCX and RCA disease 68.3%, 40.3%, 49.6% respectively but little differ with this study that may be due to only Non-STEMI patients²³.

According to Akhtar P et al²¹ analysis of total 490 CAD patients data shows 122 (24.9%) CAD patients were with SVD, 126 patients (25.71%) with DVD, 213 (43.47%) TVD patients, same with this study TVD was more in the research participants. Among 390 males, 106 (27.2%) were with SVD, 96 (24.6%) DVD, 164 (42.1%) with TVD, and 24 (6.2%) identified with LMS or other vessel diseases, and Out of 100 females, 16 (16.0%) were identified with SVD, 30 (30.0%) with DVD, 49 (49.0%) with TVD, and 5 (5.0%) identified with LMS or other vessel disease, also male patients were more with repetitive vessels diseases²¹, as similar to the findings of this study.

CAD is a preventable disease up to a certain limit that depends on a reduction in exposure of risk factors, like smoking cessation, reducing cholesterol-related foods, regular exercise and others. Beside risk factors prevention secondary prevention including medical management, a semi-invasive procedure like PCI, and also CABG reduces cardiac events, cardiac mortality and improves life quality. High BP and dyslipidemia should be treated properly and diabetic patients are required to maintain glucose control. PCI should be done for a patient having evidence of CAD seen on angiography and surgical bypass grafting is necessary for patients where PCI is not useful or contraindicated^{24,25}.

CONCLUSION

Coronary artery disease is prevalent in both gender and age groups with various pattern. We found left anterior descending artery involvement and triple vessel disease more both in male/female and young/old aged groups. CAD risk factors were found more in old aged and male patients, nevertheless CAD risk factors also found in young aged and female patients. Nowadays myocardial infarction (Heart attack) seen increasing in young aged individuals, it is suggested mandatory to do angiography whenever any coronary event experienced for both gender and all age groups.

Last not the least CAD is also a non-ignorant concern in female and young aged people.

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